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Increasing Walkability & Bikeability in the City of Charlottesville

Applied Policy Project

Prepared for The City of Charlottesville, Neighborhood Developmental Services, Transportation Department

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Client Profile

Charlottesville's Transportation Department is situated inside Neighborhood Developmental Services. They are responsible for walkability and bikeability outreach efforts with the public, such as repair reports, bike route information, and safe route plans. They are also responsible for developing and planning infrastructure pertaining to walking and cycling in Charlottesville by utilizing citizens' feedback.

Disclaimer

The author conducted this study as part of the program of professional education at the Frank Batten School of Leadership and Public Policy, University of Virginia. This paper is submitted in partial fulfillment of the course requirements for the Master of Public Policy degree. The judgments and conclusions are solely those of the author, and are not necessarily endorsed by the Batten School, by the University of Virginia, or by any other agency.

Honor Pledge

On my honor as a student, I have neither given nor received aid on this assignment.

Ethan Studenic

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Executive Summary

The small geographic area that Charlottesville covers, combined with inadequate active transport infrastructure, creates a vehicle-centric approach to transportation, which increases traffic congestion and concerns about safety among citizens who would otherwise consider biking or walking as a means of transportation (Krebs, 2019b). Though Charlottesville's Bike and Pedestrian Master Plan is nearing ten years old, they have reconfirmed their commitment through their newest Comprehensive Plan to make Charlottesville a more walkable and bikeable place in the future. The Transportation Department of Neighborhood Developmental Services will be at the forefront of this process as they work with the community to establish new plans for increasing walkability and bikeability.

This analysis provides four alternative policy options that aim to help Charlottesville address its primary issues of safety and lack of connecting pathways. It evaluates them according to the criteria of cost-effectiveness, equity, political feasibility, and administrative feasibility. The alternatives are as follows:

Alternative 1: Separated Bike Lanes

Alternative 2: Curb Extensions

Alternative 3: Multi-Use Greenway

Alternative 4: Coalition

This analysis recommends Alternative 2: Curb Extensions. By constructing curb extensions at crosswalks, this alternative would increase citizen safety and potentially reduce traffic congestion. This analysis determines that it is the most cost-effective alternative and can be implemented the fastest with the least amount of trouble. Furthermore, if proven successful, it can easily be utilized in other parts of the city and built directly into the new sidewalk infrastructure the Transportation Department is planning.

Problem Statement

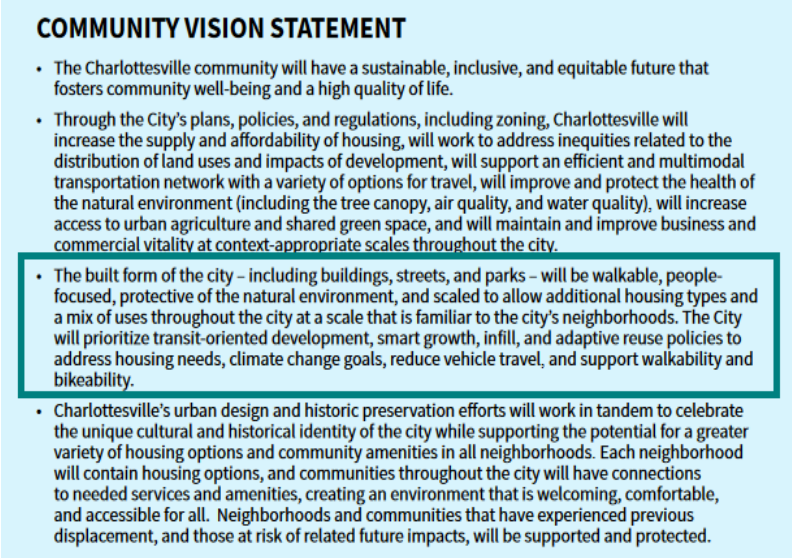
Charlottesville City's current architectural layout and public transportation infrastructure are not conducive to citizens walking or biking as a means of transportation. Charlottesville is a little over 10 square miles with around 46,000 people (United States Census Bureau, 2020). The small geographic area that Charlottesville covers, combined with inadequate active transport infrastructure, creates a vehicle-centric approach to transportation, which increases traffic congestion and concerns about safety among citizens who would otherwise consider biking or walking as a means of transportation (Krebs, 2019b).

Background

Pedestrian Mobility in Charlottesville

In Charlottesville's 2021 Comprehensive Plan and their new zoning ordinance in 2024, Charlottesville reconfirmed its commitment to making the city more pedestrian-friendly by creating a more connected city with easier means of access to goods and services for all residents (City of Charlottesville, 2021b). To that end, the number one goal under Transportation in the Comprehensive Plan is to "create and maintain a connected network of safe, convenient, and pleasant accommodations for pedestrians, bicyclists, and transit riders, including people of all ages and abilities" (City of Charlottesville, 2021b, p. 56).

Figure 1. Charlottesville Comprehensive Plan Vision Statement (City of Charlottesville, 2021b)



COMMUNITY VISION STATEMENT

- The Charlottesville community will have a sustainable, inclusive, and equitable future that fosters community well-being and a high quality of life.
- Through the City's plans, policies, and regulations, including zoning, Charlottesville will increase the supply and affordability of housing, will work to address inequities related to the distribution of land uses and impacts of development, will support an efficient and multimodal transportation network with a variety of options for travel, will improve and protect the health of the natural environment (including the tree canopy, air quality, and water quality), will increase access to urban agriculture and shared green space, and will maintain and improve business and commercial vitality at context-appropriate scales throughout the city.
- The built form of the city – including buildings, streets, and parks – will be walkable, people-focused, protective of the natural environment, and scaled to allow additional housing types and a mix of uses throughout the city at a scale that is familiar to the city's neighborhoods. The City will prioritize transit-oriented development, smart growth, infill, and adaptive reuse policies to address housing needs, climate change goals, reduce vehicle travel, and support walkability and bikeability.
- Charlottesville's urban design and historic preservation efforts will work in tandem to celebrate the unique cultural and historical identity of the city while supporting the potential for a greater variety of housing options and community amenities in all neighborhoods. Each neighborhood will contain housing options, and communities throughout the city will have connections to needed services and amenities, creating an environment that is welcoming, comfortable, and accessible for all. Neighborhoods and communities that have experienced previous displacement, and those at risk of related future impacts, will be supported and protected.

Creating greater pedestrian mobility, which means people can move around via walking, biking, or public transit, provides Charlottesville City with many benefits. Greater pedestrian mobility can lead to less traffic congestion (Rabl & de Nazelle, 2012), increased physical and mental health benefits (Soni & Soni, 2016), lower emissions (Yamagata et al., 2019), and more equitable access to goods and services (Yu et al., 2022).

Walkability

Walkability, a key aspect of city planning, is defined as the ease by which a person can walk as a form of transportation (Lo, 2009). A truly walkable city requires a robust supporting infrastructure, including sidewalks, bridges, and trails. These pathways should connect to useful destinations such as schools, grocery stores, health care, bus stops, and other goods and services and be accessible to all. This accessibility entails maintaining the infrastructure in good repair, keeping it free of debris and clutter, making

sure it is well-lit, and designed with the least amount of possible incline, in compliance with ADA standards.

Charlottesville has "more than 175 miles of sidewalk, 20+ miles of multi-use and soft surface trails, and 825 marked crosswalks" as of late 2021 (City of Charlottesville, 2021c, p.6). These sidewalks are more concentrated towards the middle of the city and are lacking or incomplete towards the city's edge. Similarly, mix-use areas, areas where zoning permits both business and residential buildings, are more concentrated at the city's center, which helps to make walking more viable in those areas due to the proximity of goods and services to people's homes (City of Charlottesville, 2021c). The zoning ordinance has changed as of February 2024 to permit more mixed-use areas throughout the city (City of Charlottesville, 2023c). While the new ordinance permits mixed-use zoning in more areas of the city, it will take a long time before those areas actually become mixed-use areas.

Bikeability

Similar to walkability, bikeability is defined as the ease by which a person can bike as a form of transportation (Castañon & Ribeiro, 2021). The primary form of infrastructure for increasing bikeability is bike lanes and greenways. Bikeability also requires supporting infrastructure, such as bike racks or sheds for riders to store their bikes. Bike lanes and off-road trails, such as Greenways, need to be accessible and connect to useful destinations. Additionally, not everyone has access to bikes, so bike-share programs and micro-mobility devices (electric bikes and scooters) can help address this need.

Charlottesville has more than 30 miles of bike lanes (City of Charlottesville, 2021c). Additionally, it has more than 10 miles of paved trails (City of Charlottesville, 2021c) and around 30 miles of natural trails (Charlottesville Parks & Rec, 2023). The city partnered with Veo in 2018 to bring 250 e-bikes and electric scooters to Charlottesville (City of Charlottesville, 2021c). Unfortunately, existing infrastructure is often unconnected, located in areas with high traffic and offering little protection from vehicles (Charlottesville, 2021c). These facts diminish the use of existing infrastructure due to safety and practicality concerns (Krebs, 2019b).

Public Transit

Public transit is a publicly controlled system of transport that runs on a schedule along designated routes and may require a fee to use (U.S. Department of Transportation, 2015a). Typically, that means buses or

trolleys in small cities such as Charlottesville. Bus routes and bus stops must be located near useful destinations to make public transit viable. It is also important that public transit be affordable and run promptly without excessively long wait times between buses. The Transit Department runs and maintains Charlottesville Area Transit (CAT), Charlottesville's bus and trolley system (City of Charlottesville, n.d.-b). CAT currently has thirty-two buses and four trolleys (City of Charlottesville, 2021c) used along eleven bus routes and one trolley route spread throughout the city. These services runs Monday through Saturday from 6 am to 10:30 pm (Charlottesville Area Transit, 2023).

Safety

The poor or missing infrastructure for pedestrians and cyclists in Charlottesville leads to concerns about safety. If a bike lane abruptly ends or a sidewalk is too narrow, people will not feel comfortable using that infrastructure. Not only is it inconvenient, but their concern for safety due to lack of or minimal infrastructure is not unwarranted. The DMV reports that in 2022 there were 1,476 car crashes involving pedestrians in Virginia, an increase of 5.5% over 2021. Of those accidents, 171 of them were fatal to the pedestrian, which is an increase of 36.8% over 2021, and unsurprisingly, 142 of the 171 fatalities were in urban areas (Virginia Department of Motor Vehicles, 2023). Charlottesville seems to be no exception, with accounts claiming that car accidents involving pedestrians in Charlottesville and Albemarle County are on the rise (Jafary, 2023). Furthermore, results from a study in Charlottesville spanning from 2013 to 2017 report 256 collisions involving pedestrians and 99 collisions involving cyclists, with a total of 355 injuries, 63 of which were severe and 13 resulting in death (Thomas Jefferson Planning District Commission & Piedmont Environmental Council, 2019).

Local Government

The four major sections of Charlottesville's government involved in walkability and bikeability are the City Council, the Engineering Division within Public Works, the Planning Commission, and the Transportation Department, both of which are housed in Neighborhood Developmental Services. The City Council is a body of elected officials accountable to the residents of Charlottesville. They work with multiple stakeholders and ultimately approve any city plans. The Planning Commission serves as an advisory board to the City Council, screening most plans and ensuring they comply with the city's comprehensive plan, vision, and zoning ordinance.

They must approve plans before passing them on to the City Council for final approval. The Engineering Division is primarily responsible for technical design and sometimes construction of infrastructure projects. Finally, the Transportation Department is responsible for planning infrastructure and community outreach involving walkability and bikeability. A few years prior, however, some of these planning responsibilities were the purview of the Engineering Division, which led to internal confusion and difficulties in progressing on walkability and bikeability goals (Charlottesville City Employee, personal communication, March 21, 2024).

Neighborhood Developmental Services houses six different departments: Building, Property Maintenance, Support Services, Zoning, Planning, and Transportation. Their general fund for the budget year of 2024 is a little less than $2,500,000, having lost a little over 3% of its funding from the previous year (City of Charlottesville, 2023b).

Table 1. Funding Allocation for Neighborhood Developmental Services (City of Charlottesville, 2023b)

2020	2021	2022	2023	2024
$3,910,247	$2,090,864	$2,487,613	$3,059,752	$2,958,119

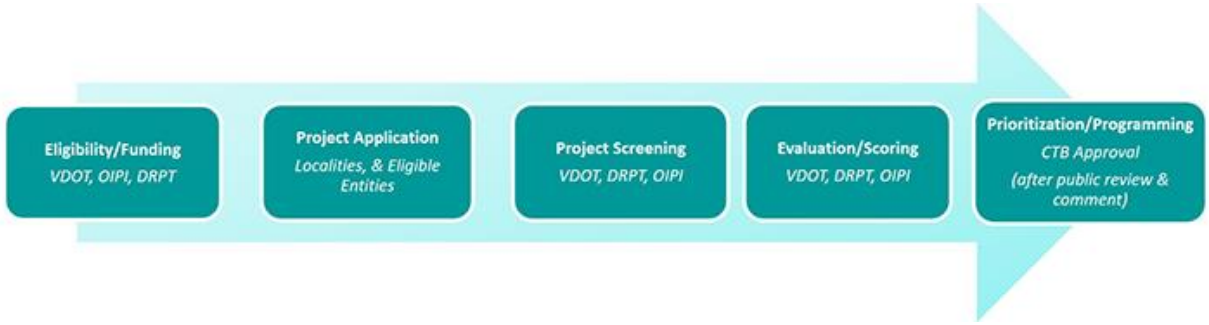
Due to the number of departments in Neighborhood Developmental Services and their level of funding, they typically need help funding the large-scale infrastructure projects (sidewalks, bike lanes, greenways) needed to increase walkability and bikeability in Charlottesville City.

Smart Scale Funding

Smart Scale is a system maintained by the Office of Intermodal Planning and Investment, the Virginia Department of Transportation, and the Virginia Department of Rail and Public Transportation (Commonwealth of Virginia, n.d.). It allocates Virginia tax dollars to transportation projects throughout the Commonwealth. The system has five major steps, each

overseen by the appropriate entities to evaluate and select projects for funding.

Figure 2. Smart Scale Process (Commonwealth of Virginia, n.d.)



The system is designed to take just under two years from application to the decision to fund (Commonwealth of Virginia, n.d.). However, with the time it takes to create plans suitable for application, the additional time to receive funding, possible denial during a cycle, and resubmitting the following cycle, the process for Charlottesville City to get funding for walking and biking infrastructure often takes somewhere between six to eight years (VDOT Employee, personal communication, March 21, 2024).

Literature Review

Measuring Walkability and Bikeability

There are many ways to measure the walkability and bikeability components of pedestrian mobility (Kellstedt et al., 2020), from traditional self-report methods (Carr et al., 2010) to using street view imagery such as Google Street View or Sky View Factor (Zhou et al., 2019), to using Space Syntax Analysis (SSA) and calculating spatial layouts and human activity patterns (Scorza et al., 2021). Using street view imagery to calculate Walk Scores and Bike Scores improves upon the accuracy of self-report methods and is less time-consuming and mathematically complicated than SSA (Carr et al., 2010). Despite the usefulness of Walk and Bike Scores (Bereitschaft, 2017), public perception of pathways can affect the level of use they receive (Zhou et al., 2019). Pathways that are clutter with small infrastructure like telephone poles and power lines (Zhou et al., 2019) or pollution (Baobeid et al., 2021) or are otherwise considered unsafe (Mehta, 2008) can lead citizens to rely on vehicles rather than active means of transportation.

Large Scale Infrastructure

One component of increasing walkability and bikeability is to build large scale city infrastructure that encourages cycling or walking for transportation. How land is structured can drive the competitiveness of cycling or walking compared to using a vehicle (Hagen & Rynning, 2021). Cities that have destinations with activities or amenities either clustered in small areas (McNeil, 2011) or with sufficient pathways between them will drive pedestrian mobility (Shamsuddin et al., 2012). Limiting urban sprawl (Rafiemanzelat et al., 2017) and zoning more of the city for mixed use (Ariffin et al., 2021), decreases the dependency on vehicles for transportation. In a comparison study of three cities, each with different design policies, the one that limited urban sprawl and zoned to increase density had the highest walkability score (Bereitschaft, 2017). A city designed with these recommendations in mind leads not only to greater pedestrian mobility but also to more equitable engagement with the city by various demographics. Children, the elderly, people with disabilities, and low socioeconomic status families gain increased access to city amenities, which increases their health, levels of engagement, and independence (Ramírez Saiz et al., 2022). By focusing on the density of amenities and activities, livability, a measure of citizen engagement (Baobeid et al., 2021),

is improved, and residents can expect a boost in both social and physical health (Tran, 2016).

City design is not the only way to drive pedestrian mobility. The more traditional method to increase walkability and bikeability is to build more supportive infrastructure. Building bike lanes and walkways that connect places of importance, interest, and usefulness is one of the primary ways of increasing alternative forms of transportation (Shamsuddin et al., 2012). A common cause for complaints among Charlottesville citizens is that they would like to bike or walk, but there is insufficient supporting infrastructure (Krebs, 2019a). Increasing the width of streets (Southworth, 2005), building cycling paths (Scorza et al., 2021), and making sure walkways and cycling paths connect (Rafiemanzelat et al., 2017) all have shown to increase active transportation.

Small Scale Infrastructure

Small-scale, supportive infrastructure is also a viable option to increase walkability and bikeability. These types of infrastructure projects would include things like crosswalks (Deehr & Shumann, 2009), bike racks and sheds (Krebs & de Cardenas, 2022), electric bikes and bike sharing systems (Castañon & Ribeiro, 2021), curb extensions for crosswalks (City of Charlottesville, 2016), minor repairs to existing infrastructure (Krebs, 2019b), and more public lighting and signage (Scorza et al., 2021), all of which would increase the feasibility and safety of walking or biking as a form of transportation (Mehta, 2008). These improvements are lower cost and less time-consuming compared to more traditional forms of infrastructure (Deehr & Shumann, 2009). Electric bikes, for example, are suitable for areas where popular destinations are spread out as they reduce the effort required for more extended travel. They are also suitable for denser areas as they can obtain high speeds quickly and are easily accessible for those who might not have a bike or somewhere to store one (Castañon & Ribeiro, 2021).

Public Information Campaigns

One obstacle to increasing modes of active transportation is the perception of an area's walkability or bikeability. Many factors can influence the public perception of whether an area is friendly to modes of transportation other than a vehicle besides the presence of physical infrastructure. The feasibility of the trip, the accessibility, safety, comfort, and pleasure are all factors in whether a citizen will decide to walk or bike to get to their

destination (Mehta, 2008). Density and surrounding activities can also influence people's decisions on how to travel, especially for people who chain their errands together by making multiple stops on a single trip (Hagen & Rynning, 2021). Things like sidewalk greenery, visual crowdedness, and proportion of road to pavement also influence people's perception of walkability and bikeability, which means even with sufficient infrastructure, an area may be highly walkable or bikeable but perceived as not walkable or bikeable by citizens (Zhou et al., 2019). Public information campaigns can help overcome this barrier by highlighting the ability to walk or bike in the city. These campaigns can include health and financial benefits to citizens and the environment (Deehr & Shumann, 2009). Furthermore, they can direct citizens to resources they may not be aware of, such as bike-sharing programs, events, and activities with related non-governmental organizations (NGOs), new public transportation pick-up points, or information on how to find electric bikes and scooters.

Community Input/Coalition Building

Sometimes, building additional infrastructure encourages alternative modes of transportation other than cars; other times, it does not (Ariffin et al., 2021). One possible reason is that those areas with increased infrastructure are not useful or are not a priority for the community. As an example, in Seattle, by carefully gaining citizen input through various initiatives, officials were able to uncover the importance of walking routes to schools and related school activities (Deehr & Shumann, 2009). With the appropriate provisions and funding, officials increased walkability to schools by repairing sidewalks, increasing crosswalk safety, and sending out information to the public about the best routes (Deehr & Shumann, 2009). Their interventions increased the number of students getting to school by walking and had public support because the public was part of the solution and had a vested interest in and ownership of the outcome (Deehr & Shumann, 2009). Communities become more active when they have attachments to their neighborhood, and those attachments can increase walking and biking in the community (Zhou et al., 2019). These attachments can lead to more participation in outdoor events and activities, which positively reinforces attachment to the community. By increasing the social sustainability of a city alongside minor adjustments to the environment determined by the community, pedestrian mobility increases (Ramírez Saiz et al., 2022). Roanoke City is an example of this sort of intervention. They determined support for bike lanes downtown by sourcing community input through surveys. Afterward, they built the bike lanes and connected them to

their already successful greenway, increasing the connected network of pathways across the city (Plan Roanoke, 2018).

Limitations

Walkability and bikeability are challenging to measure (Blečić et al., 2020). Many elements go into creating walkable and bikeable cities, and it is not easy to disentangle them. Part of the difficulty is that there is no standardization for walkability or bikeability theory (Baobeid et al., 2021). There are also many methods to measure walkability and bikeability, some requiring expertise, others relying on survey respondents, and some relying on accessible but sometimes inaccurate systems (Kellstedt et al., 2020). These factors make it hard to determine the best interventions and under what circumstances.

Takeaways

Two main takeaways are that community engagement is important to determining meaningful pathways in Charlottesville. Building any type of infrastructure is not enough on its own to drive walkability and bikeability. The infrastructure must be useful and create feelings of safety for residents so that they will be comfortable using it. Second, measuring the effectiveness of any alternative will be difficult as methods for tracking use are either complicated and costly or imprecise. This difficulty means that a level of creativity and conjecture will be required as Charlottesville pushes to meet its goal of a more walkable and bikeable city.

Evaluative Criteria

The following criteria will be used to evaluate each of the four policy alternatives to determine the optimal solution that the Transportation Department of Neighborhood Developmental Services in Charlottesville should pursue to increasing walkability and bikeability in the city.

Cost-Effectiveness

It will be important to estimate how cost-effective each policy option is as money for projects is not infinite, and Charlottesville City will want to get as much worth out of every dollar as possible. The costs will be estimated using potential inputs for each policy option, such as the cost of concrete, labor, communication materials, and meeting space utilized. Effectiveness will be estimated using the number of new connections or improved existing connections between city locations that each alternative establishes. These connections will serve as a proxy for the potential use of (i.e. effectiveness of) resulting infrastructure produced by each alternative. This analysis will hold that a new connection is worth twice what an improvement to an existing connection is worth and be weighed accordingly in the calculations.

Equity

Equitable access to the city is one of the transportation department's goals, and the opportunity to walk or bike to destinations increases residents' ability to access the services they need and participate meaningfully in society. Therefore, any policy options must be judged based on whether they increase walkability and/or bikeability in areas currently underserved in Charlottesville. This analysis will measure the equity of each alternative, using Walk and Bike Scores (Carr et al., 2010) for Charlottesville broken down by neighborhood, to see how many of the neighborhoods with low overall scores would be affected by the alternative (Walk Score, n.d.). Any alternatives with the majority of its infrastructure within or adjacent to the bottom five Walk/Bike score neighborhoods will score as **High (3)** in equity. Any alternatives where the majority of the infrastructure is outside one of these five neighborhoods but connects at least one of them to outside resources such as schools, grocery stores, and general shopping will score as **Medium (2)** in equity. Any alternatives with no infrastructure in at least one of the bottom five neighborhoods or the majority of its infrastructure in highly walkable/bikeable neighborhoods will score as **Low (1)** in equity.

Table 2. Walk and Bike Scores by Neighborhood (Walk Score, n.d.)

Rank	Neighborhood	Walk Score[1]	Bike Score[2]
1	10th and Page	92	79
2	North Downtown	84	75
3	Venable	80	66
4	Martha Jefferson	68	55
5	Lewis Mountain	68	69
6	Barracks Road	68	48
7	Belmont	64	60
8	Fifeville	64	64
9	The Meadows	62	40
10	Jefferson Park Avenue	53	68
11	Ridge Street	51	55
12	Woolen Mills	42	39
13	Barracks Rugby	39	42
14	Fry's Spring	30	51
15	Locust Grove	24	21
16	Johnson Village	24	48
17	Greenbrier	23	30

[1] A Walk Score of 90-100 is highly walkable, 70-89 is very walkable, 50-69 is somewhat walkable and 0-49 is car dependent.
[2] A Bike Score of 90-100 is highly bikeable, 70-89 is very bikeable, 50-69 is bikeable, 0-49 is somewhat bikeable.

Political Feasibility

There are two components to political feasibility relevant to this analysis. The first is Charlottesville city government officials and the second is Charlottesville city residents. Charlottesville's City Council and Planning Commission are the two primary bodies that would need to approve construction of walking and biking infrastructure. Most of the funding for these projects would come through Smart Scale applications with the Virginia Department of Transportation and the alternatives found in this analysis are supported by VDOT (Virginia Department of Transportation, n.d.-a). Likewise, Charlottesville City Council and the Planning Commission have been supportive of infrastructure projects designed to increase walkability and bikeability in Charlottesville in the past (Charlottesville Planning Commission Member, personal communication, August 7, 2023). Furthermore, the newest City Councilor, Natalie Oschrin is a strong advocate for walkability (Armesto, 2024). A primary part of her campaign revolved around increasing pedestrian mobility (Charlottesville Planning Commission Member, personal communication, August 7, 2023). It seems unlikely for these positions to change in the near future and therefore this analysis will hold their support as a constant.

The second component of political feasibility relevant to this analysis is the Charlottesville City residents. To estimate the political support for each alternative this analysis will use survey data from the Piedmont Environmental Council and the Thomas Jefferson Planning District Commission to estimate political feasibility. The survey was conducted from May 10th to September 10th of 2018 and is the largest and most recent survey to date.[3] The survey included 857 responses using email, social media, and paper copies. The survey asked questions about their desire for bikeability and walkability options, their reasons for deciding whether to use existing infrastructure and what types of infrastructure they would like to see. This survey does not have information on the opponents of bikeability and walkability. This analysis will assume that opposition is low to infrastructure that increases walkability/bikeability unless it costs or is perceived to cost the opposition something. This analysis will use the survey data to make assumptions about which types of solutions Charlottesville residents will likely favor based on their concerns and desires. Any alternative that meets a desire indicated by survey respondents and addresses a concern will score as **High (4)**. Any alternative that directly meets one of the desires of survey respondents will score as **Medium High**

[3] Piedmont Environmental Council and Move2HealthEquity conducted a similar, but more surface level survey in 2021 with difficult due to Covid-19 and received 428 responses yet the results appear to support the 2018 conclusions (Krebs & de Cardenas, 2022).

(3). Any alternative that directly addresses a concern from the survey will score as **Medium Low (2)**. Any alternative that does not meet a desire or concern in the survey will score as **Low (1)**. If perceived significant costs for automotive drivers exist, the presumed largest opponent to walkability and bikeability, or other entities, the alternatives' rating will be downgraded by 1.

Table 3. Desires and Concerns identified in 2018 Survey Data (Krebs, 2019b)

Desires	Concerns
More connected networks of on and off-road bike and pedestrian facilities	Shared paths that exist are too short or isolated to be useful for transportation
Improved quality of life through recreation and mobility for all residents	Infrastructure is overcrowded
Better access to jobs, retail educational, and recreational destinations	Safety due to infrastructure being on roads
Residents are involved in the process of mobility policy	

Administrative Feasibility

Charlottesville City has many vacant employee positions due partly to the COVID-19 pandemic and a period of contentious city politics. Furthermore, the Charlottesville City government is undergoing an internal restructuring of responsibilities. As a result, there is a loss of institutional knowledge and a certain amount of difficulty due to the turbulence of change. Therefore, policy options that are cumbersome in their administrative requirements or require a high degree of coordination may struggle to be successful in the short term, given the current context. This analysis will attempt to measure administrative feasibility by counting two things. The first is how many primary departments or outside interests, such as NGOs, businesses, or landowners, would be required for a given alternative. The second will be the estimated time for Charlottesville to implement the alternative. This analysis will take these two things combined as a proxy for complexity and potential points of failure. This analysis will rank the alternatives **Low (1)**, **Medium Low (2)**, **Medium High (3)**, or **High (4)**, with the most complex alternative getting the lowest score and the least complex alternative getting the highest score.

Policy Alternatives

The following policy alternatives were chosen because they can address community concerns and because parts of Charlottesville currently lack formal pathways. Due to the pressing desire from citizens and Charlottesville's vision of a more walkable and bikeable city, the option to let current trends continue was not considered.

Alternative 1: Separated Bike Lanes

Alternative 2: Curb extensions

Alternative 3: Multi-Use Greenway

Alternative 4: Coalition

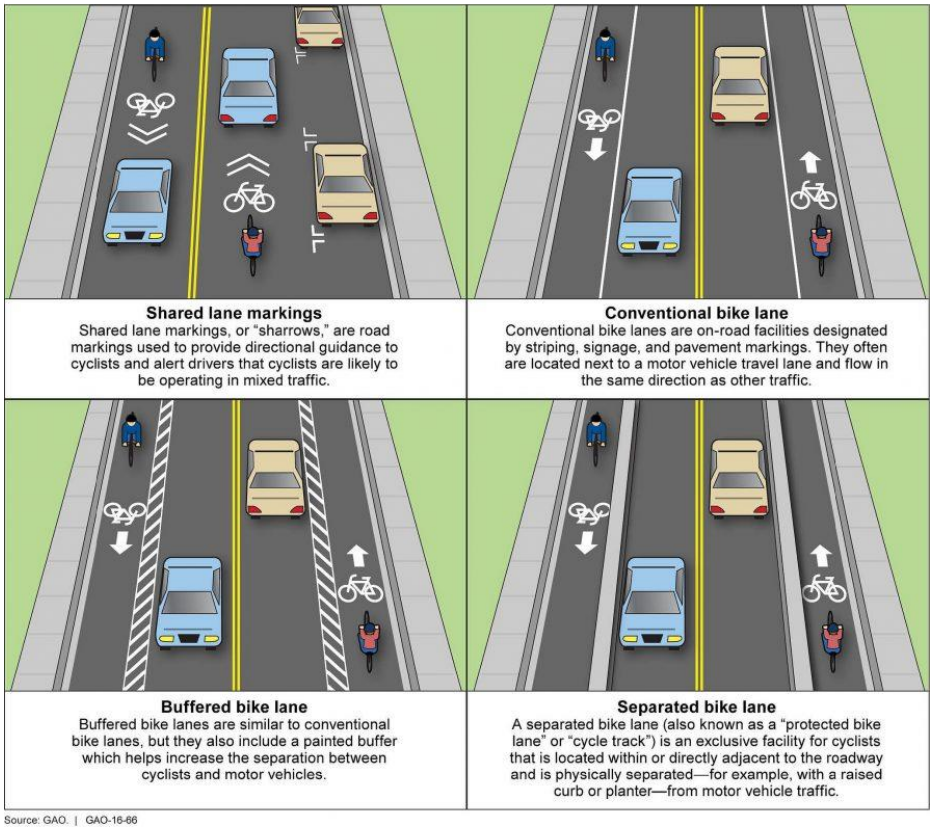
Features

The first and third alternatives are large-scale infrastructure meant to create valuable connected pathways throughout the city while providing safety and comfort for users. These are all drawn from the supporting literature and expanded upon in their respective sections. The second alternative is smaller-scale infrastructure meant to increase safety at crosswalks. The final alternative is to build a coalition that can then determine the appropriate infrastructure to build and its placement. These alternatives were chosen for analysis because they can address the largest issues Charlottesville faces involving walkability and bikeability, the lack of infrastructure, and citizens' concerns about safety. Other alternatives, such as small-scale type infrastructure like better lighting, bike racks, minor sidewalk repairs, and the use of electric bikes and scooters, were discarded because without the pathways, constructing supporting infrastructure makes less sense, and the city is already carrying out sidewalk repairs and using electric bikes. Similarly, mixed-use zoning and public transit already exist and are the primary responsibility of other divisions than the Neighborhood Developmental Services' Transportation Department.

Alternative 1: Separated Bike Lanes

Separated bicycle lanes place a physical barrier between motor vehicles and bicyclists (U.S. Department of Transportation, 2015b). This physical barrier can take many forms, including concrete barriers, medians, and parked cars, depending on the need and characteristics of the roadway (Virginia Department of Transportation, n.d.-b). Separated bike lanes would create more infrastructure that would increase the ability for Charlottesville citizens to bike to their destinations (Monsere et al., 2014). A separated bike lane would likely lead to a feeling of greater safety (Monsere et al., 2020) and comfort (Sanders & Judelman, 2018), which is one of the primary reasons that Charlottesville citizens report not choosing to bike as a means of transportation (Krebs, 2019b). This alternative would also make travel time between destinations quicker, thus increasing the likelihood of citizens taking the bike lane over their vehicle (Mehta, 2008).

Figure 3. Bike Lane Configurations (Piper Partners, 2022)



With this alternative, Charlottesville City would expand the use of separated bicycle lanes in Charlottesville by constructing three new ones. One along Cherry Avenue, one along Meade Avenue, and a third along Rose Hill Drive. These three routes were selected by looking for significant overlap in a number of factors including:

- Traffic stress (City of Charlottesville, 2015) (City of Charlottesville, 2016)
- Bicycle collisions (Thomas Jefferson Planning District Commission & Piedmont Environmental Council, 2019)
- Primary travel corridors (Thomas Jefferson Planning District Commission & Piedmont Environmental Council, 2019)
- Community input (Thomas Jefferson Planning District Commission & Piedmont Environmental Council, 2019) (City of Charlottesville, 2015) (Krebs, 2019b)
- Connections to prominent locations such as schools, bus stops, and businesses (Google, 2024)

Table 4. Separated Bike Lane Projects

Separated Bike Lanes	Distance	Route
Cherry Avenue	1.5 Miles	Along Cherry Avenue from Cleveland Avenue to 9th Street (1.1 miles) and 9th Street to 5th Street (.4 miles)
Meade Avenue	0.9 Miles	Along Meade Avenue from E High Street to E Market Street (.5 miles) and E Market Street to 9th Street (.4 miles)
Rose Hill Drive	1 Mile	Along Rose Hill Drive from Walker Upper Elementary School to Rugby Avenue (.5 miles) and Rugby Avenue to Preston Avenue (.5 miles)

Figure 4. Cherry Avenue Separated Bike Lane Project (Google, 2024)

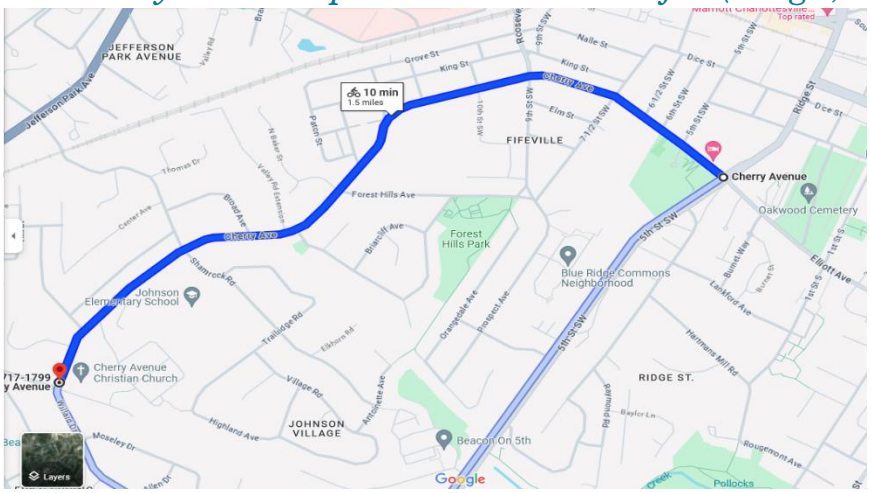


Figure 5. Meade Avenue Separated Bike Lane Project (Google, 2024)

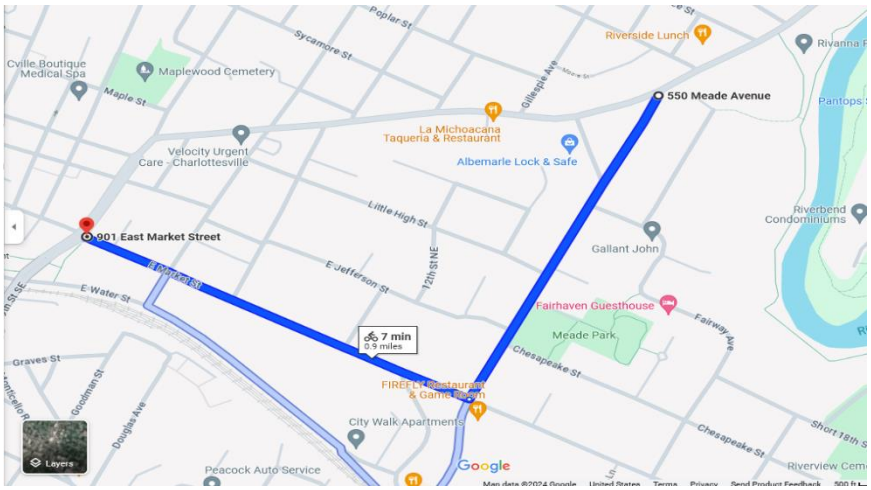
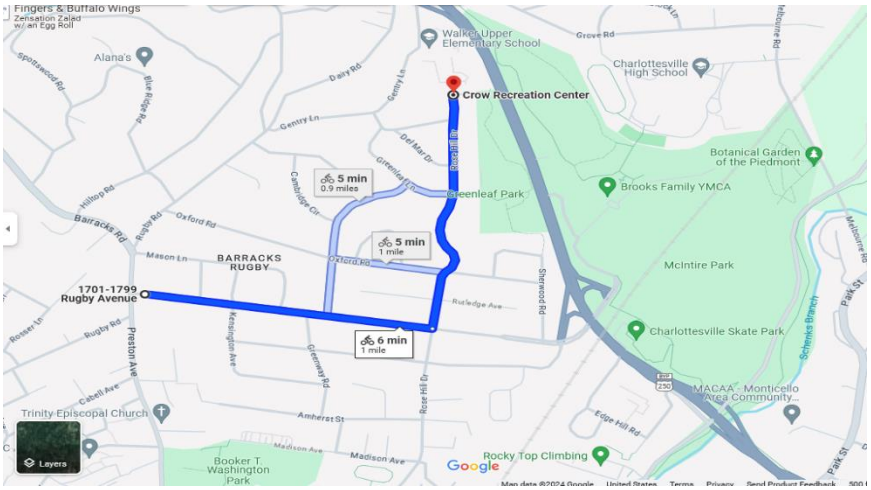


Figure 6. Rose Hill Drive Separated Bike Lane Project (Google, 2024)



These projects will involve the Transportation Department in Neighborhood Developmental Services to plan and approve each project. From there, each project will be designed by the Engineering Division in Charlottesville's Department of Public Works, which will establish directional and width criteria and develop location-specific designs to handle intersections and other crosswalks (U.S. Department of Transportation, 2015). Each project will need to go through the Virginia Department of Transportation Smart Scale application for approval and funding and then go to bid for construction companies. After selecting a construction company, the Planning Commission and the City Council must approve their proposal. The process will take an estimated ten years from planning to completion of construction with the planning and funding taking approximately six to eight years (VDOT Employee, personal communication, March 21, 2024) and the construction taking between two to three (Charlottesville City Employee, personal communication, March 21, 2024) (City of Arlington, n.d.) which seems to be in-line with timeline for other separated bike lane projects in Charlottesville (City of Charlottesville, 2021c).

Cost-Effectiveness

The separated bike lanes would create three new connections between places and improve two connections between places for $2,982,000, meaning that the cost of one additional or improved connection is $372,800 for this alternative. These cost estimates include lane markings for bicycle paths, cement for pavement, labor for widening roadways, new curbs, drainage improvements, ADA upgrades, and potential utility pole relocation.[4] Effectiveness is measured using connections between places. There is already a bike lane along Cherry Avenue and Rugby Road. These segments of the overall projects are counted as improved connections because the existing bike lane is being converted to a separated bike lane. The segments of separated bike lanes along Meade Avenue, E Market Street, and Rose Hill Drive would be brand new and counted as new connections for this analysis. The new infrastructure is weighted as twice as valuable as the improved infrastructure in the effectiveness calculations.

Equity

The majority of the proposed shared bike lanes reside within the bottom five neighborhoods for walkability and bikeability and, therefore, receive a rating of High (3) on the Equity criterion. Two of the three shared bike

[4] See Appendix A for additional costing information.

lanes reside within identified neighborhoods. Cherry Avenue is in Johnson Village, and Rose Hill Drive is in Barracks Rugby. The third shared bike route is located in Woolen Mills, which is not a neighborhood in the bottom five for walkability and bikeability but is within the bottom six.

Political Feasibility

The separated bike lane alternative meets a desire identified by survey respondents but does not directly meet a concern and, therefore, receives a rating of Medium High (3) on the Political Feasibility criterion. The proposed separated bike lanes help to provide better access to schools like Johnson Elementary School and Walker Upper Elementary School while also giving access to bus stops and shops along main roads. This alternative calls for widening roads in places so the perceived inconvenience to people driving vehicles should be minimal, and therefore, this alternative does not get downgraded.

Table 5. Desires and Concerns the Separated Bike Lane Alternative addresses (Krebs, 2019b)

Desires	Concerns
More connected networks of on and off-road bike and pedestrian facilities	Shared paths that exist are too short or isolated to be useful for transportation
Improved quality of life through recreation and mobility for all residents	Infrastructure is overcrowded
Better access to jobs, retail educational, and recreational destinations	Safety due to infrastructure being on roads
Residents are involved in the process of mobility policy	

Administrative Feasibility

The separated bike lane alternative would involve six primary organizations and take approximately ten years to complete. Therefore, it receives a rating of Low (1) on the Administrative Feasibility criterion. The six primary organizations responsible for this alternative frequently work in connection with one another on various projects, including pedestrian infrastructure such as bike lanes. In the past, there has been a siloing effect between some of these organizations; fortunately, due to some internal restructuring of responsibilities, that effect should diminish in the near future (Charlottesville City Employee, personal communication, March 21, 2024). Given the current time of separated bike lane projects (City of Charlottesville, 2021c), the funding and approval process with the Virginia Department of Transportation (VDOT Employee, personal communication, March 21, 2024), and conversations with city officials (Charlottesville City Management Employee, personal communication, July 17, 2023) it is estimated that this project will take ten years to complete.

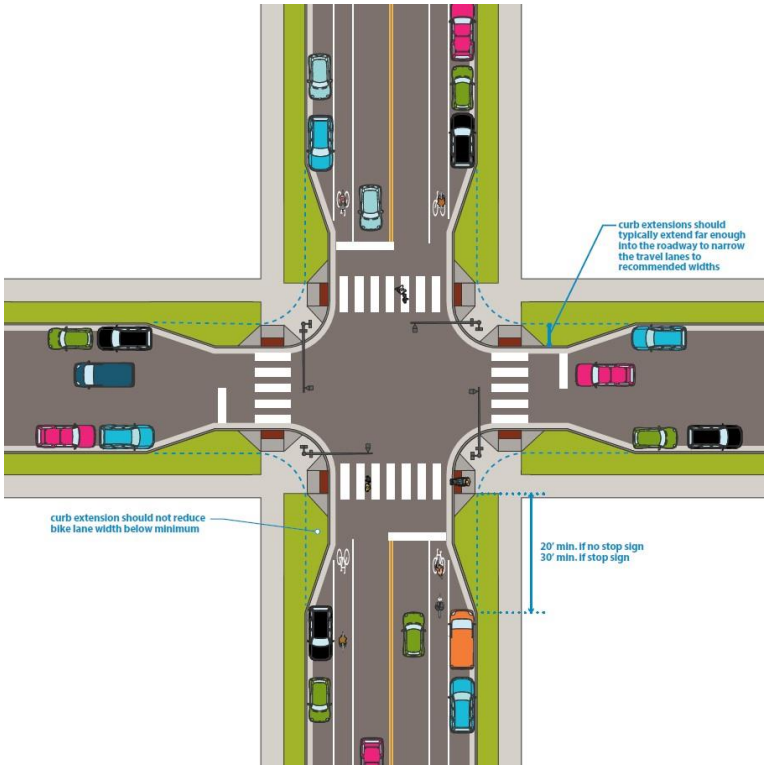
The organizations responsible for this alternative are as follows:

1. Charlottesville City Council
2. Charlottesville Planning Commission
3. Charlottesville Public Works Engineering Division
4. Charlottesville Neighborhood Development Services Transportation Department
5. A Construction Company
6. Virginia Department of Transportation

Alternative 2: Curb Extensions

Curb extensions, sometimes called curb bulbs or bump-outs, increase pedestrian visibility while shortening the distance needed to cross the road (Johnson, 2005). They also slow turning vehicles by forcing them to make tighter turns, which improves pedestrian safety (U.S. Department of Transportation Federal Highway Administration, n.d.). Curb extensions create infrastructure that encourages citizens to choose to walk places as they are protected from vehicular traffic (City of Minneapolis, n.d.). A recent survey cited traffic concerns as a primary reason against walking in Charlottesville (Krebs, 2019a), and curb extensions could help mitigate the fear of traffic as vehicles are more likely to slow down when curb extensions are present (Bella & Silvestri, 2015). Furthermore, some studies suggest that drivers may break earlier when confronted with curb extensions, thus reducing the chance of an accident (Bella & Silvestri, 2016). Finally, curb extensions are a traffic calming measure (Virginia Department of Transportation, n.d.-a), which may reduce the desire to drive in those locations, encouraging people to take other forms of transportation (Litman, 1999).

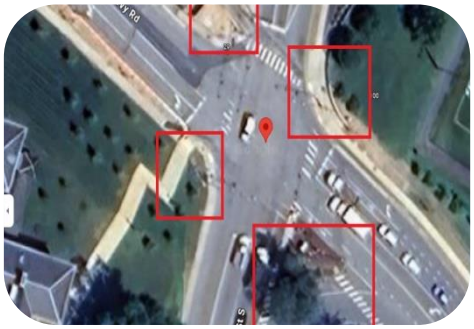
Figure 7. Curb Extension Example (City of Minneapolis, n.d.)



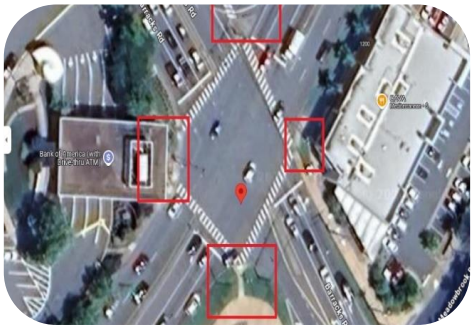
The Charlottesville City Standard and Design manual calls for the potential use of curb extensions following the National Association of City Transportation Officials (NACTO) guidelines (City of Charlottesville, 2019). There are currently a few curb extensions in Charlottesville including two at the intersection of Rialto Street and Monticello Avenue and one at the intersection of Monticello Road and Hinton Avenue. This alternative would make greater use of curb extensions at crosswalks in Charlottesville city by constructing curb extensions at six intersections. Each intersection has different characteristics which means curb extensions at every corner are not always feasible. Therefore, only some intersections have four curb extensions whereas others have less. The selected intersections with the number of corners that would receive curb extensions are as follows:

1. Emmet Street North and Ivy (4 Corners)
2. Emmet Street North and Barrack Road (4 Corners)
3. Avon Street and Monticello Avenue (1 Corner)
4. Main Street and Ridge McIntire (2 Corners)
5. Monticello Avenue and Ridge Street (3 Corners)
6. Jefferson Park Avenue and Fontaine Avenue Exit (3 Corners)

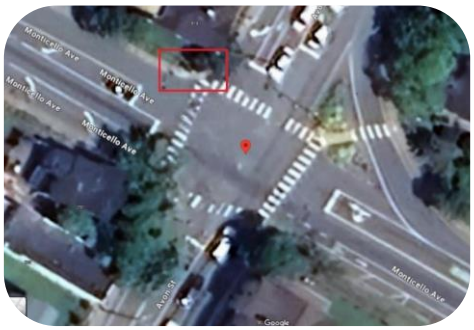
These six locations were selected by looking primarily at accident locations involving pedestrians and vehicles (Thomas Jefferson Planning District Commission & Piedmont Environmental Council, 2019) as well as areas that experienced significant traffic stress (City of Charlottesville, 2015) and are primary travel corridors (Thomas Jefferson Planning District Commission & Piedmont Environmental Council, 2019).



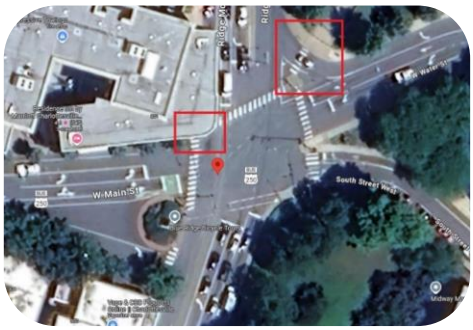
Emmet Street North and Ivy Project (Google, 2024)



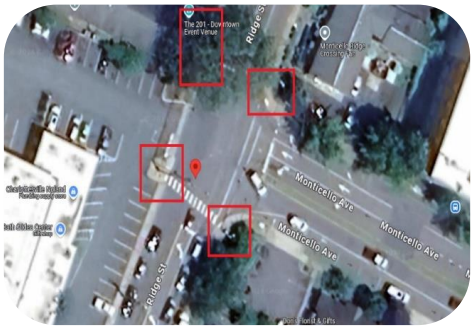
Emmet Street North and Barrack Road Project (Google, 2024)



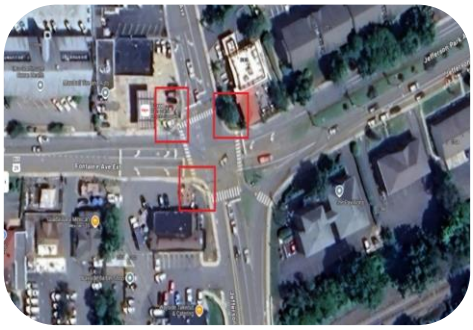
Avon Street and Monticello Avenue Project (Google, 2024)



Main Street and Ridge McIntire Project (Google, 2024)



Monticello Avenue and Ridge Street Project (Google, 2024)



Jefferson Park Avenue and Fontaine Avenue Exit Project (Google, 2024)

These projects will involve the Transportation Department in Neighborhood Developmental Services to plan and approve each project. From there, each project will be designed by the Engineering Division in Charlottesville's Department of Public Works, which will design the curb extension so as not to impede drainage and plan for drainage improvements where required (Federal Highway Administration, 2014). Each project will need to go through the Virginia Department of Transportation Smart Scale application for approval and funding and then go to bid for construction companies. After selecting a construction company, the Planning Commission and the City Council must approve their proposal. The process will take an estimated eight years from planning to completion of construction with the planning and funding taking approximately six to eight years and the construction taking around six months (VDOT Employee, personal communication, March 21, 2024).

Cost-Effectiveness

The curb extensions at intersection crosswalks would create six improved connections between places for $117,000, meaning that the cost of one additional or improved connection is $19,500 for this alternative. The cost estimates include materials, such as concrete, and labor for each curb extension. Accounting for potential drainage alterations which could prove expensive, this analysis used the average cost of a normal curb extension and a curb extension that needs drainage improvements to account for that contingency. [5] Effectiveness is measured using connections between places. As crosswalks already exist at every intersection, this alternative only improves existing connections rather than creating new ones. This analysis holds the entire project for each intersection as a single improvement to an existing connection rather than counting each curb extension. New infrastructure is weighted as twice as valuable as improved infrastructure in the effectiveness calculations.

Equity

Only two of the proposed intersections are adjacent to the bottom five neighborhoods for walkability and bikeability; therefore, this alternative receives a rating of Low (1) on the Equity criterion. Two of the intersections are in North Downtown, one of Charlottesville's most walkable and bikeable areas. Two are located in neighborhoods that rank in the middle for overall walkability and bikeability, and two of the intersections are adjacent to the bottom five neighborhoods for walkability and bikeability. Those

[5] See Appendix A for additional costing information.

intersections are Emmet Street North and Barrack Road, which is adjacent to Barrack Rugby. The other intersection is Jefferson Park Avenue and Fontaine Avenue Exit, which is adjacent to Fry's Spring neighborhood.

Political Feasibility

The curb extension alternative meets a desire identified by survey respondents but does not directly meet a concern and, therefore, would receive a rating of Medium High (3). However, this traffic calming measure will cut into the width of roads, which I anticipate will be perceived as a significant loss to drivers, and therefore, this alternative is downgraded to a score of Medium Low (2) on the Political Feasibility criterion. The proposed curb extensions should improve all residents' quality of life and mobility. The crosswalks are ADA-compliant and safe to use due to their shorter distance for anyone with mobility issues.

Table 6. Desires and Concerns the Curb Extension Alternative addresses (Krebs, 2019b)

Desires	Concerns
More connected networks of on and off-road bike and pedestrian facilities	Shared paths that exist are too short or isolated to be useful for transportation
Improved quality of life through recreation and mobility for all residents	Infrastructure is overcrowded
Better access to jobs, retail educational, and recreational destinations	Safety due to infrastructure being on roads
Residents are involved in the process of mobility policy	

Administrative Feasibility

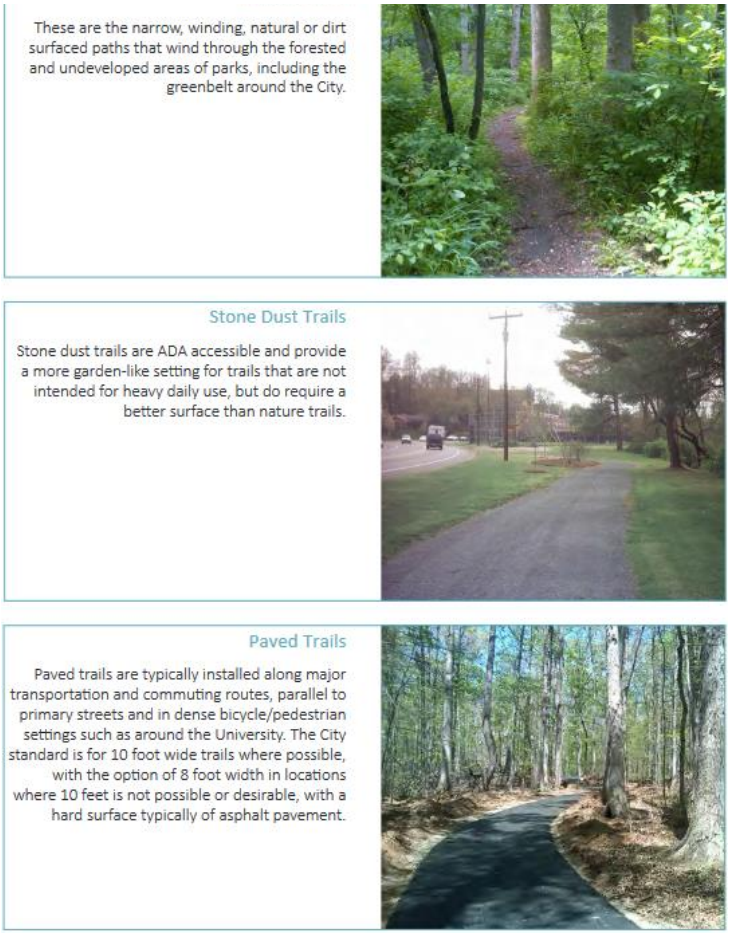
The curb extension alternative would involve six primary organizations and take an estimated eight years to complete. Therefore, it receives a rating of High (4) on the Administrative Feasibility criterion. The six primary organizations responsible for this alternative frequently work in connection with one another on various projects, including pedestrian infrastructure such as bike lanes. In the past, there has been a siloing effect between some of these organizations; fortunately, due to some internal restructuring of responsibilities, that effect should diminish in the near future (Charlottesville City Employee, personal communication, March 21, 2024). The funding and approval process with the Virginia Department of Transportation will take six to eight years, similar to the separated bike lane alternative, but construction of the curb extensions will only take around six months (VDOT Employee, personal communication, March 21, 2024).

The organizations responsible for this alternative are as follows:

1. Charlottesville City Council
2. Charlottesville Planning Commission
3. Charlottesville Public Works Engineering Division
4. Charlottesville Neighborhood Development Services Transportation Department
5. A Construction Company
6. Virginia Department of Transportation

Alternative 3: Multi-Use Greenway

Figure 8. Trail Types (City of Charlottesville, 2015)

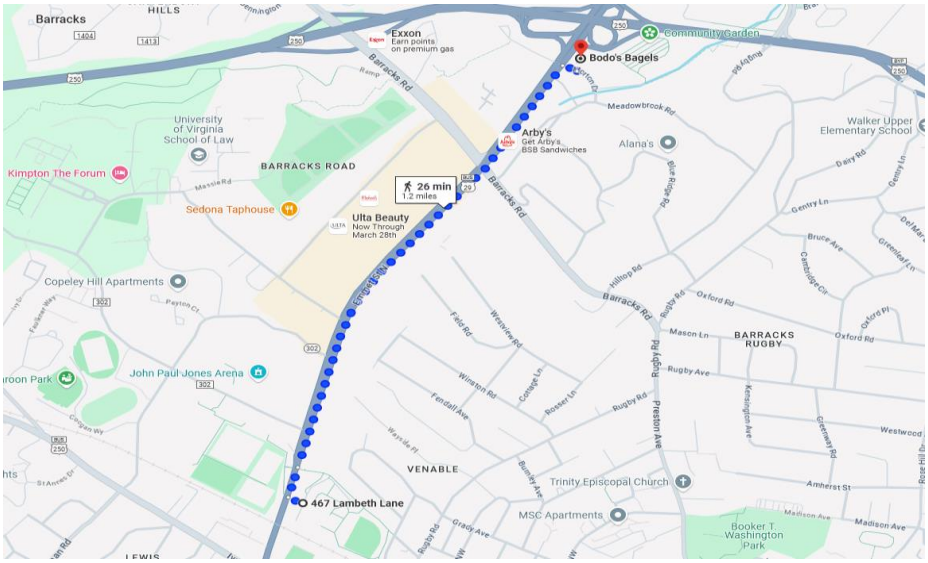


A multi-use greenway is an accessible paved path, generally ten feet wide, that residents can use for biking, walking, or hiking (Virginia Department of Transportation, 2023). Due to their size, they can easily accommodate large volumes of people (Virginia Department of Transportation, 2023). They often consist of long pathways through wooded areas and local neighborhoods. Greenways are typically set away from roads, providing greater user safety (Virginia Department of Conservation and Recreation, 2011). Greenways can increase physical activity in nearby communities, suggesting that the community will use this type of infrastructure (Auchincloss et al., 2019). Greenways can be used for exercise and as an active means of transportation (Zawawi et al., 2023). It's also possible that greenways, with intentional effort, can help desegregate cities by connecting parts of the city that have been segmented by past city planning via main roadways (Walmsley, 1995).

Charlottesville city has multiple trails, mostly in parks such as Meade Park, McIntire Park, Riverview Park, and Forest Hill Park, providing pedestrian opportunities to walk and bike. Within Charlottesville, there are around twenty trails, the longest of which is two miles (Parks & Rec Charlottesville, n.d.) The Rivanna Trail encircles Charlottesville city, and sometimes crosses within its city limits and is approximately 20 miles long (Charlottesville Albemarle County, Virginia, n.d.). This alternative would create a new multi-use greenway that would connect to the Rivanna Trail behind Bodo's Bagels (1418 Emmet St N), running roughly parallel to Emmet Street North to its conclusion at Lambeth Field Residence Parking for approximately 1.3 miles. This location was selected because it would connect to the Rivanna Trail, the most extensive trail system near (and

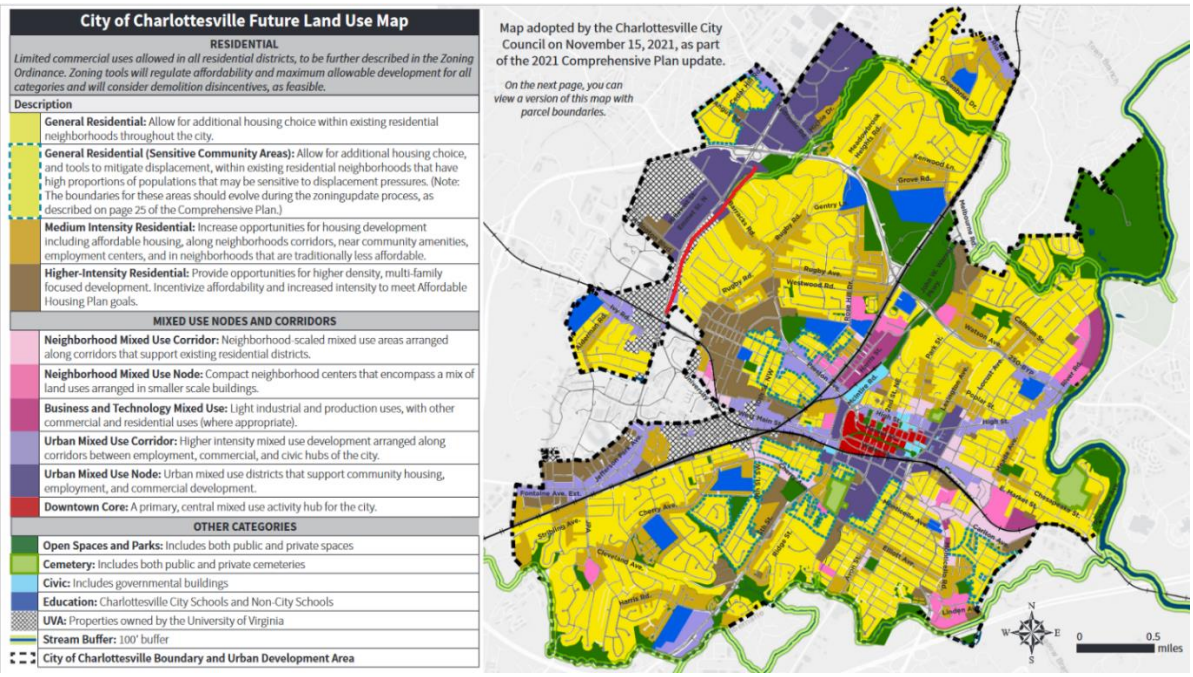
sometimes in) Charlottesville, and because it would connect to the University of Virginia, a prominent Charlottesville location. This alternative represents a slightly modified version of older plans from greenway construction in the Meadow Creek area (Greenbrier Neighborhood Association, 2021).

Figure 9. Multi-Use Greenway Rivanna Trail Extension (Google, 2024)



This project will involve the Transportation Department in Neighborhood Developmental Services to plan and approve it. From there, the project will be designed by the Engineering Division in Charlottesville's Department of Public Works, which will be responsible for determining the proper course of the path to ensure a flat gradient and that the path is on a stable foundation (East Coast Greenway Alliance, 2023). Charlottesville City will also need to get easements for the trail, primarily from the University of Virginia which owns most of the lane the trail would run through. The project will need to go through the Virginia Department of Transportation Smart Scale application for approval and funding and then go to bid for construction companies. After selecting a construction company, the Planning Commission and the City Council must approve their proposal. The process will take an estimated nine and a half years from planning to completion of construction with the planning and funding taking approximately six to eight years (VDOT Employee, personal communication, March 21, 2024) and the construction taking around a year and a half (Virginia Office of Intermodal Planning and Investment, 2022).

Figure 10. City of Charlottesville Future Land Use Map, Proposed Multi-Use Greenway indicated by red line (City of Charlottesville, 2021a)



Cost-Effectiveness

The multi-use greenway would create one new connection between places for $1,426,000, meaning that the cost of one additional or improved connection is $713,000 for this alternative. There is no pathway here, so this would be an entirely new connection from the Rivanna Trail near Bodo's Bagels (1418 Emmet St.) to Lambeth Field Resident Parking at UVA. Estimated costs include the asphalt and labor for the construction of a ten-foot-wide path, alterations to the landscape to ensure a solid foundation and ADA compliance costs, and city employee time to draft easement requests.[6] Effectiveness is measured using connections between places, and this alternative creates one new connection. New infrastructure is weighted as twice as valuable as improved infrastructure in the effectiveness calculations.

Equity

The proposed multi-use greenway is adjacent to one of the bottom five neighborhoods for walkability and bikeability and connects it to useful destinations, such as the University of Virginia, and therefore receives a rating of Medium (2) on the Equity criterion. The proposed greenway is

[6] See Appendix A for additional costing information.

adjacent to the Barracks Rugby neighborhood for .3 miles of its approximately 1.3-mile length. After that, it passes through UVA and Venable, which are more highly walkable and bikeable areas, but it does help to connect Barracks Rugby to the University of Virginia.

Political Feasibility

The multi-use greenway alternative meets two desires identified by survey respondents while addressing a concern and would receive a rating of High (4). However, this alternative hinges on UVA and other entities agreeing to property easements, and therefore, this alternative is downgraded to a score of Medium High (3) on the Political Feasibility criterion. The proposed multi-use greenway improves the quality of life for residents by increasing mobility capacity through a paved 10-foot-wide trail and provides potential recreational path while providing greater access to the University of Virginia. It also addresses concerns that shared paths are too short or isolated by attaching to the Rivanna Trail, which, save for a few incomplete segments, almost entirely encircles Charlottesville. It is also off the road, which 64% percent of respondents said they felt more comfortable about (Krebs, 2019b).

Table 7. Desires and Concerns the Multi-Use Greenway Alternative addresses (Krebs, 2019b)

Desires	Concerns
More connected networks of on and off-road bike and pedestrian facilities	Shared paths that exist are too short or isolated to be useful for transportation
Improved quality of life through recreation and mobility for all residents	Infrastructure is overcrowded
Better access to jobs, retail educational, and recreational destinations	Safety due to infrastructure being on roads
Residents are involved in the process of mobility policy	

Administrative Feasibility

The multi-use greenway alternative would involve seven primary organizations and take nine and a half years to complete. Therefore, it receives a rating of Medium High (3) on the Administrative Feasibility criterion. The seven primary organizations responsible for this alternative frequently work in connection with one another on various projects, including pedestrian infrastructure such as bike lanes. In the past, there has been a siloing effect between some of these organizations; fortunately, due to some internal restructuring of responsibilities, that effect should diminish in the near future (Charlottesville City Employee, personal communication, March 21, 2024). The University of Virginia will also play a large role and they prefer to do things on their timeline (Charlottesville City Employee, personal communication, September 25, 2023). The funding and approval process with the Virginia Department of Transportation through Smart Scale will take six to eight years (VDOT Employee, personal communication, March 21, 2024), similar to the other infrastructure alternative, and construction of the multi-use greenway will take around a year and a half (Virginia Office of Intermodal Planning and Investment, 2022).

The organizations responsible for this alternative are as follows:

1. Charlottesville City Council
2. Charlottesville Planning Commission
3. Charlottesville Public Works Engineering Division
4. Charlottesville Neighborhood Development Services Transportation Department
5. A Construction Company
6. Virginia Department of Transportation
7. University of Virginia

Alternative 4: Coalition

A coalition to address walkability and bikeability allows community members to voice their opinions and concerns somewhere other than city council or planning commission meetings (Pashek Associates, 2008). A coalition may not necessarily contribute directly to building infrastructure that supports walkability and bikeability, but community input can significantly impact if the community utilizes that infrastructure (Deehr & Shumann, 2009). Furthermore, coalitions raise awareness and support for an issue while providing opportunities to address concerns. This could lead to smoother political conditions once projects are agreed upon (Virginia Department of Conservation and Recreation, 2011).

Figure 11. Example of a Charlottesville Coalition (Krebs, 2020)

This alternative focuses on bringing people and organizations together to collaborate and share information to increase walkability and bikeability. Bicycling and trail organizations in Charlottesville and several environmental organizations have a vested interest in reducing the number of cars on the road and increasing alternative means of transportation. These organizations were chosen because they are already involved in increasing walkability and bikeability in Charlottesville, with several attending the recent Fourth Annual Active Mobility Summit (Krebs, 2024). They have mission statements that overlap with Charlottesville city's goal of increasing walkability and bikeability, appear to have public support as estimated by social media follower numbers, and represent various interests in Charlottesville. Suggested organizations are as follows[7]:

[7] This list is not meant to be exhaustive but rather a starting point for a potential coalition.

Table 8. Organizations and their Potential Strength

Non-Governmental Agency	Purpose	Members
Rivanna Trails Foundation	Promote, create, and protect pathways, trails, and greenways	1,500 Facebook Followers
Charlottesville Community Bikes	Promote environmentally-sound transportation, recycle bikes, and make cycling accessible	13 Members 1,800 Facebook Followers
Piedmont Environmental Council	Protecting and restoring lands and waters while building stronger, more sustainable communities	83 Members 10,000 Facebook Followers
Prolyfyck	A Black-led running group working to increase community involvement in running, especially for people of color	1,700 Facebook Followers
Move2HealthEquity	Increasing healthy equity	652 Facebook Followers
Southern Environmental Law Center	To protect the right to clean air, clean water, and a livable climate	200 Members 42,000 Facebook Followers

This coalition ideally includes all the above organizations in addition to Charlottesville Neighborhood Development Services, the Charlottesville City Planning Commission, the Thomas Jefferson Planning District Commission, and the University of Virginia Office of the Architect. Twice a month, one to two representatives from each organization would meet at Charlottesville City Hall to identify programs, policies, and infrastructure that would increase the walkability and bikeability of Charlottesville. They would also seek to identify locations for such initiatives. To that end, at every meeting, they would invite two to three members from different

neighborhoods to be a part of the meeting to ensure direct community input. By inviting community members, this coalition would also raise awareness of existing infrastructure and the importance of creating more.

It is unlikely that every organization would be willing to join the coalition. However, access to city officials from the Planning Commission and Neighborhood Developmental Services' Transportation Department might incentivize organizations to join the coalition when they might otherwise not. Even if the coalition initially starts smaller than desired, it will still be able to carry out its primary goal, which is to generate policies for increasing the walkability and bikeability of Charlottesville. The coalition may grow as word spreads over time, giving it access to more perspectives, which will help generate ideas and increase its effectiveness.

Cost-Effectiveness

This analysis estimates the coalition would create one new connection between places that get adopted and implemented for an estimated $818,000, meaning that the cost of one additional or improved connection is $415,000 for this alternative. The cost estimates for this alternative include hourly rates for city employees and refreshments for coalition meetings. The analysis also uses the average cost of all the proposed infrastructure in this document to determine the cost of the infrastructure that this coalition might suggest.[8] Effectiveness is measured using connections between places. As the number and type of connections have a wide range of potential outcomes, this analysis takes one new connection as the middle most result of potential infrastructure suggestions. New infrastructure is weighted as twice as valuable as improved infrastructure in the effectiveness calculations.

Equity

The coalition's purpose is not solely to suggest types of infrastructure but also to determine where infrastructure should go, which potentially means suggesting locations in the bottom five neighborhoods for walkability and bikeability and, therefore, receives a rating of Medium (2) on the Equity Criterion. The coalition will have input from community members, non-governmental organizations, and city officials, who should help place infrastructure in areas that are underserved. Under this estimation, the coalition alternative has the potential to result in

[8] See Appendix A for additional costing information.

infrastructure being placed where it will create equitable access to the city. Therefore, the alternative receives the middle most rating of Medium.

Political Feasibility

The coalition alternative meets one of the desires identified by survey respondents and therefore, receives a rating of Medium High (3) on the Political Feasibility criterion. The proposed coalition meets the desire for residents to be involved in policies that affect resident mobility. Resident input also has the added benefit of helping to ensure that any recommendations put forth by the coalition will meet both resident's desires and concerns.

Table 9. Desires and Concerns the Coalition Alternative addresses (Krebs, 2019b)

Desires	Concerns
More connected networks of on and off-road bike and pedestrian facilities	Shared paths that exist are too short or isolated to be useful for transportation
Improved quality of life through recreation and mobility for all residents	Infrastructure is overcrowded
Better access to jobs, retail educational, and recreational destinations	Safety due to infrastructure being on roads
Residents are involved in the process of mobility policy	

Administrative Feasibility

The coalition alternative would involve ten primary organizations, take half a year to get started, and approximately three years to produce a viable infrastructure suggestion. Therefore, it receives a rating of Medium Low (2) on the Administrative Feasibility criterion. The ten primary organizations responsible for this alternative have mostly worked together in the past on other issues as well as on walkability and bikeability. All of the organizations have a commitment to increasing bikeability and walkability in Charlottesville and should be able to find common cause with one another. This analysis estimates that it will take Neighborhood

Developmental Services' Transportation Department approximately a half a year to get the coalition started; many of the organizations already work with Neighborhood Developmental Services so establishing contact should be a non-issue. Likewise, gaining buy-in from organizations should not take much convincing, but organizing a schedule that fits for so many different organizations will likely take the majority of the estimated time. Once the coalition is created this analysis estimates it will take approximately three years (Summers et al., 2020) to produce a viable infrastructure suggestion.

The ten primary organizations involved in this alternative would be as follows:

1. Charlottesville City Council
2. Charlottesville Planning Commission
3. Rivanna Trails Foundation
4. Charlottesville Community Bikes
5. Thomas Jefferson Planning Commission
6. Piedmont Environmental Council
7. Prolyfyck
8. UVA Office of the Architect
9. Move2HealthEquity
10. Southern Environmental Law Center

Outcomes Matrix

	Cost-Effectiveness	Equity	Political Feasibility	Administrative Feasibility	Total
Separated Bike Lanes	$373,000 (3)	High (3)	Medium High (3)	Low (1)	10
Curb Extensions	$19,500 (4)	Low (1)	Medium Low (2)	High (4)	11
Multi-Use Greenway	$713,000 (1)	Medium (2)	Medium High (3)	Medium High (3)	9
Coalition	$415,000 (2)	Medium (2)	Medium High (3)	Medium Low (2)	9

(All alternatives have been assigned a score for each criterion with higher scores being better)

Matrix Methodology

Policy alternatives are scored using a rating of High, Medium High, Medium, Medium Low, or Low for various criterion except for the cost-effectiveness criterion. That criterion is scored using a dollar amount representing the cost of a single new or improved connection between locations created by the alternative. Each score is then assigned a point value, with the lowest number of points representing poor performance on a criterion and the highest number of points representing the best performance on a criterion. Each criterion is weighted equally as Neighborhood Developmental Services' Transportation Department attempts to take a balanced approach to increase walkability and bikeability. Therefore, adding the total points for each alternative gives a final score and determines the best alternative for recommendation.

Recommendation

This analysis recommends that Charlottesville's Neighborhood Development Services' Transportation Department pursue **Alternative 2: Curb Extensions**. Each of the policy alternatives would help increase active transportation and address at least some of the concerns and desires of residents about the walkability and bikeability of Charlottesville. The overall outcomes for all the alternatives are close. After careful consideration, the curb extension alternative has the greatest potential to affect walkability and bikeability due to its low cost and administrative feasibility. In relation to administrative feasibility, implementation time is also important. Due to the Smart Scale funding process, all the alternatives suffer from long implementation times. However, through Charlottesville's Quick Builds (VDOT Employee, personal communication, March 21, 2024) process, temporary curb extensions can be implemented with little trouble while waiting on funding for the more permanent construction.

While curb extensions offer significant benefits, it is important to acknowledge the tradeoffs. They and other traffic calming measures may not be as popular with the public as other alternatives. Some citizens may perceive curb extensions as hindrances to vehicular travel. Additionally, curb extensions are the least equitable option in this analysis. They are located in areas with high pedestrian-vehicle collision rates, which are often the most walkable areas. Charlottesville's Neighborhood Developmental Services' Transportation Department will need to address these concerns, some of which can be mitigated during implementation.

If additional funding (or faster funding) becomes available, the other alternatives are also viable options. The Neighborhood Developmental Services' Transportation Department should pursue those alternatives in conjunction with curb extensions to build the most robust pedestrian mobility network that Charlottesville City can provide its residents. If prioritization of additional options becomes necessary, this analysis suggests that separated bike lanes are the next best option to focus on due to their equity and political feasibility, which would serve to balance out the curb extension alternative's shortcomings.

Implementation

Based on the analysis of alternatives, Charlottesville Neighborhood Developmental Services' Transportation Department should implement **Alternative 2: Curb Extensions** at the following intersections:

1. Emmet Street North and Ivy
2. Emmet Street North and Barrack Road
3. Avon Street and Monticello Avenue
4. Main Street and Ridge McIntire
5. Monticello Avenue and Ridge Street
6. Jefferson Park Avenue and Fontaine Avenue Exit

There are three primary implementation issues for this alternative. The first is that curb extensions reduce the road width at intersections. While this is desirable because it slows down traffic when vehicles have to turn (PEDSAFE, 2013), makes pedestrians more visible, (van Hengel, 2013) and it reduces the distance and, therefore, time that pedestrians are in crosswalks, thereby increasing their safety (U.S. Department of Transportation Federal Highway Administration, n.d.), it does have its downsides. Large automobiles such as delivery trucks and emergency vehicles have a larger turning radius, which can restrict their ability to turn at intersections with curb extensions (City of Charlottesville, 2016). The second issue is that building curb extensions sometimes requires improving drainage, which can drive up installation costs. The third issue is that if curb extensions are not constructed thoughtfully, they can cut off bike lanes, forcing bicycle riders to merge into traffic (San Francisco City, 2011) and increasing the danger for drivers and bicyclists. Fortunately, all these potential drawbacks can be averted or accounted for.

Due to the nature of curb extensions at intersections, many stakeholder groups will be affected. The primary stakeholder groups are as follows:

1. Drivers
2. Business Owners
3. Pedestrians
4. Bicyclists

Drivers will likely feel constrained by curb extensions as they force them to slow down when going through an intersection, especially when turning, and they will likely be some of those most strongly opposed to this alternative though there is some evidence to suggest this is not always the case (Ohlms et al., 2020). Business owners are likely to be on both sides of

the issue, with some supporting the curb extensions as they can increase foot traffic in their stores and create safer off-street parking (U.S Department of Transportation Federal Highway Administration & EDC, 2018). Other business owners, particularly those with larger vehicles or needing frequent deliveries to their store, may find the curb extensions to be a hindrance and oppose them. Pedestrians will likely be the most prominent supporters of this alternative as it will increase their safety when crossing the street and make the area more walkable. Finally, bicyclists will likely favor curb extensions as well, as many of them favor alternative modes of transportation to cars (Charlottesville City Employee, personal communication, September 25, 2023), provided the curb extensions are constructed so they do not interrupt bike lanes (Virginia Department of Transportation, n.d.-b). The solution will be to stress the benefits of the increased foot traffic and parking to business owners to gain their support, ensure that the curb extensions are built in such a way as not to interrupt bike lanes, and communicate to drivers that they will be less likely to be involved in an accident involving a pedestrian (SafeRoadsUSA, 2020).

Two primary things could go wrong with implementing curb extensions: the first is that drainage improvements may be required, and the second is that the curb extensions may cause undesirable disruptions to traffic patterns. Fortunately, both issues can be dealt with. If drainage improvements are required, it may drive up the average cost of each curb extension from $3,000 to $10,000 per corner (National Association of City Transportation Officials, 2013). In costing out the alternative, an average of those two costs was used for each intersection to account for this possibility, and even if every curb extension required drainage improvements, it would still be the most cost-effective alternative of those considered in this analysis. [9]

Curb extensions may create undesirable traffic patterns as large vehicles may be required to detour to undesirable areas such as neighborhoods. Likewise drivers may take alternative routes to avoid the curb extensions and may choose to speed to make up for their route being less direct. While the construction design and location of these curb extensions (City of Charlottesville, 2015) should minimize those effects, a low-cost trial can be run by the city to understand the consequences of these curb extensions better. Temporary curb extensions, as part of Charlottesville Quick Builds process, can be created using painted lines, planters, or traffic cones (National Association of City Transportation Officials, 2013), allowing Neighborhood Developmental Services' Transportation Department to see

[9] See Appendix A for additional costing information.

the effects of the projects before committing to construction (Thomas Jefferson Planning District Commission & Piedmont Environmental Council, 2019) and also improving the likelihood that Smart Scale funding will be approved (VDOT Employee, personal communication, March 21, 2024). Furthermore, these temporary builds can be maintained until funding comes through for permanent construction. Additionally, in the event these trials prove successful the use of curb extensions can be expanded to other areas that lack supporting infrastructure, thus increasing the equitability of this alternative.

There are fewer stakeholders involved in moving this project forward than other alternatives. Charlottesville City Council will have to approve the projects, as will the Planning Commission. City engineers will need to design these curb extensions and determine if drainage improvements will be required. Finally, the city will need to hire a company to construct the curb extensions. If the city funding for such projects isn't sufficient to pay for the construction, then grants through VDOT's Smart Scale process will be required (Charlottesville City Employee, personal communication, November 2023). By having comparatively short build times compared to other alternatives and not requiring the involvement of multiple departments or organizations, the curb extension alternative should be easier to implement, which is essential given that implementation of infrastructure to increase walkability has been something Charlottesville has been struggling with in recent years (Neighborhood Developmental Service Employee, personal communication, November 2023), like due in part to a lack of long time city staff members and many current city employee vacancies (Charlottesville City Management Employee, personal communication, July 17, 2023).

By anticipating stakeholder perspectives on curb extensions, curb extension design drawbacks, and potential consequences of curb extension implementation, Neighborhood Developmental Services' Transportation Department will better understand how to implement curb extensions at the designated project sites. They will also have a solid understanding of stakeholder positions, enabling them to gain support for the project and address likely concerns about the project using trial information from Quick Builds temporary installations.

Conclusion

The small geographic area that Charlottesville covers, combined with inadequate active transport infrastructure, creates a vehicle-centric approach to transportation, which increases traffic congestion and concerns about safety among citizens who would otherwise consider biking or walking as a means of transportation (Krebs, 2019b). Charlottesville's lack of sidewalks towards the city's edges means a reliance on informal pathways that residents are not always comfortable using. Similarly, the bike lanes that exist within Charlottesville do not always connect, making their feasibility of use dubious (Mehta, 2008). Where infrastructure does exist, residents often do not feel comfortable using it because of its proximity to traffic (Krebs, 2019a). Curb extensions at intersections would directly address safety concerns from traffic and help improve the existing connections to various pathways. Curb extensions can be implemented more rapidly than other alternatives using Quick Builds to create temporary curb extensions that can be upgraded later when funding is approved. Furthermore, due to their low cost, they should not significantly impede Charlottesville's capacity to make progress on larger infrastructure projects that would address the connectivity issue, such as separated bike lanes.

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Appendix A: Costs

Separated Bike Lanes Cost Estimations (Total Cost = $2,982,448.32)

The estimated costs for these projects utilized costing data from Charlottesville's 2015 Bicycle and Pedestrian Master Plan Update. Those prices were then converted to 2024 prices and used to estimate the cost of each separate bike lane. This analysis holds that these estimations are fairly accurate as they are close in cost to other proposed separated bike lane projects in Charlottesville.

Figure 12. Bicycle and Pedestrian Master Plan Costing Assumptions (City of Charlottesville, 2015)

Project Assumptions

Item	Unit Price	Unit	Notes
Lane Markings	$ 1.50	LF	Includes assumed eradication of existing lines
Trail Asphalt (10' wide)	$ 145.00	LF	Average price for off-road trail construction
Separeated Bicycle Lane Pavement & Widening (6' wide + 2' road pavement)	$ 28.61	LF	Based on $70/Ton for asphalt at 4" deep and $25/CY for stone at 6" deep and $25/CY of excavation
Roadway Widening (per bike lane)	$ 31.55	LF	Assumes 5' wide bike lane and 2' of additional widening
Curb	$ 25.00	LF	
Utility Poles	$ 25.00	LF	Assume 200' spacing at $5000 per pole
Drainage Improvements	$ 30.80	LF	Assume 1 MH Top, 1 Inlet, and 8' of pipe every 200'
Bike Symbol	$ 1.25	LF	Assumes 200' spacing
Sharrow	$ 1.60	LF	Assumes 200' spacing
Sidewalk (5' wide)	$ 220.00	LF	Cost estimate used by City of Charlottesville
Signal/ADA Upgrades	$ 100,000.00	EA	Estimated cost. Will vary based on signal equipment locations, etc.

Unit Prices to Develop Estimates

Item	Unit Price	Unit
Excavation	$ 25.00	CY
Asphalt	$ 70.00	Ton
Aggregate/Subbase	$ 25.00	CY
Curb	$ 25.00	LF
Utility Pole Relocation	$ 5,000.00	EA
length of pipe	$ 6,200.00	EA
Sidewalk	$ 220.00	LF
Signal/ADA Upgrades	$ 100,000.00	EA

Abbreviations Key

CY - Cubic Yard
EA - Each
LF - Linear Foot
SY - Square Yard

Table 10. Proposed Separated Bike Lane Cost Estimations (City of Charlottesville, 2021c)

West Main	Preston Ave	Hydraulic Rd	9th St NE/SE	5th St SW
$ 1,172,570	$1,168,500	$1,214,250	$91,410	$478,290

Table 11. Estimated Costs for Separated Bike Lanes (City of Charlottesville, 2015)

Assumed Inputs	**Estimated Costs adjusted for 2024**
Lane Markings per foot	$1.95
Separated Bicycle Lane Pavement & Widening (6; wide + 2' road pavement) per foot	$37.25
Curb per foot	$32.55
Utility Pole Relocation, assumed every 200 feet	$32.55
Drainage Improvements per 200 feet	$40.11
Singal/ADA Upgrades per project (estimate will vary based on project)	$130,000.00

Table 12. Cherry Avenue Separated Bike Lane

Cherry Avenue (1.5 miles)	**Estimated Costs adjusted for 2024**
Lane Markings per foot	$15,444.00
Separated Bicycle Lane Pavement & Widening (6; wide + 2' road pavement) per foot	$295,020.00
Curb per foot	$257,796.00
Utility Pole Relocation, assumed every 200 feet	$257,796.00
Drainage Improvements per 200 feet	$317,671.20
Singal/ADA Upgrades per project (estimate will vary based on project)	$130,000.00
Total	$1,273,727.20

Table 13. Meade Avenue Separated Bike Lane

Cherry Avenue (1.5 miles)	**Estimated Costs adjusted for 2024**
Lane Markings per foot	$9,266.40
Separated Bicycle Lane Pavement & Widening (6; wide + 2' road pavement) per foot	$177,012.00
Curb per foot	$154,677.60
Utility Pole Relocation, assumed every 200 feet	$154,677.60
Drainage Improvements per 200 feet	$190,602.72
Singal/ADA Upgrades per project (estimate will vary based on project)	$130,000.00
Total	$816,236.32

Table 14. Rose Hill Drive Separated Bike Lane

Cherry Avenue (1.5 miles)	**Estimated Costs adjusted for 2024**
Lane Markings per foot	$10,296.00
Separated Bicycle Lane Pavement & Widening (6; wide + 2' road pavement) per foot	$196,680.00
Curb per foot	$171,864.00
Utility Pole Relocation, assumed every 200 feet	$171,864.00
Drainage Improvements per 200 feet	$211,780.80
Singal/ADA Upgrades per project (estimate will vary based on project)	$130,000.00
Total	$892,484.80

Curb Extension Cost Estimations (Total Cost = $117,000.00)

The estimated costs for the curb extensions were drawn from the Federal Highway Administration (Federal Highway Administration, 2014). Similar estimates were also found in documents by the Thomas Jefferson Planning District Commission (Thomas Jefferson Planning District Commission, 2004), PedSafe (PEDSAFE, 2013), and VDOT (Virginia Department of Transportation, n.d.-b). In most cases, the numbers were precisely the same, and it seems possible that they all originated from a single source. Though there are a few curb extensions in Charlottesville no costs for the projects could be found.

Due the high potential cost of curb extensions that require drainage alterations and the need to have engineering design the curb extension to see if it would require drainage improvements an average of the cost of each project was used to try and account for this lack of information.

Table 15. Curb Extension Cost Assumptions

Curb Extension per corner	$3,000
Curb Extension per corner (if drainage alterations are required)	$10,000

Table 16. Emmet Street North and Ivy (4 Corners)

Curb Extension per corner	$12,000
Curb Extension per corner (if drainage alterations are required)	$40,000
Average Total Estimate	$26,000

Table 17. Emmet Street North and Barrack Road (4 Corners)

Curb Extension per corner	$12,000
Curb Extension per corner (if drainage alterations are required)	$40,000
Average Total Estimate	$26,000

Table 18. Avon Street and Monticello Avenue (1 Corner)

Curb Extension per corner	$3,000
Curb Extension per corner (if drainage alterations are required)	$10,000
Average Total Estimate	$6,500

Table 19. Main Street and Ridge McIntire Road (2 Corners)

Curb Extension per corner	$6,000
Curb Extension per corner (if drainage alterations are required)	$20,000
Average Total Estimate	$13,000

Table 20. Monticello Avenue and Ridge Street (4 Corners)

Curb Extension per corner	$12,000
Curb Extension per corner (if drainage alterations are required)	$40,000
Average Total Estimate	$26,000

Table 21. Jefferson Park Avenue and Fontaine Avenue Exit (3 Corners)

Curb Extension per corner	$9,000
Curb Extension per corner (if drainage alterations are required)	$30,000
Average Total Estimate	$19,500

Multi-Use Greenway Cost Estimations (Total Cost = $1,426,286.16)

The estimated costs for the multi-use greenway were drawn from Charlottesville's 2015 Bicycle and Pedestrian Master Plan Update.[10] Those prices were converted to 2024 prices. City Attorney hourly wage data was pulled from Charlottesville's Master Job List, and an assumption was made that easement requests are often pre-drafted, so the time needed to fill them out and mail them would be around four hours.

Table 22. Multi-Use Greenway (Bodo's to UVA, 1.3 miles)

Trail Asphalt (10' wide) per foot (average price for off-road trail construction)	$1,295,991.84
Singal/ADA Upgrades per project (estimate will vary based on project)	$130,000.00
City Attorney Easement Request per hour	$294.32
Estimated Total	$1,426,286.16

[10] See Figure 12. Bicycle and Pedestrian Master Plan Costing Assumptions Page 50

Figure 13. Charlottesville Master Job List (City of Charlottesville, 2023a)

501	Account Clerk I	Non-exempt	Technical	2	I	$ 16.85	$ 20.78	$ 24.71	$ 35,043.84	$ 43,218.19	$ 51,392.54
502	Account Clerk II	Non-exempt	Technical	2	I	$ 16.85	$ 20.78	$ 24.71	$ 35,043.84	$ 43,218.19	$ 51,392.54
551	Account Clerk III	Non-exempt	Technical	3	I	$ 17.69	$ 22.35	$ 27.02	$ 36,787.97	$ 46,496.51	$ 56,205.05
226	Accountant I	Exempt	Professional	1	II	$ 16.97	$ 22.98	$ 28.99	$ 35,307.88	$ 47,808.12	$ 60,308.35
276	Accountant II	Exempt	Professional	2	III	$ 20.20	$ 29.39	$ 38.58	$ 42,010.24	$ 61,126.26	$ 80,242.28
6507	Accreditation and Compliance Manager	Non-exempt	Professional	3	I	$ 24.30	$ 30.72	$ 37.13	$ 50,551.55	$ 63,889.84	$ 77,228.13
5500	Administrative Assistant I	Non-exempt	Professional	1	II	$ 16.97	$ 22.98	$ 28.99	$ 35,307.88	$ 47,808.12	$ 60,308.35
5501	Administrative Assistant II	Non-exempt	Professional	2	II	$ 20.20	$ 27.73	$ 35.27	$ 42,010.24	$ 57,681.51	$ 73,352.79
5502	Administrative Assistant III	Non-exempt	Professional	3	I	$ 24.30	$ 30.72	$ 37.13	$ 50,551.55	$ 63,889.84	$ 77,228.13
553	Administrative Secretary	Non-exempt	Technical	3	I	$ 17.69	$ 22.35	$ 27.02	$ 36,787.97	$ 46,496.51	$ 56,205.05
503	Animal Control Officer (Sworn)	Non-exempt	Protective	2	II	$ 21.63	$ 27.07	$ 32.50	$ 44,990.40	$ 56,296.75	$ 67,603.11
601	AP/AR Supervisor	Non-exempt	Technical	4	I	$ 20.94	$ 25.90	$ 30.86	$ 43,565.31	$ 53,874.50	$ 64,183.69
227	Appraiser I	Non-exempt	Professional	1	I	$ 16.97	$ 21.12	$ 25.26	$ 35,307.88	$ 43,920.12	$ 52,532.35
279	Appraiser II	Exempt	Professional	2	II	$ 20.20	$ 27.73	$ 35.27	$ 42,010.24	$ 57,681.51	$ 73,352.79
243	Appraiser III	Exempt	Professional	3	III	$ 24.30	$ 36.68	$ 49.06	$ 50,551.55	$ 76,301.05	$ 102,050.55
245	Appraiser Supervisor	Exempt	Professional	4	II	$ 30.31	$ 42.44	$ 54.57	$ 63,038.57	$ 88,268.91	$ 113,499.26
153	Asst. Chief of Police	Exempt	Management	3	III	$ 38.57	$ 59.54	$ 80.52	$ 80,218.93	$ 123,847.15	$ 167,475.36
376	Asst. City Attorney	Exempt	Professional	4	II	$ 30.31	$ 42.44	$ 54.57	$ 63,038.57	$ 88,268.91	$ 113,499.26
3770	Asst. City Engineer	Exempt	Professional	4	II	$ 30.31	$ 42.44	$ 54.57	$ 63,038.57	$ 88,268.91	$ 113,499.26
326	Asst. Commonwealth's Attorney I	Exempt	Professional	4	II	$ 30.31	$ 42.44	$ 54.57	$ 63,038.57	$ 88,268.91	$ 113,499.26
378	Asst. Commonwealth's Attorney II	Exempt	Professional	4	III	$ 30.31	$ 46.57	$ 62.84	$ 63,038.57	$ 96,868.11	$ 130,697.65
379	Asst. Commonwealth's Attorney III	Exempt	Professional	4	III	$ 30.31	$ 46.57	$ 62.84	$ 63,038.57	$ 96,868.11	$ 130,697.65
5611	Asst. Director of Economic Development	Exempt	Management	2	III	$ 31.22	$ 49.04	$ 66.85	$ 64,936.88	$ 101,996.55	$ 139,056.22
151	Asst. Director of Finance	Exempt	Management	3	II	$ 38.57	$ 55.41	$ 72.26	$ 80,218.93	$ 115,260.61	$ 150,302.30
196	Asst. Director of Social Services	Exempt	Management	3	II	$ 38.57	$ 55.41	$ 72.26	$ 80,218.93	$ 115,260.61	$ 150,302.30
6030	Asst. Director of Transit	Exempt	Management	3	I	$ 38.57	$ 51.29	$ 64.00	$ 80,218.93	$ 106,674.08	$ 133,129.23
250	Asst. Traffic Engineer	Exempt	Professional	3	I	$ 24.30	$ 30.72	$ 37.13	$ 50,551.55	$ 63,889.84	$ 77,228.13
228	Asst. Victim Witness Coordinator	Non-exempt	Professional	1	III	$ 16.97	$ 24.85	$ 32.73	$ 35,307.88	$ 51,696.12	$ 68,084.36
3000	Asst. Zoning Administrator	Exempt	Professional	2	II	$ 20.20	$ 27.73	$ 35.27	$ 42,010.24	$ 57,681.51	$ 73,352.79
281	Benefit Programs Specialist	Non-exempt	Professional	2	I	$ 20.20	$ 26.08	$ 31.97	$ 42,010.24	$ 54,249.43	$ 66,488.63
382	Benefit Programs Supervisor	Exempt	Professional	4	I	$ 30.31	$ 38.30	$ 46.30	$ 63,038.57	$ 79,669.72	$ 96,300.86
328	Benefits Administrator	Exempt	Professional	4	I	$ 30.31	$ 38.30	$ 46.30	$ 63,038.57	$ 79,669.72	$ 96,300.86
252	Bicycle and Pedestrian Coordinator	Exempt	Professional	3	II	$ 24.30	$ 34.03	$ 43.77	$ 50,551.55	$ 70,791.99	$ 91,032.43
591	Billing Operations Technician	Non-exempt	Technical	3	I	$ 17.69	$ 22.35	$ 27.02	$ 36,787.97	$ 46,496.51	$ 56,205.05
001	Board Members		Council Members			$ -	$ -	$ -	$ -	$ -	$ -
370	Budget & Management Analyst	Exempt	Professional	3	I	$ 24.30	$ 30.72	$ 37.13	$ 50,551.55	$ 63,889.84	$ 77,228.13
3006	Building Combination Inspector	Non-exempt	Technical	3	II	$ 17.69	$ 23.80	$ 29.92	$ 36,787.97	$ 49,510.66	$ 62,233.36
505	Building Maintenance Mechanic II	Non-exempt	Technical	2	II	$ 16.85	$ 21.22	$ 25.58	$ 35,043.84	$ 44,130.04	$ 53,216.23
558	Building Maintenance Mechanic III	Non-exempt	Technical	3	I	$ 17.69	$ 22.35	$ 27.02	$ 36,787.97	$ 46,496.51	$ 56,205.05
607	Building Maintenance Mechanic IV	Non-exempt	Technical	4	I	$ 20.94	$ 25.90	$ 30.86	$ 43,565.31	$ 53,874.50	$ 64,183.69
609	Building Maintenance Supervisor	Non-exempt	Technical	4	III	$ 20.94	$ 30.47	$ 40.00	$ 43,565.31	$ 63,385.54	$ 83,205.77
506	Building Trades II	Non-exempt	Technical	2	I	$ 16.85	$ 20.78	$ 24.71	$ 35,043.84	$ 43,218.19	$ 51,392.54
559	Building Trades III	Non-exempt	Technical	3	I	$ 17.69	$ 22.35	$ 27.02	$ 36,787.97	$ 46,496.51	$ 56,205.05
404	Business Applications Specialist	Non-exempt	Technical	4	II	$ 20.94	$ 28.18	$ 35.42	$ 43,565.31	$ 58,623.69	$ 73,682.07
387	Business Development Manager	Exempt	Professional	4	II	$ 30.31	$ 42.44	$ 54.57	$ 63,038.57	$ 88,268.91	$ 113,499.26

(Assistant City Attorney $30.31 per hour)

Coalition Cost Estimations (Total Cost = $830,162.75)

The estimated costs for the coalition alternative included the hourly wage of the bicycle and pedestrian coordinator (City of Charlottesville, 2023a) and the estimates for the cost of light refreshments for meeting participants. The cost of space for the meetings was not factored in because it is assumed Charlottesville city has access to plenty of unused conference rooms or other similar spaces, and in the event those are not available Zoom is a viable option. The meetings are assumed to be an hour long, twice per month. The coalition is roughly estimated to produce a viable option in three years as only a single supporting source could be found.

Table 23. Meeting Costs

Assumptions	**Estimated Cost**
Location for Meetings	$0.00
Bicycle and Pedestrian Coordinator Time (per hour)	$34.04 per hour $2,450.88 over 3 years
Refreshments per person	$10.00
Total Number of people	20
Total refreshment cost per meeting	$200 $14,400 over 3 years
Total	$16,850.88

The estimated average cost of a project that the coalition will generate is roughly equivalent to the average cost of the other alternatives as if there were only 1 project (i.e. 1 intersection with curb extensions, 1 separated bike lane, 1 multi-use greenway)

Table 24. Project Costs

Average Separated Bike Lane	$994,149.44
Average Curb Extension Cost	$19,500
Average Greenway Cost	$1,426,286.16
Total Average Project Cost	$813,311.87

Appendix B: Infrastructure Location

Methodology

The methodology for placing each piece of infrastructure in the alternatives was to look at traffic stress maps, bicycle and pedestrian collision maps, primary travel corridors maps, community demand and input maps, and potential connections to important or useful places (grocery stores, bus stops, health care, laundry mats, schools) and determine where there was the most overlap. Different alternatives placed more emphasis on various components depending on the alternative. For example, the curb extension alternative focuses far more on collision maps because safety is primarily what that alternative attempts to address.

Disclaimer

This process was imprecise as the most readily available data was dated, and conditions may have changed. However, given that these are long-term issues, an assumption was made that they are likely persistent and have probably gotten worse over time, but there has likely been no significant shift in patterns or locations.

Figure 14. Traffic Stress (City of Charlottesville, 2015)

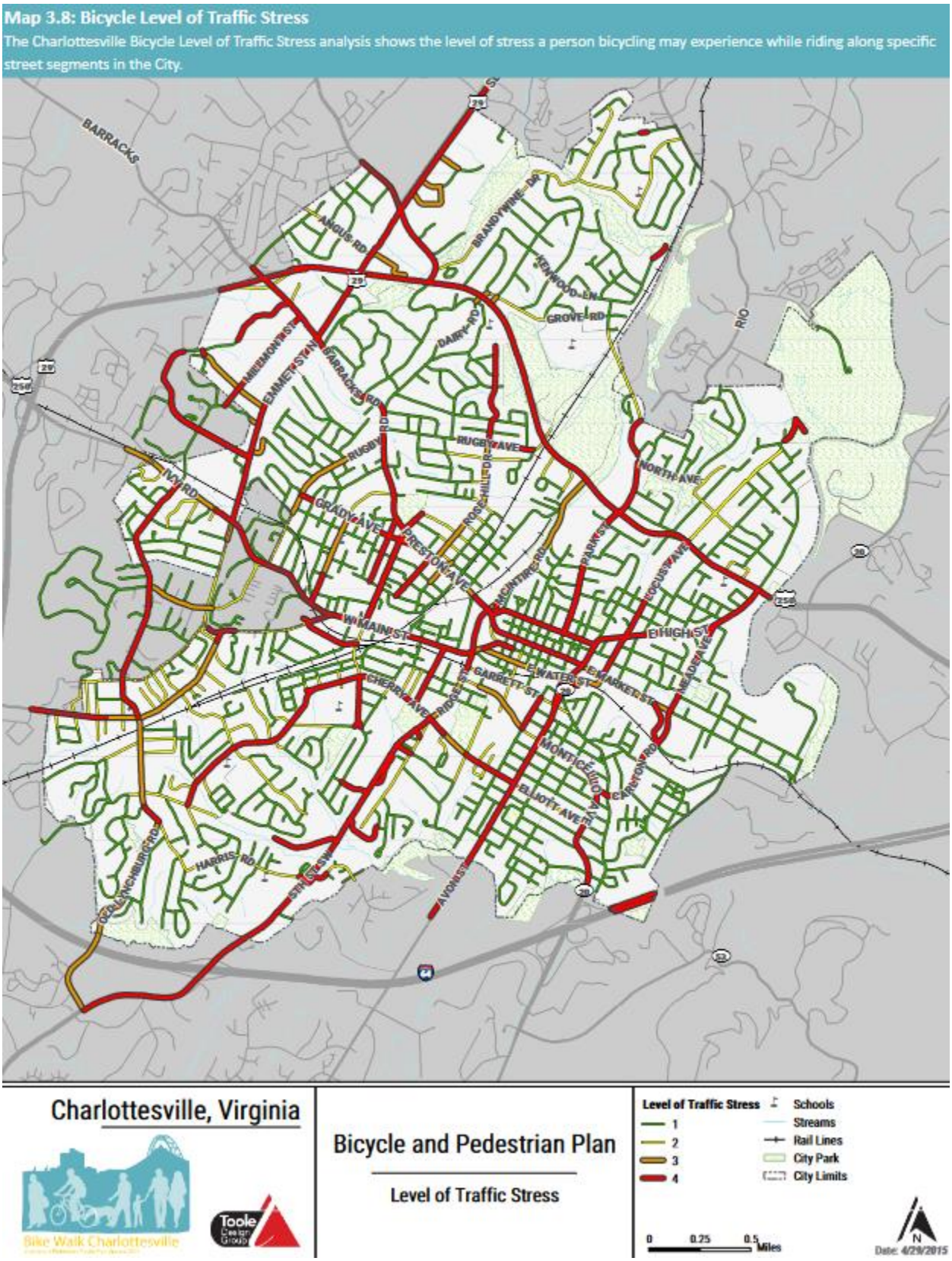


Figure 15. Collisions Map (Thomas Jefferson Planning District Commission & Piedmont Environmental Council, 2019)

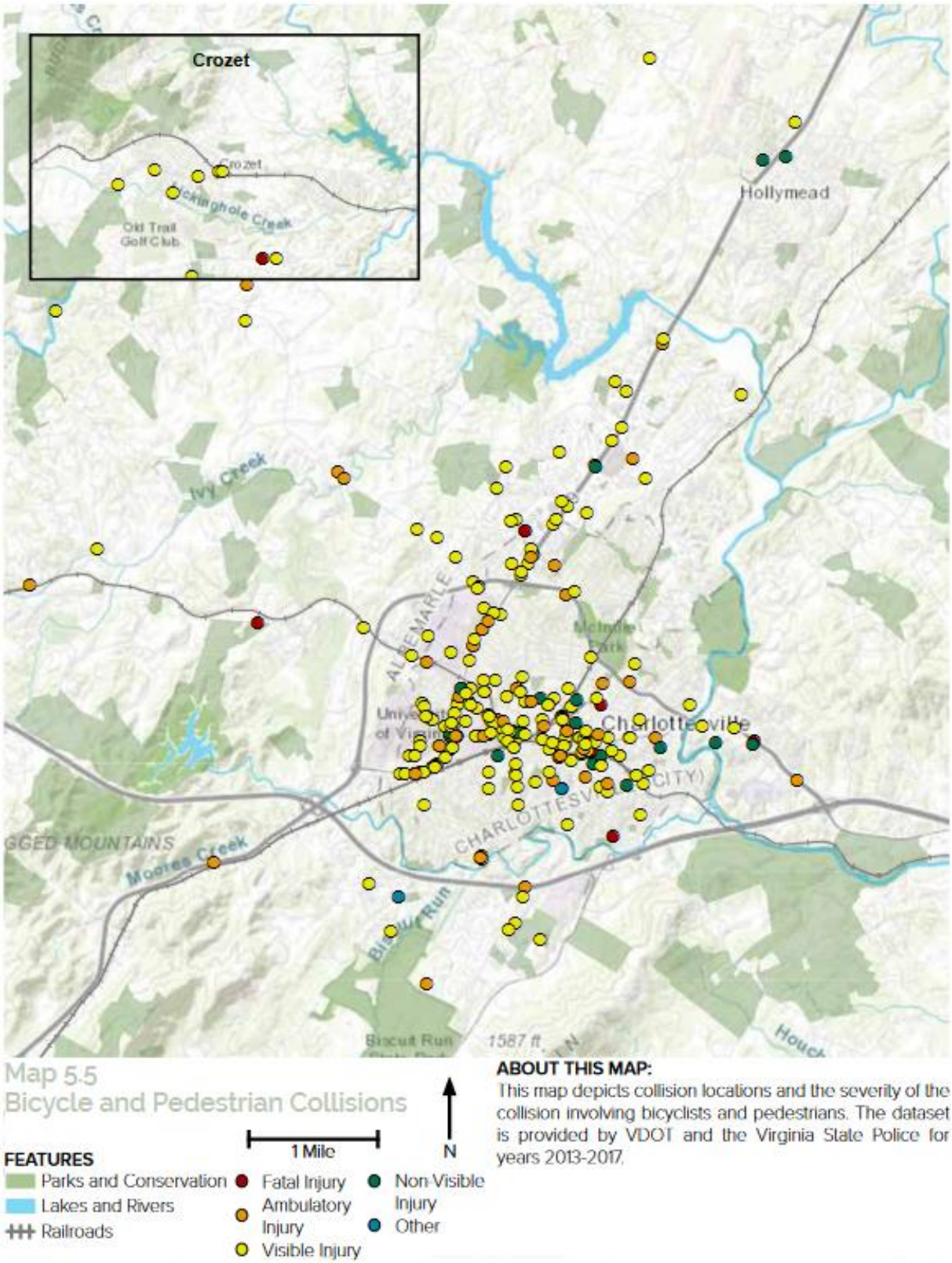


Figure 16. Collision Data (Thomas Jefferson Planning District Commission & Piedmont Environmental Council, 2019)

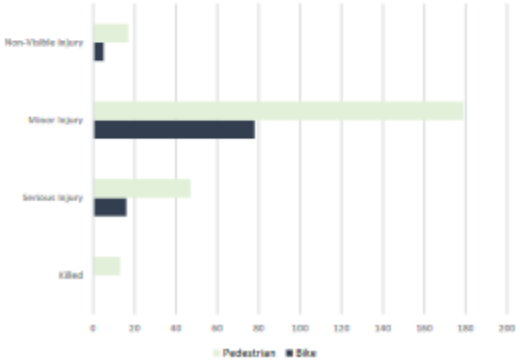
Bicycle Collisions

Collision Severity	Year					Total
	2013	2014	2015	2016	2017	
Killed	0	0	0	0	0	0
Serious Injury	7	3	2	2	2	16
Minor Injury	18	22	16	11	11	78
Non-Visible Injury	3	1	0	0	1	5
Total	28	26	18	13	14	99

Pedestrian Related Collisions

Collision Severity	Year					Total
	2013	2014	2015	2016	2017	
Killed	2	2	3	4	2	13
Serious Injury	9	9	8	12	9	47
Minor Injury	40	36	36	28	39	179
Non-Visible Injury	5	3	2	4	3	17
Total	56	50	49	48	53	256

Bicycle and Pedestrian Collisions by Severity



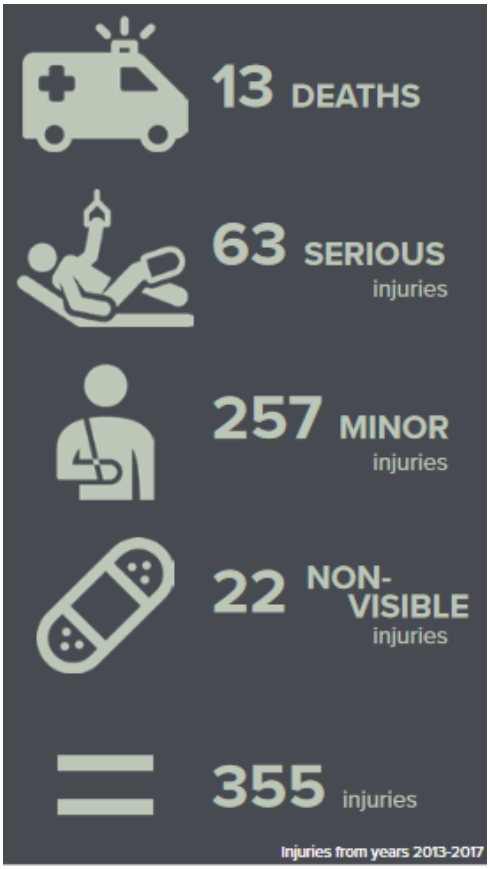


Figure 17. Corridor Prioritization (Thomas Jefferson Planning District Commission & Piedmont Environmental Council, 2019)

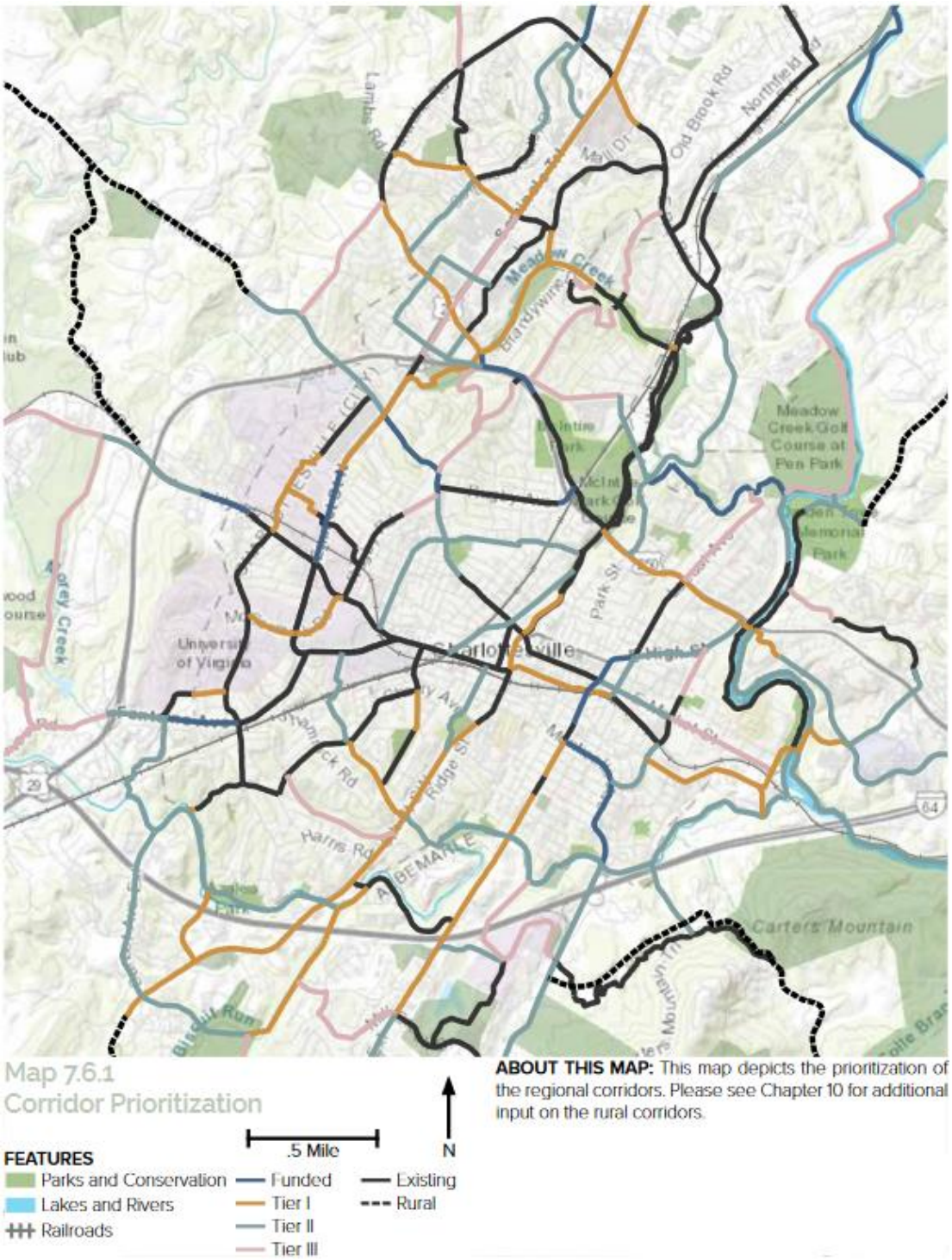


Figure 18. Corridor Priority with Community Input (Thomas Jefferson Planning District Commission & Piedmont Environmental Council, 2019)

BPID	Location/Name	Type	Status	Tier	Tier	Reason	(miles)	(Low)	(High)	Cost
BP1	Ivy Rd - Bypass	SUP	EX SR	Tier 2	Tier 2		0.89	1.60	3.35	0.88
BP2	E Market St - West	BL		Tier 2	Tier 2		0.61	0.43	0.84	
BP3	Monticello Rd	BL		Tier 1	Funded		1.19			
BP4	Barracks Rd - City West	BL		Tier 3	Tier 2	Consistency	0.52	0.37	0.71	
BP5	Avon St - Monticello Rd	BL		Tier 2	Tier 1	Consistency	0.31	0.22	0.43	
BP6	Water St	BL	EX SR	Tier 1	Tier 1		0.82	0.58	1.13	
BP7	Ridge McIntire Rd - Downtown	BL		Tier 1	Tier 1		0.28	0.20	0.39	
BP9	Dairy Rd	BL		Tier 3	Tier 3		0.52	0.37	0.72	
BP10	9th St NE	BL		Tier 1	Funded		0.35			
BP12	High St - West	BL		Tier 2	Tier 2		0.56	0.40	0.78	
BP13	US250 - East of Park St	SUP		Tier 2	Tier 1	Public Input	0.48	0.86	1.80	
BP14	US250 - West of Park St	SUP		Tier 2	Tier 1	Public Input	0.06	0.10	0.22	
BP15	High St - East	BL		Tier 2	Tier 2		0.37	0.26	0.51	
BP16	Grove Rd	BL		Tier 3	Tier 3		0.80	0.57	1.10	
BP17	Barracks Rd - City East	BL		Tier 2	Funded		0.79			
BP18	US29 - County boarder	SUP		Tier 3	Tier 3		5.91	10.60	22.25	1.40
BP19	US29 - Rio Rd	SUP		Tier 1	Tier 1		1.15	2.06	4.32	
BP20	US29 - Fashion Square	SUP		Tier 1	Tier 1		1.26	2.26	4.73	
BP21	Fontaine Ave - Interchange	SUP		Tier 2	Tier 2		0.78	1.40	2.95	
BP22	Commonwealth Dr - North	SR		Tier 2	Tier 2		0.75	0.37	1.56	
BP22	Commonwealth Dr - North	SUP		Tier 2	Tier 2		0.16	0.29	0.60	
BP23	Emmet St - South of US250	SUP		Tier 1	Tier 1		0.33	0.59	1.25	
BP24	Emmet St - Massie Rd	SUP		Tier 1	Funded		0.43			
BP25	Emmet St - Barracks Shopping	SUP		Tier 1	Tier 1		0.55	0.98	2.05	
BP26	Pantops Bridge	SUP		Tier 1	Tier 1		0.12	0.21	0.45	2.10
BP27	Rte 20 - US64 Intersection	SUP		Tier 1	Tier 2	Alternate Route	0.81	1.45	3.05	
BP28	5th St	SUP	EX BL	Tier 1	Tier 1		1.80	3.23	6.79	
BP29	Avon St - City Boundary	BL		Tier 1	Tier 1		0.40	0.29	0.56	0.88
BP30	Copeley Rd	BL		Tier 1	Tier 1		0.37	0.27	0.52	
BP31	Preston Ave	BL		Tier 2	Tier 2		0.66	0.47	0.92	
BP33	Meade Ave	BL		Tier 3	Tier 3		0.41	0.29	0.57	
BP34	Ivy Rd - Ednam	SUP		Tier 3	Tier 3		1.85	3.31	6.95	
BP35	Whitewood Rd	BL		Tier 3	Tier 1	Repaving	0.58	0.55	1.40	
BP36	Greenbrier Dr - East	BL	EX SR	Tier 1	Tier 1		0.43	0.30	0.59	
BP37	McCormick Rd - West	BL	EX SR	Tier 1	Tier 1		0.39	0.28	0.55	

BPID	Location/Name	Type	Status	Tier	Tier	Reason	(miles)	(Low)	(High)	Cost
BP38	Rio Rd - US29	BL		Tier 2	Tier 1	Connects Existing	0.40	0.38	0.96	
BP39	Hydraulic Rd - East of Georgetown Rd	SUP		Tier 1	Tier 1		0.67	1.21	2.54	
BP40	Barracks Rd - County	BL		Tier 2	Tier 2		0.94	0.90	2.29	
BP41	Ivy Rd - East of Ivy	SUP		Tier 3	Tier 3		3.04	5.45	11.43	
BP42	Three Notched Rd	SUP		Tier 3	Tier 3		3.90	6.99	14.68	
BP43	Hydraulic Rd - West of US29	SUP		Tier 1	Tier 1		0.31	0.56	1.18	
BP44	US29 - Bypass	SUP		Tier 1	Tier 3	Alternate Route	0.41	0.73	1.53	
BP45	McCormick Rd - East	BL	EX SR	Tier 1	Tier 1		0.51	0.36	0.71	
BP46	Long St	SUP		Tier 1	Tier 1		0.54	0.96	2.01	
BP47	Avon St Ext - County Boundary	SUP		Tier 1	Tier 1		0.74	1.33	2.79	
BP48	Peter Jefferson Pkwy	BL		Tier 2	Tier 2		1.22	1.47	4.23	
BP49	Berkmar Dr - South	BL		Tier 1	Tier 2	Alternate Route	0.66	0.80	2.31	
BP50	Commonwealth Dr - South	BL		Tier 2	Tier 2		0.76	0.54	1.06	
BP51	Berkmar Dr - Rio Hill	SUP	EX BL	Tier 2	Funded		1.41			
BP52	Georgetown Rd	BL		Tier 3	Tier 3		1.09	0.78	1.51	
BP53	Crozet Dr - North	BL		Tier 3	Tier 3		1.20	1.15	2.91	
BP54	Fontaine Ave - City Boundary	BL		Tier 2	Funded		0.55			
BP55	Ivy Rd - West of Ivy	SUP		Tier 3	Tier 3		3.58	6.42	13.47	1.40
BP56	Earlysville Rd	BL		Tier 3	Tier 3		0.67	0.80	2.32	
BP57	Lewis and Clark Dr Ext	SUP		Tier 3	Funded		1.10			
BP58	US29 - Airport	SUP		Tier 3	Tier 3		1.27	2.28	4.80	
BP59	McIntire Rd	SUP		Tier 1	Tier 1		0.43	0.78	1.63	
BP60	Avon St Ext - US64 Crossing	SUP		Tier 2	Tier 1	Public Input	0.84	1.50	3.15	2.80
BP61	Reservoir Rd	SR		Tier 3	Tier 3		2.82	1.38	5.88	
BP62	US29 - Hydraulic	SUP		Tier 1	Tier 3	Alternate Route	0.89	1.59	3.33	
BP64	Biscuit Run - Connector	SUP		Tier 1	Tier 1		0.98	1.76	3.69	
BP66	Rte 20 - South of US64	SUP		Tier 2	Tier 2		1.17	2.09	4.38	
BP68	Rivanna River - US29 Connection	SUP		Tier 3	Tier 1	County Effort	1.10	1.98	4.16	
BP69	Southern Railway	SUP		Tier 3	Tier 2	County Effort	1.96	3.52	7.38	
BP70	Rivanna River - South of Pen Park	SUP		Tier 3	Tier 2	City Effort	0.53	0.95	1.98	
BP71	Moores Creek - Quarry Park	SUP		Tier 2	Tier 2		0.67	1.20	2.52	
BP72	Stribling Ave Ext	SUP	EX TR	Tier 2	Tier 2		1.17	2.10	4.41	0.52
BP73	Carters Mountain Connector	SUP		Tier 2	Tier 2		0.64	1.15	2.41	2.00

BPID	Location/Name	Type	Status	APT Tier	Final Tier	Prioritization Reason	Length (miles)	Cost (Low)	Cost (High)	Barrier Cost
BP74	Moores Creek - East of Monticello Rd	SUP		Tier 2	Tier 2		1.75	3.14	6.60	0.88
BP75	Moores Creek - Pollocks Branch	SUP		Tier 2	Tier 2		0.96	1.73	3.63	
BP76	Highland Ave Ext	SUP		Tier 2	Tier 3	Alternate Route	1.03	1.85	3.88	
BP77	John Warner Pkway - Connector	SUP		Tier 2	Tier 1	City Effort	0.06	0.12	0.24	2.00
BP78	US250 - Hydraulic crossing	SUP		Tier 1	Tier 1		0.74	1.32	2.77	
BP79	Moores Creek - Azalea Park	SUP	EX TR	Tier 2	Tier 2		0.47	0.84	1.75	
BP80	Riverview Park - Crossing	SUP		Tier 1	Tier 1		0.61	1.09	2.29	2.45
BP81	Meadow Creek - Locust Grove	SUP	EX TR	Tier 2	Funded		0.80			
BP82	Meadow Creek - Rio Rd	SUP	EX TR	Tier 2	Funded		0.72			
BP83	Melbourne Rd	BL		Tier 2	Tier 2		0.69	0.49	0.96	
BP84	US250 Parallel - Hydraulic	SUP		Tier 1	Funded		0.58			
BP85	Carlton Rd	BL		Tier 3	Tier 2	Consistency	0.57	0.41	0.79	
BP86	5th St Ext - Old Lynchburg Rd	SUP		Tier 1	Tier 1		1.84	3.29	6.90	
BP87	14th St NW	BL		Tier 2	Tier 2		0.59	0.42	0.81	
BP88	Meadowbrook Heights Rd	BL		Tier 3	Tier 3		0.80	0.77	1.95	
BP89	Rugby Rd - US250	SR		Tier 3	Tier 3		0.70	0.34	1.46	
BP90	Sunset Ave Ext - North	BL	EX SR	Tier 2	Tier 2		0.32	0.39	1.11	
BP91	Rivanna River - Pen Park	SUP		Tier 3	Tier 3		1.65	2.95	6.19	
BP92	Sunset Ave Ext - South	BL		Tier 2	Tier 2		1.34	1.61	4.66	
BP93	Rugby Rd - Dairy Rd	BL		Tier 3	Tier 3		0.42	0.30	0.58	
BP94	Biscuit Run - 5th St Connector	SUP		Tier 2	Tier 2		0.90	1.62	3.39	0.68
BP95	Rockcreek Rd - Parallel	SUP		Tier 1	Tier 1		0.74	1.33	2.79	
BP97	State Farm Blvd	BL		Tier 2	Tier 2		0.86	1.04	2.99	
BP98	Town and Country Ln Ext - Stony Point	BL		Tier 3	Tier 3		0.29	0.34	0.99	
BP99	Mill Creek Dr	SR		Tier 3	Tier 3		1.17	0.57	2.45	
BP100	Riverview Park	SUP		Tier 2	Tier 2		0.41	0.73	1.54	
BP101	Town and Country Ln Ext - Rivanna	SUP		Tier 3	Tier 3		0.15	0.27	0.56	
BP102	Wakefield Rd	SR		Tier 3	Tier 3		0.39	0.00	0.00	
BP102	Wakefield Rd	SR		Tier 3	Tier 3		0.32	0.00	0.00	
BP102	Wakefield Rd	SUP		Tier 3	Tier 3		0.05	0.09	0.19	
BP103	Meadow Creek - Hillsdale Dr Connect	SUP		Tier 1	Tier 1		0.26	0.46	0.97	

BPID	Location/Name	Type	Status	APT Tier	Final Tier	Prioritization Reason	Length (miles)	Cost (Low)	Cost (High)	Barrier Cost
BP104	Bunker Hill Dr	SR		Tier 3	Tier 3		0.41	0.20	0.85	
BP106	Tonsler Park	SR		Tier 1	Tier 2	Alternate Route	0.40	0.00	0.00	
BP106	Tonsler Park	SUP		Tier 1	Tier 2	Alternate Route	0.36	0.64	1.34	
BP107	Norfolk Southern Railroad	SUP		Tier 1	Tier 2	Alternate Route	1.17	2.10	4.41	
BP108	Madison Ave	BL		Tier 2	Tier 2		0.35	0.25	0.48	
BP109	Allied St Ext	SUP		Tier 1	Tier 2	Alternate Route	0.30	0.54	1.13	2.00
BP109	Allied St Ext	SUP		Tier 1	Tier 2	Alternate Route	0.15	0.27	0.57	
BP109	Allied St Ext	SR		Tier 1	Tier 2	Alternate Route	0.42	0.00	0.00	
BP109	Allied St Ext	BL		Tier 1	Tier 2	Alternate Route	0.03	0.02	0.04	
BP109	Allied St Ext	SR		Tier 1	Tier 2	Alternate Route	0.17	0.00	0.00	
BP110	Jarman Gap Rd	BL		Tier 3	Tier 3		0.67	0.81	2.33	
BP111	9th St SE	BL	EX SR	Tier 1	Funded		0.39			
BP112	Brandywine Dr	SR		Tier 3	Tier 3		0.21	0.00	0.00	
BP113	Berkmar Rd - Airport	BL		Tier 3	Tier 1	County Effort	0.41	0.50	1.43	
BP114	Rugby Ave - US250 Crossing	SUP		Tier 2	Funded		0.18			
BP115	Hydraulic Rd - East of US29	SUP		Tier 1	Tier 1		0.22	0.39	0.82	
BP116	Hydraulic Rd - East of Hillsdale Dr	SUP	EX SR	Tier 1	Tier 1		0.19	0.33	0.70	
BP117	Holiday Dr	SUP		Tier 1	Tier 2	Expensive	0.52	0.93	1.96	0.88
BP118	Angus Rd	BL		Tier 1	Tier 2	Expensive	0.93	0.89	2.26	
BP119	College Dr	BL		Tier 3	Tier 3		0.83	1.00	2.89	
BP120	College Dr Ext	SUP		Tier 3	Tier 2	PVCC	0.53	0.96	2.01	
BP121	Broadway St	BL		Tier 2	Tier 1	City County Connect	0.96	0.92	2.32	
BP122	Broadway St Ext	SUP		Tier 3	Tier 1	Consistency	0.24	0.42	0.89	
BP123	Brandon Ave	SR		Tier 2	Tier 2		0.57	0.14	0.60	
BP123	Brandon Ave	SUP		Tier 2	Tier 2		0.22	0.39	0.83	
BP124	10th St NE	BL		Tier 2	Tier 2		0.34	0.24	0.47	
BP125	Locust Ave	BL		Tier 3	Tier 3		1.01	0.96	2.44	
BP126	Richmond Rd	SUP		Tier 3	Tier 3		4.36	7.82	16.41	
BP127	Foxhaven Farm	SR		Tier 3	Tier 3		1.04	0.51	2.18	
BP128	Meadow Creek - Hydraulic	SUP		Tier 1	Tier 1		0.90	1.61	3.37	
BP129	Greenbrier Dr - West	BL	EX SR	Tier 1	Tier 1		0.13	0.12	0.31	
BP130	Sunset Ave - Crossing	SUP		Tier 2	Tier 1	City Effort	0.06	0.10	0.21	0.42
BP131	Moores Creek - East of Avon St	SUP		Tier 2	Tier 2		0.41	0.73	1.54	
BP132	Emmet St - University Ave	SUP		Tier 1	Funded		0.31			
BP133	Darden Towe Park	SUP		Tier 2	Tier 2		0.52	0.93	1.95	

BPID	Location/Name	Type	Status	APT Tier	Final Tier	Prioritization Reason	Length (miles)	Cost (Low)	Cost (High)	Barrier Cost
BP134	Zan Rd	BL		Tier 1	Tier 2	Expensive	0.62	0.75	2.15	
BP135	Massie Rd - Copeley Rd	SUP		Tier 1	Tier 1		0.74	1.32	2.78	
BP136	Rugby Rd - Preston Ave	BL		Tier 3	Tier 3		0.30	0.21	0.41	
BP138	College Dr - US64 Crossing	SUP		Tier 2	Tier 3	Alternate Route	0.80	1.44	3.03	2.00
BP139	Rivanna River - South Fork	SUP		Tier 3	Tier 3		1.05	1.89	3.96	
BP140	South Pantops Dr	BL		Tier 2	Tier 2		0.90	0.87	2.20	
BP141	New House Dr	BL		Tier 1	Tier 1		0.34	0.41	1.20	
BP142	Rivanna River - Pantops	SUP		Tier 2	Tier 2		1.49	2.68	5.62	
BP143	Old Lynchburg Rd	BL		Tier 1	Tier 1		0.63	0.76	2.19	
BP144	Biscuit Run - Park	SUP		Tier 3	Tier 3		1.96	3.51	7.37	
BP145	Rivanna Rive - Darden Towe Crossing	SUP		Tier 3	Tier 2	Consistency	0.08	0.14	0.30	1.75
BP146	Rivanna River - County Boundary	SUP		Tier 3	Tier 3		0.75	1.34	2.80	
BP147	Meadow Creek - Greenbriar Park	SUP		Tier 1	Tier 1		0.40	0.72	1.51	
BP148	Avon St Ext - Rte 20	SUP		Tier 3	Tier 3		0.77	1.38	2.89	
BP149	Avon St Ext - South of Mill Creek	SUP		Tier 3	Tier 2	Public Input	1.13	2.02	4.24	
BP150	Crozet Dr - South	SR		Tier 3	Tier 2	Inexpensive	0.22	0.00	0.00	
BP151	Moores Creek - 5th St Crossing	SUP	EX TR	Tier 2	Tier 2		0.62	1.10	2.32	0.88
BP152	Rio Rd - Park St	BL		Tier 2	Tier 2		1.73	2.09	6.02	
BP153	Park St	BL		Tier 3	Tier 2	Consistency	0.65	0.46	0.90	
BP154	Stadium Rd	SUP	EX	Tier 1	Tier 1		0.35	0.00	0.00	
BP154	Stadium Rd	BL		Tier 1	Tier 1		0.25	0.18	0.34	
BP155	Old Mills Trail	SUP		Tier 3	Tier 2	County Effort	7.94	14.24	29.89	
BP156	E Market St - East	SR		Tier 3	Tier 3		0.88	0.43	1.84	
BP156	Riverside Ave Ext	SR		Tier 3	Tier 3		0.43	0.11	0.45	
BP157	9th St SW	BL		Tier 1	Tier 1		0.32	0.23	0.44	
BP158	Foxhaven Farm - Ivy Connector	SUP		Tier 3	Tier 3		1.54	2.76	5.79	
BP159	Moores Creek - Azalea Park Ext	SUP	EX TR	Tier 2	Tier 2		0.65	1.16	2.43	0.88
BP160	US29 - Rivanna Crossing	SUP		Tier 1	Tier 1		0.92	1.65	3.47	1.40
BP161	5th St Hub	SUP		Tier 1	Tier 1		0.54	0.96	2.02	
BP162	Rivanna River - East of Rail Road	SUP		Tier 3	Funded		1.70			
BP163	Rivanna River - West of Railroad	SUP		Tier 3	Funded	County Effort	1.08			
BP165	Ivy Rd - County Boundary	BL	EX SR	Tier 2	Funded		0.40			

Figure 19. Corridor Priority with Community Input Map (Thomas Jefferson Planning District Commission & Piedmont Environmental Council, 2019)

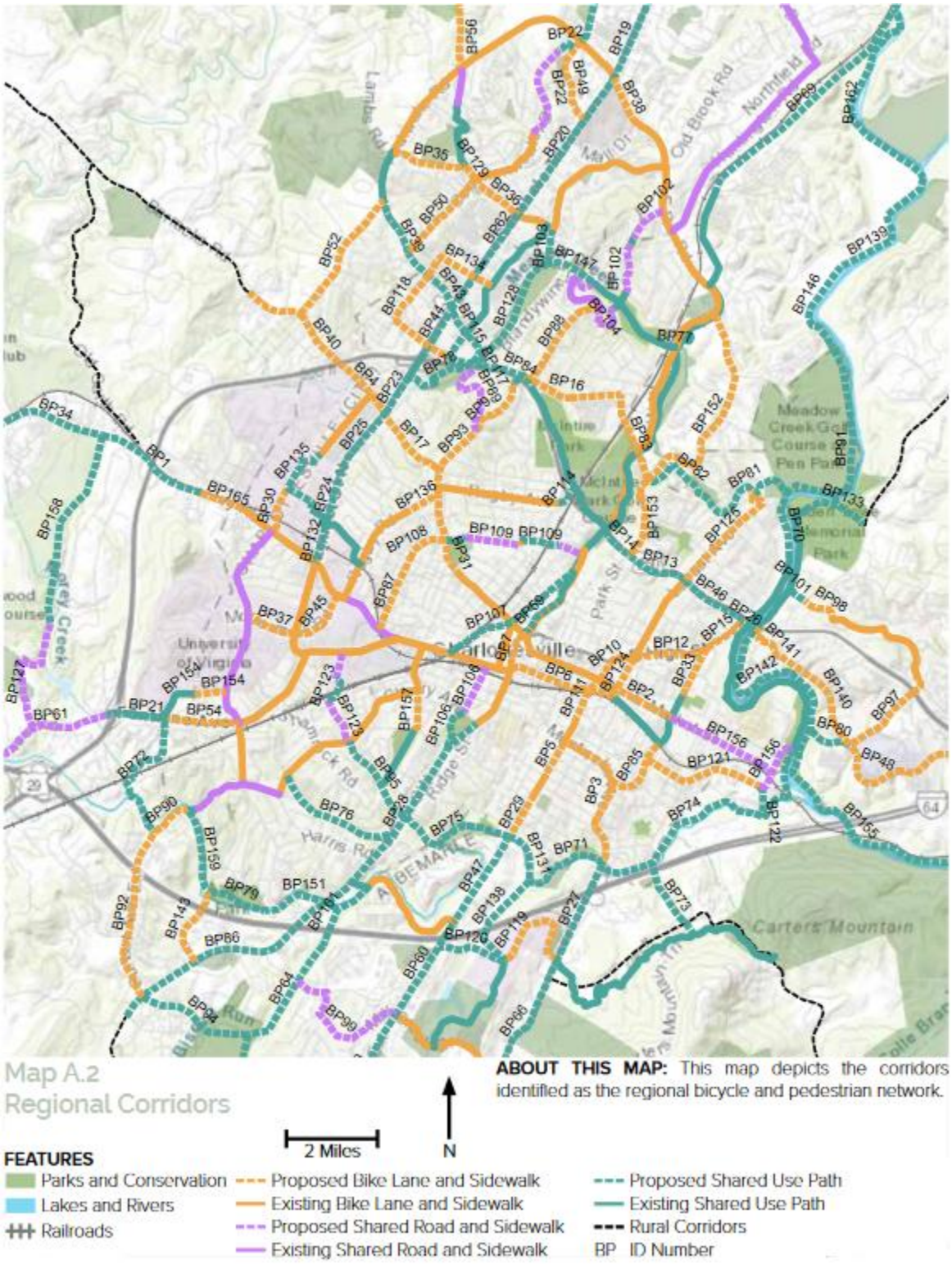
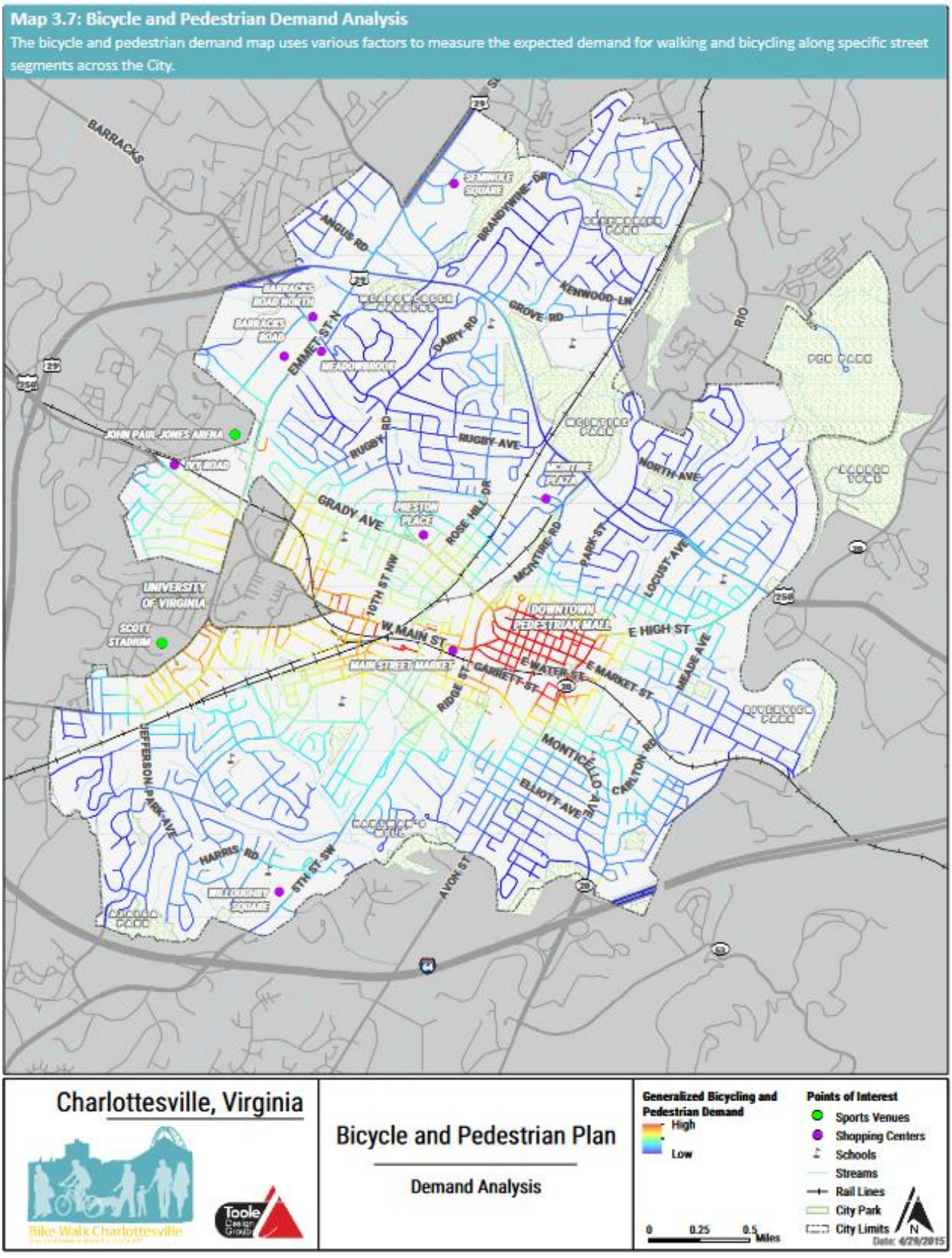


Figure 20. Infrastructure Demand Map (City of Charlottesville, 2015)



Appendix C: Current Infrastructure Location

Figure 21. Charlottesville Bike and Pedestrian Map (City of Charlottesville, n.d.-a)

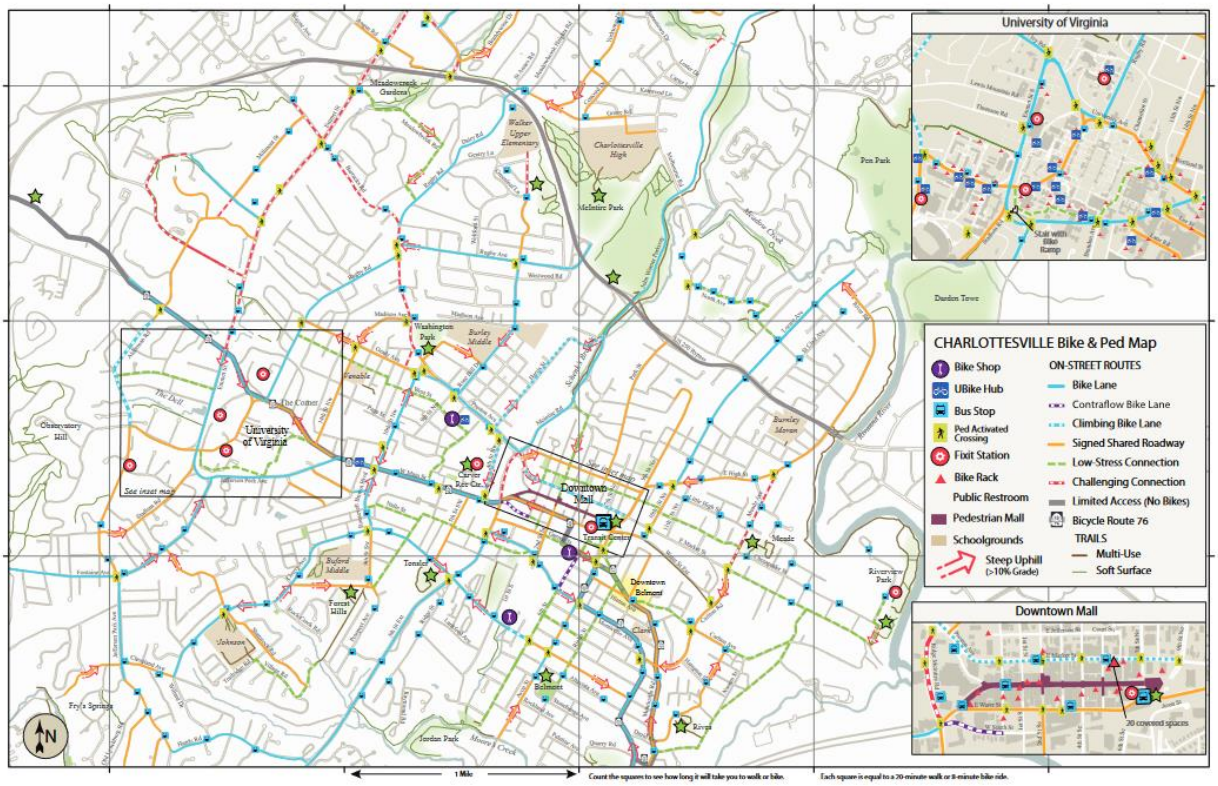


Figure 22. Bus Stops (Thomas Jefferson Planning District Commission & Piedmont Environmental Council, 2019)

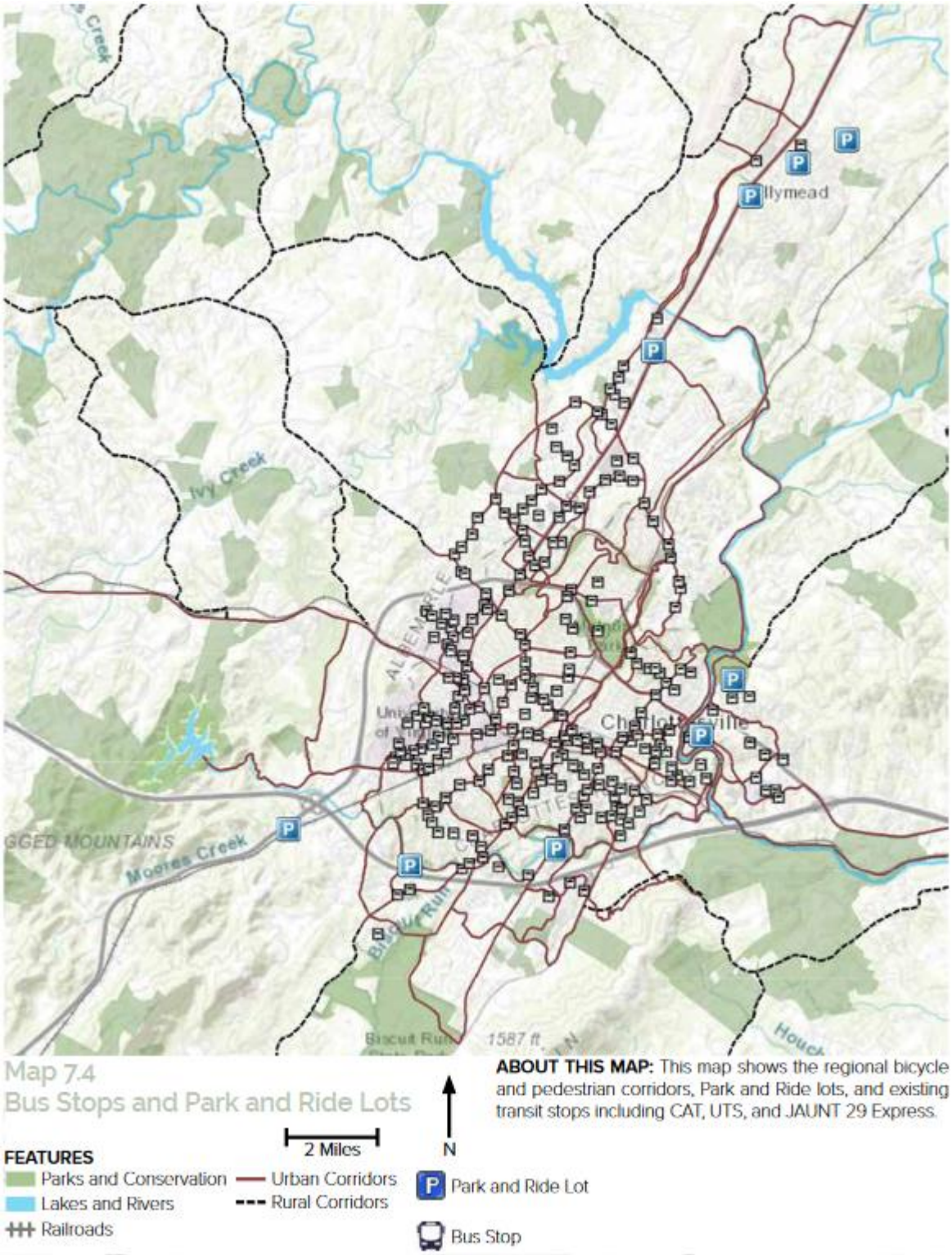


Figure 23. Bus Routes (Charlottesville Area Transit, n.d.)

Figure 24. Charlottesville Parks (Thomas Jefferson Planning District Commission & Piedmont Environmental Council, 2019)