

Improving Bicycle and Pedestrian
Accessibility across the DeKalb Ave Corridor:
A GIS Analysis

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Abstract:

Over the course of the mid-twentieth century, the American people rapidly adopted complete automobility as a lifestyle. While this newfound mobility resulted in the post-war economic boom and widespread urbanization, many researchers have since identified several negative externalities associated with this automobile-based existence. During the time that vehicle miles traveled (VMT) have risen, rates of active transportation (ex: biking or walking) have gradually declined; this can be identified as one factor that contributes to the increasingly sedentary lifestyles that are partially responsible for the obesity epidemic. Moreover, widespread automobility has been correlated with higher emission rates and more incidents of traffic fatalities. Due to this, it has been imperative for planners to focus on providing adequate alternatives to driving, such as promoting active transportation modes. One method to do this is by bolstering accessibility through infrastructural improvements.

Due to Atlanta's growth primarily during the post-war suburban boom, the transportation of this region is especially dependent on automobiles. As such, improvements the bicycle and pedestrian accessibility must be carried out throughout the region. An area ripe for such improvements is the corridor along DeKalb Ave, which is severely limited in north-south accessibility due to the fragmentary nature of the railroad and rail yard located there. This rail infrastructure acts as a barrier, restricting movement across the corridor to a set of choke points, most of which are deficient in adequate infrastructure. The accessibility problem here is twofold: 1) there is a lack of north-south connectivity, impeding route selection, and 2) there is insufficient bike/ped infrastructure where the connections do exist. As such, active transportation accessibility across the corridor is significantly limited.

In order to recommend improvements for the corridor, a GIS analysis of the area's street network and active transportation facilities is first conducted. Based on this analysis, an inventory of infrastructure is developed, which is then used to generate a metric that will gauge overall accessibility. Once this has been accomplished, these results are scrutinized in order to identify key areas lacking in sufficient accessibility. A series of recommended actions are then proposed that target these areas, falling into three general phases of increasing intensity: 1) accommodating bicycle and pedestrian accessibility on existing infrastructure, 2) adding a new dedicated bicycle and pedestrian connection, and 3) wholesale redevelopment of the corridor, including CSX's Hulsey Yard. Finally, the merits and obstacles for implementation of each phase are discussed.

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1. INTRODUCTION

1.1 Problem

As the “dominant form giver and functional connector of urban places,” transportation systems play a key role in shaping cities, which, in effect, contributes directly to human behavioral patterns (Dobbins, 2009). While modern urban form is nearly indistinguishable from that of pre-industrial cities, its function remains more or less the same: it provides a centralized location for people to live and make their livelihoods. Since time immemorial, one of the foremost facets of people’s urban experience has been how to travel from one’s place of residence to one’s workplace. Although this fact of existence has remained constant throughout human history, the transportation milieu that defines this process has certainly evolved dramatically through modernization; as such, the form of cities has recently become radically different (Dobbins, 2009).

Prior to the age of industrialization, the most prominent type of intra-city movement was through one’s own efforts: by walking. Cities were therefore limited in scope by the maximum range one could feasibly walk in a day, and urban places assumed a compact, accessible form throughout much of their history. As technological advances during the industrial age allowed for more centralized manufacturing processes, regions rapidly urbanized and cities grew significantly in both extent and intensity. In order to accommodate this unprecedented growth, new methods of intra-urban mobility, such as the streetcar, emerged through the aforementioned industrial processes as necessary components of urban transportation networks. While this shift allowed for cities to sprawl across the landscape in a never before seen fashion, their fundamental form remained constant, though to a significantly heightened degree. Streetcars allowed for longer distances to be traversed, but development was still limited to areas adjacent to their course; as such, an accessible, compact urban framework was retained in industrial cities, albeit it occurred around transit stops. It was not until the post-war suburban boom in the U.S that a real paradigm shift occurred in regard to the relationship between transportation and urban form, when the automobile emerged as the primary mode of intra-urban transportation (Jackson, 1985).

The advent of widespread automobility changed the landscape of cities dramatically, allowing for the emergence of the dendritic, disconnected street networks and single use districts characteristic of modern suburban sprawl. In essence, movement through cities was no longer limited by access, whether directly to and from destinations or to statically located

transit stops, which prompted the advent of transportation networks defined foremost by mobility. While access is defined as the human-based interface directly relating destinations and origins, sidewalks, doors, and the like, mobility is the movement of through traffic through transportation systems with neither destination nor origin in mind (Steiner and Butler, 2007). With the proliferation of the automobile in contemporary U.S. cities, access points have become virtually infinite between possible origins and destinations, contingent only on the availability of adequate parking infrastructure. Due to the occurrence of this phenomenon, modern transportation planning practices limits the provision of accessibility solely to the trip from the parking space to the final destination, while hierarchal street networks are designed entirely with a motivation to move traffic through areas and reduce congestion (Dobbins, 2009).

This paradigm basically disregards all accessibility outside of parking infrastructure while simultaneously designing streets to maximize mobility; due to this, contemporary urban form is no longer restrained by concerns of access, leading in part to the low-density, single use built environment connected through only a hierarchal system of streets characteristic of modern America. These patterns of transportation and land use mutually reinforce each other, forcing a primary of automobility over all other modes. While the widespread mobility that automobiles afford has partially removed the restraints of geography from contemporary existence—which is perceived as an avenue towards “freedom” or the “American Dream”—it has, through its effects on urban form, conversely become a crutch on which people depend entirely to navigate their environments (Jackson, 1985). This widespread dependence on automobility contributes to a host of unforeseen negative externalities, many of which have been researched in depth.

Automobile dependency is associated with several environmental, economic, and health-based issues, all of which can be overcome through better planning efforts. On the subject of the environment, automobile-based transportation is a key contributor to point-based pollution, generated through the operation of the internal combustion engine. While this has the capacity to negatively affect the natural ecosystems proximate to cities as well as the pulmonary health of its residents, the exploitation of the fossil fuels needed to operate such machinery contributes to several indirect environmental consequences, including acute events such as devastating oil spills. This reliance on oil brings up concerns of economic sustainability as well; due to the limited nature of this resource as well as its political

considerations, a transportation/land use paradigm formed entirely around its temporary ease of availability is eventually doomed for obsolescence. While these issues of automobility associated with fossil fuel use are being addressed through research to develop alternative fuel sources, there are questions as to whether these new conditions would allow for this transportation system to retain its contemporary scope due to considerations over energy storage.

Furthermore, there are several consequences associated with automobility that do not at all pertain to its energy source, including more intangible societal issues. Along with the air pollution generated through combustion, the decline of active transportation modes in favor of automobile-based transportation has contributed to another health issue: a lack of incidental physical activity, an occurrence that can be directly correlated to the emergent modern obesity epidemic. Finally, the automobile's dominance of city streets has supplanted any other activity from occurring within its right of way, which was historically the primary public space in the U.S. Without an adequate public realm, Americans have become more insular in their social life, a fact that some point to in discussions over a perceived decline in civic and community activity (Jackson, 1985). All of these negative externalities associated with automobile dependent lifestyles and the urban places built around them have gradually come into light in recent decades, prompting planning practices towards a trajectory designed towards overcoming these concerns. Many of these efforts are focused on improving accessibility between areas, which is seen as a culmination of connectivity, the provision of adequate infrastructure, as well as a fine-grained mix of destinations.

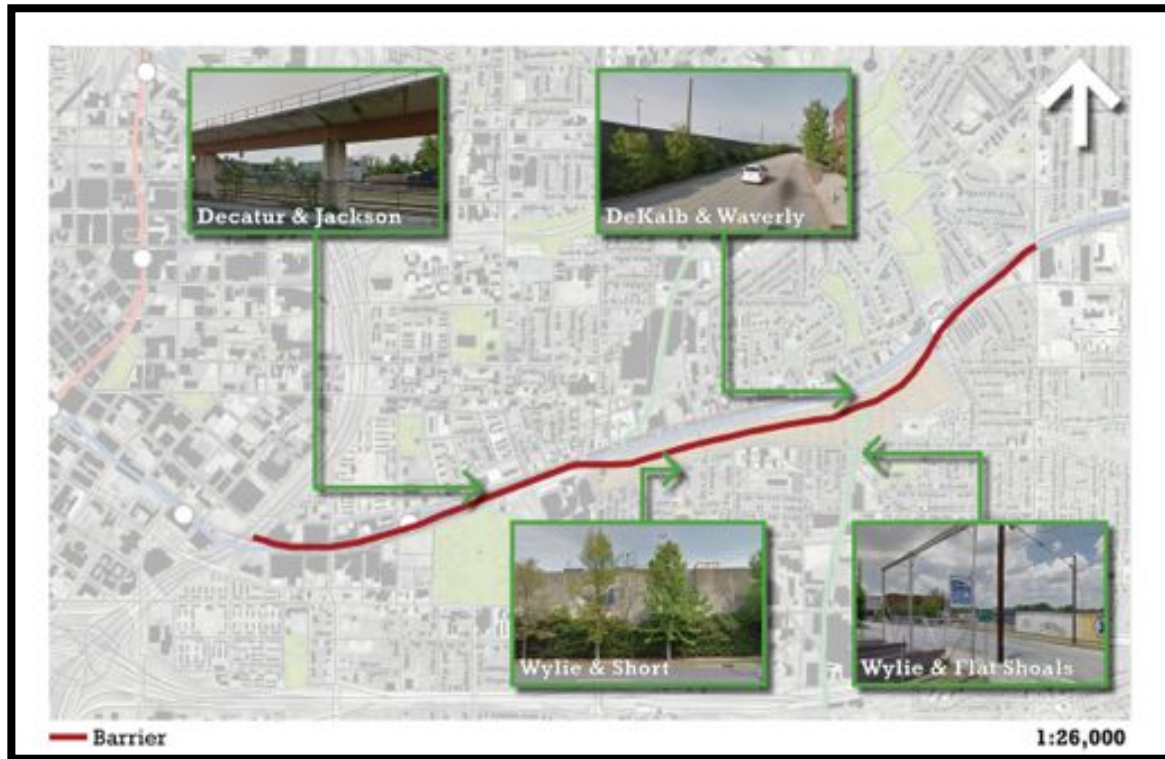
1.2 Study Area

The neighborhoods directly to the east of Downtown Atlanta have long been separated by the transportation corridor along DeKalb Avenue. Neighborhoods on the north side of DeKalb Avenue, such as Inman Park and Old Fourth Ward are barricaded from those to the south, such as Cabbagetown and Reynoldstown by a plethora of transportation infrastructure, including the MARTA heavy rail, CSX mainline, and the multimodal freight facility at Hulsey Yard; as such, access across the corridor is significantly limited, especially for those utilizing active modes of transportation, such as walking or bicycling. An overview of this area is illustrated in **map 1.1**.



Map 1.1: Overview of the eastern neighborhoods of central Atlanta.

The reasons behind these disconnects are rooted in historic precedent, dating back to the very founding of the city. Since the railroad corridor is the foremost reason for Atlanta's existence—there was no settlement in the area before the establishment of the Western & Atlantic railroad—its right of way cut through the area long before any development was initiated in the area. With no central planning authority in place to direct Atlanta's early growth, the neighborhoods along this corridor were subdivided independently; as a result, street networks do not align from neighborhood to neighborhood, especially from north to south. The subdivision of wealthier areas, such as Inman Park, was explicitly carried out to attain inaccessibility from the outside, as it was seen as undesirable to be associated with the working class, manufacturing-based communities of Reynoldstown and Cabbagetown to the south. Due to these processes, the underlying, mostly static, framework of the streets discourage north/south access by an overarching lack of connectivity. When considering the extent of the barriers erected throughout time along this corridor (**map 1.2**) following this initial subdivision, the picture of accessibility in the area becomes even more cluttered.



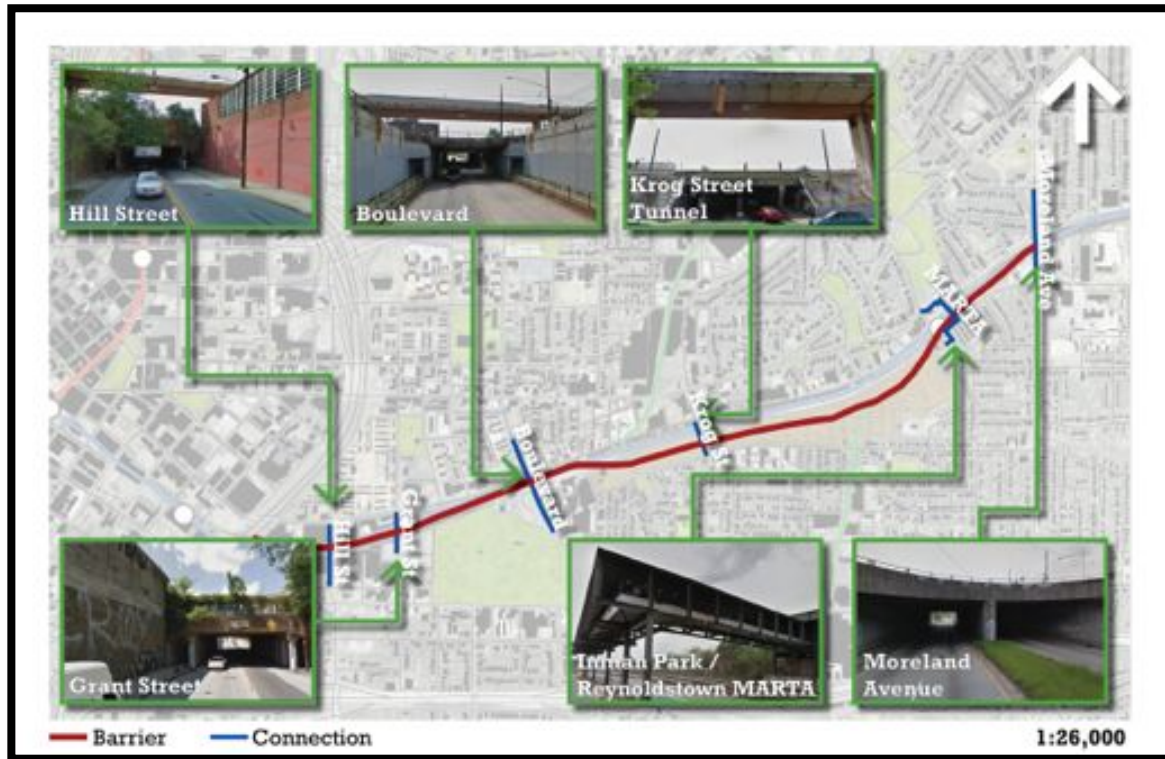
Map 1.2: Examples of barriers formed by transportation infrastructure throughout the DeKalb Avenue corridor.

Along with non-aligning street grids, various transportation infrastructure impedes movement across the corridor, with their mass acting as fortified barriers. There are three distinct entities that obstruct north/south movement, including:

1. **Elevated MARTA Heavy Rail**
2. **Hulsey Railyard**
3. **Elevated CSX Mainline**

The MARTA heavy rail line is elevated above the corridor, blocking site lines with its large footprint. In addition, the Hulsey Railyard, which spans for nearly a mile from the Inman Park/Reynoldstown MARTA station to Boulevard, is walled from the surrounding city by large concrete barriers in some portions and aluminum panels in others. Finally, the CSX mainline is separated from DeKalb Avenue through similar means. Due to these barriers, much of the

southern extent of DeKalb and the northern side of Wylie are characterized by impenetrable boundaries, further segregating Inman Park from Cabbagetown and Reynoldstown. While there are currently means to cross this corridor, shown in **map 1.3**, they are both few in number and unviable for pedestrian or bicycle locomotion.

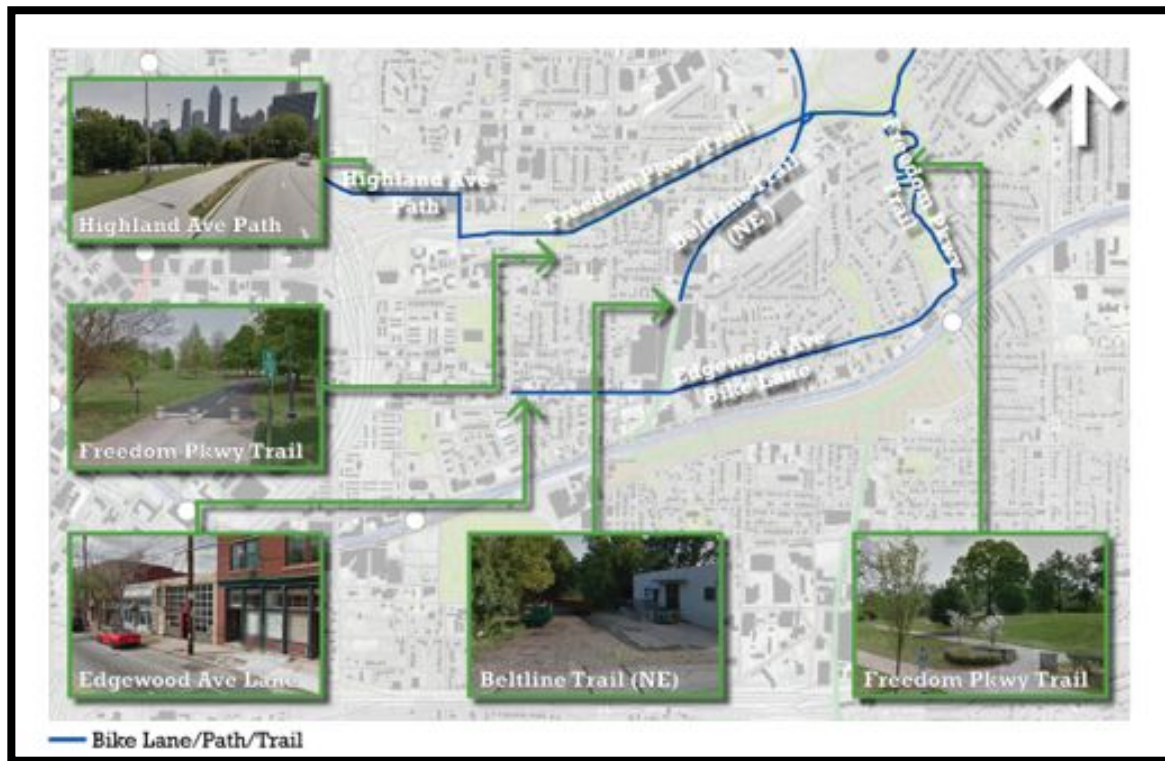


Map 1.3: Examples of connections above and under the DeKalb railroad corridor.

Over the DeKalb Avenue corridor's two mile span from the downtown connector on the west to Moreland Avenue on the east, there are only six connections from north to south, each of which negotiates the barriers through indirect means. Five out of six of these connections cross underneath the transportation corridor, while the above-ground connection at the Inman Park/Reynoldstown station offers a circuitous means to traverse the myriad barriers. While the conditions of these connections are inadequate for active modes of transportation—dim lighting, narrow sidewalks, and a lack of separation from traffic define many of the underground routes—there are also too few of them. The gaps between the north/south connections, especially the nearly $\frac{3}{4}$ mile gap between Krog Street and the MARTA station, are a symptom of the early disconnected subdivision patterns. While not directly emblematic of the subdivision limitations,

another factor that affects accessibility across the corridor is the distribution of infrastructure designed to accommodate bicycle and pedestrian circulation.

Although most streets across the corridor have some accommodation for pedestrian mobility in the form of sidewalks, many of these are purely symbolic gestures in an age of excessive automobility. Major arterial streets such as Memorial Ave and Moreland Ave have token infrastructure devoted to pedestrian movement, though it is most often composed of an 8-foot wide concrete slab not at all separated from the high-speed motorways. Connectivity for these accommodations are especially lacking adjacent to the rail corridor, where steep grade changes force pedestrians into indirect travel patterns. Bicyclists face similar issues, though compounded by the fact that the high design speeds of the major arterials sway all but the most intrepid cyclists towards alternate routes. Nevertheless, there have been efforts to improve the provision of pedestrian and bicycle-friendly infrastructure, summarized in **map 1.4**.



Map 1.4: Overview of the dedicated bicycle and pedestrian infrastructure of the eastern neighborhoods of central Atlanta.

The state of pedestrian/cyclist accommodation throughout the corridor includes three major classes of infrastructure, including:

1. **Pedestrian/Bike Trails:** Two lane multimodal routes separated from existing rights of way, usually located through parks. Includes the Freedom Parkway trail system and the newly completed BeltLine Trail
2. **Pedestrian/Bike Paths:** Two lane multimodal routes separated from auto lanes, but included as part of an existing right of way. Includes the Highland Avenue path, which connects the Freedom Parkway Trail to Downtown Atlanta.
3. **Bike Lanes:** Lanes dedicated solely to bicycle movement, but located adjacent to multipurpose travel lanes. Includes the Edgewood Avenue bike lane, which connects Inman Park and the Old Fourth Ward.

Since the character of infrastructure already in place encourages or discourages bike and pedestrian, it is important to consider both the quality as well as the spatial distribution of these facilities. Aside from the connection at the Inman Park/Reynoldstown MARTA station, there is currently no infrastructure dedicated to both bicycle and pedestrian modes that cross the railroad corridor, which significantly hampers mobility. Where connections do exist, they remain unviable for non-automobile modes, so considerations to improve the state of this infrastructure are an integral part of this analysis.

1.3 Overview

Due to these factors, accessibility across the corridor today is highly limited, a fact which significantly affects pedestrian and bicycle circulation throughout the area. In addition, planners for the BeltLine still have not decided on a means to traverse the corridor due to the complicated nature of the infrastructural barriers. In order to increase accessibility across the corridor, existing infrastructure must be improved for active transportation modes, but new connections but also be created to overcome existing gaps in connectivity. In order to better understand the reasons behind these disconnects, a historical background is of the processes that shaped the neighborhoods adjacent to the railroad is provided first, culminating in an assessment of the barriers. Following this section, a literature review of accessibility and means towards improving

it is outlined. After this understanding is developed, the main GIS analysis is presented, which includes a means to measure accessibility across an area that is used to propose improvements conducted according to three phases.

2. BACKGROUND

2.1 History

Atlanta and Railroads: To anyone unfamiliar with the city of Atlanta, it would appear that the street network of the city is chaotic and confusing: a product of unplanned, unmitigated growth. At various places throughout the city, a north/south street grid will intersect will one at a 45-degree angle, conflating travel patterns and confusing many a newcomer to the city. This shortcoming of modern Atlanta's planning was no accident; it is embedded in the history of the city and, indeed, tells the story of its emergence.

Historian Timothy Crimmins likens the history of Atlanta told through its urban form as a palimpsest, "a document whose surface writing has been recorded over imperfectly erased remnants of earlier texts." He argues that, in the search to understand Atlanta's contemporary urban form, one must study the underlying patterns and processes responsible for its unique configuration. One method of doing this is by examine the city's palimpsest, the traces of physical impresses, while partially modified or erased, nonetheless help tell the story of the city's emergent growth (Crimmins, 1982).

Atlanta's story begins in the early 19th century, when the port city of Savannah reigned as the undisputed urban center of the state of Georgia. The Georgia of this time was primarily rural in nature, with large cash-crop plantations being its primary economic output. Savannah, while being idiosyncratic in its urbanity, nevertheless served a critical role in Georgia's early economic paradigm, acting as a warehousing and shipping center for the various cash-crops exported to the old world. This agricultural economy could only spread as far as there were water-based connections to Savannah, however; due to the geography of the state, this meant that the highland Piedmont region, inaccessible by river or canal, remained mostly frontier land for much of Georgia's early history (Ambrose, 2003). With the advent of industrial technology, however, this geographic barrier would soon be conquered.

Realizing that these obstacles would hamper the economic potential of the state, the legislature of Georgia in 1825 embarked on a program to establish a state transportation network so that the lucrative markets of the Mississippi river valley, Memphis, and New Orleans could be accessed. Through this act, the Board of Internal Improvements was created, and the potential of railroads for meeting this goal was assessed. By 1837, a rudimentary network connected the key cities of Savannah, Augusta, and Macon together and plans for an interstate connection came to fruition. To connect Augusta with the

Tennessee city of Chattanooga, engineers for the Western & Atlantic railroad, a state-funded enterprise, staked out a site roughly seven miles east of the Chattahoochee river on a 1,000 foot ridge as the endpoint for this railroad (**figure 2.1.1**) : the future location of Atlanta (Ambrose, 2003).

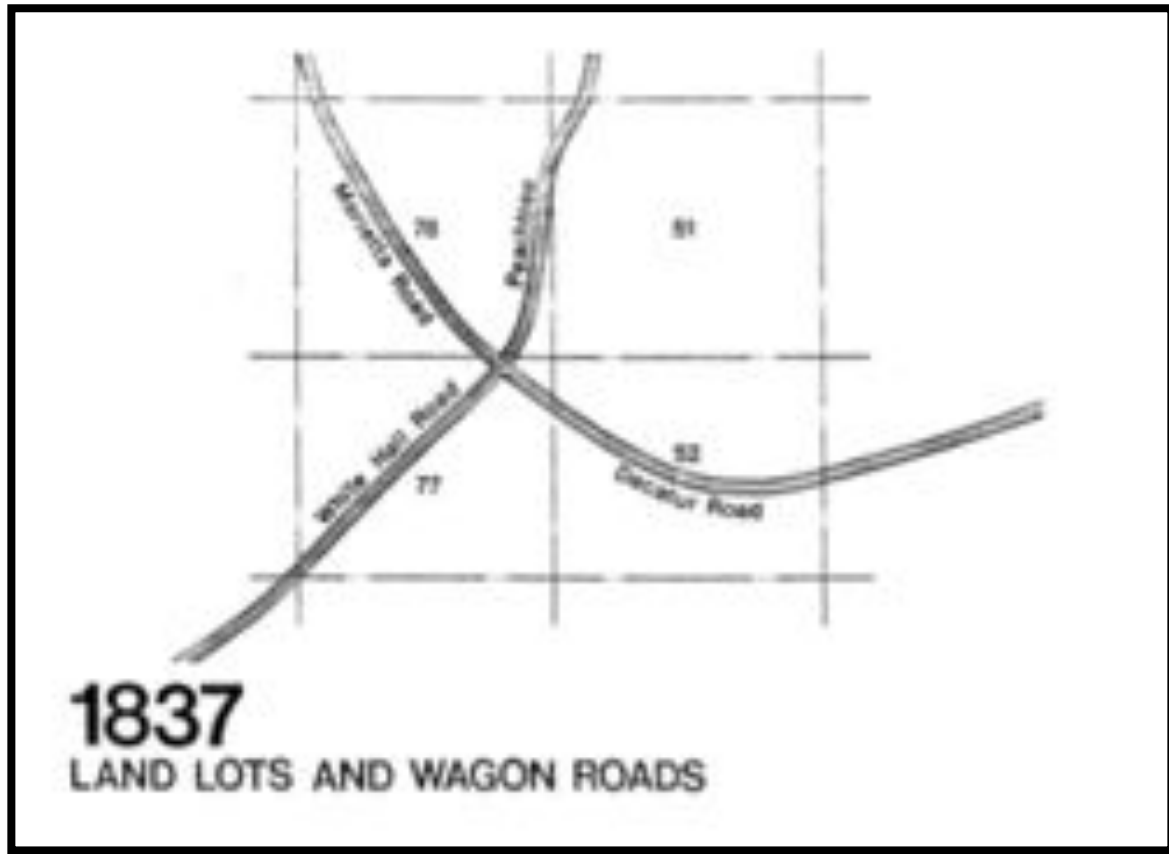


Figure 2.1.1: Site of the zero-mile marker in 1837. Rudimentary wagon roads and land lots subdivide the area.

When the zero-mile post for the W & A Railroad was staked out, the prevailing wisdom of the time suggested that the prospects for future urban growth were slim. Stephen H. Long, the chief engineer for the W & A Railroad echoed this sentiment, projecting the potential of a settlement at the site known as “Terminus” as a “good location for one tavern, a blacksmith shop, a grocery store, and nothing else” (Crimmins, 1982). Indeed, until this time, the growth of any major settlement at a landlocked site was improbable due to

geographic constraints, yet the city's very reason for being, the railroad, was its advantage. Terminus, despite projections to the contrary, grew.

As the town emerged, further rail connections snaked into the city along ridges to the northwest, southwest, and east, eventually forming a “steel triangle” around which the city would expand. **Figure 2.1.2** shows the impress of these rail lines superimposed onto the existing fabric of the city.

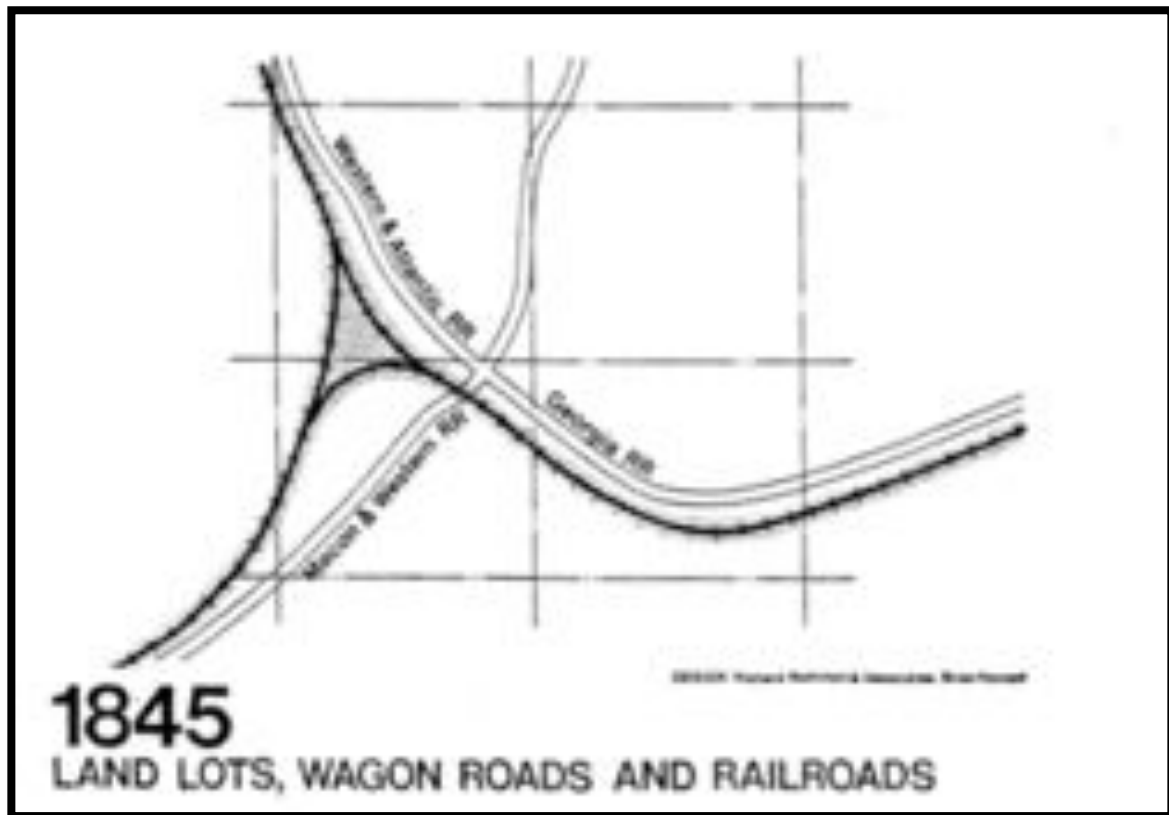


Figure 2.1.2: Site of the zero-mile marker by 1845. Three rail lines meet at today's gulch to form a “steel triangle,” about which the embryonic city grew and took form.

This junction thus became the first major impress in the city's form, guiding the subdivision patterns of adjacent land in strict adherence to its course. Making the most of his ownership of Landlot 77, Samuel Mitchell subdivided his property south of the steel triangle, following the alignment of the railroads in his scheme. By 1850, the settlement of Terminus had established an early fabric, seen in **figure 2.1.3**.

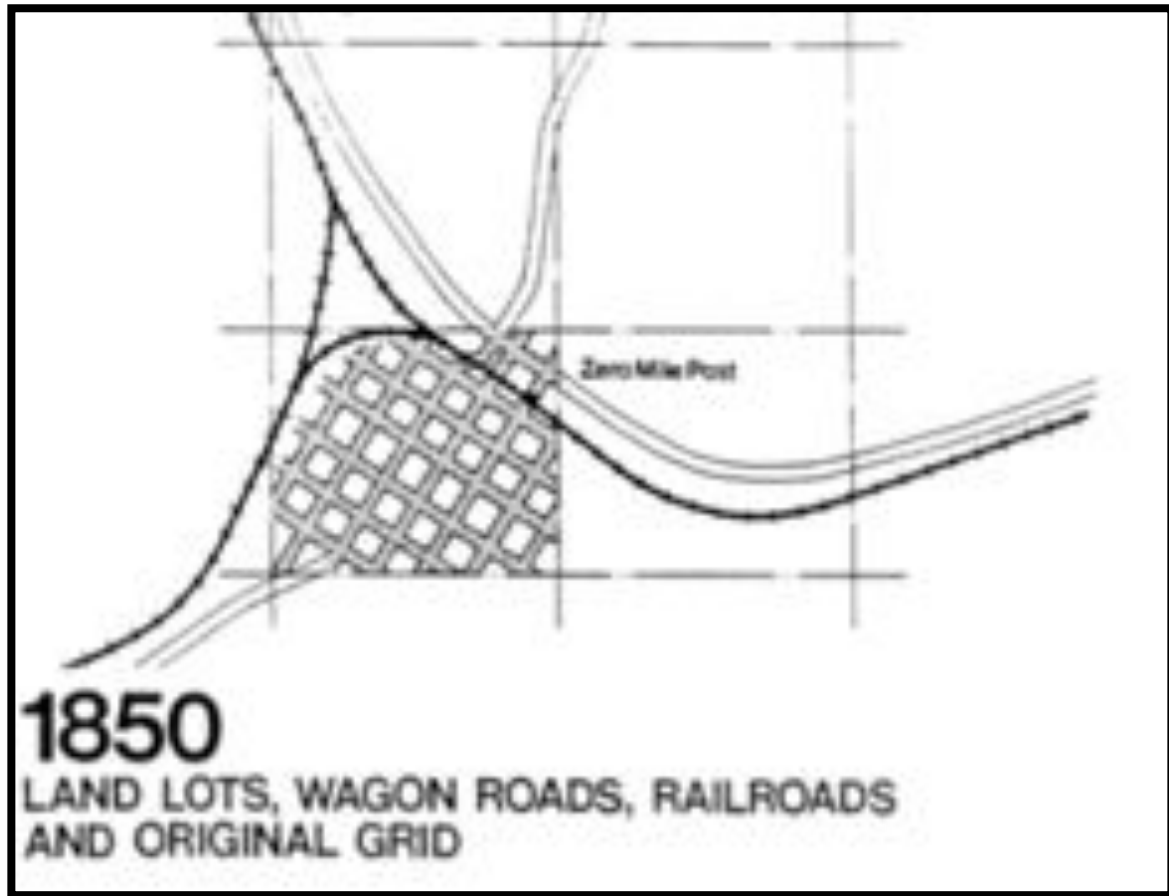


Figure 2.1.3: Site of the zero-mile marker by 1850. Samuel Mitchell's subdivision scheme forms the early grid of the settlement.

Without the guidance of a central planning authority, individual landholders split up their land lots to best serve their own interests, in accordance to the alignment of the railroad. As such, the early form of Atlanta took shape as a pattern of streets and blocks intersecting the rail lines perpendicularly, but lacking transition points between sections. **Figure 2.1.4** displays how these subdivision practices developed spatially by 1853.

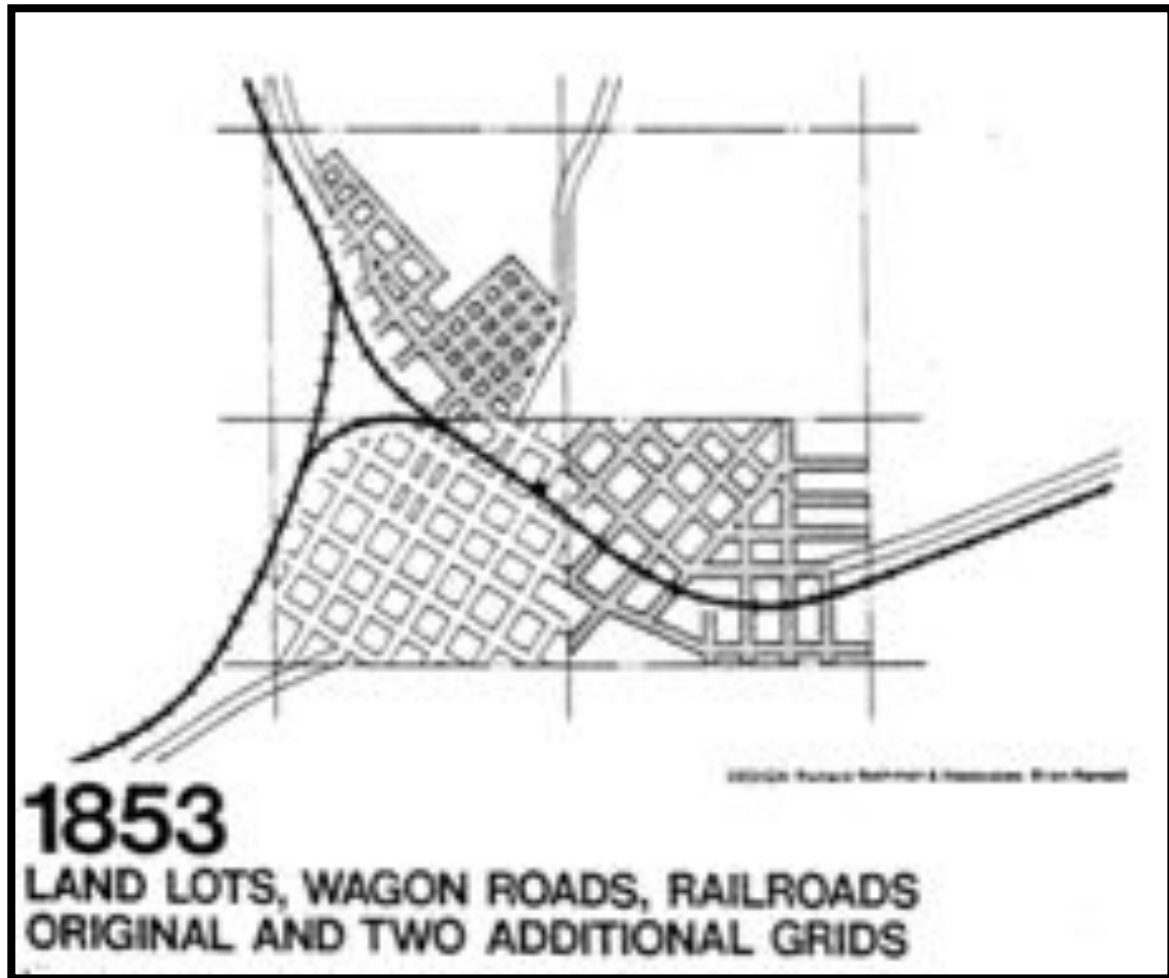


Figure 2.1.4: Site of the zero-mile marker by 1853. Independent subdivision plans result in a disjointed street network characterized by differing block sizes and alignments.

As such, the current disjointed street network was founded and thus became the precedent for subdivision as the city continued to grow. And grow it did; by 1860, just 23 years after its initial siting, the frontier town of Atlanta emerged as the fourth-largest city in the state of Georgia, with just under 10,000 people (Ambrose, 2003).

Although Atlanta did not develop into Georgia's primate city until after the Civil War, the initial subdivision practices form the early impresses of the city's urban fabric. These impresses, represented by Edward A. Vincent in his pre bellum subdivision map (**figure 2.1.5**), show how all these aforementioned dynamics intersected to shape Atlanta's early growth, patterns that were retained despite the utter destruction of the city's structures during the war.



Figure 2.1.5: Edward A. Vincent's early subdivision map of the City of Atlanta, showing the pre-war fabric of the city. These impresses formed the precedent about which the city would take form.

South of the Tracks: Despite the destruction brought upon Atlanta by the ravages of the Civil War, its geographic advantage became its salvation. While physical structures that made up the city were utterly decimated following General Sherman's occupation, the impresses of the railroads and the extant street grid were preserved underneath the ruins. Rather than organizing rebuilding efforts towards realigning this system into a more rational network,

Atlanta's citizens dove headlong into reconstruction; the immediate economic potential of the city took precedent over long-term planning concerns. As the city mushroomed in size during this postbellum period, rising real estate and construction costs in the center of the city brought horizontal expansion to Atlanta's emergent central business district (**figure 2.1.6**), which pushed residents, especially those of lower income, out (Grable, 1982).



Figure 2.1.6: The central business district of Atlanta represented in 1892, showing the vertical expansion of the area adjacent to the steel triangle.

One loci for this migration was an area to east adjacent to the Decatur Street railroad line, today known as Cabbagetown. Contrary to popular belief, Cabbagetown was not originally envisioned as a factory town. Instead, its lower property values, convenience to downtown, and eventual adjacency to streetcar lines all meant that it was a suitable place for the settlement of the working class. The western boundary of this neighborhood was the attractively landscaped Oakland Cemetery (**figure 2.1.7**), which real estate mogul George A. Adair tried to capitalize on with plans for an upper-income development.



Figure 2.1.7: Oakland Cemetery and its environs in 1892. Prior to this point, the cemetery formed the eastern boundary for residential expansion.

Adair failed to attract residents of moderate means to this idea, however, due to the area's proximity to the railroad lines, which made it less desirable for inhabitation and therefore more attractive for manufacturing interests (Grable, 1982).

Cabbagetown initially grew as an occupationally diverse neighborhood, with many of its residents commuting the 1 ½ mile distance downtown to labor at the industries located there. The rising real estate prices there eventually affected the sprawling mills and warehouses located there, however, forcing business owners to seek more economic sites elsewhere. Jacob Elsas, owner of downtown's Fulton Bag & Cotton Mill, decided to expand the operations of his business to Cabbagetown, where the land was cheap and labor was plentiful due to the extant working-class community. The reason for both circumstances was due to its adjacency to the railroad, the access it brought making manufacturing prospects even more viable. Elsas further subdivided the land around the Mill to make room for worker housing, adopting a no-nonsense gridiron approach (**figure 2.1.8**). As was precedent, Elsas platted the community according to his own economic interests, rather than coordinating the subdivision with existing right of ways (Grable, 1982).

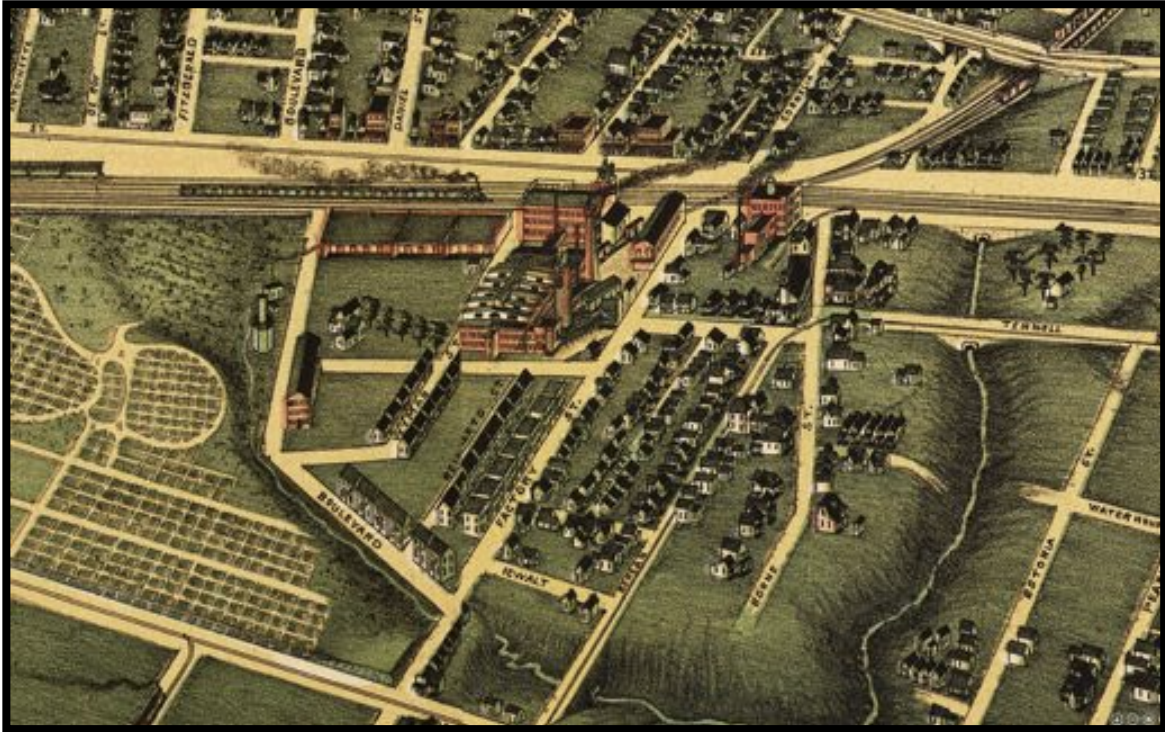


Figure 2.1.8: The modestly populated community of Cabbagetown, seen in 1892. Elsas' Fulton Bag and Cotton Mill anchors the community to the northwest, forming an early barrier between the neighborhood, Oakland Cemetery, and the emerging Inman Park to the north.

As the Fulton Bag & Cotton Mill expanded, it gained more of a monopoly on the employment of the surrounding neighborhood's residents. From 1890 to 1940, Cabbagetown gradually evolved from an occupationally diverse neighborhood to one where the mill was the primary source of employment. What remained constant, however, was its working class nature, which is in stark contrast to the emergent upper-class neighborhood of Inman Park to the north (Grable, 1982). Separated by only a rail line, Inman Park nevertheless developed on an opposite trajectory from Cabbagetown, a fact that is manifest in both its general layout and in the character of its populace.

North of the Tracks: Although Adair failed to bring the wealthy out of Atlanta's core with his scheme near Oakland, the desire for new upper-middle class development was not a lost cause. The same pressures that pushed both the working class and the industry out of the core began to affect the city's social elite by the 1880s, who at this time inhabited grand

homes along Peachtree Street. Recognizing that they sought new residential establishments with the encroachment of commercial growth, in 1886 businessman Joel Hurt decided to provide them with an alternative, which would eventually culminate as Inman Park. Capitalizing on the in-vogue aesthetics of the pastoral life, Hurt acquired an undeveloped rural site to the north of Cabbagetown and subdivided it according to ideas developed by Frederick Law Olmsted. Although this site was adjacent to the railroad tracks—like Cabbagetown—Hurt successfully gained the interests of the city’s elite by laying out this new streetcar suburb with large lots on curvilinear streets. Thus, through marketing efforts, the radically different organic urban form of Inman Park was implanted into Atlanta’s already chaotic structure, contrasting significantly with the formalist traditions evident in Cabbagetown (Marr and Jones, 2008). This distinctive pattern, along with the barrier formed by the railroad, had the additional benefit of segregating the new development from the perceived undesirable areas to the south (**figure 2.1.9**).



Figure 2.1.9: 1892 representation of early subdivision in Inman Park, showing the organic pattern ushered by its curvilinear streets. The DeKalb Ave railroad corridor separates the emergent neighborhood from the growing working class communities of Cabbagetown and Reynoldstown to the south, while the truck line that forms the modern BeltLine segregates it from the thoroughly developed Fourth Ward.

Inman Park's earliest history indeed satisfied Hurt's business interests. By 1889, nine land lots were auctioned, each with the stipulations that houses built on them had to cost at least \$3,000 with setback requirements. These conditions acted as an early form of exclusionary zoning, ensuring economic homogeneity in the neighborhood even before such standards were mandated through municipal planning bureaus. For the first twenty years of its existence, these restrictions guaranteed that only large, expensive houses would be built in the neighborhood, which, along with the organic form of the neighborhood established a much different place than Cabbagetown. By 1910, however, these residential deeds expired, allowing more diverse buildings to be built and lead to, in part, the development of the commercial district of Little Five Points (Marr and Jones, 2008). At this point, the impress of the initial organic subdivision had already become permanent and continued to separate Inman Park from the communities on the other side of the tracks.

2.2 Today

Today, these initial impresses caused by the routing of the railroad as well as the differing subdivision practices on either side of it (the 1892 conditions summarized in **figure 2.2.1**) are still factors in accessibility across the corridor, though now with even further articulation.



Figure 2.2.1: The culmination of the varied subdivision practices in early Atlanta is represented here in 1892. The impress of the railroad network is evident.

Three factors preventing access across DeKalb Avenue include the CSX mainline, the elevated east-west MARTA line, and the CSX Hulsey Yard intermodal facility. These developments have culminated as a “physical wall of railroad and transit infrastructure” on the southern edge of DeKalb Avenue, which further restricts accessibility (EDAW, 2009). Currently, there are only four access points to and from the north, occurring at Boulevard, Krog Street, Moreland Avenue, and the Inman Park/Reynoldstown MARTA station.

Negotiating the deficiencies in bike and pedestrian accessibility across this corridor becomes superseding in priority when one considers the scope of infrastructure defining the area, including that associated with MARTA. When MARTA began construction in the late 1960s, the east-west route was established along the existing railroad corridor in order to reduce the costs associated with acquiring additional right of way. Since the mantra of the time did not focus on the maximization of accessibility, MARTA’s planners adopted a mindset of expanding heavy rail, which requires enormously intense infrastructural demands. As such, many stations along the east-west line are behemoth, separated in large part from the surrounding city due to their elevation above the street. The elevated lines that follow the railroad form an additional barrier, obstructing sightlines and cluttering space with the large footprint of its pillars. The Inman Park/Reynoldstown station does span across the railway to connect north and south, but it provides only an auxiliary route across the corridor and is inconvenient for cyclists due to its stairways. Because the infrastructure associated with MARTA is static, efforts must be made to both negotiate its right of way with new connections as well as improvements to existing stations.

To improve accessibility, an additional barrier that must be overcome is the CSX Hulsey Yard facility, an active intermodal terminal. Hulsey Yard takes a linear form, spanning nearly a mile from the Fulton Bag & Cotton Mill complex to the Inman Park MARTA station, forming the northern boundary for Cabbagetown and much of Reynoldstown. While the facility plays an important role in the Georgia economy by bringing goods directly into the heart of Atlanta, its position adjacent to residential neighborhoods is far from ideal. From a perspective of accessibility, Hulsey Yard is the foremost barrier across the corridor. Due to the rail lines being above grade, much of the areas of Wylie Street and DeKalb Avenue that border this facility are separated by ten-foot tall concrete barriers, which form a literal and figurative wall. Indeed, there is only one connection across Hulsey Yard, underneath it through the Krog Street tunnel. Aside from the accessibility issues it presents, Hulsey Yard is

a nuisance for local residents due to the noise and traffic it generates; the truck traffic entering and exiting the facility from Boulevard often causes standstills during rush hour periods.

As demonstrated, there are several barriers to accessibility across the DeKalb Avenue corridor, including both the elevated MARTA line as well as the ground level intermodal facility. While these barriers must be directly negotiated, a goal to realign the disjointed street grid must be addressed when making new connections to best maximize their potential to increase accessibility. Since this corridor is already a major area of concern for the BeltLine, those responsible for making the plans have suggested working through the problem in stages, including: 1) in the short term, running PATH trail through the Krog Street tunnel, 2) crossing the transit component under the yard through a new tunnel to the west, 3) redeveloping Hulsey Yard as a mixed use site. After a literature review outlining principles and methods towards improving accessibility is presented, these possibilities will be considered.

3. LITERATURE REVIEW

3.1 Access

If cities are to become more equitable, healthy, and community-orientated places, then automobile dependency must be overcome by focusing on the provision of accessibility in urban planning schemes. While cars certainly have their benefits, the realm of planning must not be solely orientated towards maximizing mobility; automobiles should instead be made to co-exist in urban environments along with other modes. Accomplishing this relies on an understanding on the relationship between transportation and land use; the emphasis should not be on how to relieve congestion, but how transportation holistically affects patterns of land use and how they in turn affect other elements of urban areas. Planning efforts must be made “at the scale of centers, corridors and other focal places of urban environments,” instead of standards based on the hierarchal street classification (Dobbins, 2009). To accomplish this, certain key principles must be considered to address accessibility considerations, including a desire for increased connectivity, the provision of adequate infrastructure for pedestrians and cyclists, and a fine-grained mix of destinations.

3.2 Connectivity (and barriers)

The foremost factor behind the accessibility (or inaccessibility) of a given area is its connectivity, that is, the quantity of connections in a street network, linking one place to another (Steiner and Butler, 2007). In the sprawl-based paradigm of urban form, connectivity is largely ignored in lieu of a hierarchal classification of streets, including local streets, connectors, and arterial roads. While this standard is ideal for mobility considerations—it limits the traffic on streets according to pre-determined capacities, designed to reduce congestion—it is far from adequate from a perspective of accessibility. This is due to dendritic pattern of streets iconic to contemporary suburbs, which are characterized by cul-de-sac subdivisions and super blocks. Such a pattern of streets and blocks “often provide relatively indirect connections and few routes and thus have low connectivity” (Steiner and Butler, 2007). In many suburban areas, locations that are separated by relatively short Euclidean distances are actually exponentially further away in terms the routes available on the network, which prompt many to drive what would otherwise be very walkable distance in an interconnected street network. Conversely, the traditional street grid “provides relatively direct connections and multiple routes, thus it has high connectivity” (Steiner and

Butler, 2007). From a perspective of accessibility, reducing travel times and dispersing travel patterns through increased connectivity is paramount for encouraging active modes of transportation.

Connectivity is measured through several methods, including block length standards and connectivity indices. Block length standards make the assumption that an urban form defined by smaller blocks are inherently more connected, especially when compared to the super blocks that define the disconnected street networks of modern suburbia. This measure is flawed, however, in that it does not consider the number of intersections in a network, a key indicator of connectivity. As such, there also exist connectivity indices, which relate the number of links (continuous street segments) in a given network to the number of nodes (intersection of three or more links) (Steiner and Butler, 2007). These indices are commonly used to provide an overview of general connectivity in an area, but they do not account for the existence of extenuating factors in street networks, such as barriers. By limiting traffic to a few chokepoints, barriers like railroads or highways may prevent easy access across corridors in certain areas otherwise perceived as interconnected.

According to Duany and Plater-Zyberk, corridors are “at once the connector and separator of neighborhoods and districts,” characterized by their relative continuity (Duany and Plater-Zyberk, 1993). While corridors are defined by their adjacent districts and, indeed, provide access to them, they can simultaneously discourage permeability if they act as barriers. In his prototypical guide to the urban environment, *Image of the Environment*, Kevin Lynch theorizes extensively on the fundamental characteristics of paths and edges, both of which are seemingly inconsistent elements of corridors. As the connective links of a city, paths are most effective when they lead to clear destinations and origins, allowing the independent observer his bearings whenever he or she crosses them. While also linear elements, edges are conversely the boundaries between two or more areas, acting as a contrasting element in the image of the city while paths harmoniously unify. While many edges have the capacity to act as seams in areas by tying two otherwise distinct areas together, they also have a tendency to fragment the urban environment; these barriers are typified as railroads, highways, or topography. In the case of corridors as barriers, access is severely hampered to and from neighboring districts; in Boston, for example, “the broad gash of [its] railroads tracks seemed to dismember the city, and to isolate the ‘forgotten triangle’ between the Back Bay and the South End” (Lynch, 1960). Indeed, despite the two

neighborhoods' high degree of internal connectivity, they are severed from the city as a whole due to the swaths rendered by these barriers (CITE).

In *Death and Life of Great American Cities*, Jane Jacobs speaks extensively to the community-rending aspects of barriers in modern U.S cities. In many cases, barriers such as railroad tracks can serve to segregate on the basis of socioeconomic status, contributing to a prototypical urban phenomenon known as the 'other side of the tracks.' While this is often the case, the worst off places are "typically the zones directly beside the track, on both sides," which is "explained as a result of noise, the soot of steam locomotive days, and the general undesirability of railroad tracks as an environment" (Jacobs, 2011). This causes several problems, as these railroad corridors form so-called 'border vacuums' of use directly adjoining them as well as creating dead ends to the users of city by becoming barriers. According to Jacobs, the trouble with these barriers "arises when districts are bisected or fragmented by borders so that the neighborhood sundered are weak fragments and a district of subcity size cannot functionally exist," such as in the case of Back Bay and South End (Jacobs, 2011).

While the formation of barriers is often the result of railroads and other intrusive infrastructure, buildings themselves have the capacity to bar accessibility in areas that are otherwise interconnected, such as in the case of downtown Los Angeles. In "Fortress L.A.," Mike Davis describes the inaccessible nature of the city's central business district, which is characterized by tall, despotic towers, insular mega structures. As Los Angeles went through its post-war suburban boom, developers determined a need to accommodate the automobile in downtown area. To accomplish this, they 'recreated the downtown *tabula rasa* at a site with readily available highway access, in effect 'moving' the central business district from its historic boundaries. Since the accommodation of automobiles was the primary goal of this endeavor, the buildings that were designed in this new downtown area were primarily oriented towards the movement and storage of cars; anyone daring to venture through this area on foot is today greeted by blank façades with occasional outward openings to underground parking decks (CITE). As such, accessibility is severely diminished for the pedestrian or cyclist in modern downtown Los Angeles, yet another symptom of contemporary auto-dependency. In any scheme to improve connectivity, both the physical infrastructure as well as the buildings must therefore be analyzed for their capacity to form barriers from accessibility with the public realm.

3.3 Adequate Infrastructure

Another fundamental component of improving accessibility is the provision of adequate infrastructure for active transportation modes. The precedent of overzealous, one-dimensional focus on optimizing mobility has often resulted in a complete disregard for pedestrian and bicycle infrastructure, the consequences of which are today clear. Along with augmenting connectivity in deficient areas, the ‘milieu of accessibility’ must also be implanted into existing urban fabric. This milieu includes basic infrastructure such as sidewalks, bike lanes, and adequate lighting, factors that are oftentimes completely overlooked in the design of streets (Steiner and Butler, 2007). While these types of improvements are typically added to cities through piece-meal, sometimes superficial actions, there are several movements proposed by contemporary planners that suggest a more holistic vision, including those associated with the ‘complete streets’ program.

Complete streets are, in their essential form, streets are designed to accommodate more than simply the automobile, including infrastructure for both pedestrian and cyclists in their design. At a basic level, complete streets guidelines recommend for the provision of bike lanes and sidewalks, though additional milieu of accessibility such as street trees and bulb-outs are often considered (Broward County, 2010). Complete streets guidelines, even at a core level, are a radical departure from the commonly used best-practices handbooks of highway engineers, such as the blue book, which shun the use of street trees due to the potential danger they pose for motorists travelling at a high speed. Since it is now certain that street trees act as a traffic-calming device, this perspective is rapidly become outdated as civil engineers gradually turn their focus from mobility to access.

Indeed, state- and city-based municipalities nationwide are currently adopting many complete streets guidelines as binding rules for the construction of any new street. The proliferation of these guidelines is credited largely to the success of California’s Safe Routes to School (SR2S) program, an effort to combat rising childhood obesity levels by providing viable ways for children to bike or walk to school (Fehr & Peers, 2008). Although complete streets programs such as SRS2 help to bolster accessibility by provisioning adequate infrastructure, they represent only a single piece of the overall solution. These programs do not holistically consider associated factors of accessibility in their scope, so they are flawed as an end-all-be-all solution. Despite this omission, the provision of adequate infrastructure is

nevertheless a key component in any urban design solution, along with improved connectivity and a mix of uses and destinations.

3.4 Destinations

The final and arguably most integral factor towards improving accessibility is to ensure that a mix of destinations are readily present within a specified area. Without the existence of proximate destinations, there is no impetus to travel, no matter how adequate the infrastructure or connectivity of a neighborhood is. Low-density, single-use zones are a primary constituent in contemporary suburban development patterns, so it is often necessary to traverse large distances just to reach desired destinations. As such, schemes towards improving accessibility should focus on providing proximate destinations, which is possible by simultaneously elevating density and providing a finer-grained mix of uses at the local level (Jacobs, 2011; Lynch, 1984; CNU, 1993).

In *Good Urban Form*, Kevin Lynch provides a value-based assessment of urban places, arguing that “a good environment is a place which affords obvious and easy access to a moderate variety of people, goods, and settings” (Lynch, 1984). Disregarding whether or not Lynch’s vision of a “good environment” is commonly-held value among Americans, this argument nonetheless provides a basis for measuring accessibility in regard to the availability of destinations. The Congress for the New Urbanism (CNU) echoes this sentiment, advising for a range of uses and densities located within a 10-minute walk, or 0.5 miles. While a mix of uses is important by itself, increased density compared to conventional suburban development is needed in order for residences, shops and services to be closer together and to create a more convenient, enjoyable place to live (CNU, 1993). This same argument is posed by Lynch, who argues that “origin and destination can be brought closer together by increasing the general density of occupation of a settlement” (Lynch, 1984). Working in tandem with adequate infrastructure and a connective street network, the availability of proximate destinations through a mixture of uses and densities can make for a highly accessible environment.

Relating two of this factors to each other, Jane Jacobs also argues for mixtures of uses and densities, though from a perspective of combating the aforementioned ‘border vacuums’ caused by urban barriers. Seeing the deficiencies presented by border vacuums as a result of a lack of diversity in these areas, Jacobs suggests that “population concentration ought to

made deliberately high (and diverse) near borders... mixtures in primary uses should be abundant” (Jacobs, 2011). In addition to resonating the principles held collectively by Lynch as well as CNU, Jacobs proposes a novel solution for addressing barriers by opening them up to the public and making them a destination onto themselves. She recounts an example of such an occurrence in her native New York:

“Near where I live is an old open dock, the only one for miles, next to a huge Department of Sanitation incinerator and scow anchorage. The dock is used for eel fishing, sunbathing, kite flying, car tinkering, picnicking, bicycle riding, ice-cream and hot-dog vending, waving at passing boats, and general kibitzing.” (Since it does not belong to the Parks Department nobody is forbidden anything.) You could not find a happier place on a hot summer evening or a lazy summer Sunday. From time to time, a great slushing and clanking fills the air as a sanitation truck dumps its load into a waiting garbage scow. This is not pretty-pretty, but it is an event greatly enjoyed on the dock. It fascinates everybody. Penetrations into working waterfronts need to be right where the work (loading, unloading, docking) goes on to either side, rather than segregated where there is nothing to see. Boating, boat visiting, fishing, and swimming where it is practical, all help make a seam, instead of a barrier, of that troublesome border between land and water.”

(Jacobs, 2011)

Such an occurrence culminates many of the aforementioned principles outlined in this literature review, connecting a community through an adjacent barrier by making it a destination. This idea holds promise moving forward, as it is entirely within the realm of possibility to address accessibility considerations due to barriers while simultaneously retaining the economic benefits granted by their function. In an effort to improve accessibility across the DeKalb Avenue corridor, the outlined principles of connectivity, adequate pedestrian infrastructure, and a mix of destinations will all be analyzed, along with a special consideration towards how the barriers therein may well produce a destination onto itself.

4. GIS ANALYSIS

4.1 Data/Methods

Over the DeKalb Avenue corridor's two mile span from the downtown connector on the west to Moreland Avenue on the east, there are only six connections from north to south, each of which negotiates the barriers through indirect means. Five out of six of these connections cross underneath the transportation corridor, while the above-ground connection at the Inman Park/Reynoldstown station offers a circuitous means to traverse the myriad barriers. While the condition of these connections is inadequate for active modes of transportation—dim lighting, narrow sidewalks, and a lack of separation from traffic define many of the underground routes—there are also too few of them. The gaps between the north/south connections, especially the nearly $\frac{3}{4}$ mile gap between Krog Street and the MARTA station, are a symptom of the early disconnected subdivision patterns.

Due to these factors, accessibility across the corridor today is significantly limited, a fact which affects pedestrian and bicycle circulation throughout the area. In addition, planners for the BeltLine still have not decided on a means to traverse the corridor due to the complicated nature of the infrastructural barriers. In order to increase accessibility across the corridor, existing infrastructure must be improved for active transportation modes, but new connections but also be created to overcome existing gaps in connectivity. For the purpose of this study, both solutions are explored. In order to do this, a network analysis is conducted based on existing conditions, which is used to highlight those areas most deficient in accessibility. Following this step, multiple interventions are proposed and analyzed. This is conducted in three phases, including:

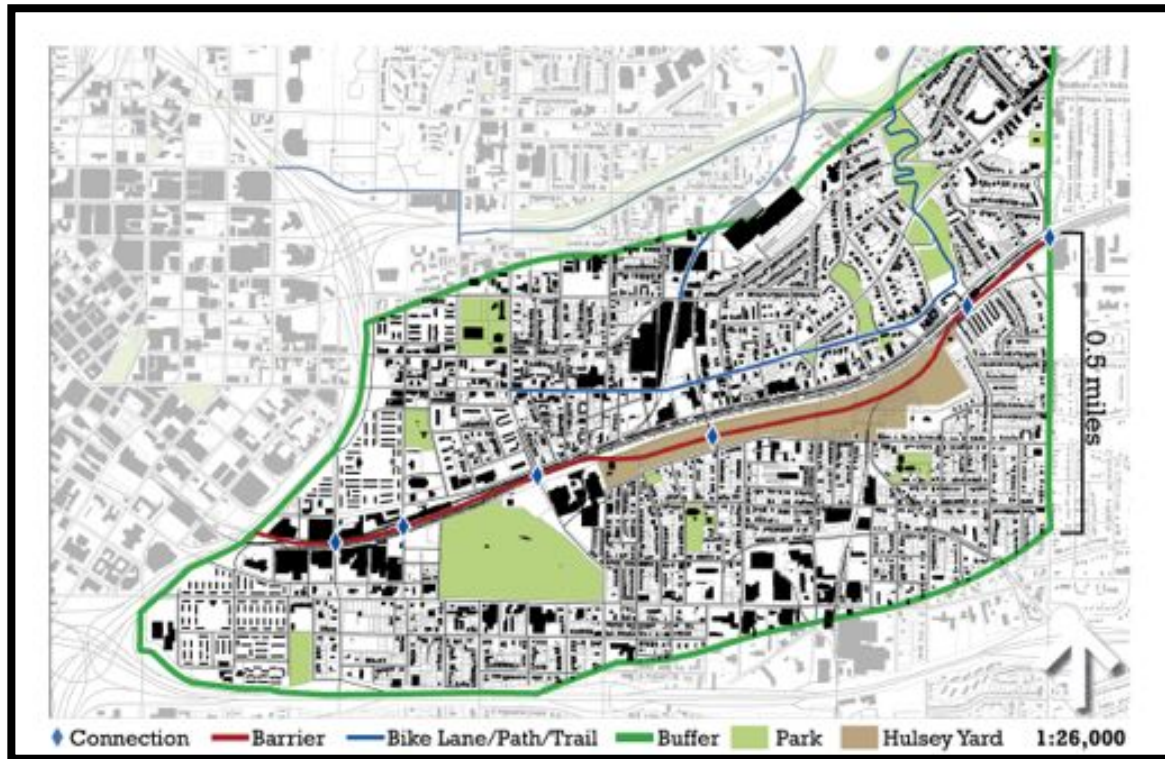
- **Phase 1:** Provision of new pedestrian and bicycle infrastructure,
- **Phase 2:** Creation of a new connection spanning Hulseley Yard
- **Phase 3:** Subdivision and redevelopment of Hulseley Yard.

Data: In this analysis of accessibility, four main data sources were used, including: 1) a basic street network of Atlanta, 2) parcels data for Fulton County, 3) a polyline designating the mean center of the barriers along the DeKalb Avenue corridor, and 4) an inventory of existing pedestrian and bicycle accommodations throughout the corridor. As explained in

the methods section, the street network shapefile was used to create a network dataset that allowed for the measurement of accessibility. An additional impediment accounting for bicycle and pedestrian suitability was built into this network dataset. For example, neighborhood roads and streets with existing accommodations were given no additional impediment, while major arterials were assigned a higher travel time to account for poor conditions.

Since the analysis was conducted in three phases, three new network datasets were created to account for changes in the network due to the proposed solution(s). First, additional impediments due to poor bicycle/pedestrian infrastructure were reduced or eliminated entirely due to the provision of additional accommodations. Second, the network was augmented with an additional link. Finally, a number of new connections were imputed into the network dataset, simulating the subdivision of Hulsey Yard. All of these additional factors were used to reconstruct the network analysis three times by accounting for each subsequent phase of improvements. Furthermore, improvements to the network applied in one phase were carried over to the next; for example, the reduced impediments to bicycle/pedestrian access determined in phase one were taken into account when repeating the network analysis for phase two. The methods used are detailed below.

Methods: The first step towards measuring accessibility in the study area was to isolate those parcels within a walkable distance of the corridor, which was determined to be one-half of a mile, or a ten-minute walk. To do this, a Euclidean buffer was created around the railroad centerline with a radius of 0.5 miles. This buffer was restricted according to two extenuating factors, including: 1), the interstate highways, since they acted as an additional barrier, and 2), Moreland Avenue, as parcel data was not available for areas to its east, which are in DeKalb County. The resulting buffer can be seen in **map 5.1**. Once this buffer was created, the parcels with centroids contained within its borders were isolated by clipping the data. The accessibility of each parcel in the study area to the corridor was measured following the network analyses, which is outlined next.



Map 5.1: 1/2 mile buffer from the railroad corridor, areas outside of Moreland and highways excluded.

To conduct the network analysis, the street network data was transformed into a network dataset within the personal geodatabase. Since the resulting network dataset biased route selection to roads more suitable for bicycle and pedestrian travel, this in essence highlighted areas deficient in existing infrastructure. Using this dataset, a service area analysis was conducted, using the six points where the existing connections intersect with the railroad corridor as point-based facilities. This method was used in order to ensure equidistance to parcels on both the north and south sides of the railroad tracks; the distance from each parcel to the closest of these intersections indicates the shortest-possible route that must be traversed in order to cross the corridor. The service area analysis was run with four buffer distances, 0.25 miles, 0.5 miles, 0.75 miles, and 1 mile. The results were translated as:

- **Very Accessible:** Areas within 0.25 miles of connection
- **Accessible:** Areas within 0.5 miles of connection
- **Partially Accessible:** Areas within 0.75 miles of connection
- **Inaccessible:** Areas further than 0.75 miles from connection

Since the Euclidean distance of the buffer area was 0.5 miles, network distances of 0.5 miles or less were determined to be within accessible range, as no additional distance was necessary to reach a connection. Otherwise, distances of higher than half a mile are partially accessible or inaccessible, since the network distance required to travel exceeds the Euclidean distance. After the network analysis was conducted, each parcel within the study area was spatially joined (by centroid) to these network buffer layers, which provided a parcel-based measure of the shortest-possible distance to one or more connections.

Once this step was accomplished, it was possible to measure the spatial correlation of accessibility, accomplished through a hot spot analysis. This was done in order to help identify clusters of parcels that had low accessibility values. By analyzing the results of the hot spot analysis as well as the map of existing parcel-based accessibility, it was possible to locate areas where interventions would be effective. Furthermore, the mean value of all parcel distances in the study area was calculated as an 'accessibility score', which is an effort to objectively measure the overall accessibility throughout the region as a whole. For the purposes of a ½ mile buffer, an ideal accessibility score is 0.25. This score represents an area in which an equal amount of parcels are within ¼ and ½ miles from a connection, which can only be accomplished if there is both an even distribution of parcels as well as a perfectly connected network.

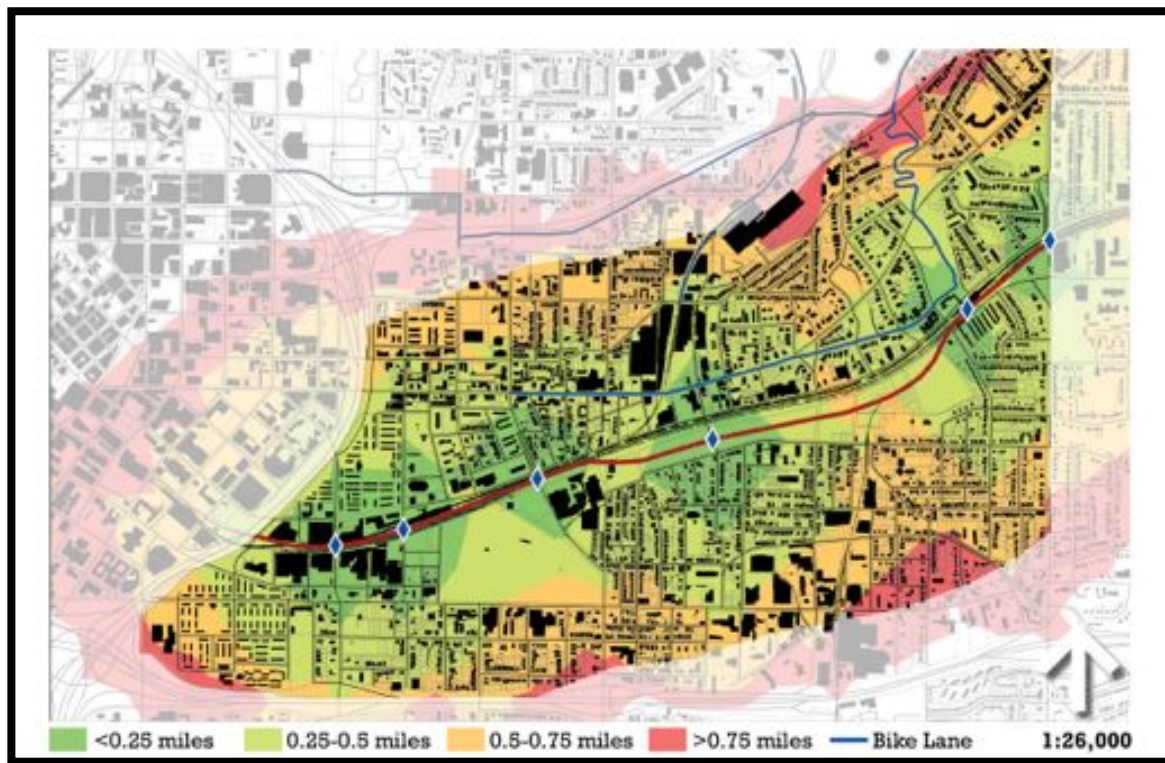
After the spatial distribution of the initial accessibility across the region was summarized, it became possible to propose improvements for the network according to phases. First and foremost, a series of infrastructural improvements in the form of complete streets and bicycle lanes were taken into account, which reduced or eliminated the additional impediment values present on major routes. For the second phase, a new connection, a new link was manually imputed into the existing street shapefile. This same method was followed for the third phase, the outright redevelopment of Hulsey Yard, where several new links and associated facilities were added to the dataset.

For each phase, a new network dataset was created that was used to produce an updated service area analysis, each of which culminated the accessibility improvements gained by each previous incarnation. The service area analysis was conducted with the same buffer distances for all phases, although there was now an additional facility where a new link crossed the railroad corridor for phases two and three. The distance values were applied to the parcel data for each phase, and the change in parcel distances in the updated scenario

was calculated by taking the difference between existing parcel distances and those under the new conditions. As such, a metric of the improvements was created for the difference between baseline conditions as well as between the implementation of each phase, which were then measured objectively through an averaged accessibility score. An overview of the results of these analyses follows.

5.2 Results

Using the current street network, an illustration of basic accessibility across the study area became pronounced. Looking at the existing network analysis (**map 5.2.1**), it is clear that gaps in the street network, especially across Hulsey Yard, indeed result in reduced accessibility for the adjacent areas.

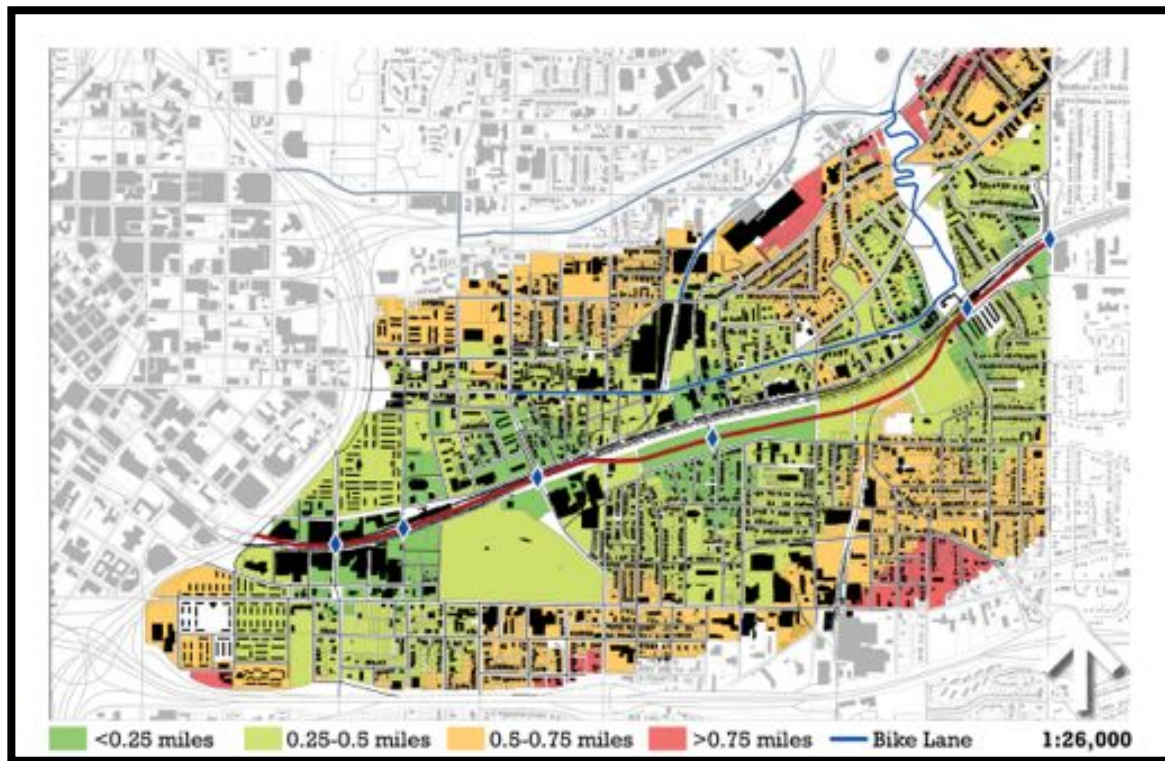


Map 5.2.1: Network distance to nearest connection.

After the results of this analysis were applied to the parcels within the study, certain trends are made evident. These results are shown in **table 5.2.1** and graphically in **map 5.2.2**.

Access	Distance from Connection (miles)	Number of Parcels	% of Total
<i>Very Accessible</i>	0 - 0.25	432	11.44%
<i>Accessible</i>	0.25 - 0.5	1797	47.59%
<i>Partially Accessible</i>	0.5 - 0.75	1356	35.91%
<i>Inaccessible</i>	0.75 - 1	191	5.06%
Total		3776	100.00%

Table 5.2.1: Existing accessibility conditions, showing the number of parcels falling into each category as well as the percentage of the area composed by that type.

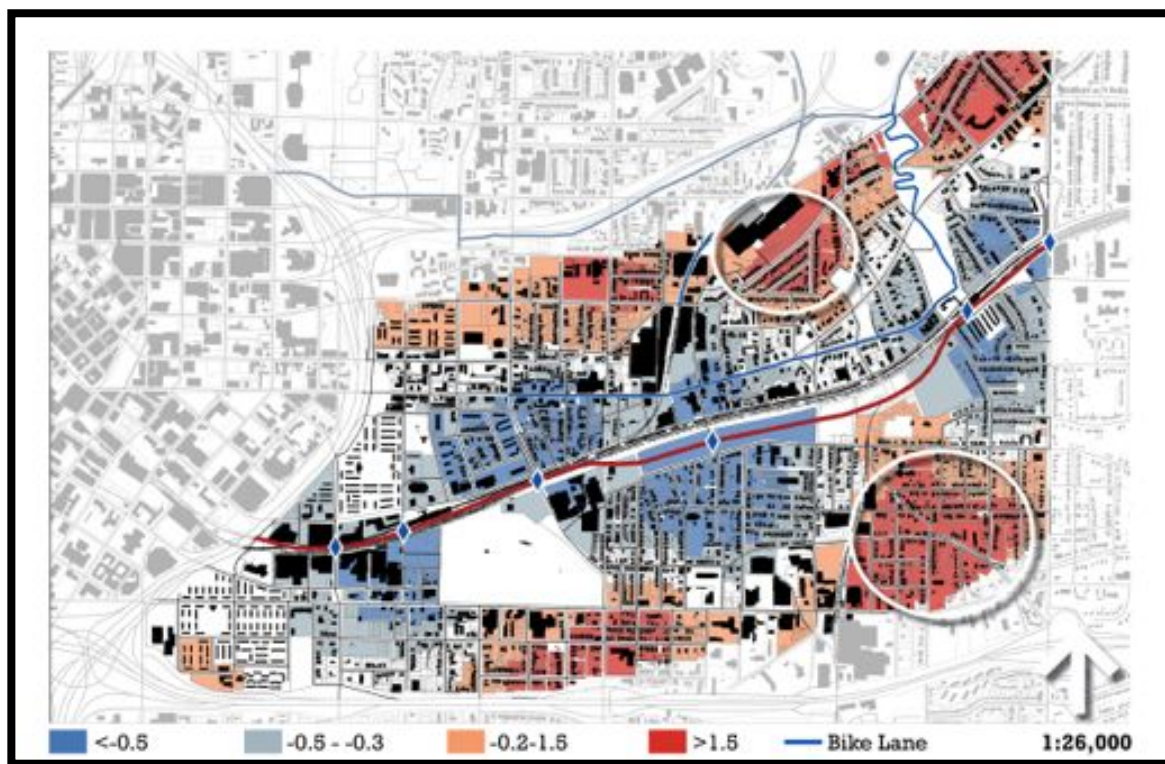


Map 5.2.2: Network distance of parcel centroid to nearest connection.

Out of a total of 3,776 parcels:

- 11% (432) are very accessible to one or more connections
- 48% (1,737) are accessible to one or more connections
- 36% (1,356) are partially accessible to one or more connections
- 5% (191) are inaccessible to any connections

Overall, slightly more than one-half of all parcels are either very accessible or accessible to one or more north/south connections. However, the latter half of parcels are either partially accessible or completely inaccessible to these connections. In order to propose a viable intervention for this corridor, the areas most lacking in adequate accessibility were first identified. The results of the hotspot analysis (**map 5.2.3**) helped to highlight clusters of parcels that lacked accessibility.



Map 5.2.3: Hotspot analysis of parcel-based accessibility, with significant clusters highlighted. Score is α -value.

The hot spot analysis shows two general trends immediately:

1. Cold (highly accessible) areas are clustered around connections
2. Hot (inaccessible) areas are found on the margins of the study area

While these two facts are obvious due to proximity considerations, the hotspot analysis did identify two hot areas away from the margins. The reason for this occurrence is due to the aforementioned gap in connectivity. With baseline conditions accounting for this gap in the network, the averaged accessibility score is 0.46, far above the ideal score of 0.25. Before this gap is directly addressed by imputing new link(s) into the network, as conducted in phases two and three, improvements to overall accessibility gained by reducing impediments in the existing system are first analyzed.

5. RECCOMENDATIONS

5.1 Phase 1: Improve

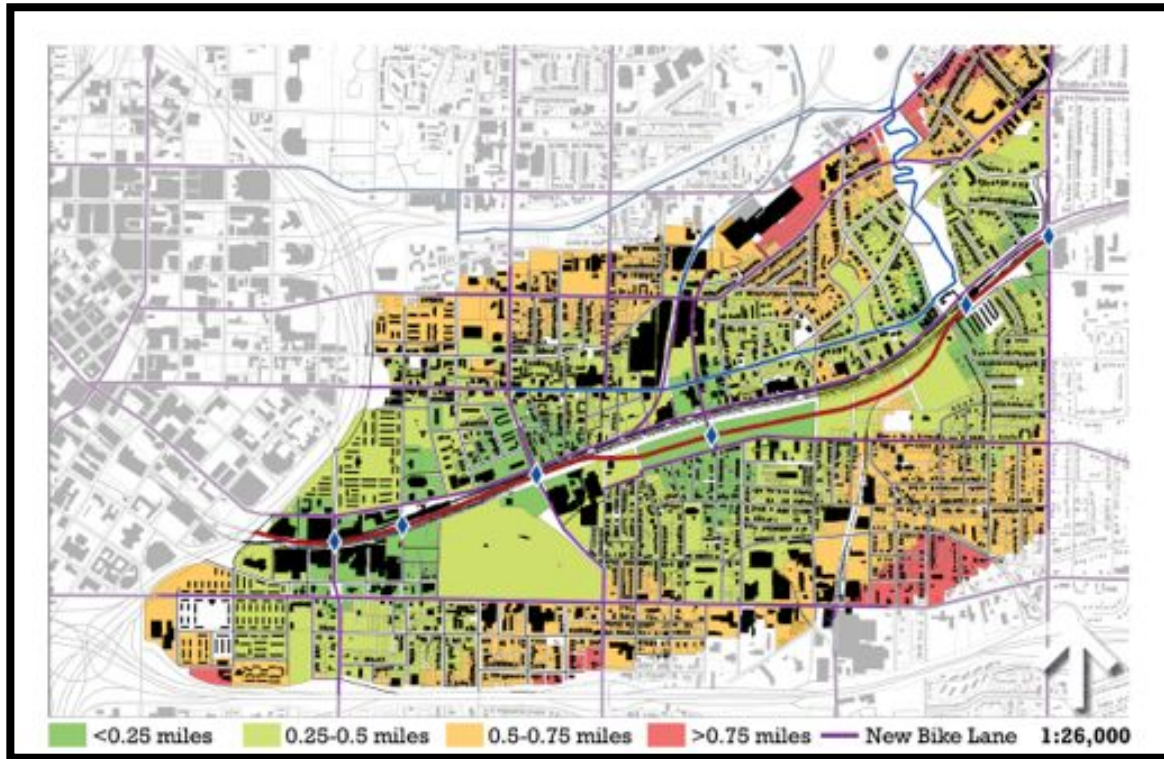
For the first round of improvements, additional bicycle and pedestrian infrastructure (conceptualized in the form of complete streets) was factored into the network analysis, the extent of which is displayed in **map 5.1.1**.



Map 5.1.1: Proposed and existing bicycle/pedestrian infrastructure.

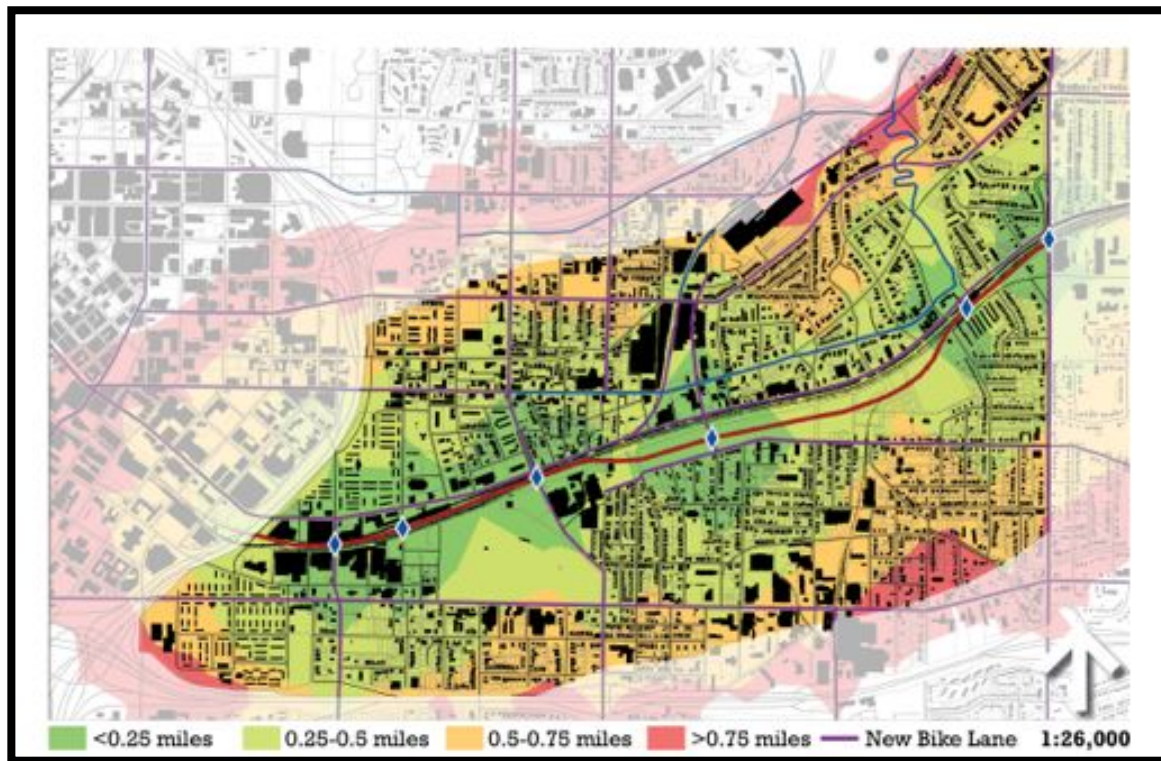
The distribution of these network improvements was based on several criteria, including the existing impediment that insufficient roads incurred on bicycle/pedestrian movement as well as the lack of infrastructure at corridor crossing. The resulting selection of potential improvements was therefore designed to maximize mobility across the corridor by reducing impediment values at connection choke points as well as along arterial roads. As outlined earlier, the placement of potential accommodations was factored into the network analysis as reduced impediment values along their associated routes, which would ensure greater access across the whole of the study area. With these improvements superimposed onto the baseline accessibility conditions, it is difficult to pinpoint exactly where heightened

accessibility would occur based solely on speculation (**map 5.1.2**), but they would nevertheless be experienced throughout the entire study area.



Map 5.1.2: Proposed and existing bicycle/pedestrian infrastructural improvements superimposed upon existing accessibility values.

After repeating the network analysis with these reduced impediment values in place, new service area buffers were generated (**map 5.1.3**).

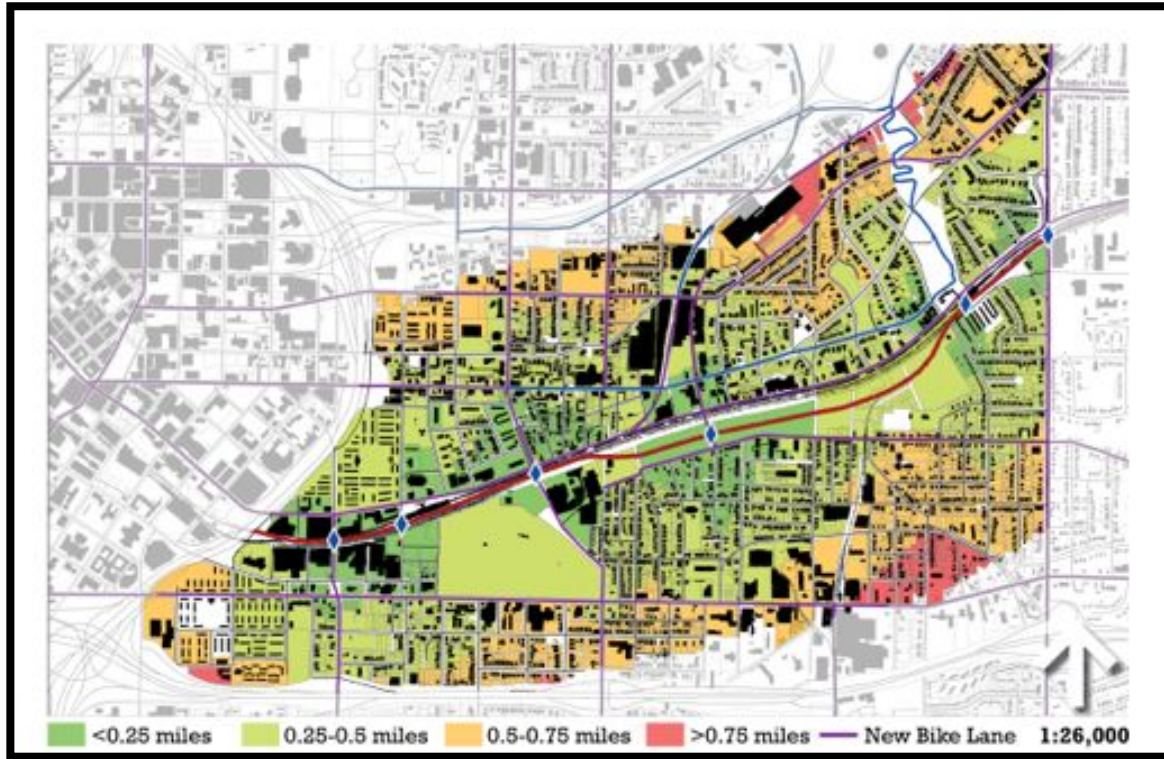


Map 5.1.3: Network analysis of existing street network with improved bike/ped accommodations, showing distance to nearest connection.

These buffer distances were then translated into parcel distance values (**table 5.1.1**), which are demonstrated spatially with **map 5.1.4**.

Access	Distance from Connection (miles)	Number of Parcels	% of Total
<i>Very Accessible</i>	0 - 0.25	540	14.30%
<i>Accessible</i>	0.25 - 0.5	1890	50.05%
<i>Partially Accessible</i>	0.5 - 0.75	1234	32.68%
<i>Inaccessible</i>	0.75 - 1	112	2.97%
Total		3776	100.00%

Table 5.1.1: Accessibility conditions with bike/ped improvements, showing the number of parcels falling into each category as well as the percentage of the area composed by that type.



Map 5.1.4: Network analysis of existing street network with improved bike/ped accommodations, showing distance of parcel centroid to the nearest connection.

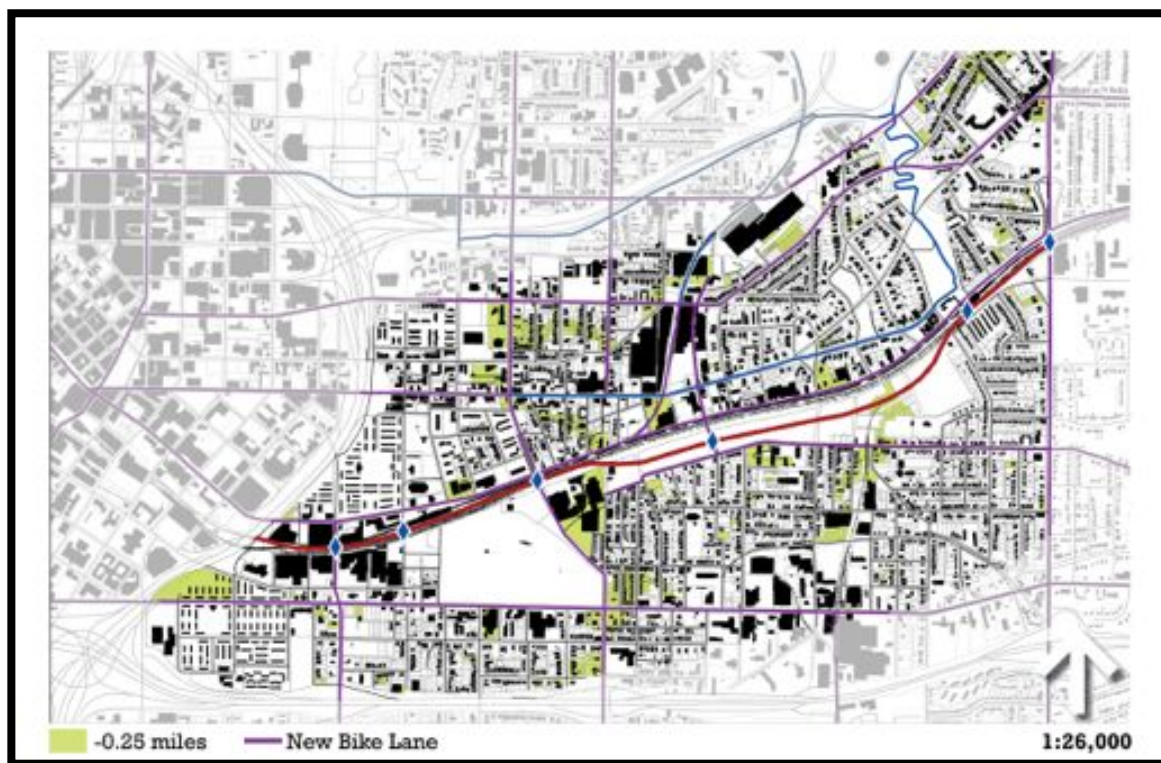
With reduced impediments taken into account across the network, accessibility begins to increase across the network, albeit to a modest degree. Out of a total of 3,776 parcels:

- 14% (540) are very accessible to one or more connections
- 50% (1,890) are accessible to one or more connections
- 33% (1,234) are partially accessible to one or more connections
- 2.97% (112) are inaccessible to any connections

Overall, the addition of new bicycle and pedestrian infrastructure results in nearly two-thirds (64%) of parcels being within accessible distance to a connection across the corridor. Despite this, over one-third of parcels are still either partially or completely inaccessible to one or more connections, with 3% being completely inaccessible. Since these values do not inform as to the exact extent of improvements, the change statistics must be analyzed in depth (**table 5.1.2** and **map 5.1.5**)

Access	Distance from Connection (miles)	Parcel Change	% Change	Change in % of Total
<i>Very Accessible</i>	0 - 0.25	108	25.00%	2.86%
<i>Accessible</i>	0.25 - 0.5	93	5.18%	2.46%
<i>Partially Accessible</i>	0.5 - 0.75	-122	-9.00%	-3.23%
<i>Inaccessible</i>	0.75 - 1	-79	-41.36%	-2.09%

Table 5.1.2: Changes in parcel-based accessibility from base to improved phase one conditions due to additional bike/ped accommodation. Displayed by raw and percentage change from previous period, as well as change in overall percentage of the study area covered by each class between the two time frames.



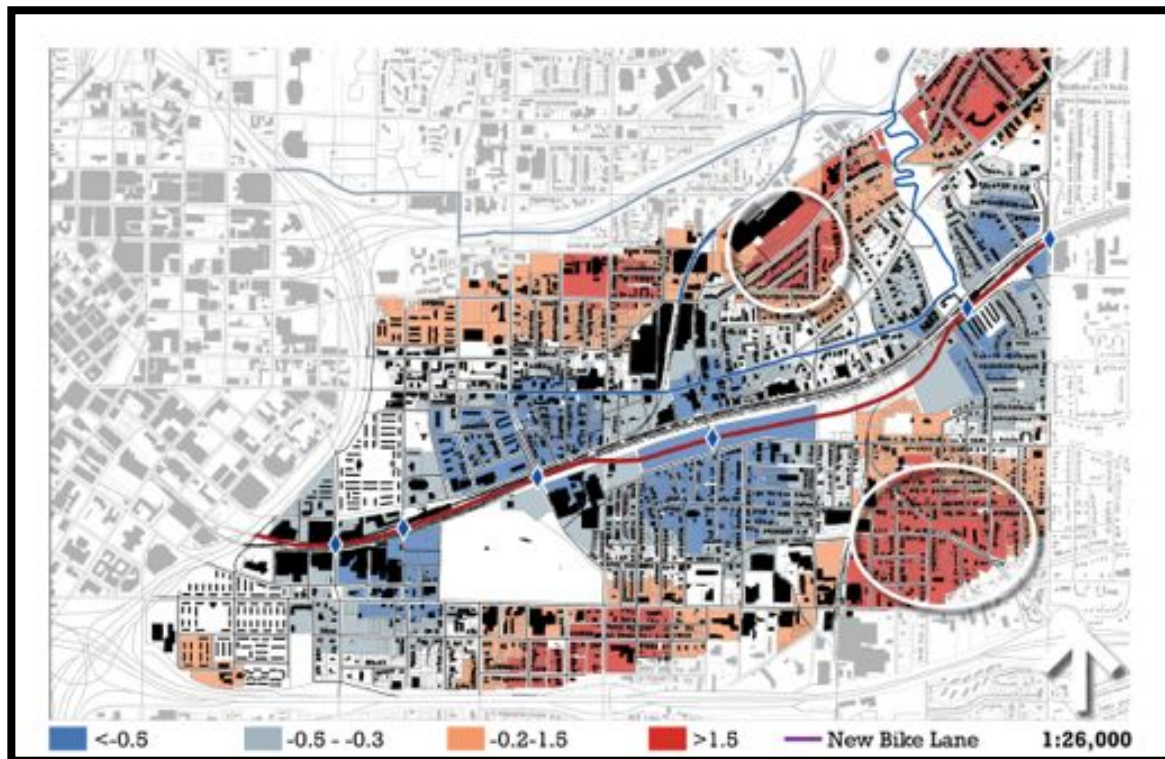
Map 5.1.5: Improvements to accessibility from base to phase one conditions, symbolized by a decrease in distance of a parcel from the nearest connection.

The provision of bolstered pedestrian and bicycle accommodation across the buffer area occurs according to a dispersed pattern, with improvements scattered throughout the study region. More often than not, however, these increases to accessibility cluster adjacent to the new infrastructural provisions, evidence that reduced impediment costs had an effect. The general

increases to accessibility include:

- **25% increase** (+108) in very accessible parcels
- **5% increase** (+93) in accessible parcels
- **9% decrease** (-122) in partially accessible parcels
- **41% decrease** (-79) in inaccessible parcels

Except for the marked decrease in parcels inaccessible to a connection, all of these shifts are quite unremarkable. As further evidence of this fact, the generalized accessibility score barely drops, falling only .02 points from 0.46 to 0.44, which is still not close to the ideal score of 0.25. In general, however, inaccessible parcels appear to be replaced by those that are accessible to a connection. A hotspot analysis of these new conditions was conducted, displaying the same gap in connectivity that was observed with baseline conditions (**map 5.1.6**).

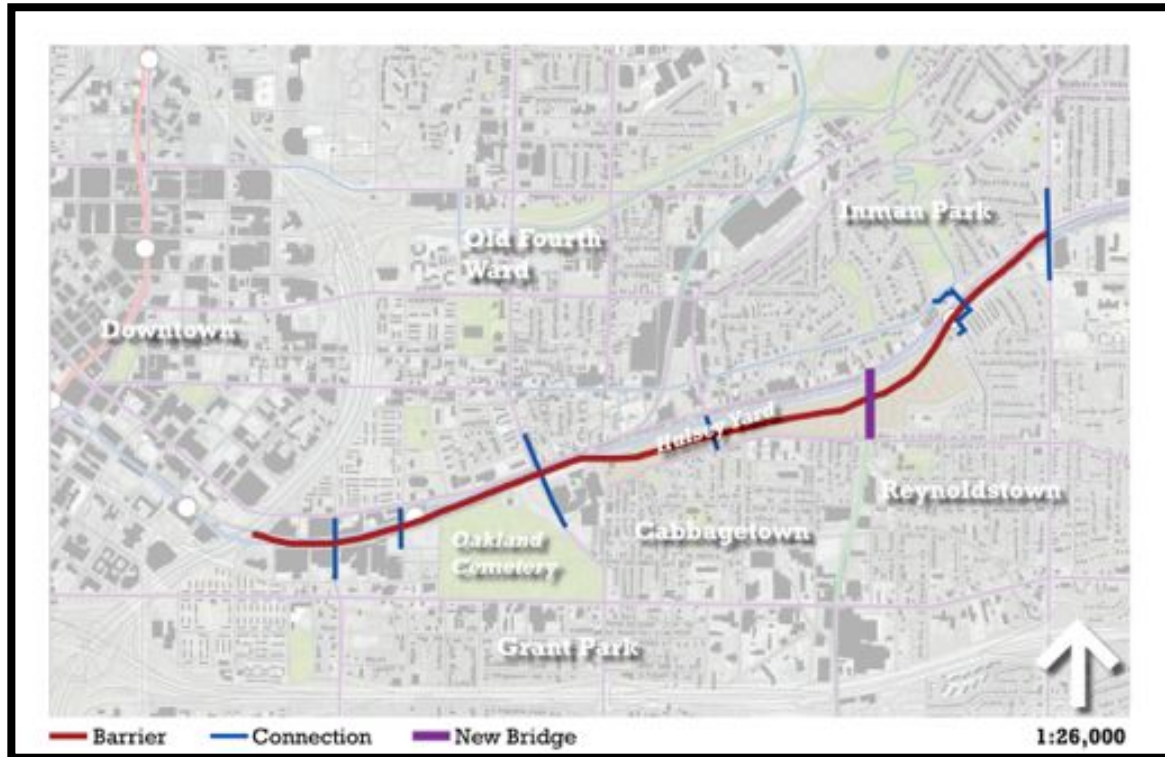


Map 5.1.6: Hotspot analysis of parcel-based accessibility after phase one improvements. Score is z -value.

According to this analysis of spatial correlation, the same two major hotspots can be seen to cluster around a common north/south axis along the railroad corridor. This pattern is emblematic of the gap in network connectivity here, and no intervention aside from an entirely new connection across this gap could mitigate the accessibility concerns. As such, the next phase of the accessibility improvement plan involves the provision of an entirely new connection to span this breach and connect Inman Park with Reynoldstown.

5.2 Phase 2: Connect

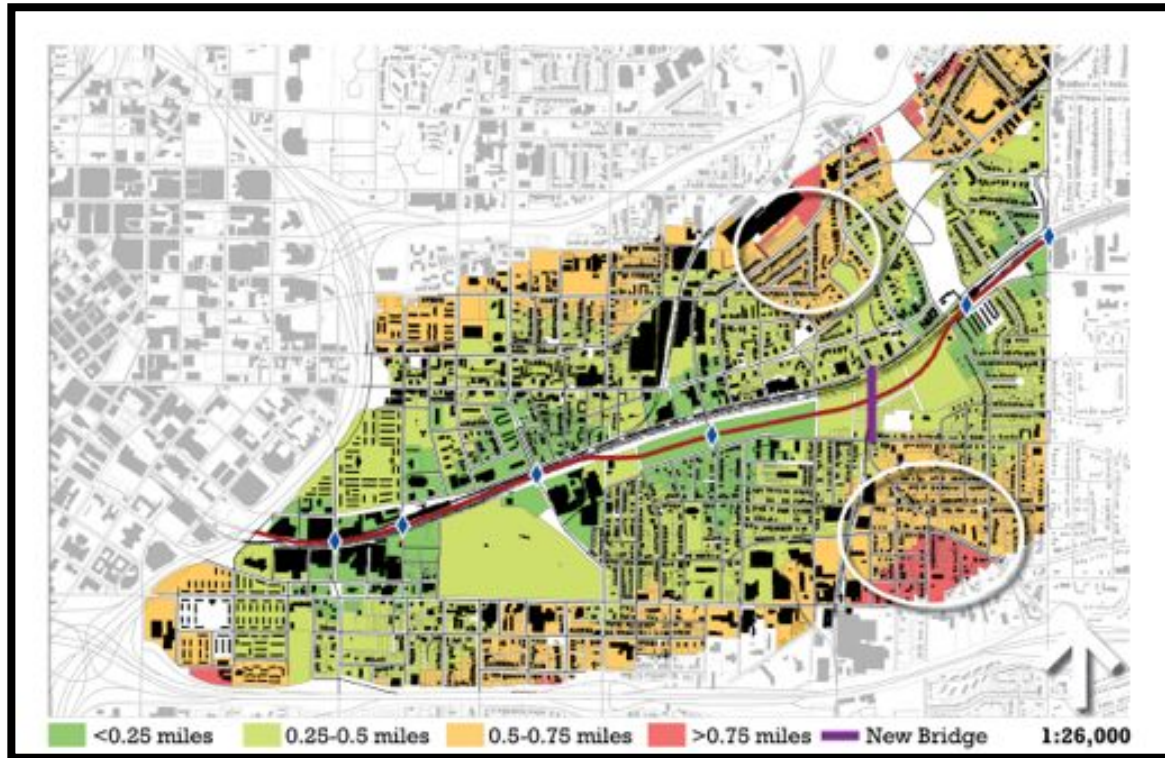
The second phase of this analysis involves the provision of entirely new infrastructure to the network: the creation of a bridge that crosses Hulsey Yard's midpoint (**map 5.2.1**).



Map 5.2.1: Proposed bridge spanning extent of Hulsey Yard.

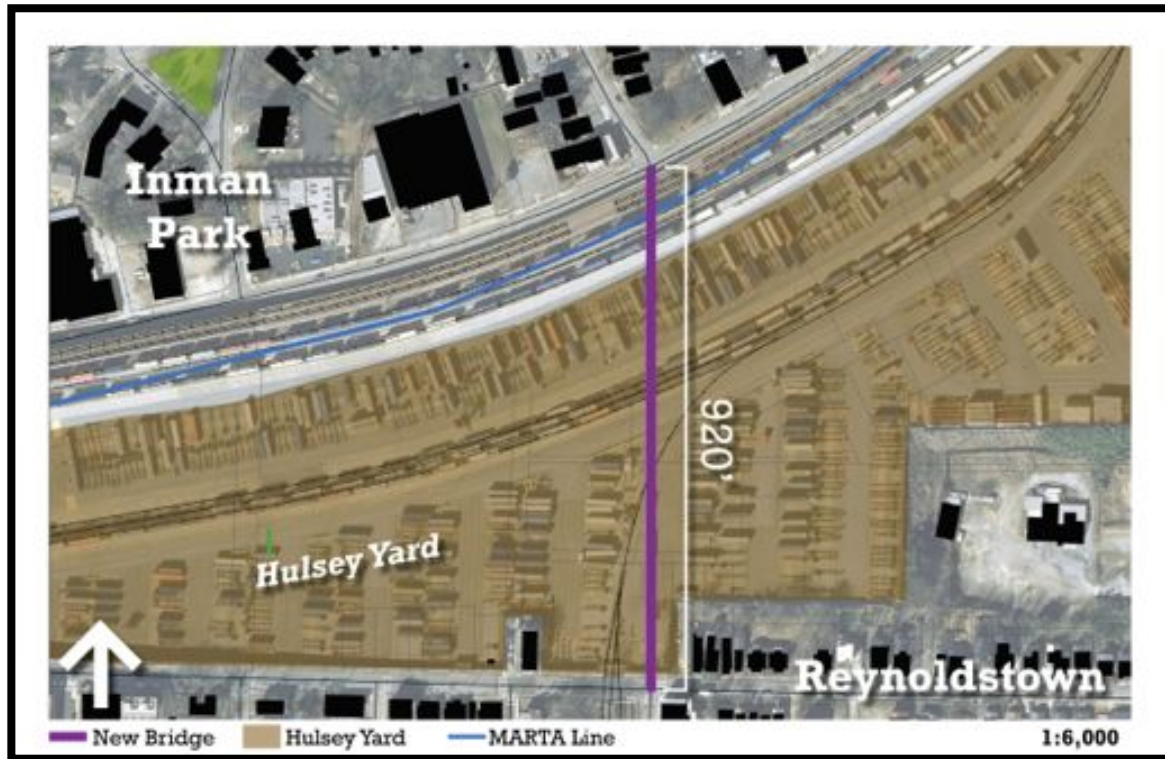
As displayed through this overview, this new bridge creates a connection across Hulsey Yard to connect Inman Park with Reynoldstown in an area most deficient in adequate north/south connectivity. As previously demonstrated, two distinct areas (circled) were still determined to be

lacking in accessibility the most, despite the added distribution of bike/ped infrastructure throughout the study area during phase one (**map 5.2.2**).



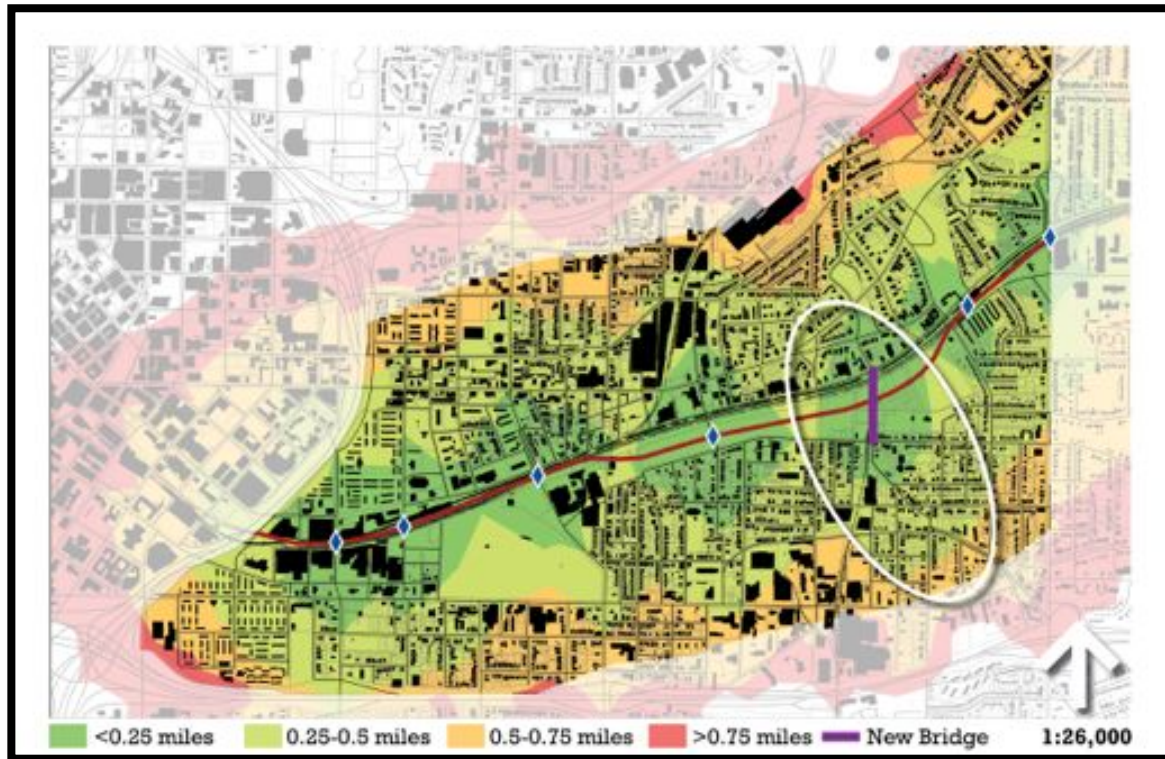
Map 5.2.2: Proposed connection superimposed upon phase one accessibility values.

These parcels appear to be located along common north/south axis, in direct relation to the gap in connectivity caused by Hulsey Yard. As seen above, a new bridge across the railroad terminal would help to span this gap and connect the two disparate areas. The placement of this intervention was chosen to both maximize the accessibility improvements and align two street networks that are currently disconnected. A smaller-scale view of this connection is shown in **map 5.2.3**.



Map 5.2.3: Location of a new bridge connecting Inman Park to Reynoldstown.

Spanning across the widest portion of Hulsey Yard, a pedestrian and cyclist-oriented bridge could increase accessibility from Inman Park to Reynoldstown. In order to connect Flat Shoals on the south to Waverly Way in Inman Park, such a bridge would need to cross 920' over the active rail yard and CSX mainline, and would also need to negotiate the elevated MARTA line. Securing right of way over this corridor would be difficult, as would designing the connection to weave through all the extant transportation infrastructure. While these obstacles may prevent such an intervention from being reality, the improvements it would bring for accessibility would nevertheless be significant. The results of the network analysis with the addition of this new connection are displayed in **map 5.2.4**.

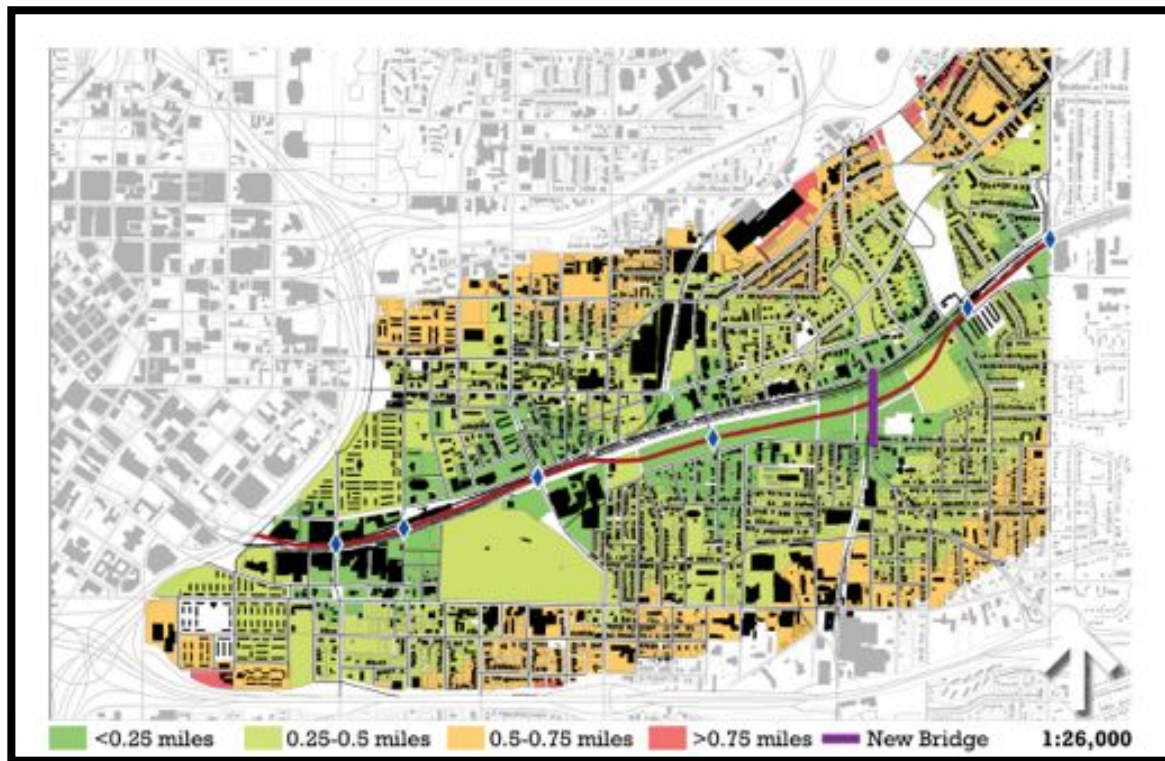


Map 5.2.4: Network analysis of existing street network with phase 1 & 2 improvements, showing distance to nearest connection. The circled area shows areas with improved accessibility.

As seen above, this new connection was included in an updated network analysis, significantly increasing accessibility within the circled area. With this intervention, the gap from MARTA to Krog Street tunnel is resolved, connecting Inman Park to Reynoldstown along the Southeastern portion of the BeltLine ROW. This helps increase accessibility in those deficient areas, which may encourage new development on vacant industrial lots adjacent to this area. To measure the exact scope of this improvements, these buffer values were again applied to the parcels of the study area, which is visible in **table 5.2.1** as well as **map 5.2.5**.

Access	Distance from Connection (miles)	Number of Parcels	% of Total
<i>Very Accessible</i>	0 - 0.25	680	18.01%
<i>Accessible</i>	0.25 - 0.5	2044	54.13%
<i>Partially Accessible</i>	0.5 - 0.75	1023	27.09%
<i>Inaccessible</i>	0.75 - 1	29	0.77%
Total		3776	100.00%

Table 5.2.1: Accessibility conditions with all phase two improvements, including bike/ped improvements as well as new connection. Shows the number of parcels falling into each category as well as the percentage of the area composed by that type.



Map 5.2.5: Network distance of parcel centroid to nearest connection, with new connection and improved bike/ped accommodations included.

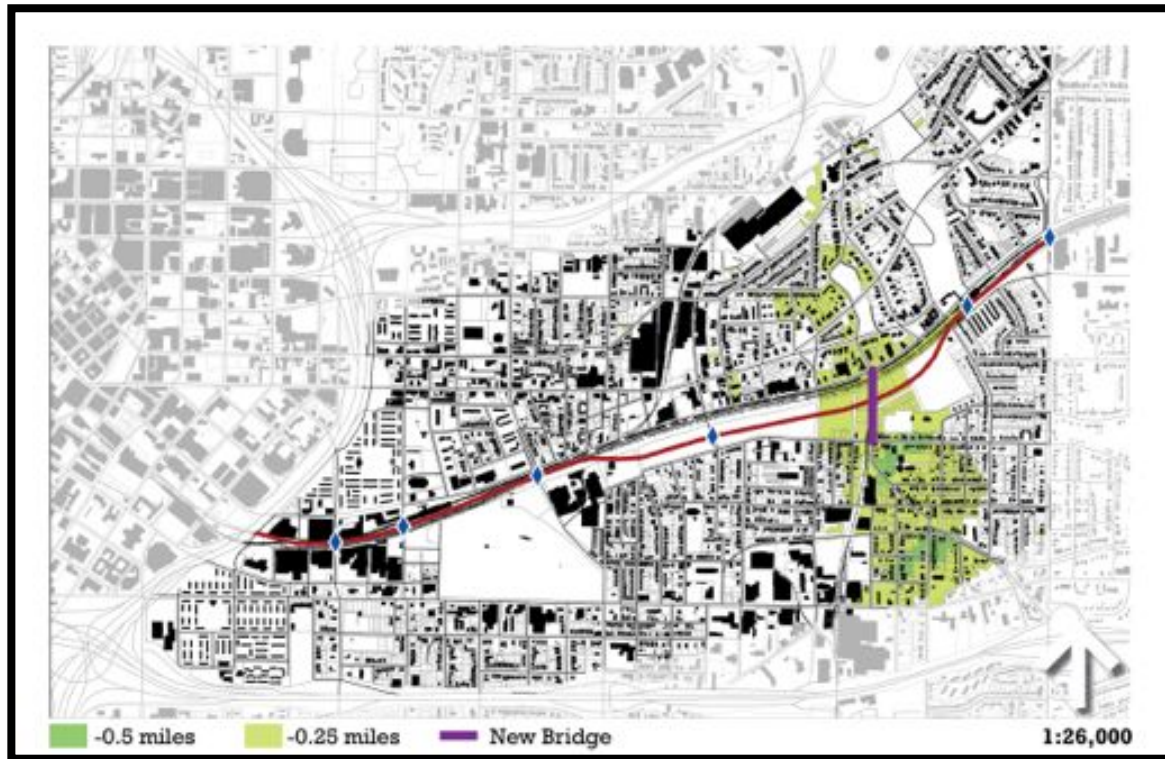
Accessibility with the bridge are seen to be markedly improved under new conditions. Out of a total of 3,776 parcels:

- **18%** (680) are very accessible to one or more connections
- **54%** (2,044) are accessible to one or more connections
- **27%** (1,023) are partially accessible to one or more connections
- **0.8%** (29) are still inaccessible to any connections

With the addition of the new bridge, over two-thirds of all parcels are now either very accessible or accessible to one or more north/south connections. Slightly more than a quarter of parcels are either partially accessible or inaccessible, although only 29 (0.8%) parcels are still inaccessible. The new condition would fundamentally improve accessibility for residents throughout much of Reynoldstown. Due to disconnects in Inman Park's street network, however, many parcels in that neighborhood remain inaccessible. **Table 5.2.2** shows a detailed account of the improvements gained from phase one to phase two, while the precise spatial distribution of the improvements are shown **map 5.2.6**.

Access	Distance from Connection (miles)	Parcel Change	% Change	Change in % of Total
<i>Very Accessible</i>	0 - 0.25	140	25.93%	3.71%
<i>Accessible</i>	0.25 - 0.5	154	8.15%	4.08%
<i>Partially Accessible</i>	0.5 - 0.75	-211	-17.10%	-5.59%
<i>Inaccessible</i>	0.75- 1	-83	-74.11%	-2.20%

Table 5.2.2: *Changes in parcel-based accessibility from phase one conditions to improved phase two conditions due to a new connection. Displayed by raw and percentage change from previous period, as well as change in overall percentage of the study area covered by each class between the two time frames.*



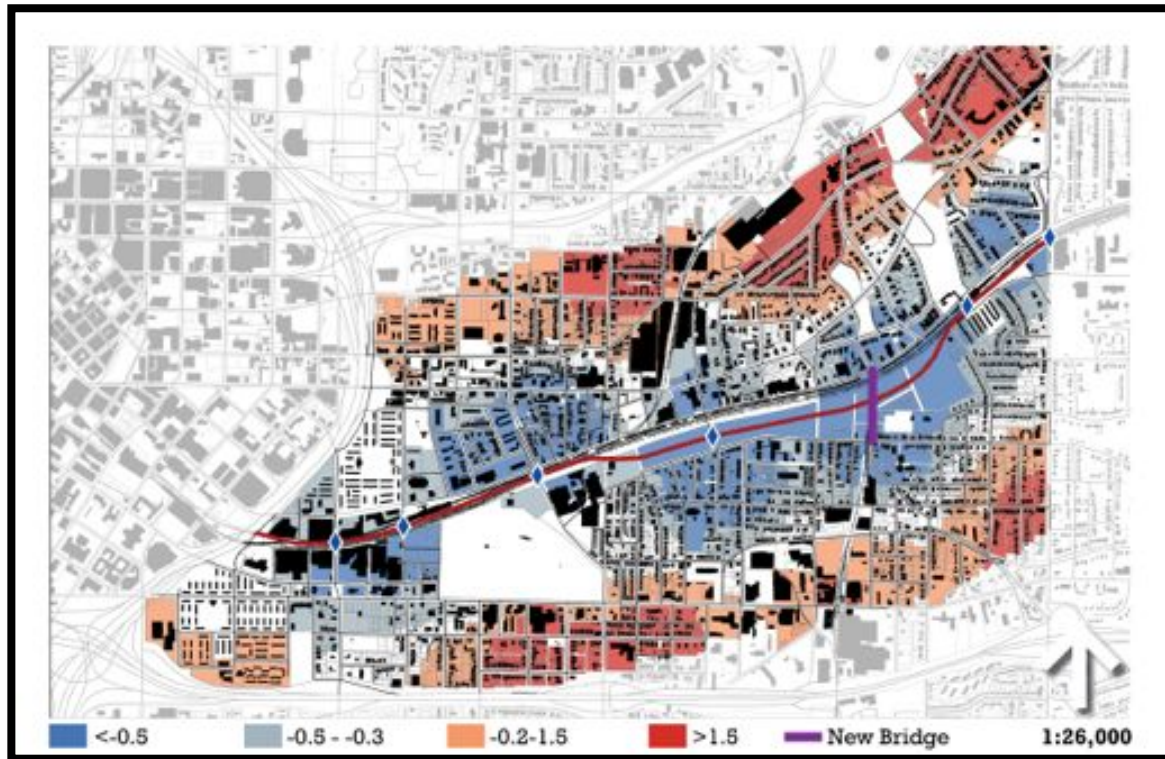
Map 5.2.6: Improvements to accessibility from phase one to phase two conditions, symbolized by a decrease in distance of a parcel from the nearest connection.

When comparing accessibility between phases one and two, significant improvements can be seen, especially throughout Reynoldsburg. The increases in accessibility are less pronounced across Inman Park, which is partially due to its less connective street grid. Improvements include:

- **26% increase** (+140) in very accessible parcels
- **8% increase** (+154) in accessible parcels
- **17% decrease** (-211) in partially accessible parcels
- **74% decrease** (-83) in inaccessible parcels

In general, the same trends seen after the phase one improvements are again seen with the new bridge put into place. While very accessible parcels again increase modestly in number, completely inaccessible parcels are nearly eliminated. The decline in partially accessible and inaccessible parcels is accompanied by a marked increase in those that are accessible under improved conditions; as such, the accessibility score drops another 0.04

points during this stage, falling to an improved .4. In general, this intervention will be effective in decreasing the distance from parcels to a north/south connection where additional accommodation did not, especially those near the now-eliminated gap (**map 5.2.7**).

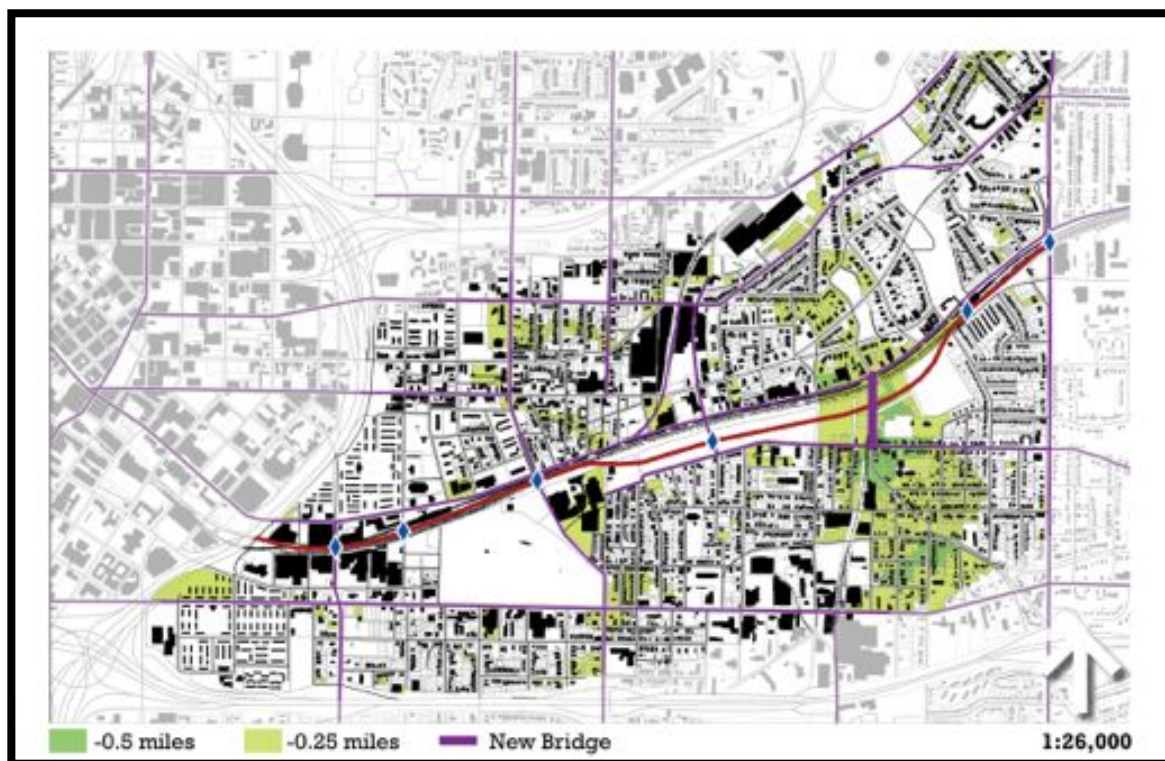


Map 5.2.7: Hotspot analysis of parcel-based accessibility with phase two improvements. Score is z -value.

The updated hotspot analysis now shows the pattern expected from a spatial phenomenon such as distance, with cold (highly accessible) areas clustered near the center and cold (inaccessible) parcels grouped near the margins. The overall improvements from baseline conditions to a scenario that considers the provision of both a new bridge as well as more bike/ped accommodations are outlined through **table 5.2.3** and **map 5.2.8**.

Access	Distance from Connection (miles)	Parcel Change	% Change	Change in % of Total
<i>Very Accessible</i>	0 - 0.25	248	57.41%	6.57%
<i>Accessible</i>	0.25 - 0.5	247	13.75%	6.54%
<i>Partially Accessible</i>	0.5 - 0.75	-333	-24.56%	-8.82%
<i>Inaccessible</i>	0.75 - 1	-162	-84.82%	-4.29%

Table 5.2.3: Changes in parcel-based accessibility from base to improved phase two conditions due to additional bike/ped accommodation as well as a new connection. Displayed by raw and percentage change from previous period, as well as change in overall percentage of the study area covered by each class between the two time frames.



Map 5.2.8: Improvements to accessibility from base to phase two conditions, symbolized by a decrease in distance of a parcel from the nearest connection.

When considering the effects of both phase one and phase two improvements on overall accessibility, the influence of a new connection on increased access is self-evident. In spite of the marked improvements shown clustered around the new bridge, the numerous improved

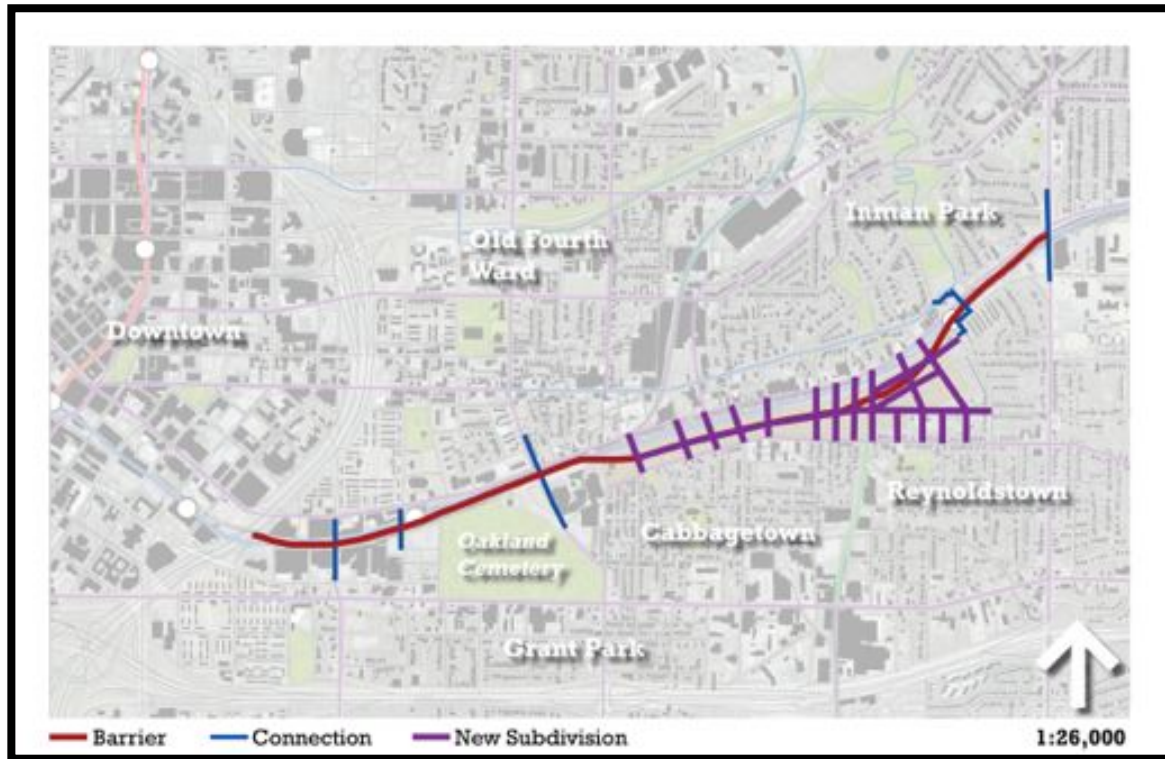
parcels scattered across the study area are still significant. The sum of all accessibility enhancements can be summarized thusly:

- **57% increase** (+248) in very accessible parcels
- **14% increase** (+247) in accessible parcels
- **25% decrease** (-333) in partially accessible parcels
- **85% decrease** (-162) in inaccessible parcels

In addition to the near-complete removal of all inaccessible parcels, the effects of phase one and two collectively result in a more than 50% growth of those parcels considered to be very accessible. While those parcels rated as accessible do not increase dramatically when their initial proliferation is considered, the raw value change is nevertheless significant (+247) and on par with the increase in very accessible parcels. Parcels considered to be within an accessible range to a connection increase in scope by over 13% while those outside this distance decrease by the same amount, a trend which suggests that inaccessible or partially accessible parcels are actually shifting towards accessibility, rather than there simply being movement from the accessible to very accessible score. The generalized accessibility score reflects these overall improvements, falling 0.06 points from 0.46 to 0.4. While this score is still not within the ideal range, it nevertheless shows there are improvements made with the proposed enhancements. The final phase of recommendations, which involves a wholesale redevelopment of Hulsey Yard, stands to reduce this value even further.

5.3 Phase 3- Subdivide

The final—and arguably the most radical—phase of the recommended plan is to subdivide Hulsey Yard in its entirety, a solution which would simultaneously eliminate the gaps in connectivity between Cabbagetown/Reynoldstown and Inman Park as well as create new real estate for a transit-oriented development centered around the MARTA and BeltLine corridors. An overview of a potential subdivision scheme is represented in **map 5.3.1**, shown in the context of existing conditions.



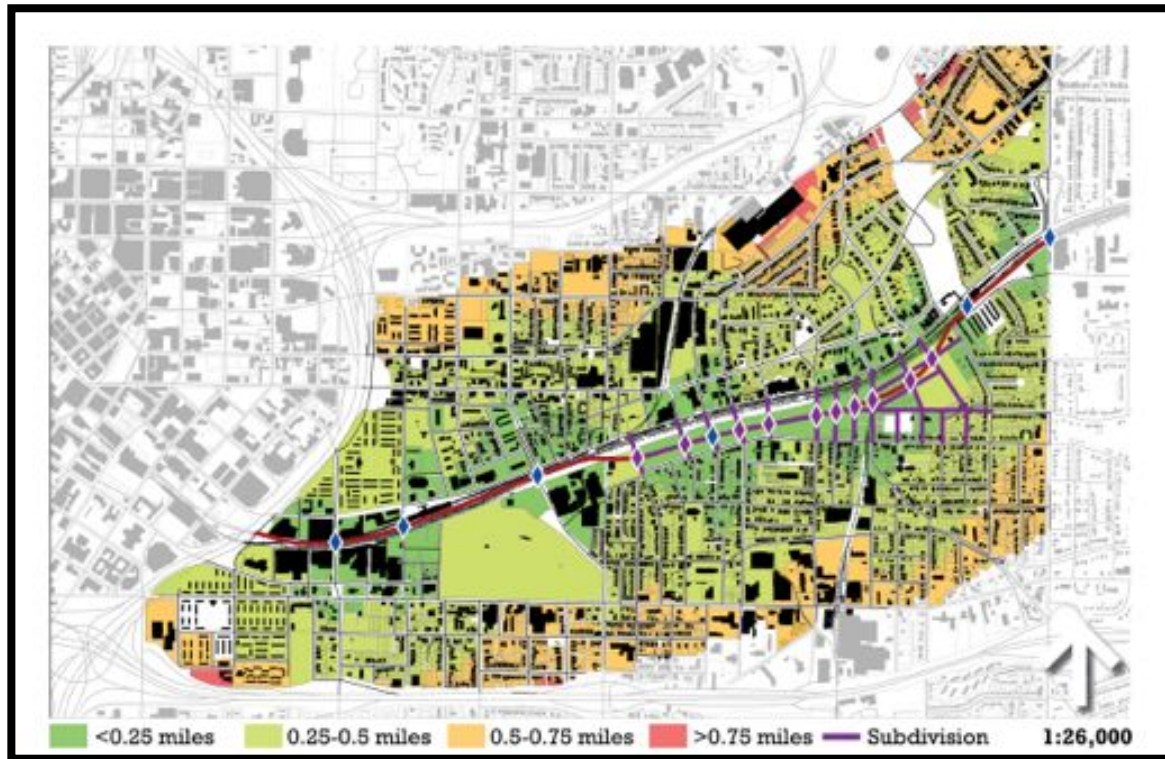
Map 5.3.1: Proposed subdivision of Hulsey Yard, including nine new north/south connections.

The proposed subdivision scheme was laid out according to a set of guiding principles, which include:

- Maximize connectivity across the corridor and uniting north with south
- Minimize disturbance of the existing development and neighborhoods
- Follow existence parcel boundaries and road right of ways
- Establish a center of activity for the three adjacent neighborhoods
- Devise a method to connect MARTA with the BeltLine

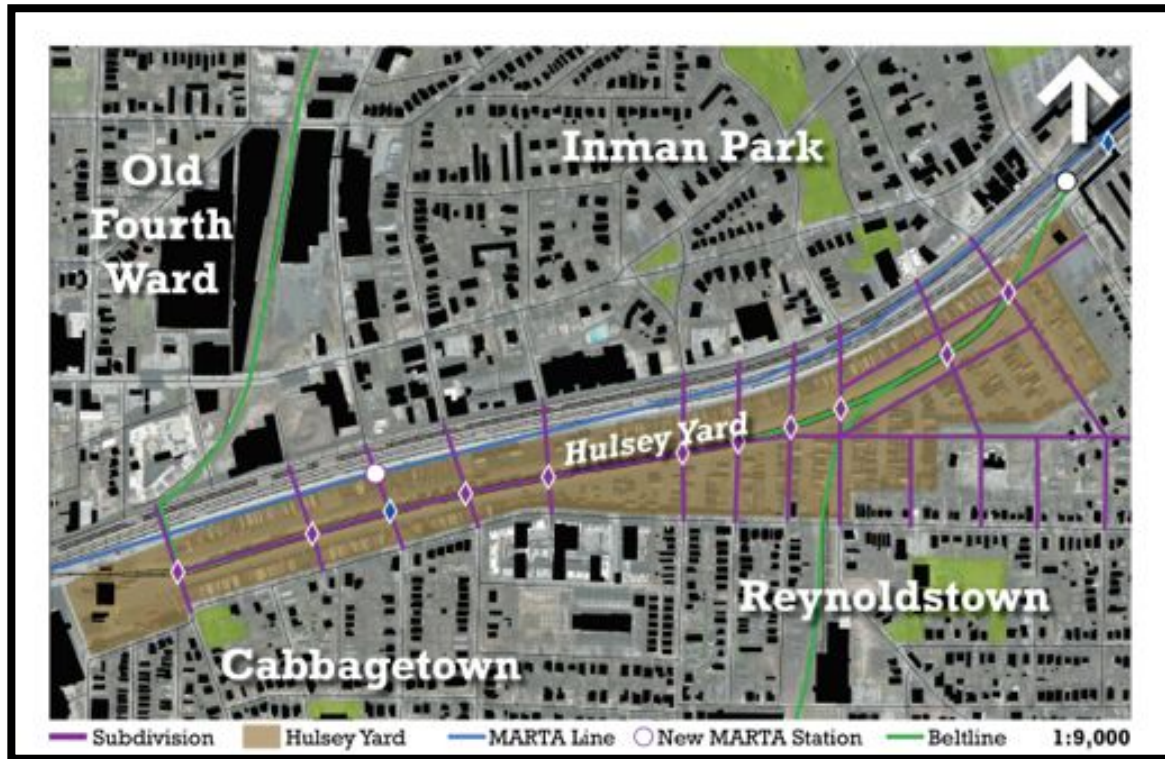
With the additional cross streets implemented, this subdivision plan provides ten new points of access across the corridor, most of which continue the course of existing ROWs. Additionally, there are two streets that flow across Hulsey Yard at its midpoint, providing a means for east/west navigation, as well as providing a solution for BeltLine transit to transverse the corridor as a streetcar. Finally, the plan provides a location for transfers between the proposed BeltLine transit and the existing MARTA line, which could occur at a

new MARTA station. While there are several obstacles to be overcome in its implementation, the benefits of such a subdivision scheme would nevertheless be many. **Map 5.3.2** shows this plan overlain onto the accessibility improvements seen through phase two.



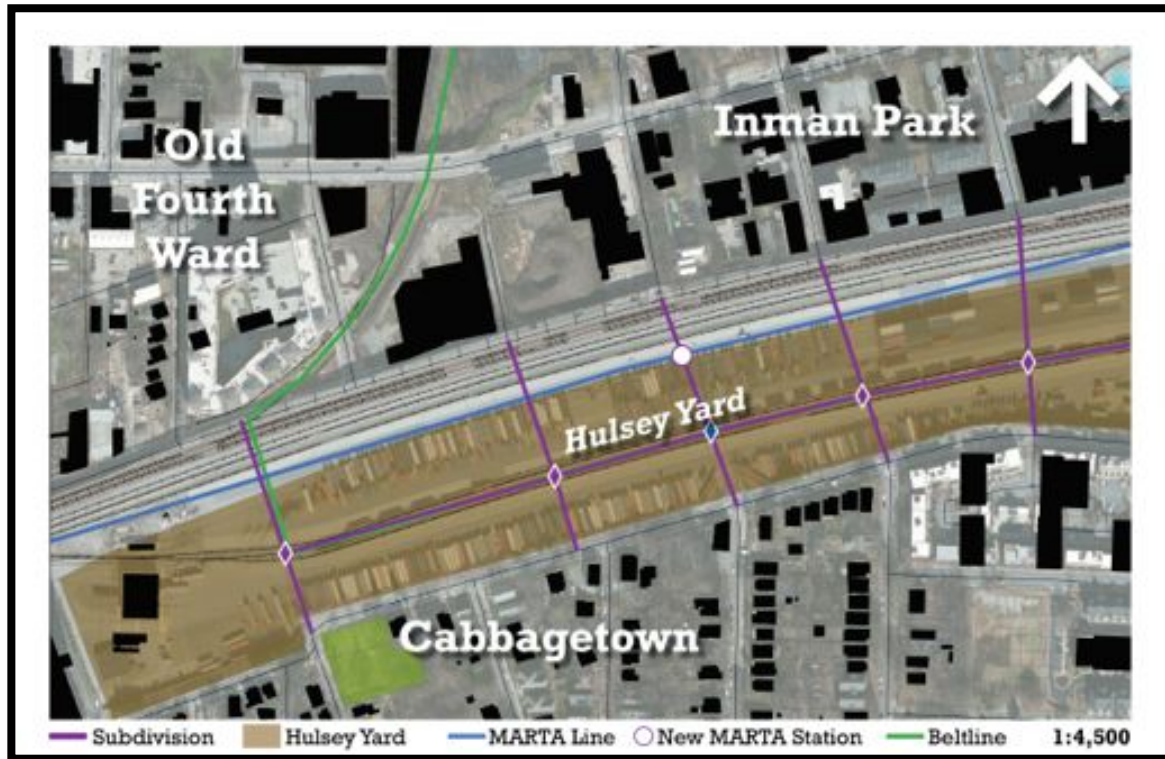
Map 5.3.2: Proposed subdivision scheme superimposed upon phase one accessibility values.

As outlined earlier, the Hulsey Yard subdivision plan would put nine new north/south into place across the corridor, phase two's proposed bridge notwithstanding. Although accessibility along this area will already improve greatly following the installation of this bridge, there is still room for improvement, as evident by the accessibility score of 0.4 following phase two. A closer look at this arrangement is provided through **map 5.3.3**.



Map 5.3.3: Overview of proposed subdivision, showing BeltLine ROW as well as new MARTA station.

As shown above, the subdivision scheme provides a system of blocks and streets consistent with the character of the surrounding neighborhoods, reconnecting long separated roads. Additionally, a new Cabbagetown/Inman Park MARTA station is proposed near the intersection of DeKalb Avenue and Krog Street, shown in detail with **map 5.3.4**.



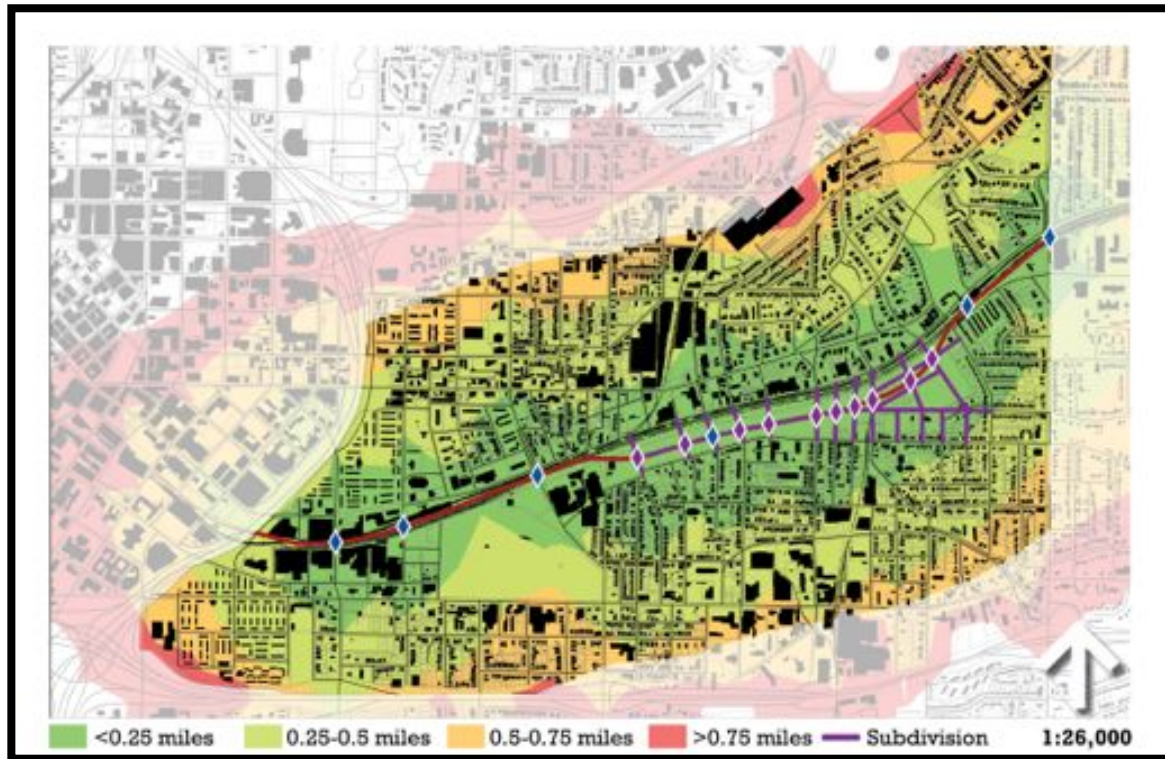
Map 5.3.4: Subdivision scheme and relation to BeltLine NE segment and proposed MARTA station.

The proposed new MARTA station would be located along MARTA's existing ROW, providing a direct connection with the transit component of the BeltLine. As the BeltLine's NE segment terminates at DeKalb Avenue, it could then enter into Hulseley Yard along a new street, where it would become a streetcar. The BeltLine would then turn east, passing the MARTA station along another newly platted street, allowing a nexus to transfer between the two transit systems. As it travels east through the subdivision, it can ultimately connect with the SE section of the BeltLine in Reynoldstown (**map 5.3.5**).



Map 5.3.5: Subdivision scheme and relation to BeltLine SE segment.

Though it is not shown in this illustration, the BeltLine transit could unite with the SE portion at the eastern end of the proposed Hulsey Yard subdivision. What is displayed here is the current alignment of the BeltLine, which is designed to connect it with the existing Inman Park/Reynoldstown MARTA station. What is proposed instead is using the subdivision scheme as an outline for the BeltLine's possible routing, which would create room for transit-oriented redevelopment to occur within the newly created blocks. Zooming back out to the study region as a whole, the accessibility boosting effects of this plan will first be determined (**map 5.3.6**).

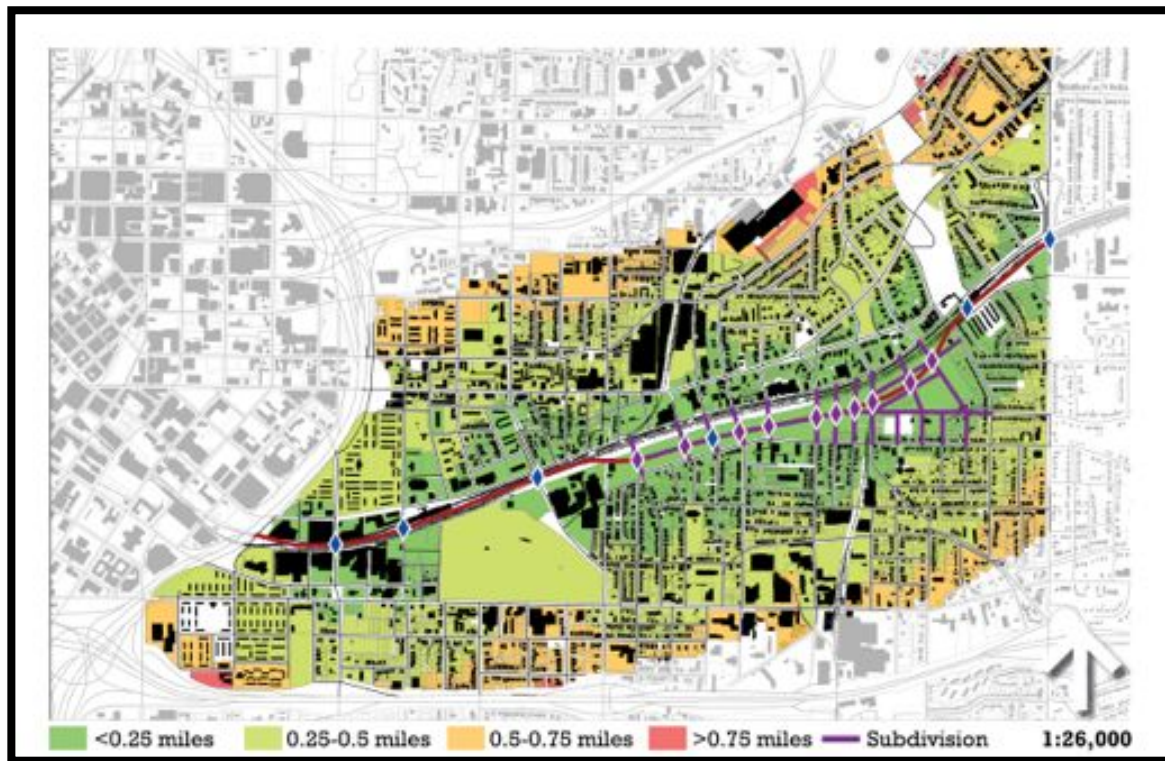


Map 5.3.6: Network analysis of existing street network with improved bike/ped accommodations as well as the subdivision scheme, showing distance to nearest connection. The circled area shows areas with improved accessibility.

As with the bridge proposed in phase two, these new connections were manually placed into the existing network dataset, resulting in the buffer distance calculation as seen above. At first glance, it is evident that all the areas directly adjacent to Hulsey Yard to the north and to the south are now very accessible. A parcel-based approach was again taken to determine the overall accessibility statistics of this change, outlined in **table 5.3.1** and displayed graphically in **map 5.3.7**.

Access	Distance from Connection (miles)	Number of Parcels	% of Total
<i>Very Accessible</i>	0 - 0.25	1260	33.37%
<i>Accessible</i>	0.25 - 0.5	1726	45.71%
<i>Partially Accessible</i>	0.5 - 0.75	765	20.26%
<i>Inaccessible</i>	0.75 - 1	25	0.66%
Total		3776	100.00%

Table 5.3.1: Accessibility conditions with all phase three improvements, including bike/ped improvements as well as subdivision. Shows the number of parcels falling into each category as well as the percentage of the area composed by that type.



Map 5.3.7: Network distance of parcel centroid to nearest connection, with subdivision and improved bike/ped accommodations included.

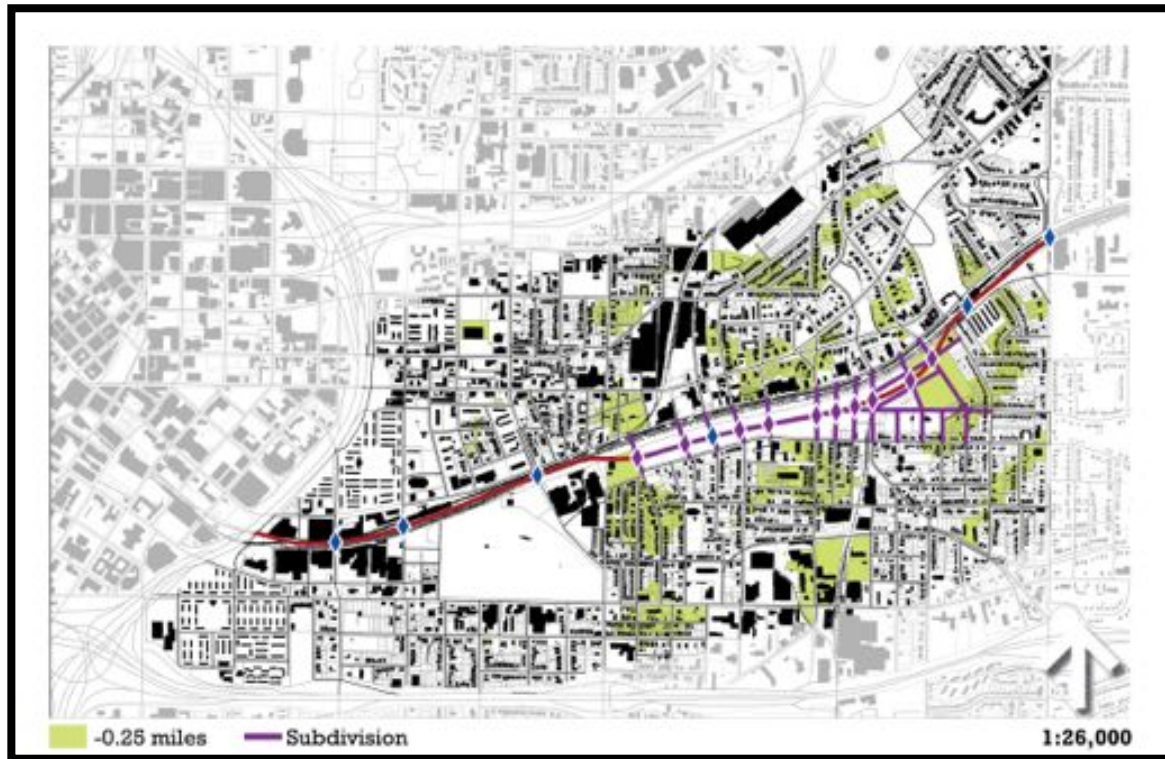
As shown above, there are now very few parcels within the region that are not accessible, though some clusters still exist. Out of the 3,776 parcels within the study area:

- **33%** (1,260) are very accessible to one or more connections
- **46%** (1,726) are accessible to one or more connections
- **20%** (756) are partially accessible to one or more connections
- **0.7%** (25) are still inaccessible to any connections

With the subdivision plan in place and the additional connectivity it brings with it, over four-fifths of the study area's parcels are within accessible range. The remaining 20% of parcels are generally partially accessible, though there do remain some that are entirely outside of the acceptable range. The continued existence of these phenomena is likely due to the occurrence of other factors not accounted for in this analysis, such additional barriers preventing north/south mobility (i.e., Oakland Cemetery), or an extant street network that was not well connected from the outset (e.g., in northern/northeastern Inman Park). The general patterns of accessibility gains incurred from this improvement are nonetheless substantial, even between phases two and three (**table 5.3.2** and **map 5.3.8**).

Access	Distance from Connection (miles)	Parcel Change	% Change	Change in % of Total
<i>Very Accessible</i>	0 - 0.25	580	85.29%	15.36%
<i>Accessible</i>	0.25 - 0.5	-318	-15.56%	-8.42%
<i>Partially Accessible</i>	0.5 - 0.75	-258	-25.22%	-6.83%
<i>Inaccessible</i>	0.75 - 1	-4	-13.79%	-0.11%

Table 5.3.2: *Changes in parcel-based accessibility from phase two to improved phase three conditions due to subdivision. Displayed by raw and percentage change from previous period, as well as change in overall percentage of the study area covered by each class between the two time frames.*



Map 5.3.8: Improvements to accessibility from phase two to phase three conditions, symbolized by a decrease in distance of a parcel from the nearest connection.

Displayed above, the parcel-based change in distance to/from the nearest connection highlight several significant improvements to the existing network after the subdivision scheme is realized. While no individual parcels become more than $\frac{1}{4}$ miles closer to a connection than under conditions brought on with a new bridge (suggesting the bridge did indeed address the most important issue for immediate accessibility: lack of connectivity), the effects of increased accessibility are widespread. Out of a total of 3,776 parcels, there was a continued:

- **85% increase** (+580) in very accessible parcels
- **16% decrease** (-318) in accessible parcels
- **25% decrease** (-258) in partially accessible parcels
- **14% decrease** (-4) in inaccessible parcels

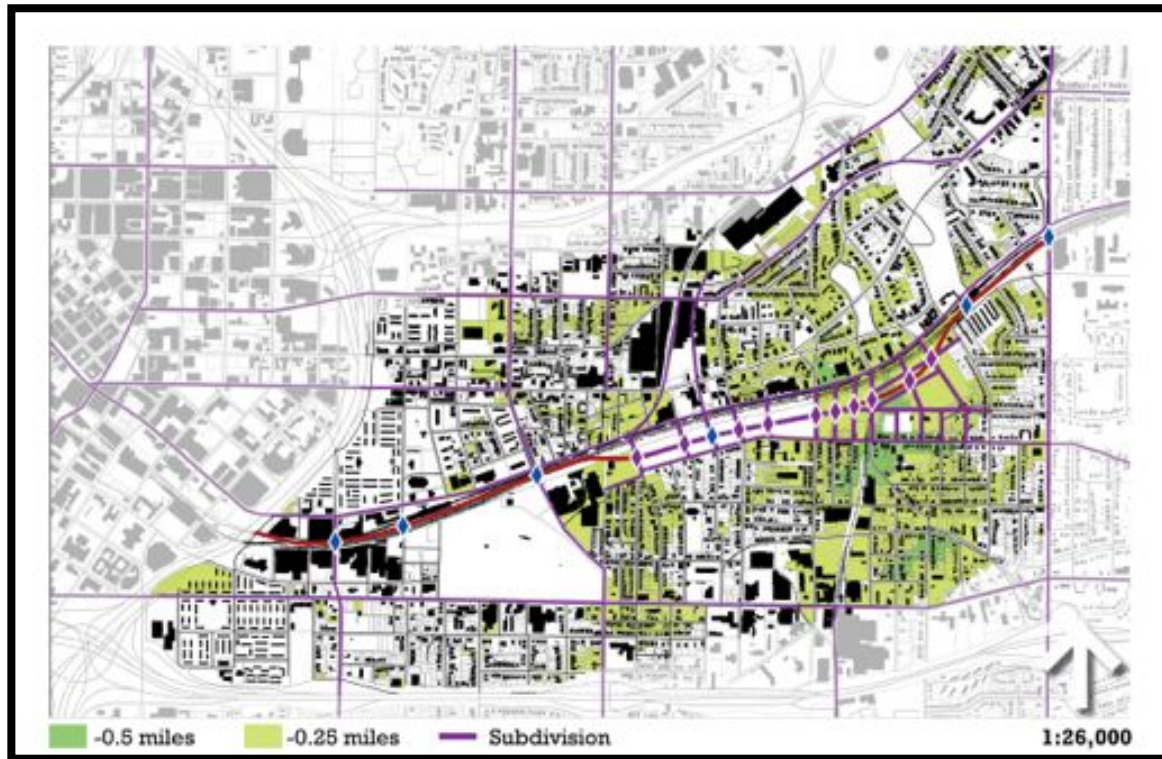
Indeed, the negligible decrease in totally inaccessible parcels provides further evidence that there are existing flaws in the connectivity of the street network, despite the effects of the railroad corridor as a barrier. These parcels are outside of the reach of any Hulsey Yard-based intervention. Otherwise, partially accessible parcels once again decline in number, shrinking in scope by 7% compared to pre-subdivision conditions. There is also a marked decrease in parcels considered to be accessible, though it can be assumed that these are now very accessible in this scenario. This is evidenced by the extreme increase in these very accessible parcels, which almost double in number from phase two to phase three. Overall, the scope of very accessible parcels across the study areas increases by a net value of 15% to encompass a total of 33% of the region, while accessible parcels compose 45%. In the ideal scenario (accessibility score of 0.25), very accessible parcels would compose 50%, with the remaining half being accessible, and this intervention brings the overall composition closer to this ideal. The average accessibility rating of all parcels in the study area does drop substantially, by 0.05 to a final 0.35, but it remains higher than the ideal score due to the continued existence of partially accessible parcels. With all three phases of the recommended action plan now outlined, it is now necessary to summarize the culminated changes in accessibility in a comprehensive discussion.

5.4 Discussion

Looking at accessibility changes from baseline conditions to the fulfillment of phase three (table 5.4.1 and map 5.4.1), many of the aforementioned trends are further demonstrated.

Access	Distance from Connection (miles)	Parcel Change	% Change	Change in % of Total
<i>Very Accessible</i>	0 - 0.25	720	133.33%	21.93%
<i>Accessible</i>	0.25 - 0.5	-164	-8.68%	-1.88%
<i>Partially Accessible</i>	0.5 - 0.75	-469	-38.01%	-15.65%
<i>Inaccessible</i>	0.75 - 1	-87	-77.68%	-4.40%

Table 5.4.1: Changes in parcel-based accessibility from base to improved phase three conditions due to additional bike/ped accommodation as well as subdivision scheme. Displayed by raw and percentage change from previous period, as well as change in overall percentage of the study area covered by each class between the two time frames.



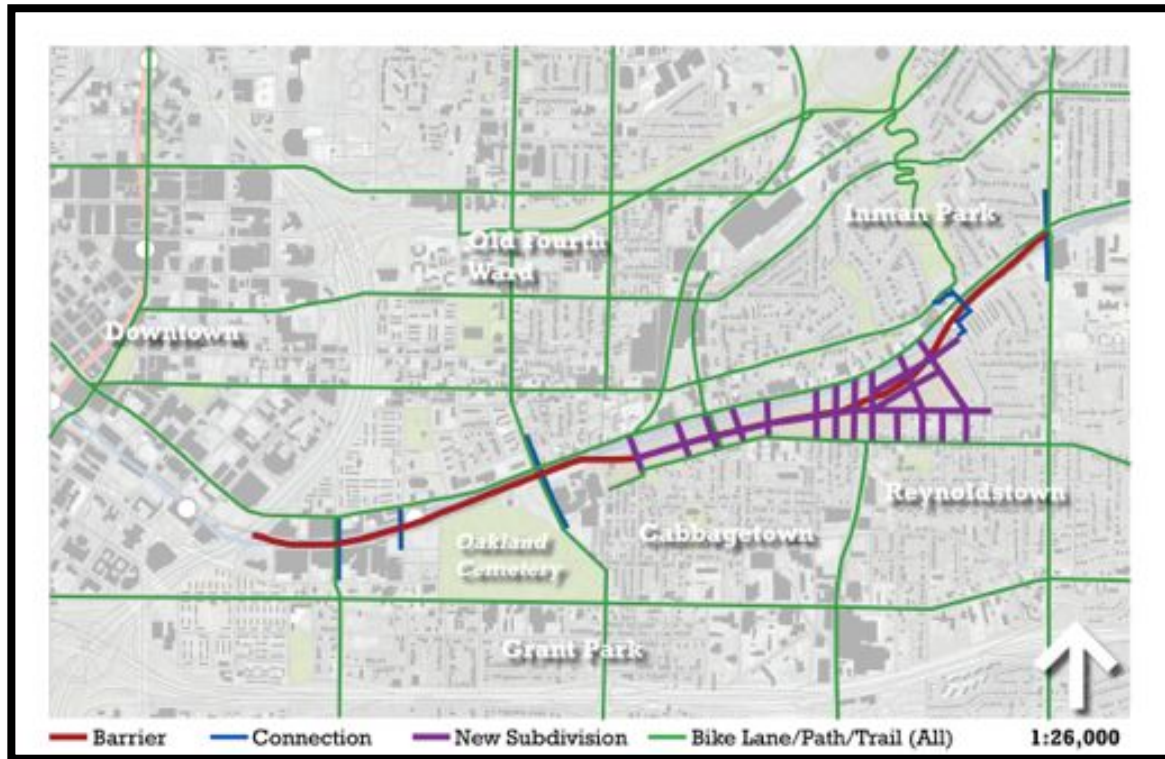
Map 5.4.1: Improvements to accessibility from base to phase three conditions, symbolized by a decrease in distance of a parcel from the nearest connection.

The complete picture of accessibility improvements due to the proposed improvements illustrates some key patterns, as seen above. First and foremost, improved parcels are clustered around the areas that are adjacent to the extant gap in connectivity, showing the potential influence of its installation. Otherwise, parcels next to existing connections see little to no improvement, while marginal decreases in parcel distance values are centered around some of the nine new proposed Hulsey Yard redevelopment connections. The outliers spread throughout the remaining study area most likely are more accessible due to the proposed bike/ped accommodations summarized in phase one; this includes the cluster of improved parcels around the intersection Memorial Avenue and Boulevard, both major arterials that would be more suitable for bike/ped mobility with appropriate infrastructure. Changes in parcel distance to a connection from baseline conditions through the implementation of phase 3, subdivision, include a:

- **133% increase** (+720) in very accessible parcels
- **9% decrease** (-174) in accessible parcels
- **38% decrease** (-469) in partially accessible parcels
- **78% decrease** (-87) in inaccessible parcels

While the overall number of accessible parcels decreases throughout the entire course of phases 1-3, that figure could potentially be misleading. These parcels did not become less accessible despite the proposed improvements; instead, a greater number of them became very accessible than partially accessible or inaccessible parcels becoming accessible. The more than doubling of very accessible parcels must still be scrutinized, however, as the overall number of parcels located within ½ miles of a connection grew by a net of 556 parcels, or 25% of their original cumulative value (2226). The associated 556 difference in partially accessible or inaccessible parcels from the original circumstances through phase three, conversely, corresponds to a 35% decrease in these parcels' overall number (1550). Over the course of the three phases, very accessible parcels grew to a cover 22% share more of the study area's total scope, from 11% to 33%. Partially accessible parcels, which composed 36% of all parcels at the outside, likewise defined just over 20% of total parcels following the completion of phase three.

While this set of proposals does not necessarily fulfill the goal of accessibility improvements across the entire study area completely (i.e., a final accessibility score of 0.25), they would nonetheless move the area in a positive direction. All of the proposed improvements to the study area's street network, which include new connections as well as bolstered infrastructure (**map 5.4.2**), are summarized phase by phase in **table 5.4.2**.



Map 5.4.2: Overview of all proposed improvements to existing network, including subdivision and new bike/ped accommodations.

Stage	Very Accessible	Accessible	Partially Accessible	Inaccessible	Accessibility Score
<i>Base Conditions</i>	432	1797	1356	191	0.46
Phase 1: <i>Improvements</i>	540	1890	1234	112	0.44
Phase 2: <i>Bridge</i>	680	2044	1023	29	0.40
Phase 3: <i>Subdivision</i>	1260	1726	765	25	0.35

Table 5.4.2: Number of parcels falling into each accessibility category, organized according to phase. Accessibility score is displayed, which is an average of all parcels' accessibility scores by phase.

Indeed, the gradual decline in inaccessible to partially accessible parcels through the three phases is accompanied by an associated increase in accessible to very accessible parcels. Fulfillment of the goal to overall increase accessibility is represented by the gradually falling accessibility score, which gradually declines from the baseline value (0.46) to 0.35, which is far closer to the ideal score of 0.25. Furthermore, each subsequent stage shows a greater drop in the accessibility score; this can possibly be interpreted as a cost-benefit ratio as projects become more intensive and radical throughout the course of implementation.

Overall, a well-formed picture of the dynamics of accessibility can be drawn from this analysis, which may help inform future efforts. While this understanding of several potential solutions and their effects on accessibility is rudimentary, it can, however, provide a starting place for an implementable planning solution. The limitations in this analysis alluded to heretofore will next be outlined, which then leads to a set of potential research implications. Finally, key conclusions are then summarized.

6. CONCLUSIONS

6.1 Limitations

Although this basic analysis presented a method for measuring and understanding the dynamics of accessibility and how a set of interventions has the capacity to improve it within the study area, it is flawed in several areas. First of all, only one outcome that was analyzed out of several possibilities for each proposed phase of improvements. The development of an objective ‘accessibility score’ provides a basic measure for this purpose, but it is only relevant for movement across individual corridors and has not yet been tested for other applications. Even with this metric, there nevertheless remains the issue of analyzing and comparing alternatives; while the reasons for deciding upon the placement of the new bridge, for example, was based on logical assumptions—the street networks to the north and south should be reconnected at a prominent gap—it was chosen entirely through a visual scan. Since only one potential solution for analyzed during each phase at the expense of any others, it is impossible to gauge whether each would be the most cost effective for the goal of increased accessibility.

On a related level, a second limitation of this analysis concerns the lack of a cost-benefit analysis of the proposed projects. Ignoring for a moment whether or not increasing accessibility along this corridor is a priority for the city at the moment, there is no method outlined in this analysis that relates the accessibility improvements to real investment opportunities. The closest thing to a metric of success developed during this study is the accessibility score, which could be developed more through GIS methods. Furthermore, the auxiliary benefits of the proposed projects—such as the implications of a Hulsey Yard redevelopment would have on development efforts and tax revenue—were not considered. If this idea were developed more thoroughly, these projects may align with planning goals and implementation may be considered. Because this study relies entirely on potential outcomes without considering similar projects that have already been implemented, however, none of this is possible without some of kind of implementation plan that considers both costs and benefits of all varieties.

Building upon this idea, the final limitation of this study is a lack of an action plan concerning the acquisition of rights to Hulsey Yard. Although it is obviously a nuisance for the surrounding neighborhoods, it nevertheless remains an asset for the City of Atlanta’s economic functions. As long as Hulsey Yard remains economically viable for the company, CSX will have

no incentive to sell the property, which prevents any component of phase three from occurring. Furthermore, the implementation of phase two, a new bridge across the area, would not only require right of way access from CSX, but also from various other entities, such as MARTA. The negotiation of both legal and physical access to this site for the installation of new infrastructure remains an unaddressed issue, preventing any of the ideas presented in phases two and three from any realistic implementation. Since the goal of this study was not to lead to implementation, but rather to explore the dynamics of accessibility in the area and present potential improvements, these questions remain available for future research endeavors.

6.2 Further Research

Due to these limitations, it is clear that further research could be directed towards the completion of a more holistic action plan for implementation. This would include a consideration of the acquisition of Hulsey Yard, as well as a more developed set of costs and benefits of implementation in order for the projects to align with realistic planning goals. Furthermore, several alternatives would need to be explored to compare to those presented, to ensure successful investment. Considering the series of possible solutions, a more holistic study and an plan for implementation would definitely reinforce an argument to intervene.

6.3 Conclusion

Despite the limitations of this analysis, it foremost provided a useful exercise for understanding accessibility dynamics and how a metric may be developed to measure it through an objective accessibility score. Furthermore, the proposed solutions nonetheless remain relevant in a discussion concerning redevelopment along the corridor, each with their own host of benefits that have yet to be truly fleshed out in addition to accessibility improvements. The improvements to bicycle and pedestrian infrastructure proposed in phase one, for example, are already a priority in Atlanta, furthering the goal of a more sustainable transportation system for the city. Additionally, the projects presented in phases two and three also have several benefits not yet fully explored, including using the increased connectivity to pursue other goals.

In addition to improving connectivity in areas lacking the most in accessibility across the corridor, a bridge over Hulsey Yard would provide a host of associated benefits. For one, investments in infrastructure could prompt additional development in the vacant industrial

properties around the proposed intervention, an outcome that could provide additional benefits to the surrounding communities. Furthermore, a bridge over the active rail yard may well act as a sightseeing attraction; a chance for Atlantans to become more intimate with the process of railroad freight, an integral component of the city's economy that is often taken for granted. As rail-based transit becomes a more prominent piece of regional economies, this opportunity to reintegrate the railroad with the surrounding city is a solution that would retain the benefits it garners for the region while mitigating its negative effects to a certain degree.

Conversely, while the Hulsey Yard subdivision scheme would require the elimination of this railroad facility and its unique benefits, it too has a host of advantages that have not been thoroughly analyzed. For example, this plan calls for a set of new blocks in addition to its provision of north/south connections, which would perhaps prompt redevelopment centered around a MARTA/BeltLine transfer point. It also lays out a potential right of way for the BeltLine transit component, an issue that has not yet been resolved by its planners. If ideas presented are considered as a part of a more holistic scheme for improvement, such as the BeltLine master plan, it may yet have potential. Whether or not these ideas are implementable is irrelevant for the scope of the project, however, the analysis itself provided a better understanding of accessibility and how it can be measured.

7. REFERENCES

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