# capital bikeshare

# development plan update

MAY 2020

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The analysis presented in this report includes data through late 2019. **This report does not include data or analysis related to the COVID-19 pandemic** that was underway when the report was released.  The results of the analysis included in the report, including the financial plan update, may be impacted as a result of the pandemic.

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# introduction

**In September 2010 the District of Columbia and Arlington County launched Capital Bikeshare as one of the first large-scale bikeshare systems in North America.** In the intervening nine years, the system has grown into one of the largest and most popular bikeshare programs in the nation. Capital Bikeshare continues to face challenges and identify opportunities to provide Metro DC with an affordable, safe, convenient, equitable, and sustainable transportation option.

The District Department of Transportation (DDOT) embarked on the Capital Bikeshare Development Plan in 2015 to understand how the program was performing five years after launch and devise a strategy for future growth and funding. That study laid the groundwork for the program's major efforts to address program equity and expansion into new neighborhoods.

Since the release of the 2016 Bikeshare Development Plan, the bikeshare industry has experienced tremendous change, as over $2 billion in private capital has fueled the creation of new business models, technology, and competitors. The transportation industry continues to grow and evolve rapidly as new micromobility providers such as e-scooters, dockless bikeshare, e-bikes, carshare, and transportation network companies (TNCs) enter the market. The 2019 Bikeshare Development Plan Update allows the agency to revisit and update the findings of the 2016 study, while also formulating a strategy that responds to new and unforeseen challenges in the bikeshare industry. Some of the ways the study can help DDOT navigate change include:

- Revisiting how well Capital Bikeshare serves its existing market and outlining how the program can grow and expand over time.

- Reviewing the expansion policies outlined in the 2016 study and updating those policies based on the latest data.

- Identifying how Capital Bikeshare is affected by wider industry trends and formulating a response to outside competition in the shared mobility space.

- Reviewing the current business model to ensure DDOT is maximizing the value of its investment in bikeshare.

- Evaluating existing equity initiatives to and devising an updated strategy to better reach low-income households and people of color.

Both the 2016 Development Plan and the 2019 Plan Update ensure that the District's bike sharing program is on the right course for continued growth and financial sustainability. The 2019 Plan Update will revise the language and analysis needed for improved DDOT staff communication with the public and regional stakeholders about decisions or policies related to Capital Bikeshare. This Plan Update will include a strategic plan update, market analysis update, expansion priorities, financial plan update, and business plan.

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# strategic framework

**The 2016 Development Plan's Strategic Framework established goals and objectives for the bikeshare system to assess whether the current system and expansion scenarios were meeting performance-based goals.** The Strategic Framework provided standards to measure progress. The 2019 Strategic Framework Update revisits and revises the goals, objectives, performance measures, and targets identified in the 2016 Plan.

The Strategic Framework Update will be revised to better guide the Development Plan and also allow DDOT to assess program performance moving forward. The updated goals and objectives will emphasize safety, equity, access, and differentiating Capital Bikeshare from other micromobility providers. The Strategic Framework Update begins with updated goals for the program. Goals are clear statements of purpose; each with its own function that drives the end result. Connected to each goal is a set of objectives. Objectives are specific, measurable steps to achieve a related goal. Finally, performance measures built from current data will quantitatively or qualitatively track progress toward each objective over time. DDOT has set targets that gauge progress towards the objectives.

# GOALS AND OBJECTIVES

In 2011, Capital Bikeshare established a unified regional mission for the program:

> "to transform our community by providing a high quality, convenient and affordable bicycle transit system that will connect people to more places where they live, work, and play in the region."

During this process, program partners also composed a regional vision for Capital Bikeshare:

> "Life connected by pedal strokes."

As a publicly funded program, DDOT focuses on ensuring Capital Bikeshare continues to be a leader among micromobility services by meeting transportation, community, quality of life, equity, and sustainability goals. DDOT's four goals and supporting objectives are grounded in both the regional mission and vision of Capital Bikeshare, and in the vision presented by the District's MoveDC plan. The four goals selected can each be succinctly summarized under a theme. These goals are intended to evocatively communicate what motivates the planning and operations of Capital Bikeshare in the District. The program goals not only help frame internal planning for the system but allow DDOT to clearly communicate to the public what drives decision-making.



## Theme: Transportation

### Goal 1: Ensure Capital Bikeshare is an Integral Part of the District's Transportation System for all District residents and visitors

**1.1:** Increase transportation system utility and support MoveDC

**1.2:** Integrate Capital Bikeshare into the existing transit system

**1.3:** Focus on Vision Zero initiatives by encouraging a culture of safety among users

**1.4:** Minimize the environmental impact of the transportation system by supporting non-auto transportation

## Theme: Community

### Goal 2: Leverage Capital Bikeshare to Promote a Thriving Community

**2.1:** Promote retail and entertainment spending through improved accessibility

**2.2:** Develop a system that effectively serves tourists and visitors in the District

**2.3:** Expand user access to a range of destinations that can be reached by Capital Bikeshare

## Theme: Quality of Life

### Goal 3: Make People's Lives Better Through Capital Bikeshare

**3.1:** Focus on equity by attracting a wide variety of users regardless of age, race, income, and gender

**3.2:** Improve public health and safety by increasing physical activity through biking, reducing health disparities among communities in the District

## Theme: Program Sustainability

### Goal 4: Use Effective Management and Decision-Making to Guarantee System Sustainability

**4.1:** Maintain Capital Bikeshare in a state of good repair and continue to provide high quality service

**4.2:** Grow responsibly by balancing service provision, system costs, public input, and revenue generation concerns

**4.3:** Maintain a sustainable and productive partnership with our operating vendor

# PERFORMANCE MEASURES AND EVALUATION

The District's Capital Bikeshare goals and objectives detail how the bikeshare system will serve residents, workers, and visitors. The performance measures are used to monitor and evaluate the Capital Bikeshare system. Certain measures pertain to the full bikeshare system, others to individual station performance, and many can be applied to both. Table 1 provides a detailed list of goals, objectives, performance measures, and evaluation methods.

I use CaBi almost every day (many times multiple times per day), and absolutely love it. THANK YOU for providing this great service. It is a total lifesaver for someone like me who doesn't own a car. I am very impressed with the service.

—User survey response

| Objectives | # | Performance Measure | Evaluation Method/Source | Target |
|---|---|---|---|---|
| Increase transportation system utility for users and support MoveDC | 1 | Capital Bikeshare ridership | Trips per bike per day – Monthly operating report | Year over year increase in ridership and membership renewals |
| | 2 | Member turnover | Percentage of members not renewing at the end of membership term | Increase member retention |
| Focus on Vision Zero initiatives and encourage a culture of safety among users | 3 | Number of crash incidents | Crashes per 100,000 rides per year – monthly operating report | Achieve zero crashes |
| Minimize the environmental impact of the transportation system by supporting non-auto transportation | 4 | Capital Bikeshare usage at stations within one-eighth of a mile of transit stops | Washington Metropolitan Area Transit Authority (WMATA) and DDOT Data | Improve coordination between Capital Bikeshare and WMATA and increase Capital Bikeshare ridership surrounding transit stops |
| | 5 | Availability of LTS 1 and 2 facilities within 400m of bikeshare stations | LTS data from District Mobility, GIS | Annual increase year over year |
| | 6 | Green House Gas (GHG) reduction | Capital Bikeshare survey and DDOT data | Greater GHG reduction year over year |
| Promote retail and entertainment spending through improved accessibility | 7 | Number of retail and hospitality jobs within a quarter mile of a bikeshare station | LEHD Data | Annual increase when new LEHD data are available |
| Develop a bikeshare system that effectively serves tourists and visitors in the District | 8 | Number of casual memberships purchased by users with a billing zip code outside a Capital Bikeshare member jurisdiction | Membership records | Annual increase year over year |

| Objectives | # | Performance Measure | Evaluation Method/Source | Target |
|---|---|---|---|---|
| Focus on equity by attracting a wide variety of users regardless of age, race, income, and gender | 9 | Demographic profile (age, income, race, gender) of bikeshare population compared to the demographic profile of the District population as a whole | DDOT Data and US Census Data | Achieve parity between the District's bikeshare population and the city's overall population |
| Improve public health by increasing physical activity through biking, reducing health disparities among communities in the District | 10 | Number of employees and households per square mile within bikeshare service area | Number of employees and households per square mile within bikeshare service area | All District residents are within a 10-minute walk of a bikeshare station |
| Expand user access to a range of destinations, including jobs and services that can be reached by bikeshare | 11 | Number of total public service destinations within a quarter of a square mile of a bikeshare station | Number of total public service destinations within a quarter of a square mile of a bikeshare station | Increase number of major destinations with bikeshare access |
| Expand user access to a range of destinations, including jobs and services that can be reached by bikeshare | 12 | Dock and station offline time | Dock and station offline time | Annual reduction in dock and station offline time |
| | 13 | Number of station and dock failures | Number of station and dock failures | Annual reduction in dock and station failures |
| | 14 | Operating cost per dock | Operating cost per dock | Reduce operating costs year over year |
| | 15 | Cost recovery ratio | Monthly operating reports (Tableau), Looker, annual financial results | Increase cost recovery ratio year over year |
| | 16 | Private-sector financial support for Capital Bikeshare | Total monetary value of corporate memberships, sponsorships, and advertising | Increase private-sector support |
| Grow responsibly by balancing service provision, system costs, public input, and revenue generation concerns | 17 | Instances of new technology adoption (e.g. new payment, software upgrades, new generation bicycles, new dock types) | Qualitative measures; DDOT data | No set target |

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# market study

**This market study examines the characteristics of Capital Bikeshare users, trip patterns, station performance, and selected geographic measures to identify market segments at the neighborhood level.** Each market was examined to highlight ridership potential, revenue potential, and areas with a public welfare/health need for bikeshare. The study found that, overall, the Capital Bikeshare system serves much of the District's core bikeshare market. Future expansion will require a targeted and nuanced approach that focuses on filling in gaps, improving service reliability, and diversifying the user base.

## CHANGES IN THE DISTRICT

### Changes in Population and Employment Growth

**Figure 1** shows the areas of the District that the Metropolitan Washington Council of Governments (MWCOG) has projected will have the highest population growth between 2015 and 2025. Population growth appears to be scattered across the District, however the highest concentrations of growth are expected along the Southwest Waterfront along the Wharf and Navy Yard, in areas northeast of downtown, and in the far eastern portion of the District surrounding Deanwood. Population in parts of Anacostia, Navy Yard, and Mt. Vernon are expected to increase more than 100 percent between 2015 and 2025.

For the most part, the Traffic Analysis Zones (TAZs) with the highest anticipated percent increase in population are already served by Capital Bikeshare. High growth areas with limited or no Capital Bikeshare stations include:

Figure 1: Projected Population Growth Estimates (2015-2025)
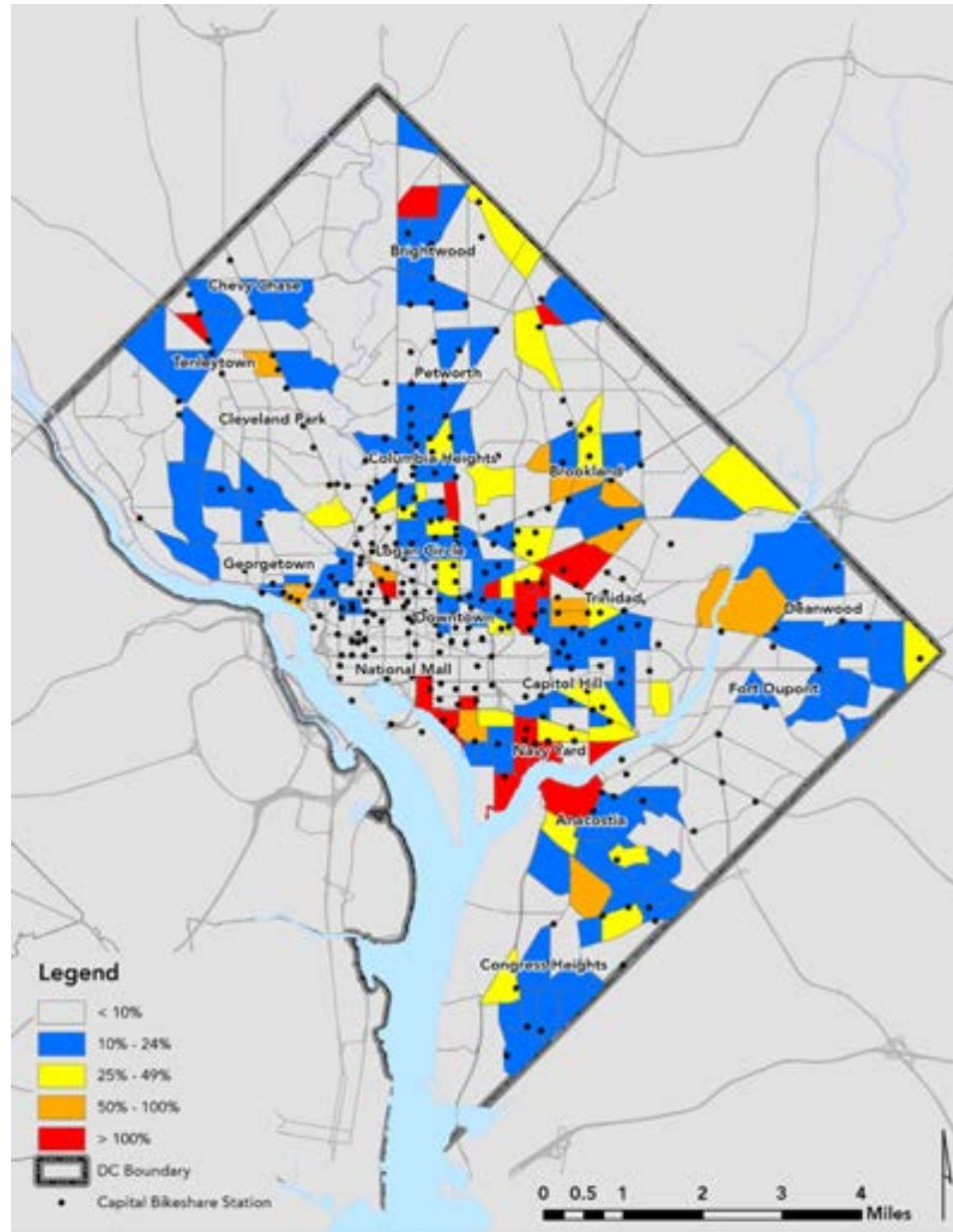
- The Walter Reed site between Georgia Ave and 16th St, NW

- The Poplar Point site beside the Anacostia Metrorail station

- Congress Heights near the St. Elizabeths site

- The Parkside redevelopment site across Route 295 from the Minnesota Avenue Metrorail station

- Buzzard Point in the Southwest, which is seeing large-scale mixed-use development.

In addition to these locations, there are several lower-density, high-growth areas that lack bikeshare access, notably TAZs along Eastern Avenue where the District borders Maryland.

**Figure 2** shows the areas expected to have the highest household growth between 2015 and 2025. The findings shown differ from those seen in population projections in that growth is more concentrated in specific areas, whereas population growth was spread across the District. The most significant increases in household units are anticipated in Navy Yard, Mt. Vernon, NoMa, Deanwood, and Poplar Point. The number of households in each of these neighborhoods are expected to increase by more than 100 percent. Brookland is projected to have moderate, but more widespread increases in households by 2025.

Overall, the gaps in bikeshare coverage for high household growth areas mirror closely that of high residential growth areas. Many of the high-growth TAZs have household growth the exceeds overall population growth. This is likely indicative that the housing mix in these areas leans toward high-density, mixed-use projects.



Figure 2: Projected Household Growth Estimates (2015-2025)

Figure 3: Projected Employment Growth Estimates (2015-2025)
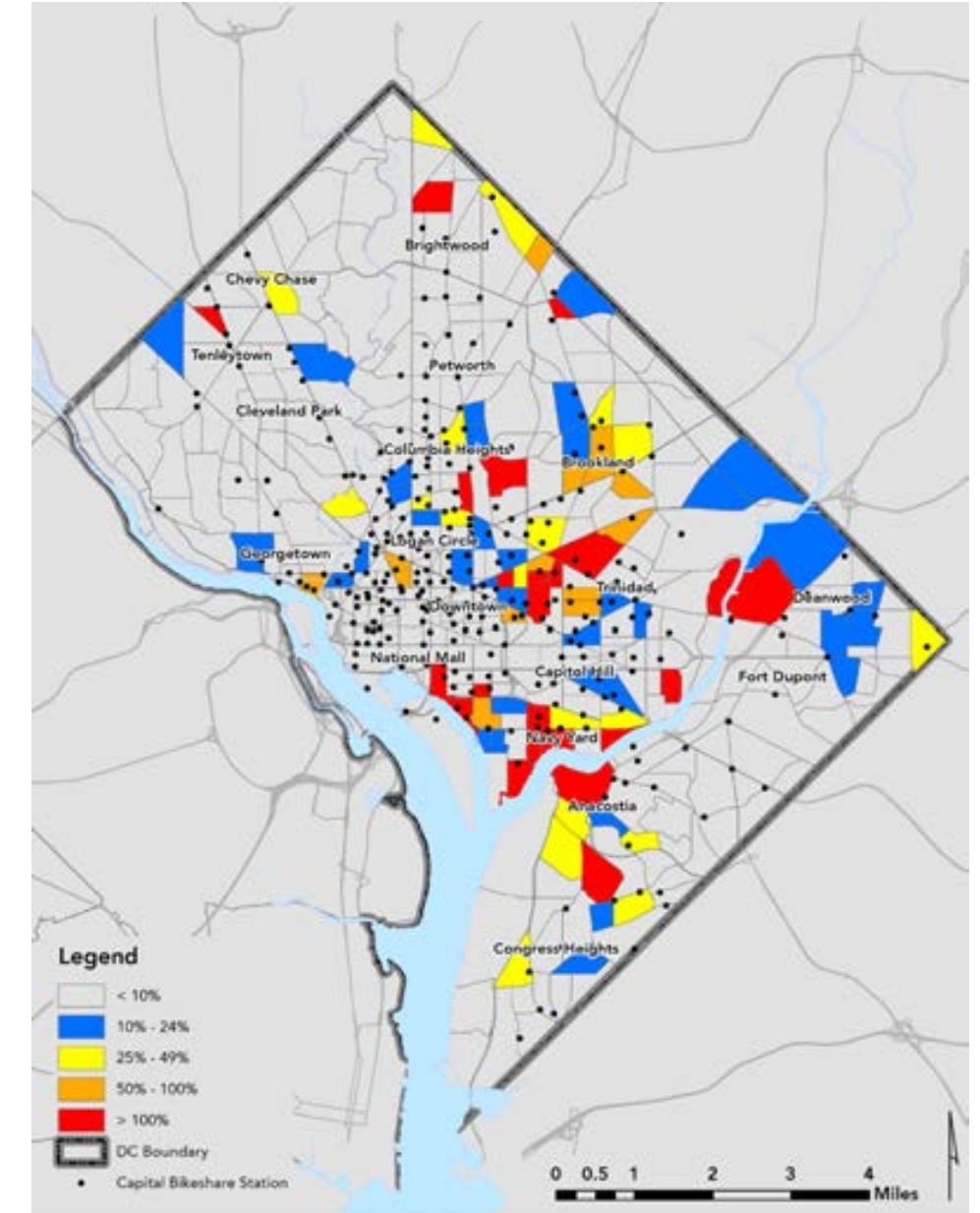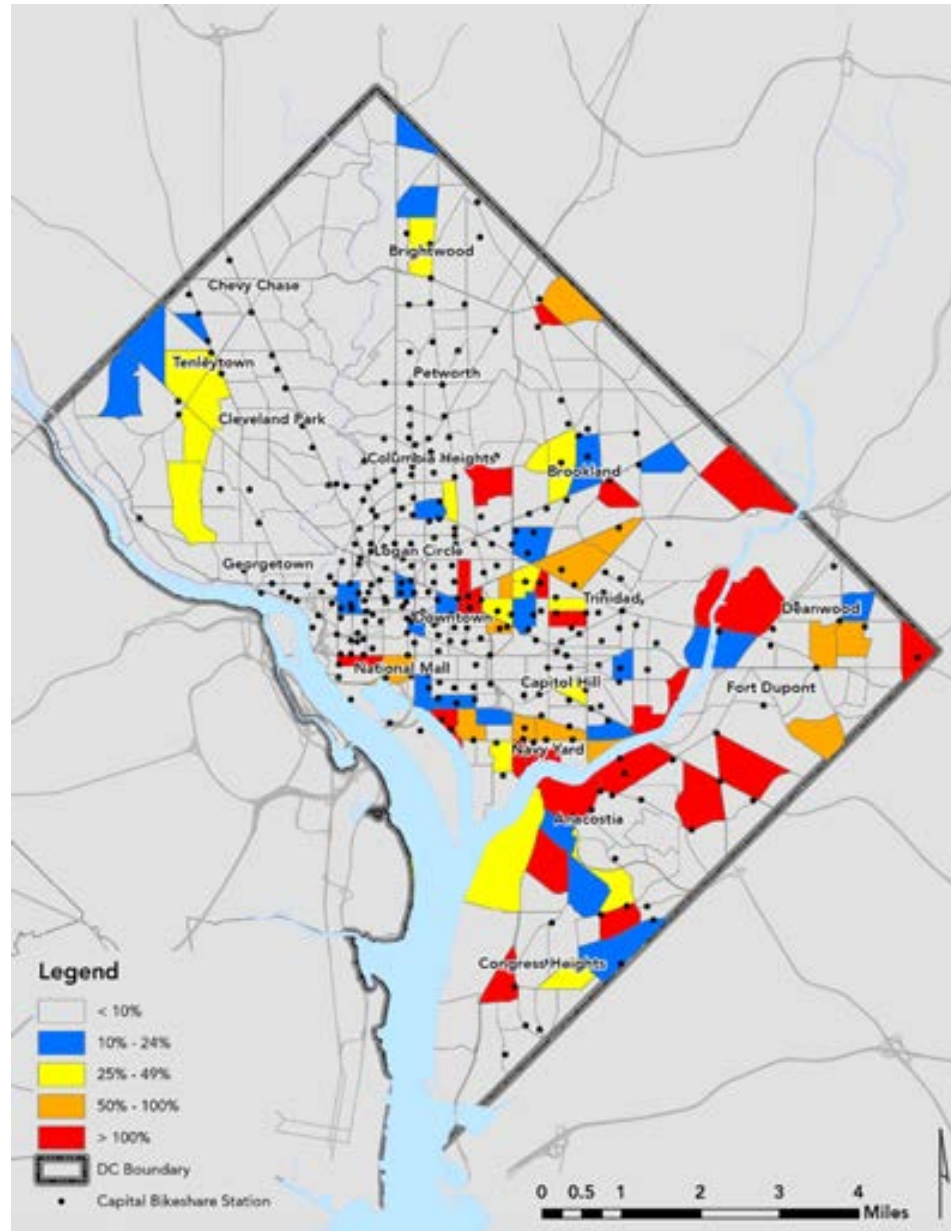
Figure 3 shows projected growth rates in employment between 2015 and 2025. These growth rates vary from what is anticipated for population and households in that growth is significantly more concentrated in the Southeast, especially east of the Anacostia River. A moderate increase in employment is also projected in the far Northwest, surrounding Tenleytown and American University Park.

Some of the areas with high projected employment growth that have limited or no Capital Bikeshare coverage today include:

• The proposed development at Poplar Point, across from the Anacostia Metrorail Station

• Old Anacostia, where the Historic Anacostia gateway project is bringing in new retail and office jobs

• The Parkside site near the Minnesota Avenue Metrorail station

• The TAZ encompassing the reconstructed Southeast Boulevard

• The TAZ in Fort Lincoln encompassing retail development along South Dakota Avenue

• The McMillan site along North Capitol Street

# MAJOR INVESTMENTS

Numerous major investments occurring across the District are expected to significantly impact housing, population, and employment. **Table 1** outlines the largest developments underway in the District. All but three of the projects have a residential component. The largest development is a mixed-use property of just over 950,000 square feet in Dupont Circle. Two of the 10 developments are in NoMa, two in Mt. Vernon Triangle, and three in the Navy Yard.

Table 1: Major Developments

| # | Major Use | Square Footage | Neighborhood |
|---|-----------|----------------|--------------|
| 1 | Office | 865,000 | Downtown |
| 2 | Mixed-Use | 751,707 | Mt. Vernon Triangle |
| 3 | Mixed-Use | 969,000 | Dupont Circle |
| 4 | Residential | 438,000 | Navy Yard |
| 5 | Office | 556,000 | NoMa |
| 6 | Office | 505,000 | NoMa |
| 7 | Mixed-Use | 480,000 | Mt. Vernon Triangle |
| 8 | Residential | 475,000 | Navy Yard |
| 9 | Residential | 475,000 | Southwest Waterfront |
| 10 | Residential | 442,000 | Navy Yard |

In addition to these private developments, the second phase of the development at the Wharf in the Southwest is underway. This development will bring 255 new apartments, 96 condominiums, 131 hotel rooms, 223 boat slips at the Wharf Marina, 547,000 square feet of office space, 95,000 square feet of retail space, two parking garages for 1,000 vehicles, and a 1.5-acre park. This development expands upon Phase 1 of the Wharf which opened in 2017.

# RIDERSHIP CHARACTERISTICS

## Overall Ridership Trends

**Figure 4** shows ridership trends from January 2016 to May 2019 by average daily trips. Ridership varies considerably by season, with average daily trips doubling between the peak season of April to October over the off-peak season of November to March.

Overall ridership between 2016 and 2019 has averaged a 2 percent annual growth rate. This rate is well below the high ridership growth rate achieved by the program in its first five years. Moreover, ridership has begun to decline, with the peak months of May and June 2019 more than 10 percent below ridership during those same months in 2018.

Figure 4:
Ridership Trends
(January 2016-
May 2019)
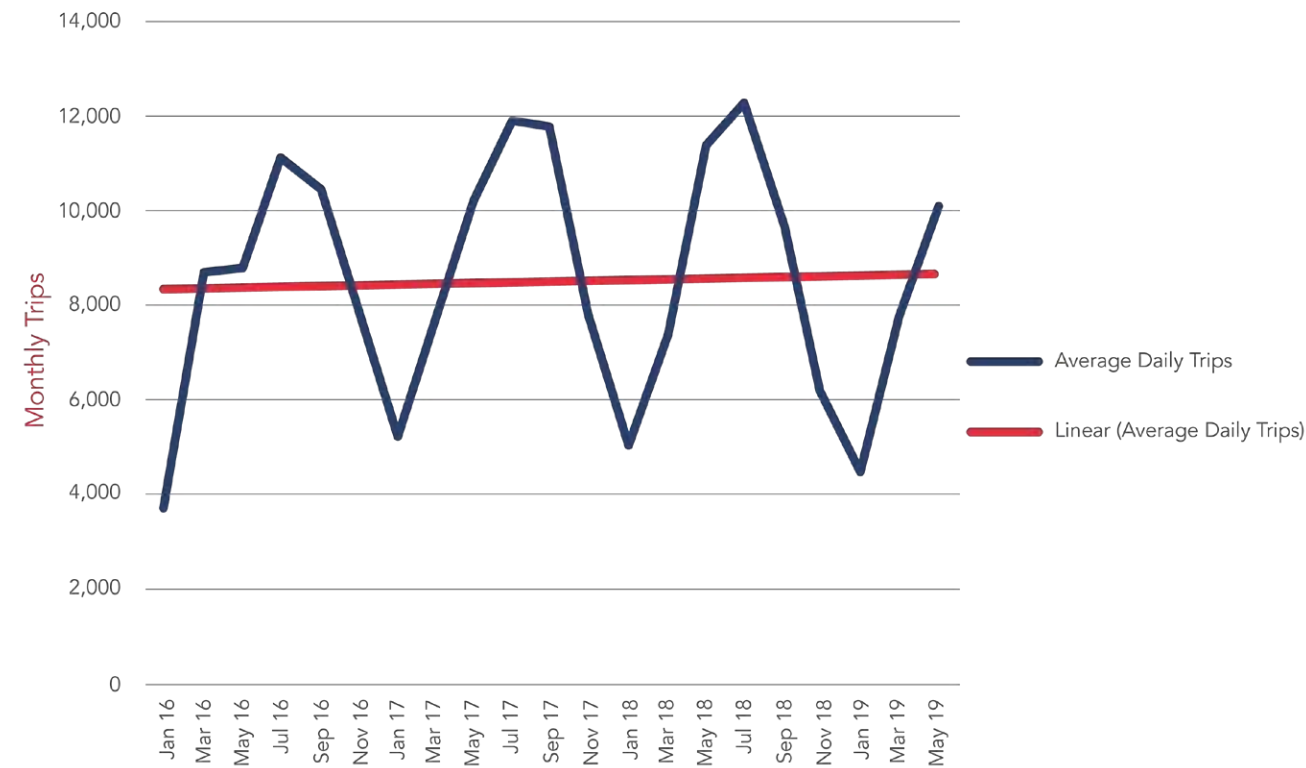
**Figure 5** shows the average trips per bike per day from 2016 to 2019. Trips per bicycle per day is a common measurement of bikeshare utilization that controls for ridership growth due to system expansion. Ridership per bicycle increased slightly between 2016 and 2017 before steadily declining. However, 2019 data in this graph represents average ridership between January 2019 and June 2019 and is therefore missing part of the peak ridership season. The decline in ridership per bicycle is most pronounced for casual users. Between 2016 and 2018, unit ridership among casual users declined by 14 percent. This decline coincides with the introduction of dockless bikeshare services, suggesting that the casual user market is more impacted by dockless competition than registered members.
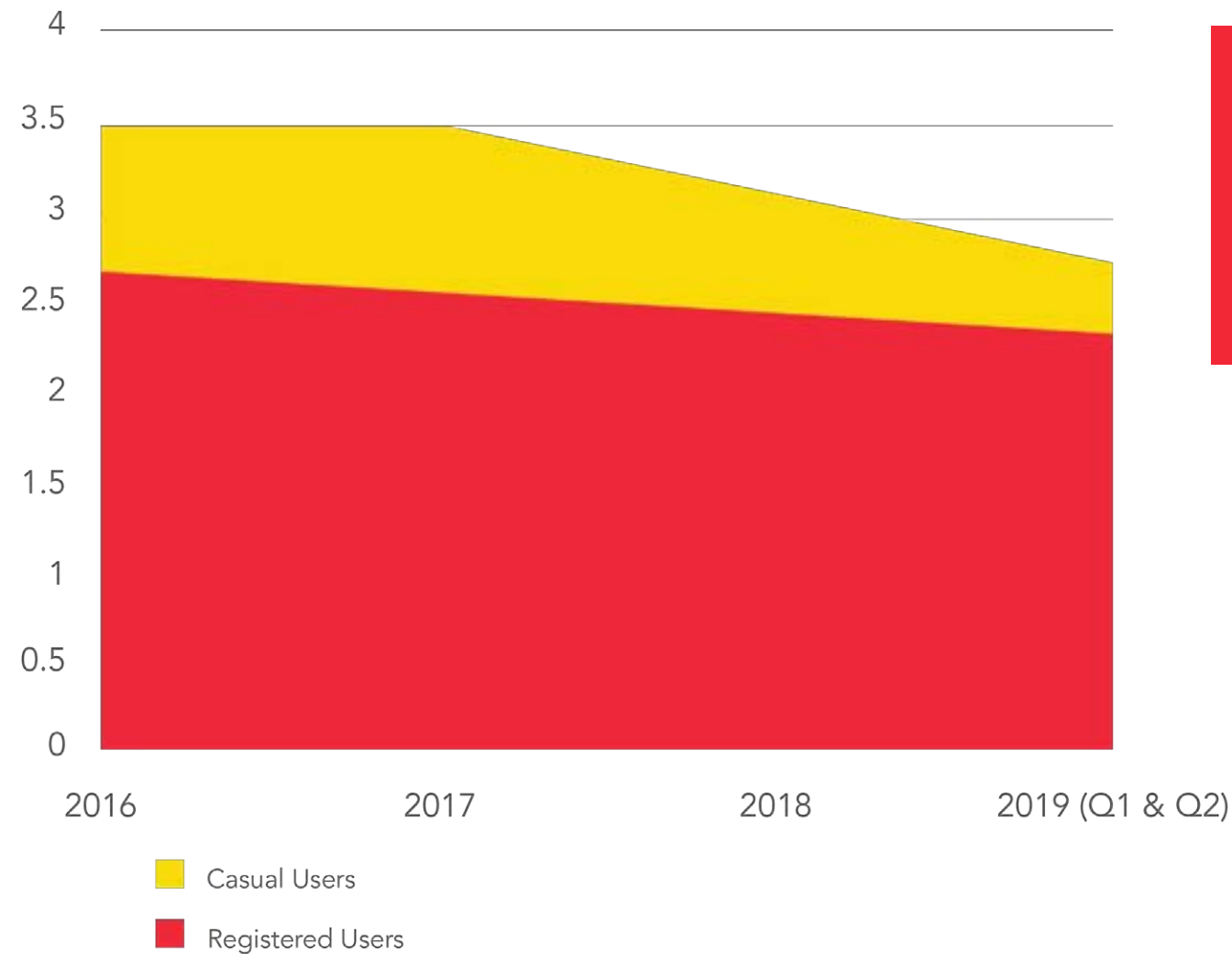


Figure 5: Annual Average Trips per Day by Membership Type (2016-2019)

- ■ Casual Users
- ■ Registered Users

## Travel Patterns

**Figure 6** shows the origin and destination flows of bicycle trips within the District from July 2018 to June 2019. Thicker, darker lines represent a higher number of trips between two neighborhoods. Likewise, circles represent the number of trips that start and end within the same neighborhood. The bulk of trips occur within the center of the District, with the highest volumes of trips connecting to Downtown, the National Mall, and Capitol Hill. Neighborhoods with the highest volume of internal trips include Logan Circle, Downtown, the National Mall, and Trinidad. Neighborhoods furthest from the center of the District see the lowest share of trips within and between them. Overall trip patterns appear fairly similar to 2015, when DDOT last completed the same analysis. The one notable difference is that the National Mall has strengthened as a ridership market, especially trips internal to the National Mall.
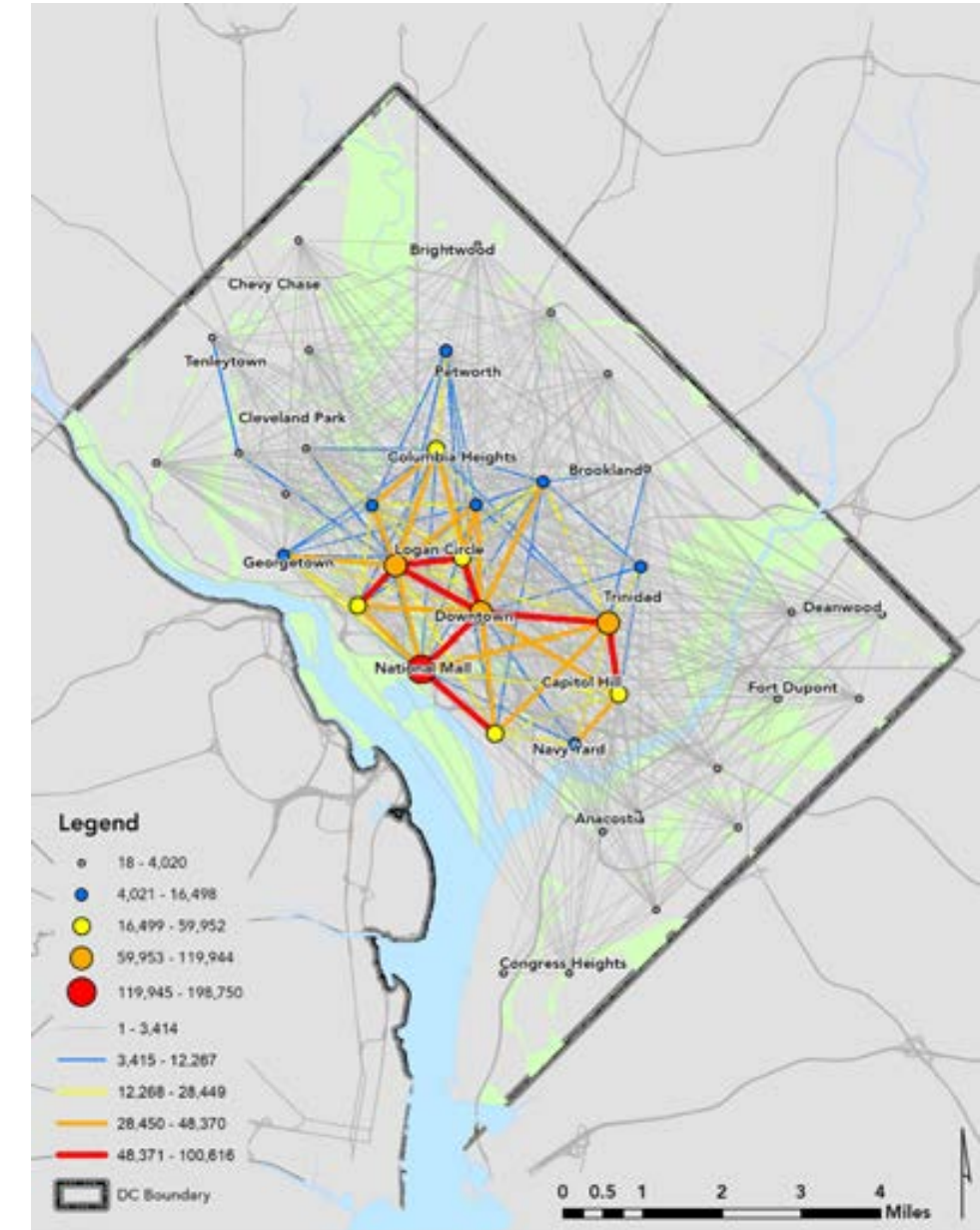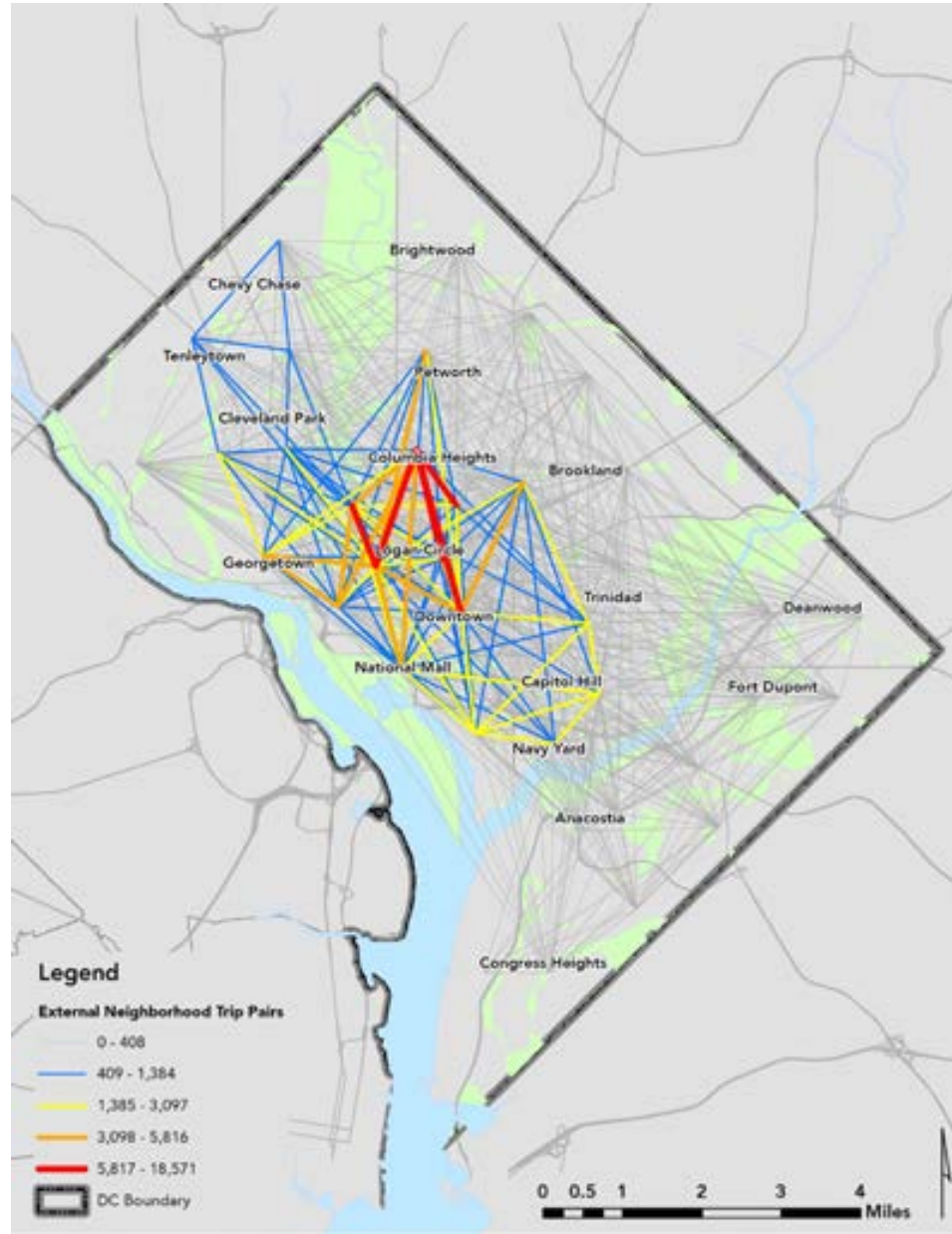


Figure 6: Origin-Destination Travel Flows by Neighborhood

## Figure 7: Neighborhood Trip Imbalance

**Figure 7** shows the imbalance of neighborhood trips between neighborhoods. Lines represent the net difference between trips in one direction and another between any two neighborhoods. A large trip imbalance signifies that riders are more likely to take a trip in one direction than the other and are indicative of locations where rebalancing may be a challenge due to the unidirectional nature of demand.

A significant imbalance exists between Columbia Heights and several surrounding neighborhoods, including Logan Circle, Downtown, and Shaw. Trip imbalances reflect the topography of the District as riders are more likely to travel from uphill neighborhoods like Woodley Park and Columbia Heights to downhill neighborhoods like Dupont or Logan Circle than the reverse. The introduction of electric assist bicycles could lessen this imbalance by making uphill trips easier on riders.

Additionally, the graphic shows overall lower ridership east of the Anacostia River. The topography and lower land use densities make bikeshare a less convenient and less desirable mode. Increasing station density and introducing e-bikes in this area may improve bicycle access, but programmatic and engagement interventions will be critical to connecting low-income communities to Capital Bikeshare.
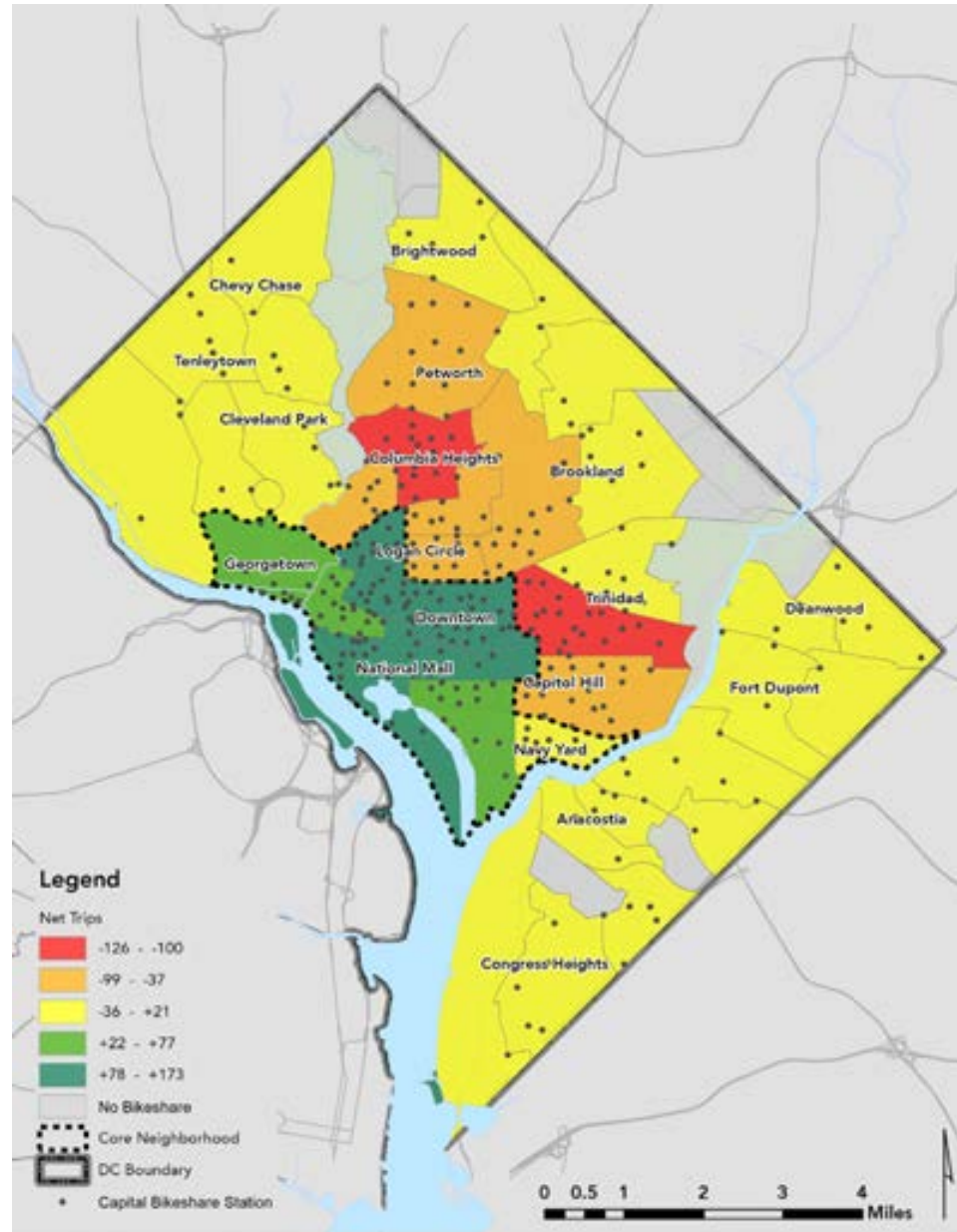
**Table 2** lists the top 10 station pairs, showing the stations between which the highest volume of trips occurred from July 2018 and June 2019. Station pairs which include the same station, meaning a trip began and ended at the same bikeshare station, are bolded. Of the top 10 pairs, four include identical pairs. Several of the stations included in the top 10 are located along the National Mall.

## Table 2: Top 10 Station Pairs (July 2018 to June 2019); Bidirectional

| Rank | To/From Station | To/From Station | Trips |
| --- | --- | --- | --- |
| **1** | **Smithsonian-National Mall / Jefferson Dr & 12th St SW\*** | **Smithsonian-National Mall / Jefferson Dr & 12th St SW** | 5,393 |
| **2** | Lincoln Memorial | Jefferson Memorial | 4,746 |
| **3** | **Jefferson Dr & 14th St SW** | **Jefferson Dr & 14th St SW** | 4,574 |
| **4** | **4th St & Madison Dr NW** | **4th St & Madison Dr NW** | 4,219 |
| **5** | Columbus Circle / Union Station | 6th & H St NE | 4,103 |
| **6** | Jefferson Dr & 14th St SW | Lincoln Memorial | 3,796 |
| **7** | Columbus Circle / Union Station | 8th & F St NE | 3,570 |
| **8** | 17th St & Independence Ave SW | Lincoln Memorial | 3,447 |
| **9** | 6th & H St NE | Columbus Circle / Union Station | 3,353 |
| **10** | 15th St & Constitution Ave NW | 15th St & Constitution Ave NW | 3,347 |

*Station pairs where trips start or end at the same location bolded.

Figure 8 shows net trips gained or lost in each neighborhood during the a.m. peak period, with red indicating the highest losses, and green the highest gains. Neighborhoods with no ridership gains or losses (i.e., neighborhoods with no bikeshare stations) are shown in gray. Core neighborhoods, those which experience a net gain in trips equivalent to or greater than 1 percent of all trips, are outlined with a thick black border. Overall, the analysis shows that for every three trips during the morning, one will result in a net gain of bikes within the core. This analysis serves to determine how future bikeshare expansion will impact bikeshare capacity in the core. Based on the findings, it is determined that for every three bikeshare docks added outside of the core, one additional dock would be needed in the core to absorb ridership demand. The definition of core neighborhoods remains unchanged from the previous Capital Bikeshare Development Plan.



Figure 8: Core Neighborhoods

# MEMBERSHIP CHARACTERISTICS

## Capital Bikeshare For All

In the past four years, the DDOT has grown its Community Partners Program to over 1,700 members who qualify for the free or reduced membership through affiliation with over 45 partners. On February, 2020 Capital Bikeshare launched Capital Bikeshare for All, an expanded version of the Community Partners Program that offers a $5 annual membership for riders who qualify for certain state and federal assistance programs.

## Membership Trends

Figure 9 shows the trends of annual, monthly, and total memberships over time. Since it only includes data through July, 2019 was excluded. Since monthly members make up such a small share of annual members, the total members trend is nearly identical to that of annual members. Total and annual membership saw steady increases between 2011 and 2017, followed by a slight decline in 2018. Should the current 2019 trends continue, 2019 will see additional declines in the number of Capital Bikeshare members.

Figure 9: Membership by Type Trends (2011-2018)

*Annual member count based on active members as of June 1 of a given year.



| 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 |

Annual Members — Total Members — Monthly Members
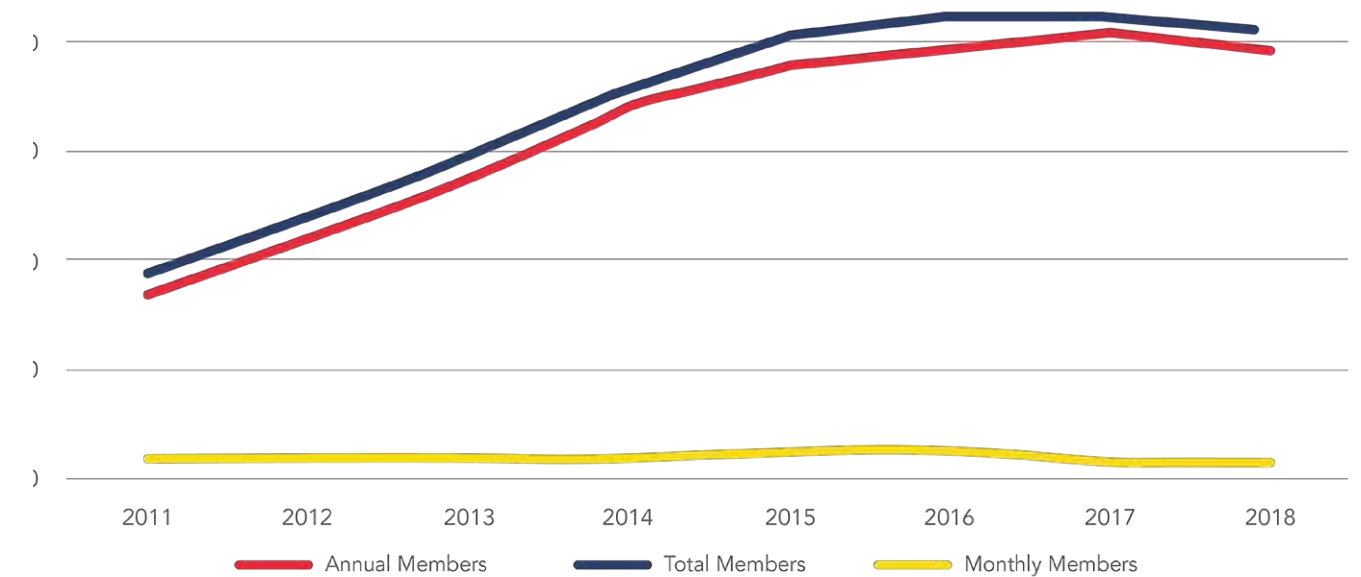
**Figure 10** provides the annual membership renewal rates from 2011 to 2019. The largest drop in renewal rates occurred between 2011 and 2012 and likely reflected the expiration of some introductory incentives and discounts. Since 2012, the program has seen a slow but steady increase in its renewal rates except for a slight drop between 2017 and 2018. The highest increases in renewal rates occurred between 2012 and 2013, and between 2016 and 2017. So far, 2019 has seen an increase in renewal rates from 2018.

Higher renewal rates coupled with membership decline suggests that Capital Bikeshare is failing to attract new users to the program at the same rate it did in the past while still holding on to its user base. If membership renewal rates were to begin declining, overall ridership would take a major hit. The program could explore how it can bring in new users to expand its loyal user base.

## Figure 10: Annual Membership Renewals[1]
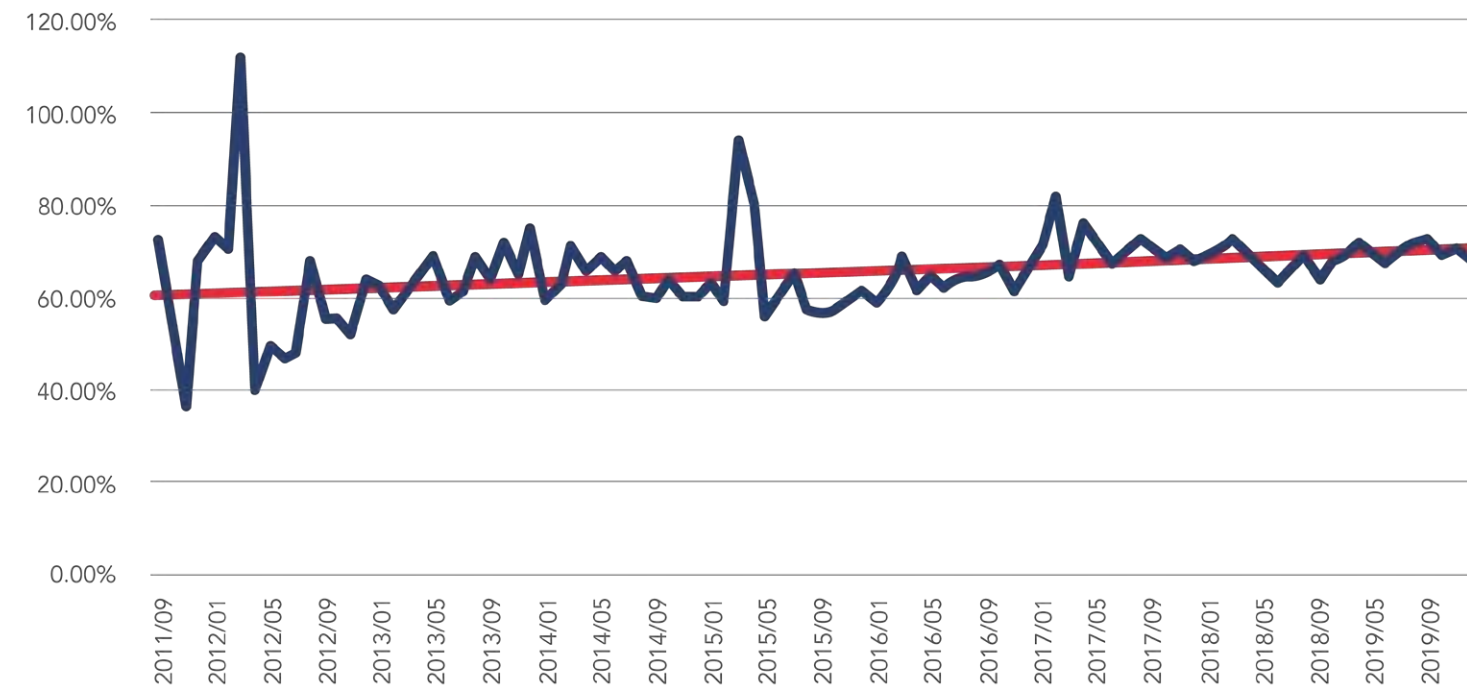


[1] Renewal rates over 100 percent are due to differences in accounting of membership end month and renewal month.

## Member Demographics

Capital Bikeshare's most recent member survey, completed in 2019, included questions regarding demographics such as gender, age, race, and income. These demographics were compared to those of District residents to determine whether Capital Bikeshare members generally represent the population, as well as to the preceding 2016 member survey. The results are shown below. The survey found that Capital Bikeshare members tended to be younger and were more likely to be white/Caucasian and/or males than District residents overall. Additionally, Capital Bikeshare has a higher share of members in mid-to-high income brackets than District residents. Overall, this comparison stresses the importance of ensuring that stations are distributed equitably, and that reduced-cost memberships are offered to low-income residents.
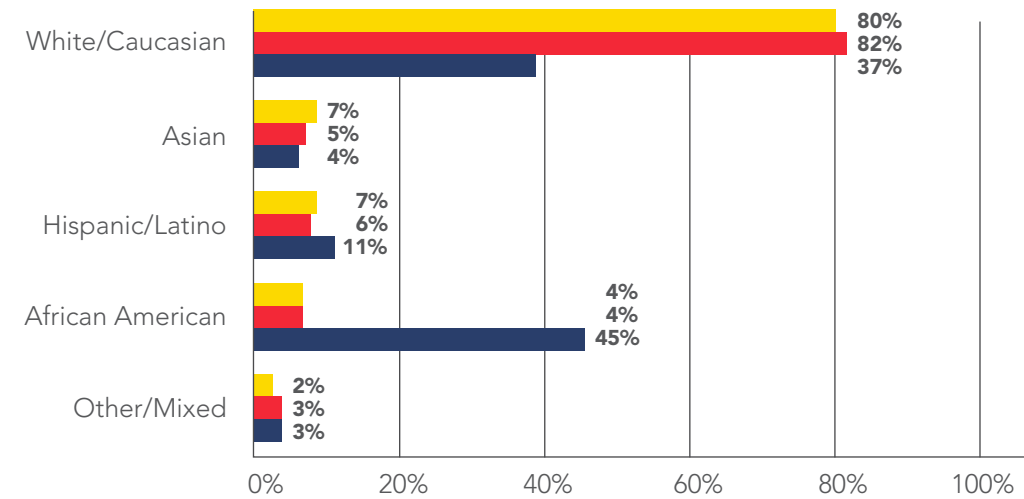
These figures show little change from the 2016 membership survey. The only demographic statistics that shifted by more than two percentage points were the proportion of female riders (+3 percentage points), and the corresponding decrease in members under 35 years of age and increase in members between 35 and 44 years of age (-3 and +3 percentage points respectively).
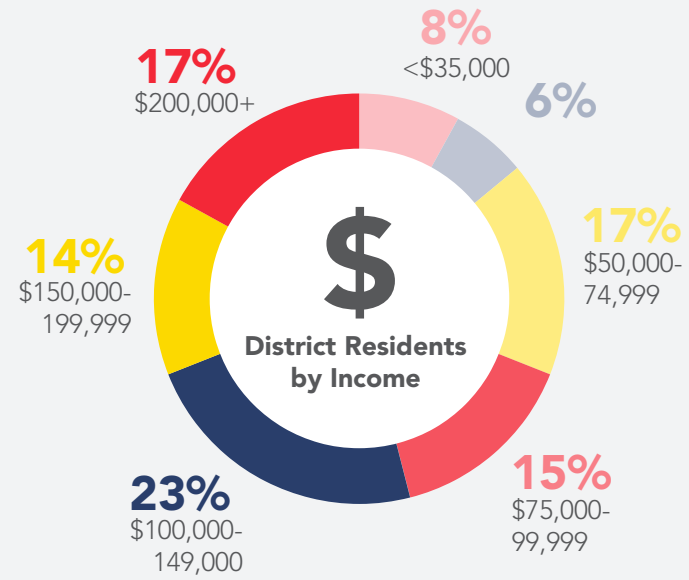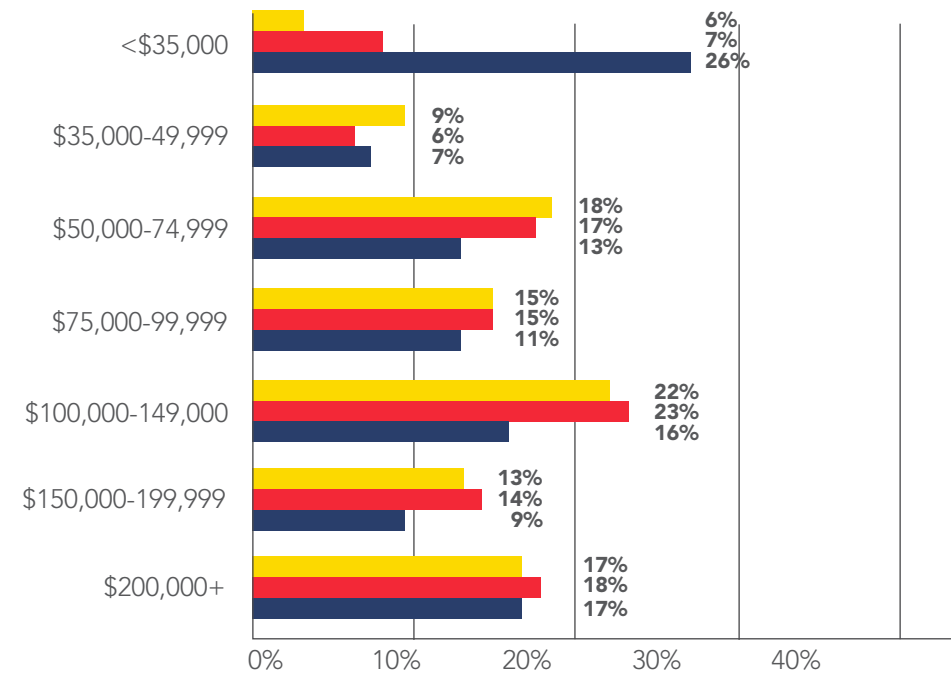
### Gender & Age
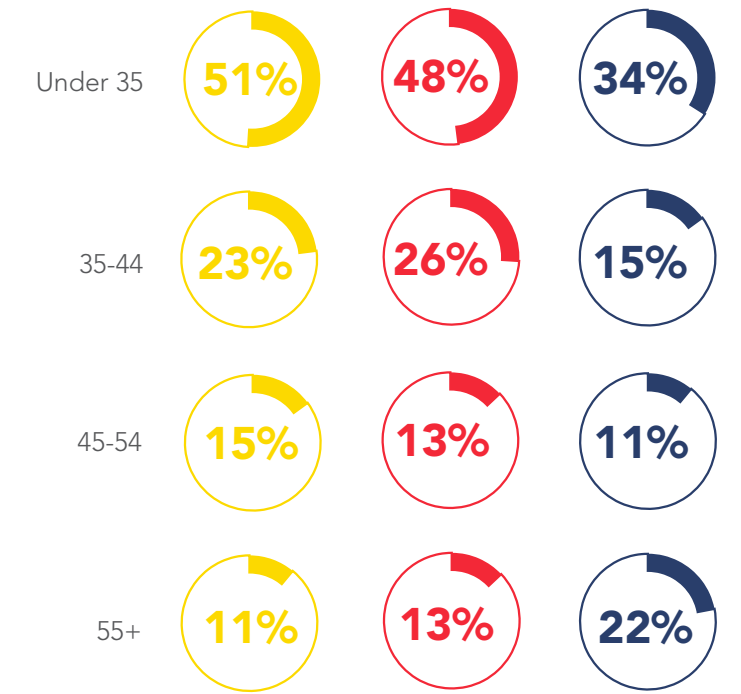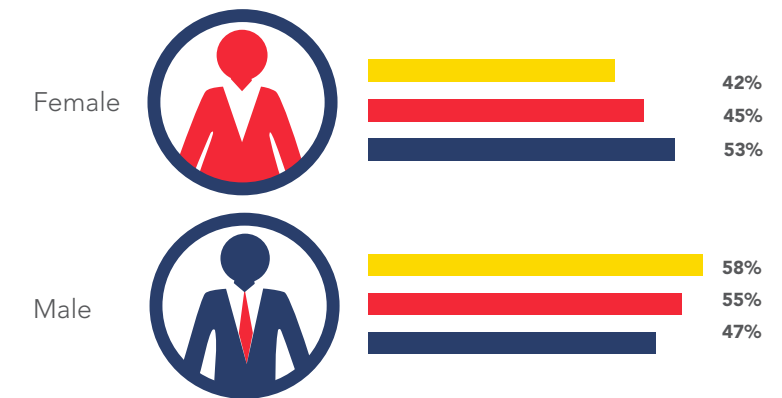
# Racial Background & Income

## Racial Background (2016 Members / 2019 Members / District Residents)

| Race | 2016 Members | 2019 Members | District Residents |
|------|------|------|------|
| White/Caucasian | 80% | 82% | 37% |
| Asian | 7% | 5% | 4% |
| Hispanic/Latino | 7% | 6% | 11% |
| African American | 4% | 4% | 45% |
| Other/Mixed | 2% | 3% | 3% |

Legend: 2016 Members, 2019 Members, District Residents

## Income (2016 Members / 2019 Members / District Residents)

| Income | 2016 Members | 2019 Members | District Residents |
|--------|------|------|------|
| <$35,000 | 6% | 7% | 26% |
| $35,000-49,999 | 9% | 6% | 7% |
| $50,000-74,999 | 18% | 17% | 13% |
| $75,000-99,999 | 15% | 15% | 11% |
| $100,000-149,000 | 22% | 23% | 16% |
| $150,000-199,999 | 13% | 14% | 9% |
| $200,000+ | 17% | 18% | 17% |

## District Residents by Income

- 8% <$35,000
- 6%
- 17% $50,000-74,999
- 15% $75,000-99,999
- 23% $100,000-149,000
- 14% $150,000-199,999
- 17% $200,000+

| Percentage of Survey Respondents by Income Level | White/ Caucasian | Asian | Hispanic/ Latino | African American |
|---|---|---|---|---|
| <$35,000 | 5% | 1% | | |
| $35,000-49,999 | 4% | | | 1% |
| $50,000-74,999 | 14% | 1% | 1% | 1% |
| $75,000-99,999 | 11% | 1% | 2% | |
| $100,000-149,000 | 19% | | 2% | 1% |
| $150,000-199,999 | 13% | | | |
| $200,000+ | 15% | 1% | | 1% |

Capital Bikeshare is committed to serving all members of the District. The discrepancy between current member demographics and those of the District emphasizes the importance of connecting low-income and under-represented racial groups to Capital Bikeshare. Equitable station distribution, low-cost memberships, and additional community outreach efforts will help to make bikeshare accessible, comfortable, and affordable for all.

# Member Feedback

## 2016 Member Survey

In 2016, a member survey was conducted which asked questions related to member satisfaction with Capital Bikeshare features. Generally, respondents gave high marks, especially for registration and customer support features. Eighty-five percent of respondents rated the condition of stations and appearance of bicycles highly, however members indicated dissatisfaction with nighttime lighting at stations, the availability of bikes at docks, and the availability of open docks when returning bikes. DC members and frequent bikeshare users gave lower ratings for service features than respondents from other Capital Bikeshare jurisdictions, particularly the availability of bikes at stations, and open docks to return bikes to.

Nine in 10 respondents indicated they would increase their bikeshare use if service were expanded and/or other service enhancements made. Additionally, 55 percent of respondents indicated they would ride more often if more docks and bikes were added to existing locations, highlighting the dissatisfaction with availability of bikes and open docks. Additionally, 38 percent of respondents said they would use bikeshare more often if they could lock their bike near a station when a station dock is full.

Service improvements that might increase bikeshare use differed between frequent and infrequent riders. Frequent riders indicated they would be motivated to increase their bikeshare use if more docks and bikes were added to existing stations. Infrequent riders said they would be likely to increase their bikeshare use if the free-use period were increased, and if their SmarTrip card could be used as a bikeshare key.

## 2019 Member Survey

A follow-up survey of Capital Bikeshare members conducted in 2019 asked similar questions to those asked in 2016. Respondents were given the ability to rank each category from one to five, with one being poor and five being excellent. Similar to 2016, respondents gave generally high marks to registration and customer support features. They gave moderate marks for the availability of bikes and docks, as well as the condition and appearance of bicycles. Relatively high marks were given for the mobile app and the online station maps. When asked what would encourage them to use the service more often, respondents indicated that more bikes/docks at existing stations, more stations in residential neighborhoods, electric bikes, and the ability to lock a bike near a station when it is full are all factors. The full results are outlined in **Table 3**.

| Category | Rank | | | | |
|---|---|---|---|---|---|
| **Registration Process & Call Center** | **1 (Poor)** | **2** | **3** | **4** | **5 (Excellent)** |
| Online Registration | 1% | 3% | 10% | 36% | **50%** |
| Obtaining Your Key | 4% | 5% | 11% | 30% | **50%** |
| Key Activation | 3% | 3% | 10% | 31% | **53%** |
| Call Center Wait Time | 5% | 5% | 18% | **31%** | 41% |
| Ability of Customer Support to Solve Issues | 6% | 6% | 13% | **29%** | 46% |
| **Bike & Stations** | | | | | |
| Availability of Bikes | 4% | 10% | 23% | **45%** | 18% |
| Availability of Docks | 5% | 10% | 29% | **43%** | 14% |
| Condition of Bikes | 2% | 7% | 28% | **49%** | 14% |
| Appearance of Bikes | 1% | 4% | 23% | **47%** | 25% |
| Capital Bikeshare Mobile App | 2% | 3% | 11% | **36%** | 48% |
| Online Station Map | 1% | 3% | 11% | **37%** | 47% |
| Condition of Stations | 1% | 5% | 20% | **46%** | 29% |
| Docking/Releasing a Bike | 4% | 9% | 24% | **44%** | 19% |
| Map at Station | 3% | 6% | 26% | **41%** | 24% |
| Nighttime Lighting at Station | 5% | 12% | **33%** | 35% | 15% |

**Table 3: 2019 Member Survey Satisfaction Results***

*Median ranking bolded.

**Desired Improvements**

In the 2019 survey, respondents were also asked questions related to dockless mobility options and how the new options may have changed their Capital Bikeshare usage. However, the majority of respondents (72 percent) indicated that dockless mobility options have not changed the way they use Capital Bikeshare. Additionally, when asked their preference when it comes to using micromobility transportation options, 42 percent of respondents indicated that they have no preference and/or dislike all micromobility options.

Users were asked to choose up to three improvements that would increase their use of Capital Bikeshare. Electric assist bikes were the top requested improvement, followed by more docks and bicycles at stations, and being able to lock a bicycle near a station when it is full (hybrid docking) (see **Table 4**).

Table 4:
Improvements
Most Likely
to Increase
Ridership

| Improvement | Count |
| --- | --- |
| E-Bikes | 799 |
| More bikes and/or docks at stations | 776 |
| Ability to lock a bike near a station when it is full | 671 |
| More stations in residential neighborhoods | 645 |
| Lighter bicycles | 344 |
| Longer free use period | 338 |
| More stations in commercial/employment areas | 280 |
| Expanding bikeshare into new areas | 269 |
| SmarTrip card integration | 174 |
| Greater station density | 157 |
| More stations near Metro stations | 131 |
| Other | 103 |

# STATION PERFORMANCE

## Highest Productivity and Overall Ridership Stations

The highest productivity stations, based on average trips per bike per day[2] between 2016 to 2019, are shown in **Table 5** and **Figure 11**. Three of the top 10 stations are on the National Mall and four in the vicinity of Logan Circle. An additional high performing station is located in NoMa and another at Eastern Market. These high productivity stations are each associated with a specific destination, including tourist attractions (Lincoln Memorial, Jefferson Memorial), and dense mixed-use neighborhoods (Logan Circle, Dupont Circle, NoMa, Eastern Market).

While many of the highest productivity stations today were among the highest ones in 2015, there are some notable changes. Dupont Circle/Massachusetts Avenue and Union Station were the two highest performing stations in 2015 by trips per bike per day but are no longer in the top 10. The opening of additional nearby stations and expansion at these two locations likely reduced the per-bike ridership as both still appear in the list of highest ridership stations overall.

**Table 5: Highest Performing Stations by Average Trips Per Bike (2016-2019)**

| Rank | To/From Station | To/From Station | Average Trips Per Bike |
|------|-----------------|-----------------|------------------------|
| 1 | Lincoln Memorial | 12.33 | 5,393 |
| 2 | Jefferson Dr & 14th St SW | 11.89 | 4,746 |
| 3 | 15th & P St NW | 11.60 | 4,574 |
| 4 | Henry Bacon Dr & Lincoln Memorial Circle NW | 11.28 | 4,219 |
| 5 | 1st & M St NE | 11.08 | 4,103 |
| 6 | Eastern Market Metro / Pennsylvania Ave & 7th St SE | 9.04 | 3,796 |
| 7 | 14th & R St NW | 8.93 | 3,570 |
| 8 | Jefferson Memorial | 8.71 | 3,447 |
| 9 | 20th St & Florida Ave NW | 8.20 | 3,353 |
| 10 | 17th St & Independence Ave SW | 8.11 | 3,347 |

*Trips per bicycle calculations based on duration of time each station has been in operation

2 Trips per bicycle per day are calculated as the total trip starts at a station divided by the number of days a station has been active and its average bicycle capacity (i.e., 50 percent of the number of docks).

> Please advocate for better biking infrastructure in DC. I live in an area that is underserved in biking infrastructure and is quite dangerous to bike in as there are no/few traffic calming measures.
>
> —User survey response



Highest & Lowest Performing Stations by Average Trips per Bike

Legend
- Lowest Performing Station
- Highest Performing Station
- DC Boundary

**Figure 11: Top & Bottom 10 Stations by Average Trips Per Bicycle Per Day (2016-2019)**
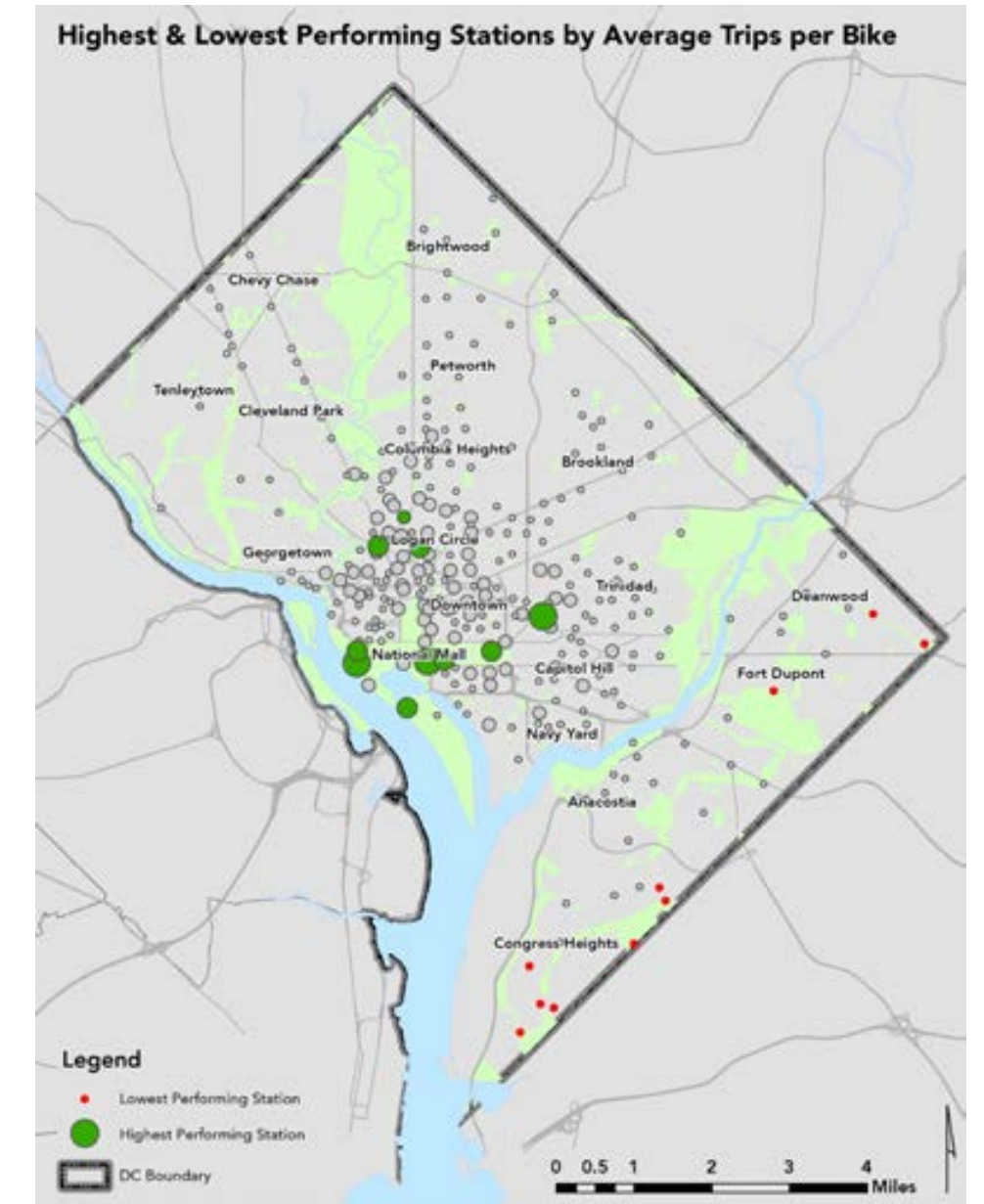
### Highest Ridership Stations

**Table 6** and **Figure 12** show highest ridership stations based on total trips between 2016 and 2019. Bolded stations are those which are also top productivity stations based on average trips per bike per day. Using the metric of total trips has added two additional stations on the National Mall and removed one from the Logan Circle area. Union Station is the highest ridership station in the system, even though it is not within the top 10 stations by trips per bicycle per day.

**Table 6: Highest Performing Stations by Total Trips (2016-2019)**

| Rank | To/From Station | Total Trips |
|------|-----------------|-------------|
| 1 | Columbus Circle / Union Station | 230,283 |
| 2 | **Lincoln Memorial** | 196,827 |
| 3 | **Jefferson Dr & 14th St SW** | 174,589 |
| 4 | Massachusetts Ave & Dupont Circle NW | 152,469 |
| 5 | **15th & P St NW** | 140,768 |
| 6 | **Jefferson Memorial** | 127,864 |
| 7 | Smithsonian-National Mall / Jefferson Dr & 12th St SW | 125,624 |
| 8 | **Henry Bacon Dr & Lincoln Memorial Circle NW** | 119,124 |
| 9 | **New Hampshire Ave & T St NW** | 114,126 |
| 10 | 4th St & Madison Dr NW | 114,043 |

*Bolded stations also are among the top 10 for trips per bike per day.

Your service has transformed my commute, I appreciate you every day! Reducing the carbon footprint? Check. Reducing my commute time? Check. Reducing my idle time? Check. Seriously, you're amazing.

—User survey response



**Highest & Lowest Performing Stations by Total Trips**

Legend
- Lowest Performing Station
- Highest Performing Station
- DC Boundary

0 0.5 1 2 3 4 Miles

**Figure 12: The 10 Highest and Lowest Performing Stations by Total Trips (2016-2019)**
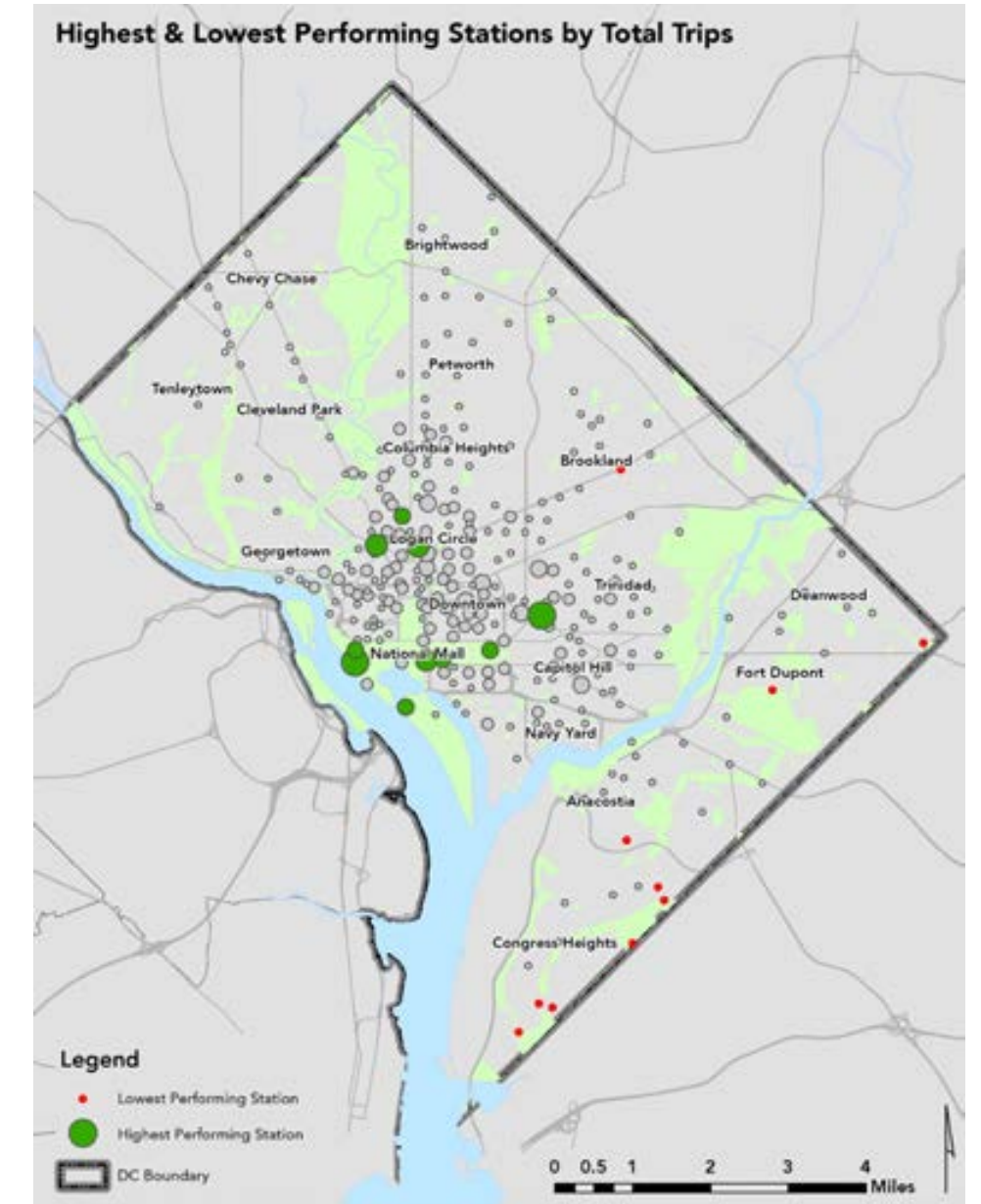
## Lowest Ridership Stations

The lowest productivity stations by average trips per bike day are shown in **Table 7** and **Figure 12**. Nine of these 10 stations are located east of the Anacostia River, including seven adjacent to the District/Maryland border. These patterns are likely attributable to several factors, including lack of bicycling infrastructure in these areas, hilly terrain, and lower population densities. Moreover, stations on the edge of a bikeshare system typically underperform due to the reduced network effect of having fewer stations within cycling distance. It should be noted two of the 10 lowest productivity stations have been active for less than a year, which may explain in part their low ridership.

Additionally, lower ridership may indicate that surrounding residents do not feel comfortable with, cannot afford, or are not well informed about Capital Bikeshare. The areas with low ridership simultaneously have high concentrations of low-income communities and people of color. As noted in the member demographics section, there is a gap in connecting low-income groups and people of color with Capital Bikeshare memberships. In addition to increasing station density and introducing e-bikes to the District, it will be imperative to connect with underrepresented communities to minimize the obstacles associated with using Capital Bikeshare.

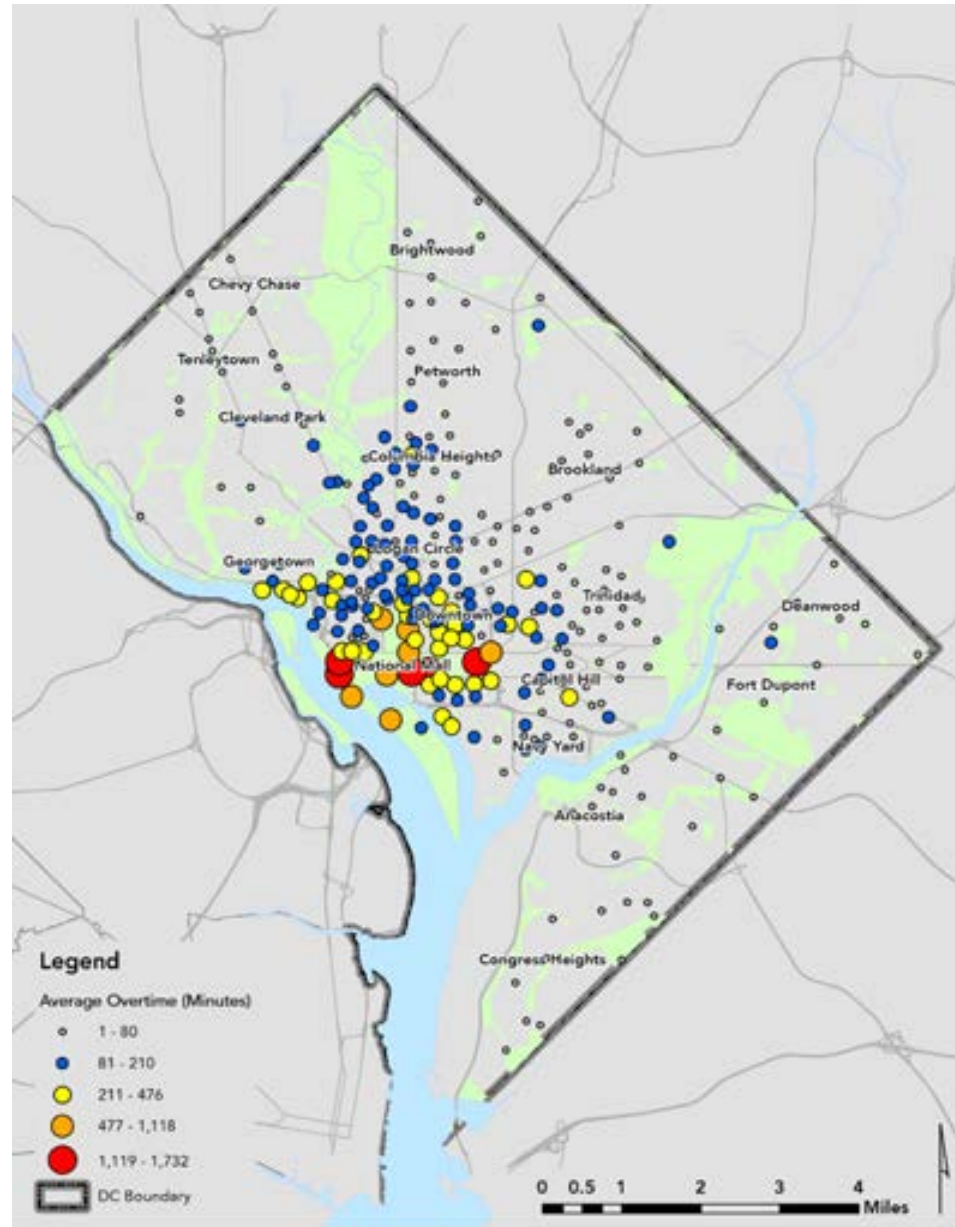**Table 7: Lowest Performing Stations by Average Trips Per Bike (2016-2019)**

| Rank | To/From Station | To/From Station | Average Trips Per Bike |
|------|-----------------|-----------------|------------------------|
| 1 | 37th & Ely Pl SE | 0.02 | 5,393 |
| 2 | Joliet St & MLK Ave SW/Bald Eagle Rec Ctr | 0.03 | 4,746 |
| 3 | 61st St & Banks Pl NE | 0.03 | 4,574 |
| 4 | Mississippi Ave & 19th St SE / THEARC | 0.03 | 4,219 |
| 5 | 19th & Savannah St SE | 0.03 | 4,103 |
| 6 | United Medical Center | 0.03 | 3,796 |
| 7 | 1st & S Capitol St SE / Oxon Run Trail | 0.04 | 3,570 |
| 8 | Livingston Rd & 3rd St SE | 0.05 | 3,447 |
| 9 | South Capitol & Atlantic St SW | 0.05 | 3,353 |
| 10 | Division Ave & Foote St NE | 0.05 | 3,347 |

**Table 8** shows the lowest performing stations by total trips. These stations largely match the list of lowest stations by trips per bicycle per day except for Rhode Island Avenue and Montana Avenue NE, which has been active for less than six months.

**Table 8: Lowest Performing Stations by Total Trips (2016-2019)**

| Rank | To/From Station | To/From Station | Total Trips |
|------|-----------------|-----------------|-------------|
| 1 | United Medical Center | 39 | 5,393 |
| 2 | Joliet St & MLK Ave SW/Bald Eagle Rec Ctr | 47 | 4,746 |
| 3 | 19th & Savannah St SE | 80 | 4,574 |
| 4 | 37th & Ely Pl SE | 94 | 4,219 |
| 5 | Rhode Island Ave & Montana Ave NE | 96 | 4,103 |
| 6 | Mississippi Ave & 19th St SE / THEARC | 169 | 3,796 |
| 7 | Stanton Square SE | 192 | 3,570 |
| 8 | 1st & S Capitol St SE / Oxon Run Trail | 217 | 3,447 |
| 9 | Livingston Rd & 3rd St SE | 221 | 3,353 |
| 10 | 61st St & Banks Pl NE | 246 | 3,347 |

Figure 13: Average Daily Station Overtime

## Station Overtime

**Figure 13** shows average daily station overtime for each Capital Bikeshare station in the District. Overtime minutes are defined as the sum of all minutes beyond 30 minutes for trips starting at a particular station. Stations with the most overtime trips are concentrated along the National Mall and several stations in the area surrounding the District's center have a moderate number of overtime trips. As station distance increases from the District center, the number of overtime trips decreases.

Overtime is a good proxy for revenue generation, as trips over 30 minutes incur additional user fees. The concentration of overtime trips near major tourist destinations like the National Mall point to the importance of tourist/leisure users to generating revenue for Capital Bikeshare.

## Station Downtime and Lost Trips

**Figure 14** shows the average daily percentage of downtime that each bikeshare station experiences along with a "lost trip" calculation based on downtime and overall ridership. Downtime refers to the amount of time that a station is completely full or empty, which results in lost trips because users are unable to return or pick up bicycles. On this map, the percentage of downtime is represented by the color of the station dots, while the size represents the number of lost trips.

The larger the dot, the more lost trips there are, while red represents a higher percentage of downtime and green a lower percentage.

The analysis shows that the stations with the highest downtime rates may not necessarily be the ones with the highest numbers of lost trips. Even a short amount of downtime each day at a very busy station can negatively impact more riders than high rates at a lower ridership station. The data shows little correlation between the number of riders impacted by a station being full or empty and the duration of daily downtime. Areas with the greatest capacity issues include the National Mall, Adams Morgan, Columbia Heights, NoMa, H Street, and Capitol Hill.

Some lower ridership locations are frequently full or empty due to the nature of their ridership demand. Stations that see demand clustered during a short time (e.g., around shift changes) and see predominantly unidirectional traffic (e.g., lots of trip starts in the a.m. peak and lots of trip ends in the p.m. peak) are going to be challenging to keep operational even if they have fairly low ridership. Busy stations in places like Logan Circle, by comparison, see lower rates of station downtime as demand is spread out by time of day and direction.



Figure 14: Daily Station Downtime and Lost Trips
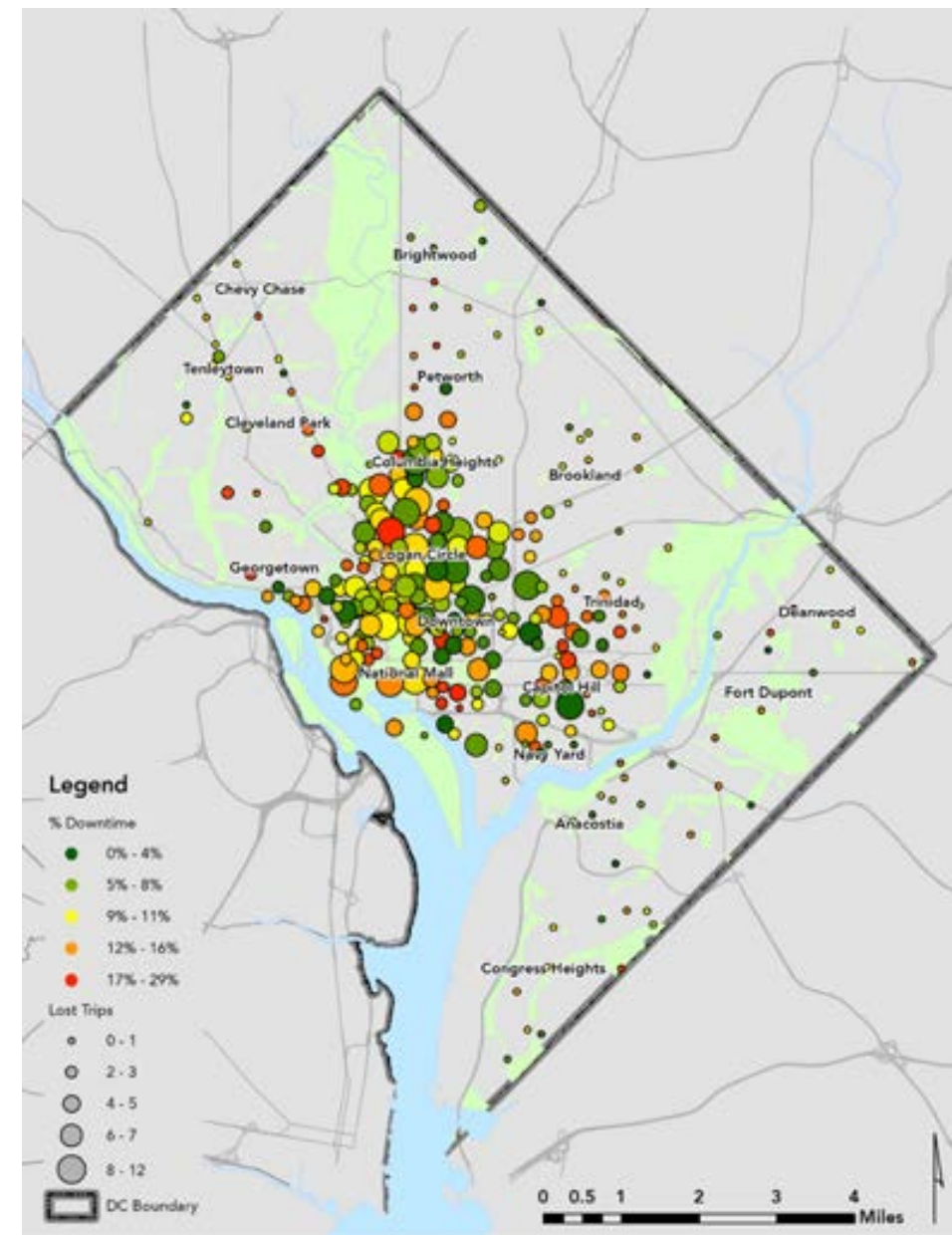
# CAPITAL BIKESHARE VS. DOCKLESS MICROMOBILITY SERVICES

## Summary of Micromobility Usage Patterns

This analysis will use the term "dockless" to describe any of the private micromobility services active in the District, including electric-assist bicycles (e-bikes), conventional dockless bikeshare (pedal bikes), and electric powered scooters (e-scooters). The study team looked at a sample of dockless data from the start of DDOT's dockless pilot in September 2017 to July 2019.[3] The graphic below shows the average trip length of dockless trips from the sample across all years for which data is available, separated by vehicle type. E-bikes saw the highest average trip length, 2.5 miles, while both pedal bikes and e-scooters saw an average distance of almost one mile less, 1.7 miles. It should be noted that since the middle of 2018, dockless conventional pedal bikes are no longer available.

### Average Dockless Trip Distance



**E-bike**
2.5 miles

**Pedal Bike**
1.7 miles

**E-Scooter**
1.7 miles
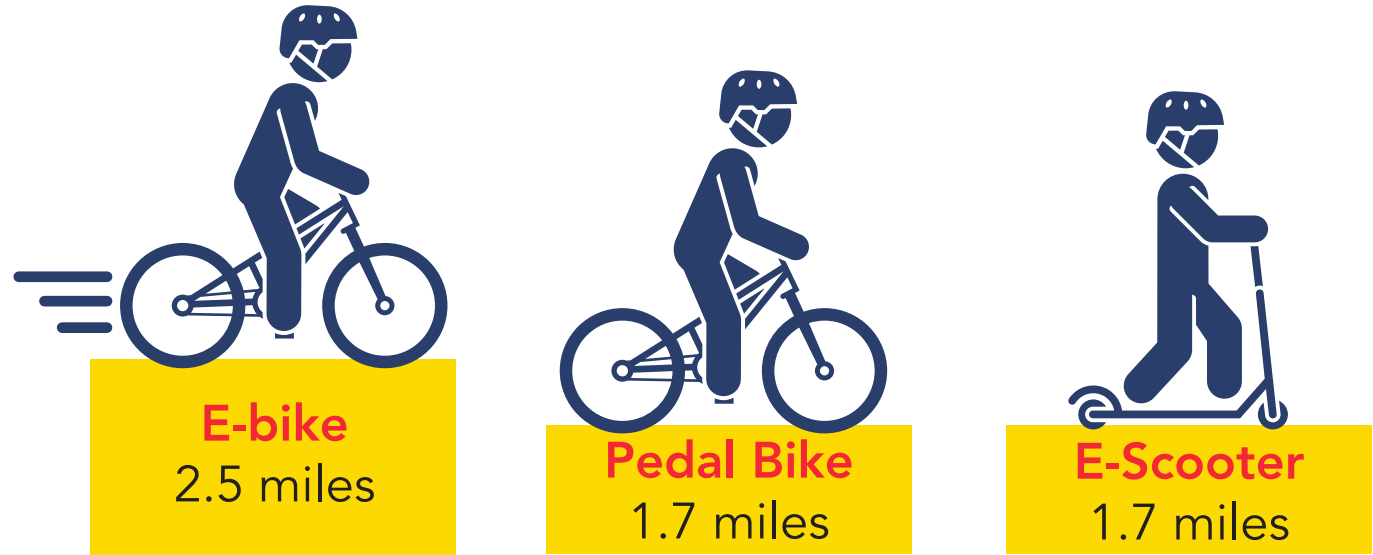
3 The data provided to the study team included only 2,254,192 unique trips beginning in September 2017 to July 2019, a sample of all dockless trips in the region. This is assumed to be a representative sample.
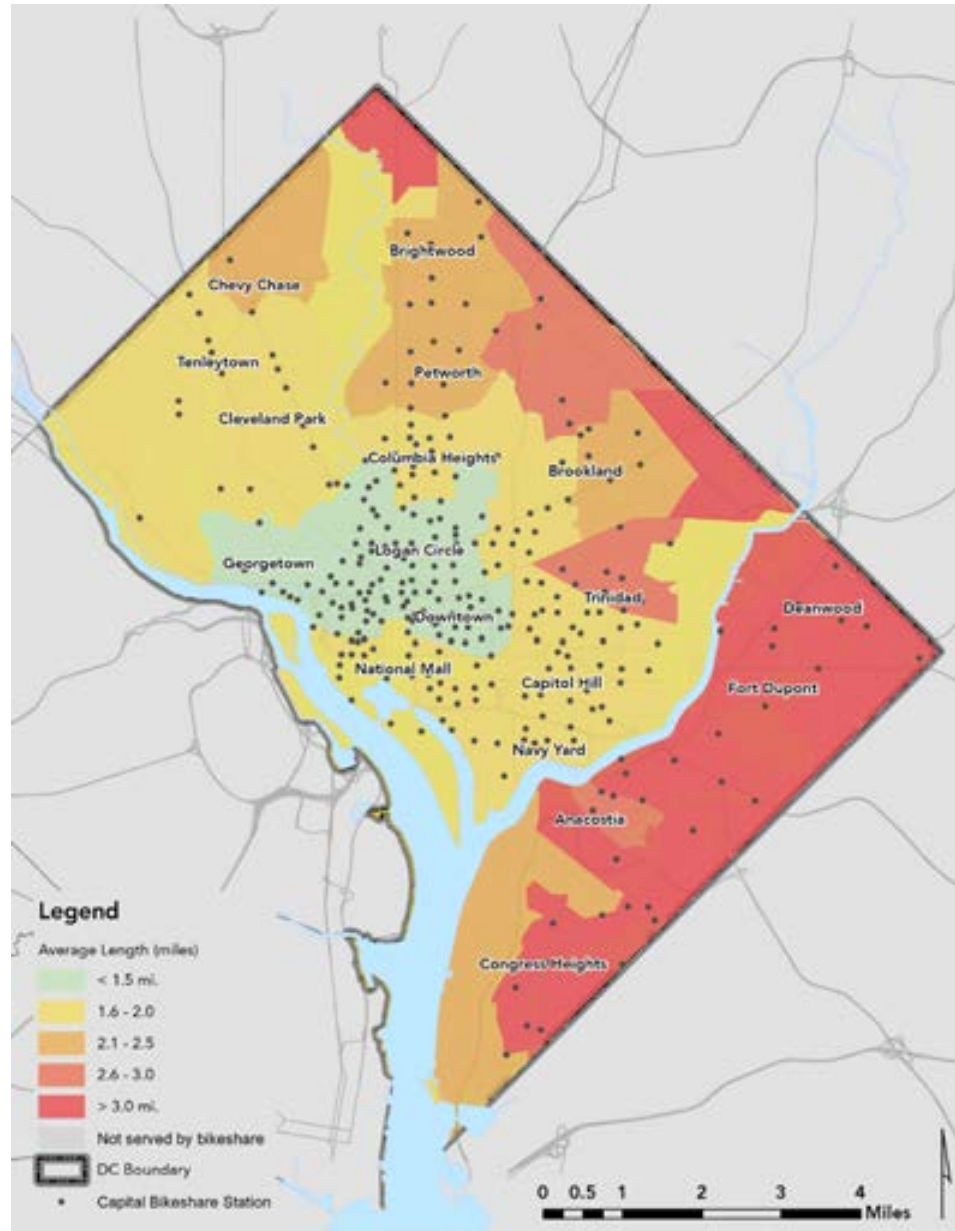
Average dockless trip length for e-bikes and e-scooters by neighborhood is shown in **Figure 15**. Average dockless trip length increases in proportion to distance from the center of the District, as well as in reverse proportion to the number of Capital Bikeshare stations within the neighborhood. Dockless trips are shortest in the center of the District at less than 1.5 miles, where density is greatest and land use is the most mixed. Neighborhoods east of the Anacostia River, as well as in far Northeast see the longest average trip lengths at over three miles. These areas also have fewer bikeshare stations compared to the center of the District and Northwest.

Dockless trips from the sample mirror Capital Bikeshare ridership. The highest ridership areas are clustered in the center of the District and surround dense mixed-use neighborhoods. While dockless trips have occurred across nearly all the District, trips are highly concentrated in a small area. The study team mapped dockless trips by the sum of trips that end in an analysis grid cell. The District is composed of 4,988 of these cells. Ten cells account for 18 percent of all dockless trips since 2017. Sixty-four percent of trips are confined to the cells with greater than 2,500 trips (see **Figure 16**).
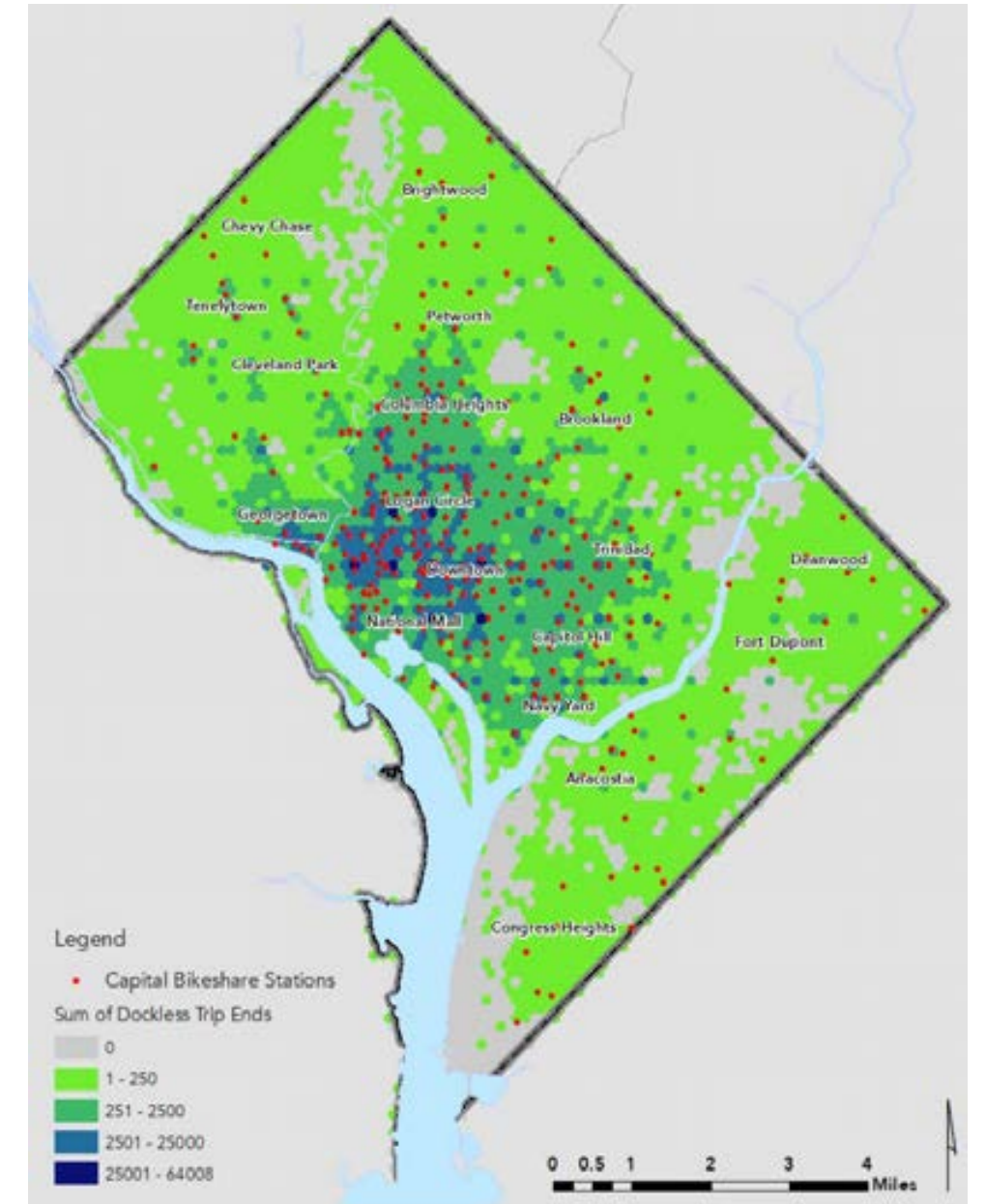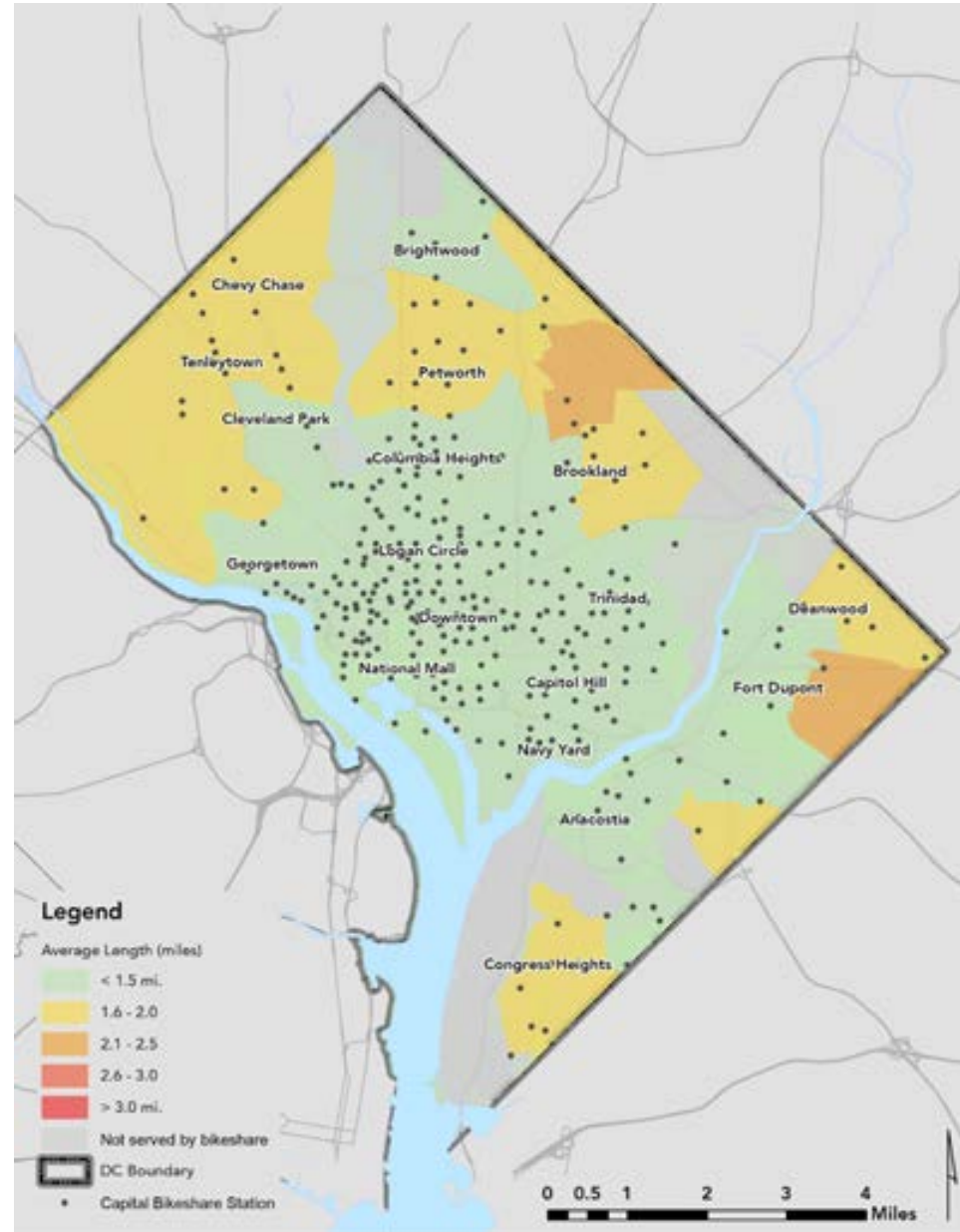
**Figure 15: Average Dockless Trip Length**



**Figure 16: Density of Dockless Trips**

Legend

Average Length (miles)

- < 1.5 mi.
- 1.6 - 2.0
- 2.1 - 2.5
- 2.6 - 3.0
- > 3.0 mi.
- Not served by bikeshare
- DC Boundary
- Capital Bikeshare Station

## Differences from Capital Bikeshare Ridership Characteristics

**Figure 17** shows the average straight-line distance of Capital Bikeshare trips in District neighborhoods without bikeshare stations in gray. For docked bike trips, trip lengths are notably different than for dockless trips. Overall, docked trips are shorter than dockless trips, with more than half of neighborhoods seeing an average trip distance of less than 1.5 miles. The most notable differences between docked and dockless trips occurs east of the Anacostia, where for docked trips, average distance ranges from less than 1.5 miles to 2.5 miles. Dockless trips east of the Anacostia average over three miles for all but two neighborhoods, which see average distances of 2.1 to 3.0 miles.

Based on the sample of dockless trip data, neighborhoods with a large Capital Bikeshare member base see Capital Bikeshare out-perform dockless services. Conversely, dockless trips are concentrating in high casual user markets like Downtown and Georgetown—with the notable exception of the National Mall. The terms of the dockless operator agreements bar trips from ending on federal property, including the National Mall, which may account for this exception. Finally, outlying parts of the District with limited bikeshare coverage see higher proportional dockless usage but overall ridership numbers in these areas is still fairly low.

Dockless ridership data provides a snapshot of unconstrained demand, as trips are not tied to the location of station infrastructure. Based on a dockless usage, Capital Bikeshare's trips are underrepresented in several core markets, including Downtown, U Street, Dupont Circle, Georgetown, and most outlying neighborhoods in the District.

**Figure 17: Average Capital Bikeshare Trip Length**

# PROPENSITY ANALYSIS

## Methodology

The bikeshare propensity analysis examines 15 different geographic measures related to bikeshare use to better understand the likelihood of use across the city. Geographic measures for this analysis include:

- Population density
- Low-income population density
- Non-white population density
- Density of population categorized as obese
- Employment density
- Commercial services density (retail and hospitality job density)
- Bicycle commute density
- Bicycle infrastructure density
- Transit ridership
- Dockless bicycle and scooter trips
- Public service locations
- Tourist amenities and destinations
- Auto trips
- Change in elevation

In order to summarize this extensive analysis and support later stages of the Development Plan, a series of aggregate propensity maps were developed. The measures were combined into three separate analyses, with each one looking at specific market segments/market typologies:

**High Ridership:**
Measures that indicated a high overall demand for bikeshare.

**High Revenue:**
Measures that indicate a high revenue potential, especially among casual users.

**Public Welfare and Health:**
Measures that indicate where bikeshare stations would have a major impact on public welfare goals like increasing the diversity of users, improving access to public facilities, and reducing obesity.

### Mapping Measures to a Grid

To measure propensity, all measurements were aggregated to an analysis grid consisting of hexagonal cells that covers the entire District of Columbia. Each cell measures 400 feet from its center to the nearest edge. Measures were assigned to the grid by simply averaging all values that overlap with a grid cell. Point-based measures, like number of visitors per year to major tourist sites, are aggregated through a quarter-mile search distance.

### Normalizing Data

As the input measures in this analysis feature drastically different ranges and numerical distributions, normalization had to occur to allow for the development of propensity maps. The normalization process serves two purposes. First it constrains all factors to a range from zero (minimum) to one (maximum). Second, normalization allows removal of outliers that can skew the data.

Several methods were used to normalize the data to a standard scale (see **Table A-1**). For most measures, the cell's value was normalized to its proportion of the maximum value in the sample. To control for outliers, the maximum was defined as a certain percentile (varied based on the distribution but typically either the 99th or 99.5th percentile). For example, the average minority population density ranged from zero to 66,003 people per square mile, with the 99th percentile at 36,226 people per square mile. A cell with a minority population density of 18,642 received a normalized score of 0.5, while one with an average minority population density of 42,853 received a score of 1.0.

Certain measures were normalized by alternative methods. Factors like employment density and tourist attractions do not lend themselves as well to proportional normalization, as they have significant break points far below the samples' maximum or even 99th percentile values. For example, population and employment density uses break points defined by state-level

and federal guidance on transit propensity; using a proportional method would under-score many areas that have population densities conducive to bike sharing.

### Combining Data into a Unified Measure

To arrive at the final four propensity maps, a set of relevant factors were identified for each market segment (high ridership, high revenue, and public welfare). These factors were then combined. Certain factors perceived as more significant were given double weighting, and the normalized change in elevation was subtracted from the score. **Table A-1** shows the factors and weighting used to develop the three propensity maps.

- High Ridership propensity is derived from factors shown to contribute to high bikeshare usage. These factors include overall high travel demand, density, availability of bicycle infrastructure, bicycle level of stress, existing bicycle commute mode share, the density of retail, and the count of dockless bike and scooter trips. The most important factors in high bikeshare ridership are population and employment density.

- High Revenue propensity is based on factors that drive casual trips taken by infrequent users and tourists. Casual users contribute a large share of total revenue and generally use the service in and around retail destinations, tourist sites, major hotels, and densely developed neighborhoods. In this scenario, hotel room and tourist destination frequency are most important.

- The Public Welfare propensity is built around factors that illustrate public policy objectives. This analysis includes minority population, low income population, the obesity rate, access to public services, access to grocery stores, and overall population and employment density. The most important factors in public welfare are low income population, minority population, and obesity.

## Ridership Propensity

**Figure 18** shows ridership propensity, which highlights areas in the District where ridership is expected to be the highest. For this metric, high ridership areas are concentrated in the center of the District and around Metrorail stations. Areas of high propensity are generally well-served by bikeshare; however, some gaps still exist. Neighborhoods in the upper northwest, such as portions of the Connecticut Avenue and Wisconsin Avenue corridors and the upper parts of Georgetown have moderate demand areas underserved by bikeshare. The Georgia Avenue corridor, while already served somewhat by bikeshare, is another area with growth opportunities to serve higher ridership areas. While there are bikeshare stations located in this high and moderate propensity area, there are significantly fewer.
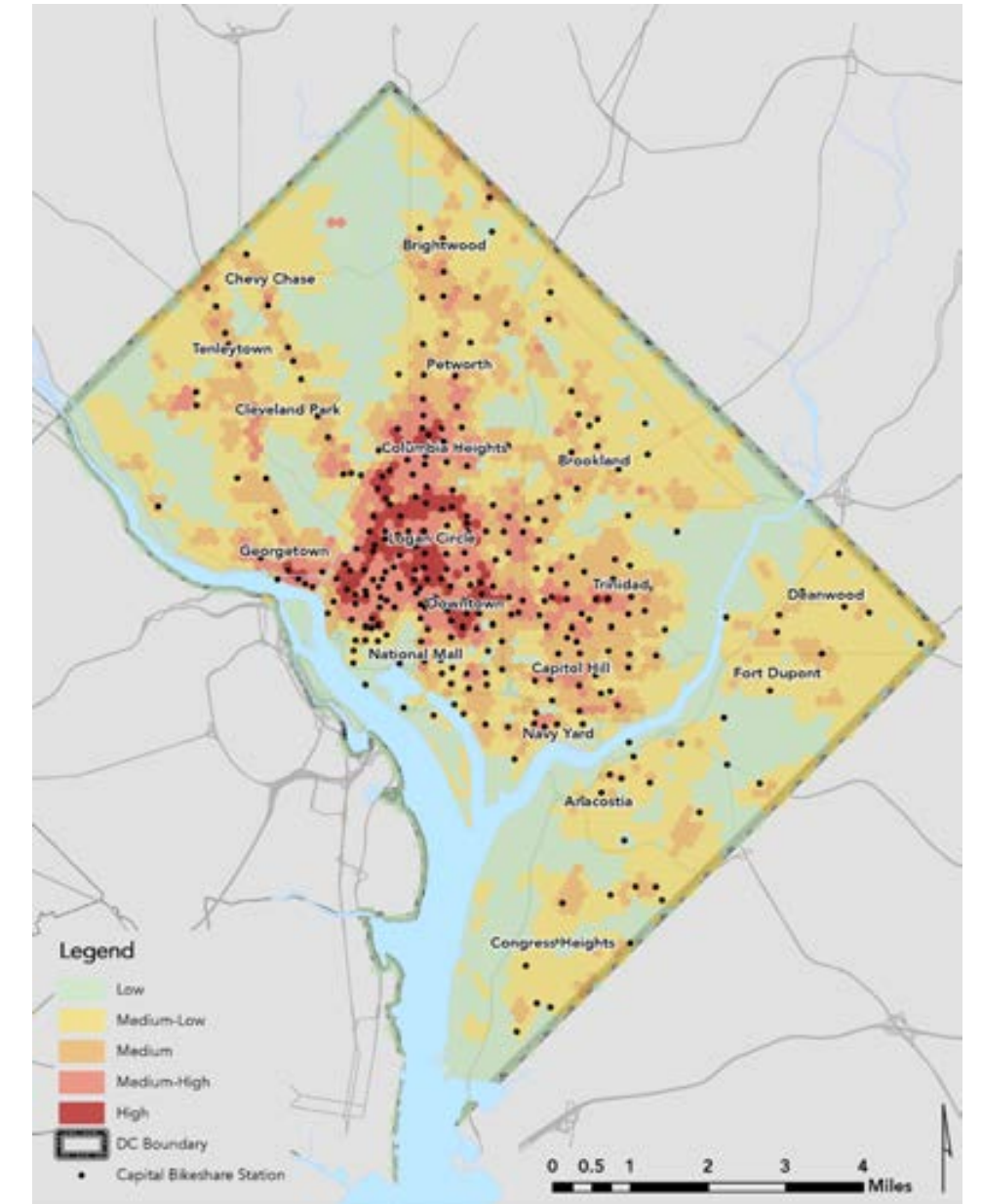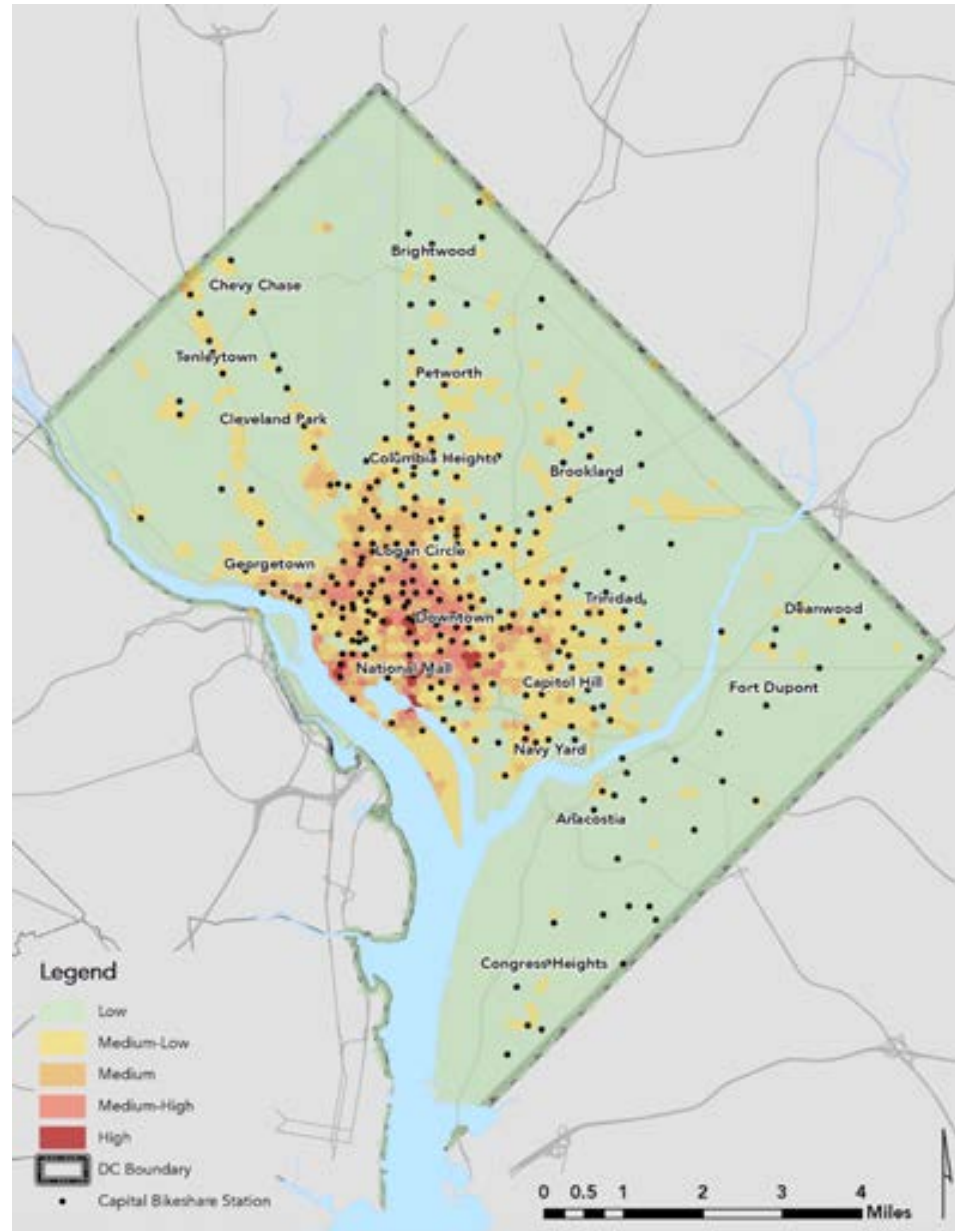


Figure 18: Ridership Propensity

## Revenue Propensity

**Figure 19** shows revenue propensity, which highlights areas where revenue is expected to be the greatest due to high casual user demand. Overall, areas that are anticipated to generate the greatest revenue are well-served by bikeshare. Unlike the other two propensity measures, the revenue propensity is highly concentrated in a small area around the National Mall and Downtown. These areas are home to the largest number of tourist and recreational destinations. The only discernable gap in coverage is a portion of the Tidal Basin between the Jefferson Memorial and Floral Park. The challenge with serving high propensity areas is likely not coverage but capacity. Stations along the National Mall are among the busiest in the system and additional expansion could be absorbed by existing demand.



Figure 19: Revenue Propensity

## Public Need Propensity

**Figure 20** highlights areas with the greatest propensity for bikeshare based on established District and Capital Bikeshare goals. The map highlights areas with high low-income populations, concentrations of people of color (who are underrepresented among bikeshare users), negative public health indicators, and limited access to public services. A handful of areas in the District score highly under this measure, including Columbia Heights, Petworth, Brightwood, North Capitol Street, Anacostia, and Congress Heights. Most of the high and medium-high propensity areas have some bikeshare access, but there are several growth opportunities across the District to improve access to bikeshare to promote wider policy goals.
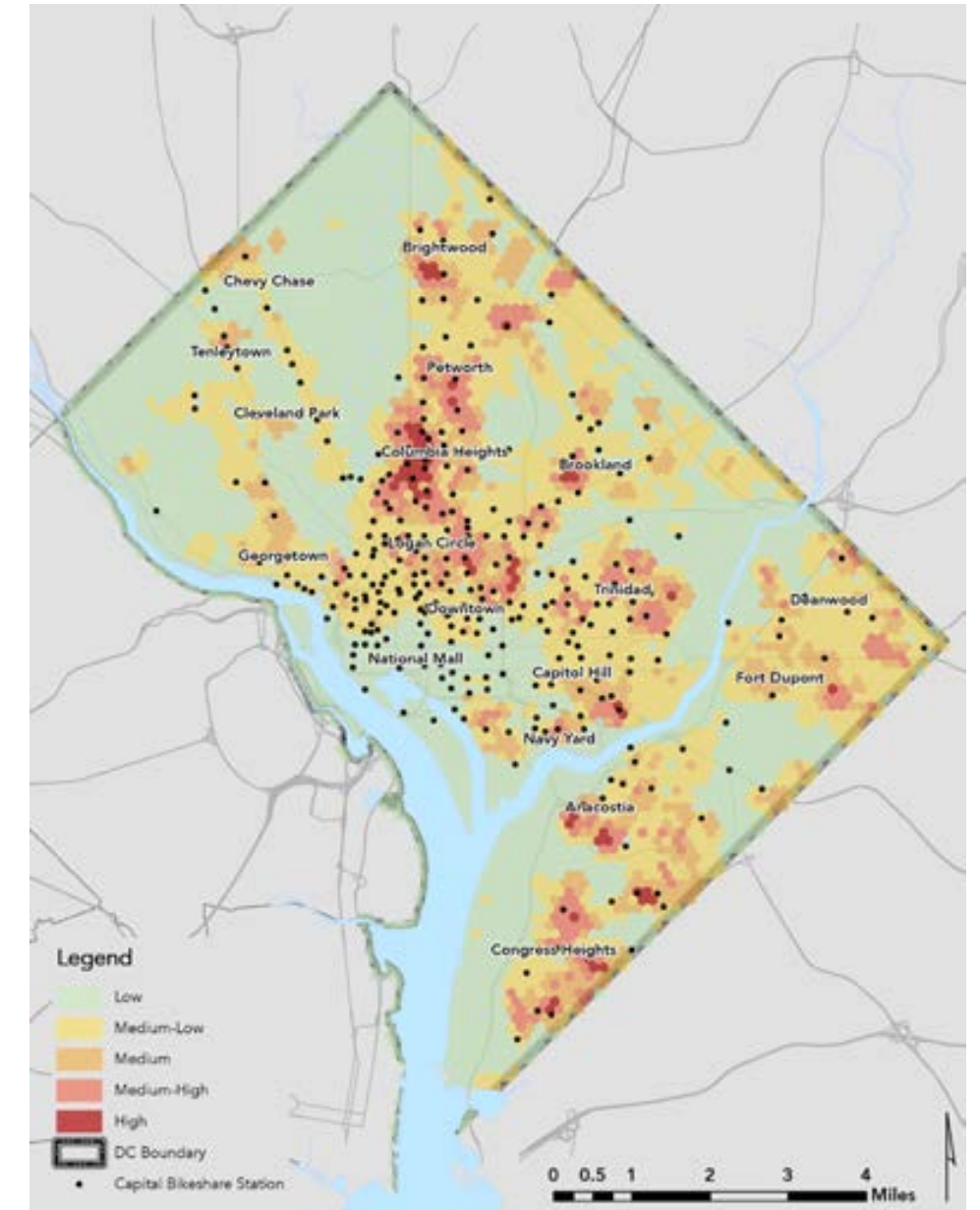


Figure 20: Public Need Propensity

# SWOT ANALYSIS

Capital Bikeshare's future growth and success depends on conditions that are supportive of bikeshare activity. This study utilizes a wide range of sources from GIS analyses to user survey results to understand the needs and opportunities for growth and development within the system. To help organize and summarize the findings of this extensive data collection effort, a strengths, weaknesses, opportunities, and threats (SWOT) analysis was conducted that ties the findings of this market study back to the program's strategic goals and objectives.

This SWOT analysis identifies where the Capital Bikeshare system currently succeeds in effectively serving its markets, along with areas where it underperforms. It also assesses factors outside Capital Bikeshare's control that impact the program presently and/or in the future. Strengths, weaknesses, opportunities, and threats will be framed through the following questions:

## Why a SWOT analysis?

A SWOT analysis is a strategic planning method used to evaluate a project or venture's strengths, weaknesses, opportunities, and threats. It is intended to help guide development and prioritization of strategic initiatives. SWOT analyses are often used in business planning to identify strategic advantages and anticipate future challenges.

**STRENGTHS:**
What are the ways bikeshare succeeds or is anticipated to succeed in serving its markets?

**WEAKNESS:**
What are the ways bikeshare falls behind or is anticipated to fall short in serving its markets?

**OPPORTUNITY:**
What are opportunities bikeshare can take advantage of in future expansion?

**THREATS:**
What factors pose threats or constraints on future bikeshare expansion?

| Goal | Question | Strength | Weakness | Opportunity | Threat |
|---|---|---|---|---|---|
| **Ensure Capital Bikeshare is an Integral Part of the District's Transportation System for All District Residents and Visitors.** | How well is Capital Bikeshare integrated into the District's transportation network? | • Program colocated near every Metrorail station in the District.<br>• Most high-frequency bus lines provide good connectivity to bikeshare.<br>• Registered user base has remained fairly stable. Capital Bikeshare has high renewal rates. | • Stations like Naylor Road which are outside the District but near the border lack bikeshare.<br>• Some high-ridership bus corridors (Wisconsin Ave; Alabama Ave) have gaps in bikeshare connectivity.<br>• Lack of e-bikes reduced the programs utility for longer trips or hilly terrain. | • Opportunities to further integrate Capital Bikeshare into station wayfinding.<br>• Bikeshare can help relieve capacity constraints along Metro's crowded core.<br>• Ensure adequate space for bikeshare as part of new developments. | • Limited sidewalk space to expand bikeshare in core.<br>• Lack of e-bikes may drive users to competitors.<br>• Casual users are drifting to other services suggesting Capital Bikeshare is a less convenient option for infrequent users. |
| **Leverage Capital Bikeshare to Promote a Thriving Community** | How well does Capital Bikeshare promote job access, tourism, retail, and entertainment spending? | • Capital Bikeshare now serves most of the District's commercial corridors.<br>• ~87 percent of jobs are within a quarter mile of a bikeshare station, a 9 percent increase since 2015. | • Lower bikeshare coverage along outlying commercial corridors like Georgia Ave.<br>• Few smaller employment hubs lack bikeshare access such as: Providence Hospital; Upper Georgia Ave; Former Fannie Mae Campus; GW Mount Vernon Campus; Georgetown University Hospital; St. Elizabeths West Campus.<br>• Declining casual user ridership – Capital Bikeshare connects visitors to the District's outlying commercial corridors. | • Large-scale redevelopments across the District provide new growth opportunities for bikeshare. Notable examples include Walter Reed, McMillan, Parkside, Buzzard Point, Poplar Point, and West St. Elizabeths.<br>• Capital Bikeshare can continue to expand on the National Mall to meet tourist demand; dockless providers are restricted from operating on National Mall property.<br>• Ensure adequate street lighting in the vicinity of the bikeshare station. | • Dockless services draw from part of Capital Bikeshare's tourist market.<br>• Decentralization of employment in the District (and regionally) can make bikeshare less competitive compared to other modes.<br>• Fewer unserved markets to grow coverage. Existing high-demand locations could support more stations but face a shortage of available space for expansion. |

| Goal | Question | Strength | Weakness | Opportunity | Threat |
|---|---|---|---|---|---|
| **Make People's Lives Better Through Capital Bikeshare** | Is Capital Bikeshare providing an accessible and equitable public service? Is it meeting the goal of improving people's lives? | • Capital Bikeshare has significantly expanded equity and outreach initiatives over the last few years.<br>• ~72 percent of District residents are a quarter mile from a bikeshare station, an 80 percent increase since 2015.<br>• East of the river, expansion has reduced disparities in bikeshare access.<br>• Existing bicycle infrastructure network well served by bikeshare.<br>• Recent bikeshare growth. | • A handful of high-density residential areas have limited bikeshare coverage, such as Marshall Heights/Benning Ridge; Upper Georgetown; Fort Totten/Queens Chapel; Washington Highlands; and Naylor Gardens.<br>• Capital Bikeshare station locations do not correlate closely with the location of public services, notably in outlying parts of the District<br>• Program continues to trend wealthier and higher income than overall District population.<br>• Capital Bikeshare member demographics do not reflect the broader demographics of the District | • Introducing new technologies like e-bikes may attract a more diverse user base. Preliminary observations in other cities find that lower-income users adopt e-bikes at a faster rate than conventional pedal bikes.<br>• Leverage lessons learned from the Better Bikeshare Partnership to continue to improve upon Capital Bikeshare's equity initiatives. Strive to attract a more diverse base of riders by income and race. | • Without clearly communicating the program's value, Capital Bikeshare may see reduced political support in the face of dockless competitors. |

# expansion priorities

**This expansion plan identifies areas where Capital Bikeshare stations/docks can be added or expanded to meet system demands.** The expansion plan was informed by the market analysis to identify areas of need based on ridership, revenue, and public need. The expansion plan also addresses DDOT's goal to provide Capital Bikeshare coverage to 90 percent of the District's population and areas of ongoing capacity issues for Capital Bikeshare. An unconstrained expansion plan was developed to identify all possible areas for expansion, which was then informed by the financial plan to create a constrained expansion plan.

## EXPANSION PLAN DEVELOPMENT

The Expansion Plan was developed using underlying data from the Capital Bikeshare market analysis (Chapter 3) and five key expansion policies. Each of the subsequent sections provide details on these variables which guided the expansion plan.

## Typologies

To help model out ridership and revenue, the District was broken into three market typologies: **revenue, ridership, and access.** These typologies were defined based on the market analysis and existing ridership figures of stations within their boundaries. The **revenue typology** corresponds to areas with both high ridership and high casual usage. This typology closely aligns with the revenue propensity analysis presented in the Market Analysis; these areas see a high share of rides by infrequent users, such as tourists, and ridership is highly seasonal.

The **ridership typology** corresponds to high ridership areas with low casual usage, with trips largely generated by monthly and annual members. This typology roughly corresponds with the ridership propensity analysis, with adjustments made based on underlying station ridership and land use. The ridership typology is where the largest share of trips on Capital Bikeshare are generated and sees less seasonal variability than the revenue typology.

The remaining areas that were not categorized as revenue or ridership typologies were assigned to the **equity and access typology.** These areas show low casual usage and lower overall ridership. The defined typologies are shown in **Figure 21**.

Revenue areas are concentrated around the National Mall, while ridership areas surround the revenue areas and encompass many high-density neighborhoods, including Georgetown, Logan Circle, Columbia Heights, Downtown, Capitol Hill, and Navy Yard. Neighborhoods outside of center of the District and Southwest, including Chevy Chase, Tenleytown, Brightwood, Brookland, and areas east of the Anacostia River have been categorized as the access typology.

For each typology, the study team calculated the average trips per bike for peak (April 1 to October 31) and off-peak (November 1 to March 31) seasons, as well as the proportion of casual to registered users by season based on historical ridership data.



## Figure 21: Typology Areas

## Table 9: Ridership Variables by Typology

| | Avg. Trips per Bike | | Registered User Share | |
|---|---|---|---|---|
| Typology | Peak (April - Oct.) | Off-Peak (Nov. - March) | Peak (April - Oct.) | Off-Peak (Nov. - March) |
| Existing System Average | 3.96 | 2.23 | 75% | 85% |
| Ridership | 4.60 | 2.82 | 84% | 91% |
| Revenue | 5.93 | 2.45 | 44% | 56% |
| Equity & Access | 0.74 | 0.42 | 85% | 91% |

The results are shown in **Table 9**, along with a system average. During off-peak periods, registered users make up the largest share of riders for all typologies. The same is true during the peak, except for stations located in revenue areas where casual users make up just over 50 percent of trips.
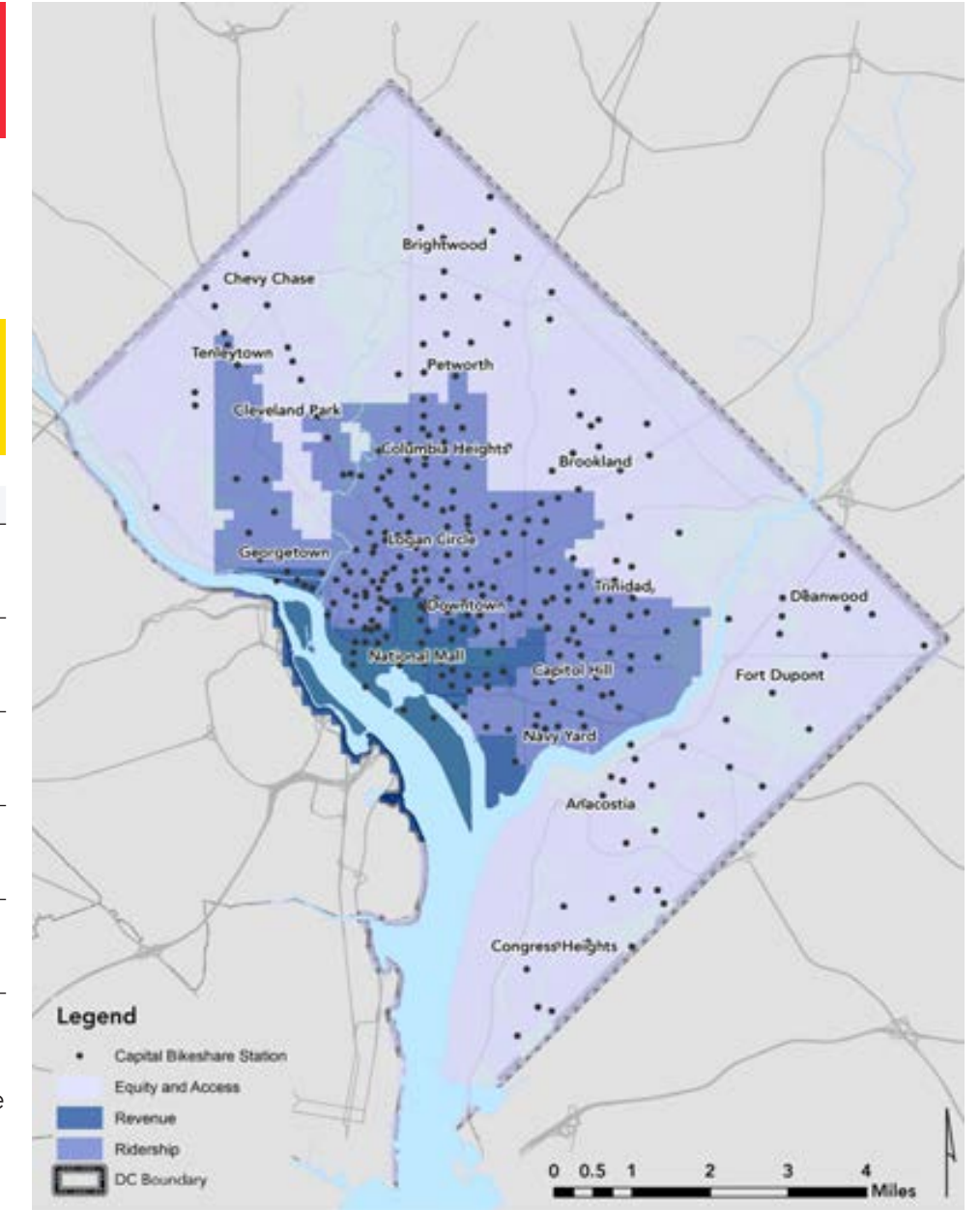
# EXPANSION CRITERIA

A set of expansion criteria developed during the 2016 Capital Bikeshare Development Plan was used to guide expansion proposed in the current plan. Expansion criteria allow DDOT to ensure that future expansion is in line with the program's strategic goals and objectives, and structures how future Capital Bikeshare investments will be made. These criteria are intended to provide a basis for future decision-making and have been updated based on inputs collected through this plan.

## Policy 1: Balance Between Station Typologies

As a publicly-funded program, Capital Bikeshare has a duty to serve the public good. The desire to expand the system and provide stations in new neighborhoods can sometimes run counter to what is optimal for the program's financial well-being. Bikeshare usage rates differ widely across the city, with some areas having a much higher rate of ridership than others. The planning team recommends that DDOT establish a station expansion policy that balances stations by type of location. The District has been broken into three market areas: ridership, revenue, and equity/access. Stations located in each of these three markets are expected to have different ridership characteristics and revenue-generating potential.

DDOT's goals and objectives for Capital Bikeshare help guide the creation of the expansion policy. The District wants to increase the importance of bikeshare in the District's overall transportation network, diversify the program's ridership base, and connect residents to new opportunities through bikeshare. To meet these goals, the program will need to expand to new neighborhoods, yet this expansion may run counter to the program's objective to grow in a financially responsible way. In order to ensure that cost recovery rates for the program remain stable, every station added in equity and access areas should be complemented by stations in revenue and ridership areas.

Based on financial projections for the program, DDOT should target the following allocation of stations:

- Half of all new stations should be located in equity and access areas

- The remaining stations should be located in ridership and revenue locations. In the constrained expansion plan, the team allocated approximately a fifth of all future stations to the high revenue market, but due to the limited size of this market, DDOT may run into station siting constraints.

## Policy 2: Ensure Suitable Capacity in the District's Core Neighborhoods

Bikeshare ridership patterns in the District vary widely by time of day. During the morning commute peak, many more trips are heading into the core neighborhoods than away from them. During the afternoon commute peak, the reverse is true. These travel patterns put a strain on the system as Capital Bikeshare must redistribute bikes constantly throughout the system.

If the bikeshare program expanded solely at its periphery, the additional ridership would overwhelm core stations during peak periods. In order to ensure that riders have available dock capacity at their destination, additional stations must be added to the core for every additional station added outside it.

To define the "core," the study team looked at bikeshare travel patterns by the District's defined neighborhood clusters. The study team found that during the morning peak period (6 a.m. to 9 a.m. on weekdays), only seven neighborhoods saw a net gain of bikeshare bicycles in the District of greater than one percent. These seven neighborhoods are all contiguous and form a core area that extends west from Georgetown and east to Union Station, and north from Dupont Circle and south to Navy Yard. The core neighborhoods are shown in **Figure 22**.

In order to ensure suitable capacity in the core, the system should add additional docks at an approximately proportional rate to the net trips to the core. **For every two stations (or dock/bicycle equivalent) added outside the core, roughly one station (or dock/bike equivalent) should be added within the core.** Core stations should be distributed in core neighborhoods based on the share of net trips each neighborhood cluster receives during the morning peak period. **Table 10** outlines the percentage of new stations that should be added to core neighborhoods based on existing travel patterns.
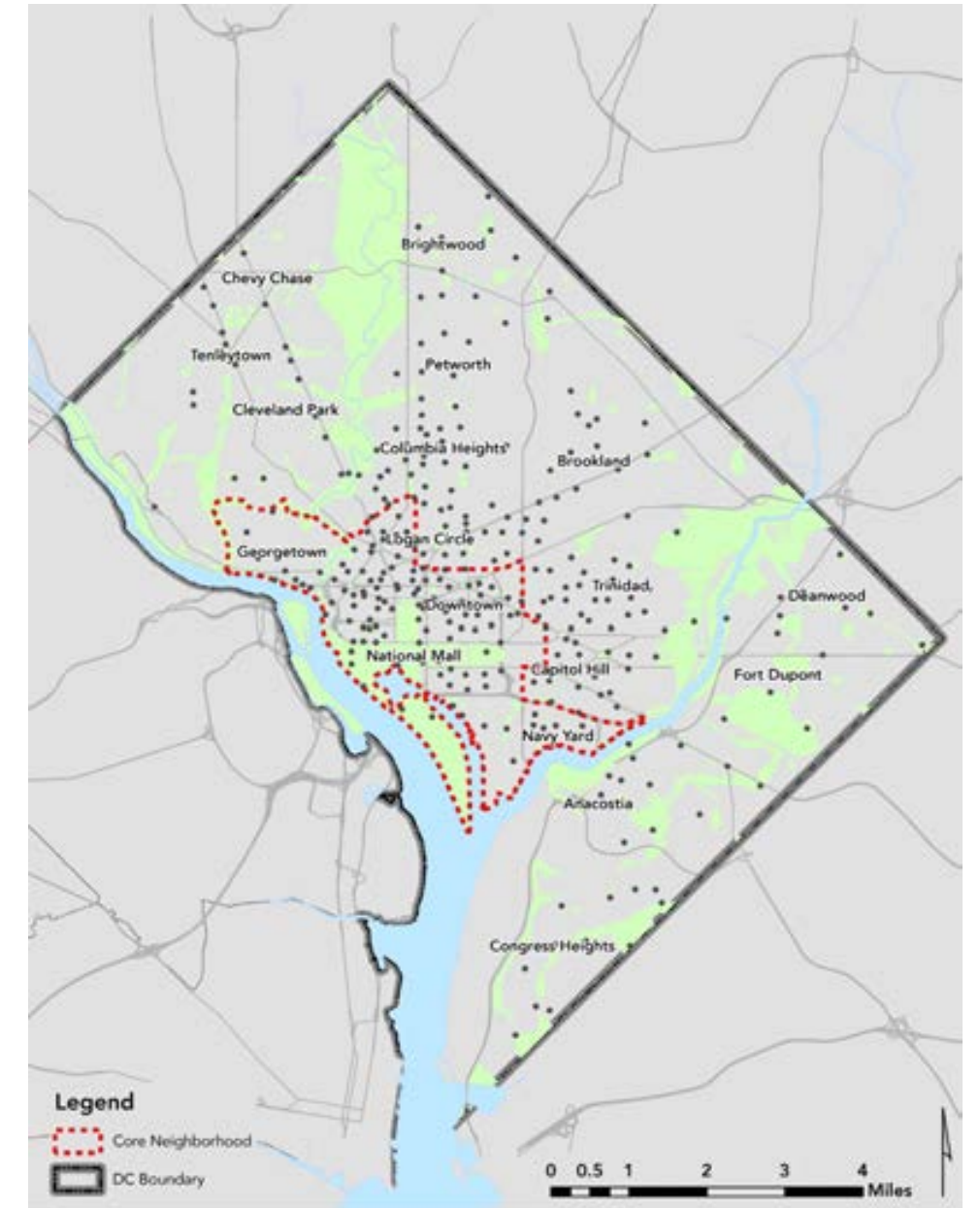


## Figure 22: Core Neighborhood

## Table 10: Approximate Targets for Core Stations by Neighborhood Cluster

| Neighborhood Cluster | Percentage of New Stations |
|---|---|
| Downtown, Chinatown, Penn Quarter, Mount Vernon Square, North Capitol Street | 10% |
| West End, Foggy Bottom, GWU | 4% |
| Georgetown, Burleith/Hillandale | 2% |
| Dupont Circle, Connecticut Avenue/K Street | 7% |
| National Mall, Potomac River | 6% |
| Near Southeast, Navy Yard | 1% |
| Southwest Employment Area, Southwest/ Waterfront, Fort McNair, Buzzard Point | 3% |
| Total Core Stations | 33% |
| Outside Core | 67% |

Capacity in the core does not need to be accomplished entirely by adding stations. A number of additional strategies are at DDOT's disposal to reduce system capacity constraints:

- **Station Expansion:** In certain parts of Downtown, curbside space for new stations is in limited supply, and simply adding docks to existing stations could be a more effective strategy than station expansion.

- **Bicycle Corrals:** Motivate, Capital Bikeshare's contracted operator, deploys staffed bicycle corrals during the a.m. peak to provide temporary additional downtown capacity. These corrals can reduce the need to add additional dock capacity downtown, especially in locations with demand concentrated within a short time span.

- **Improved Rebalancing:** New tools and improved modeling of user demand could allow for more efficient rebalancing efforts that target locations with the greatest needs.

- **Variable Pricing:** Innovative pricing strategies could also help to regulate demand and reduce capacity constraints. Variable pricing that charges higher rates based on time of day or destination could encourage the system to better self-balance itself.

- **User Incentives:** Capital Bikeshare operates the Bike Angel program to incentivize riders to rebalance the system. Depending on the program's performance, it could be expanded to include a financial reward to further incentivize users to rebalance the network.

- **New Technology:** Lyft's latest generation of e-bikes have a hybrid locking mechanism that allows them to be locked up at stations or conventional bike racks. This technology could alleviate some station constraints by allowing users to lock their bicycles near stations that are entirely full.

In addressing the Capital Bikeshare's capacity issues, DDOT should assess the trade-offs between adding more stations and docks, policy, pricing, and operational and technological solutions for reducing station overcrowding.

## Policy 3: Optimize Where Station Dock Expansion Occurs

The most basic metric for determining if a station has too few docking points or bicycles is how much of the day it spends entirely full or empty (i.e., downtime). If a station is unable to keep up with demand during much of the peak period, Capital Bikeshare can expand a station with docks and bicycles. However, downtime is not a perfect metric for selecting stations for expansion. Certain stations have significant downtime but also low ridership; these locations tend to have a lot of unidirectional traffic that empties or fills up the station in a short time. In such instances, additional dock capacity may be used up quickly and have a negligible effect on overall system performance.

The team recommends that DDOT prioritize additional capacity for stations that meet the following criteria:

- Station that has a high amount of downtime (greater than 12 percent of the day).

- Station has high overall ridership, indicating that additional capacity would serve the largest number of users.

- Demand at the station

## Policy 4: Maintain a Minimum Station Density When Possible

The utility of a bikeshare system is largely determined by the number of destinations a rider can reach in a short period of time. Most bikeshare trips are under three miles in length and 30 minutes in duration. Denser bikeshare systems benefit from the network effect of having a greater number of convenient origin and destination pairs.

When expanding the system, the District should try to maintain a maximum distance between stations of half a mile. An even higher station density is preferable. In some instances, terrain and land uses will require the system to place stations farther than half a mile from an existing station location, but these exceptions should be rare.

When expanding the system into new parts of the District, DDOT should phase in a cluster of nearby stations over a short period of time; this will ensure that new stations are adequately connected to the rest of the bikeshare system.

## Policy 5: Gradually Introduce E-bikes

The bikeshare market shows a strong preference for electrification and the lack of e-bikes was one of the top concerns raised by members in the last member survey. Lyft plans to introduce e-bikes within the next 12 months; e-bike unlock surcharges and dockless locking fee revenue will go entirely to Lyft. DDOT should complement this growth by transitioning a portion of its conventional bicycle fleet to e-bikes as well. E-bikes in other markets have generated a higher utilization rate than conventional bikes and can be lucrative from a revenue standpoint due to users' willingness to pay extra for an electric bicycle. Additionally, e-bikes may help to reach communities with lower ridership and make bikeshare more accessible and equitable across the District. E-bikes are anticipated to help overcome the topographic challenges east of the Anacostia River and make biking a more convenient and accessible option for all communities.

As part of future expansion, the study team recommends that starting in 2021, e-bikes account for half of all new bicycles purchased by DDOT. Over the long-term, this will result in a 50/50 split between conventional and electric assist bicycles. Waiting until 2021 to fund e-bike acquisitions will allow DDOT time to coordinate procurement with other Capital Bikeshare jurisdictions and observe the on-street performance of Lyft's self-funded e-bikes.

Capital Bikeshare e-bikes should be deployed consistently with other micromobility programs. Distribution and rebalancing should match demand and provide access for all District residents. Special care should be taken to provide e-bike services in underserved areas that lack robust mobility options.
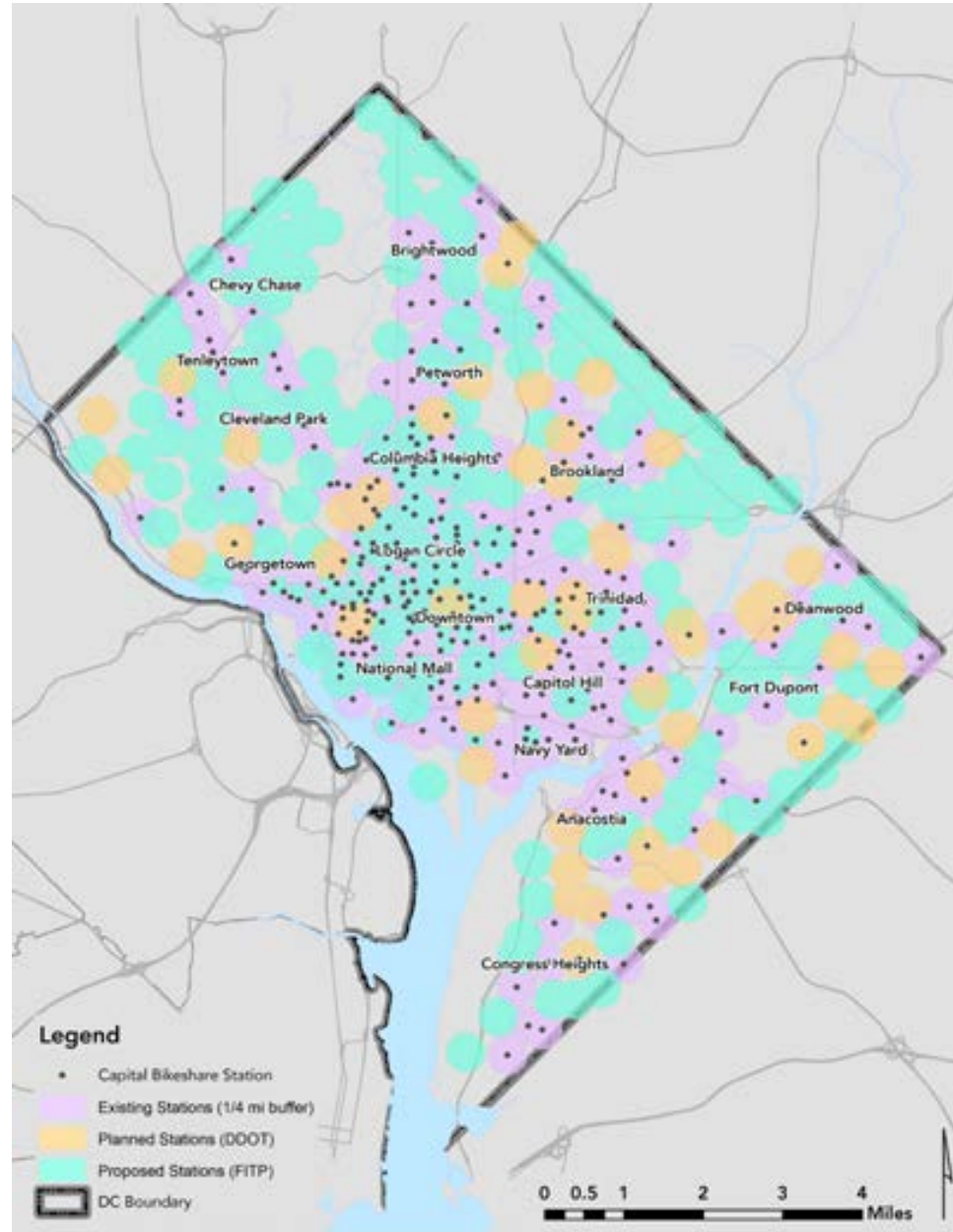
# UNCONSTRAINED EXPANSION PLAN

The market study shows that there are extensive opportunities and needs for expanding bikeshare in the District. An unconstrained expansion plan was developed without financial or logistical limitations to identify all areas of possible expansion for Capital Bikeshare within the District. The plan identifies DDOT's recommendations and additional recommendations from the project team. Each of the recommendations focuses on the three expansion categories:

1. Stations with ongoing capacity issues

2. Areas without stations identified by the market study as having medium to high demand

3. Locations which need coverage in order to reach DDOT's goal of having bikeshare within walking distance of 90 percent of the population

The team first identified areas that fall into category 3. Stations in this category may also fall into one or both of the remaining categories. New stations were placed, at a minimum, a quarter mile from existing Capital Bikeshare stations. However, due to the existing high density of stations within the core, a smaller buffer of one-eighth mile (660 feet) was sometimes used.

Recommendations for added stations in the core focused on mitigating existing capacity issues and balancing new stations that will be added outside the core. Recommendations to add stations outside the core largely focused on increasing access and serving high ridership areas. **Figure 23** shows the unconstrained expansion plan, color coded by existing stations (quarter-mile buffer), stations planned by DDOT, and stations proposed by the project team.

A more detailed set of maps for expansion stations is presented in the Appendix. The expansion station map can also be reviewed online.

"Keep up the good work! Please add more bikes, more docking stations and advocate for more bike lanes in the DC area so everyone can enjoy cycling and we can get more cars off the road."

—User survey response

**Figure 23: Unconstrained Expansion Plan**

# CONSTRAINED EXPANSION PLAN

Capital Bikeshare faces unknowns that add a degree of uncertainty to developing a constrained capital plan. As one of the oldest bikeshare programs in the nation, it is also one of the first to deal with end-of-life equipment replacement. Stations and bicycles have lasted longer than initially expected and DDOT expects that most stations can be brought to a state of good repair by refurbishing the kiosk and docks. The team made conservative assumptions on the cost of station refurbishment which in turn has diverted money away from future expansion. Based on the assumptions outlined in the financial plan (Chapter 5), the study team believes Capital Bikeshare can add 81 expansion stations to the program while remaining within existing fiscal constraints. Simultaneously, the program would refurbish 194 stations and replace 2,533 bicycles either retired due to end-of-life or lost due to theft and vandalism. E-bikes would replace half of all bicycles retired at the end of their useful life. See **Table 11** for a detailed breakdown of the number of bikes and stations purchased or refurbished over the next six years.

In order to create an expansion plan capable of evolving with Capital Bikeshare's constraints and opportunities, specific station expansion locations have not been identified by year. Rather, the unconstrained expansion plan has been made into a constrained expansion plan by identifying high and low priority stations. Expansion locations ranked as high priority fall into areas showing high bikeshare demand according to the propensity analysis and ongoing capacity issues at nearby stations. DDOT will then be able to choose from the list of high priority expansion locations based on the expansion policies and available funding for the given year. **Figure 24** shows the constrained expansion plan, color coded by existing stations (quarter-mile buffer), stations planned by DDOT, and high- and low priority stations proposed by the project team.

We recommend that DDOT evaluate its equipment replacement and refurbishment needs on an annual basis, and when these costs are below what was projected, use remaining funds to add more stations to the system.

## Table 11: Fiscally Constrained Schedule of Capital Investments by Equipment Quantity

| Equipment | FY20 | FY21 | FY22 | FY23 | FY24 | FY25 | Total |
|---|---|---|---|---|---|---|---|
| **Conventional Bikes** | | | | | | | |
| Expansion | 336 | 79 | 5 | 0 | 84 | 89 | **593** |
| Replacement | 77 | 218 | 298 | 315 | 252 | 242 | **1402** |
| **E-Bicycles** | | | | | | | |
| Expansion | 0 | 79 | 5 | 0 | 84 | 89 | **257** |
| Replacement | 11 | 158 | 248 | 275 | 220 | 218 | **1131** |
| **Stations** | | | | | | | |
| New Expansion Stations | 32 | 15 | 1 | 0 | 16 | 17 | **81** |
| Refurbished Stations | 10 | 32 | 44 | 54 | 31 | 24 | **194** |

"Biking (rather than driving, assuming the distance is too great to walk) in DC has been an enormous quality of life improvement to living here. I simply wish more people got out of their cars and onto a bike."

—User survey response

See the financial plan (Chapter 5) for a discussion of assumptions made to generate the constrained expansion plan.

Additional views of the expansion plan can be found in the Appendix, **Figure B-1** through **Figure B-5** and at https://www.capitalbikeshare.com/system-data.

**Note:** Locations listed as "Planned Stations (DDOT)" are tentative locations in various stages of the station planning process DDOT is exploring and do not represent definite final station siting. Final locations may shift based on site conditions, public input, or other factors and may be removed entirely from DDOT's plans for installation.



Figure 24: Constrained Expansion Plan

capital bikeshare

5
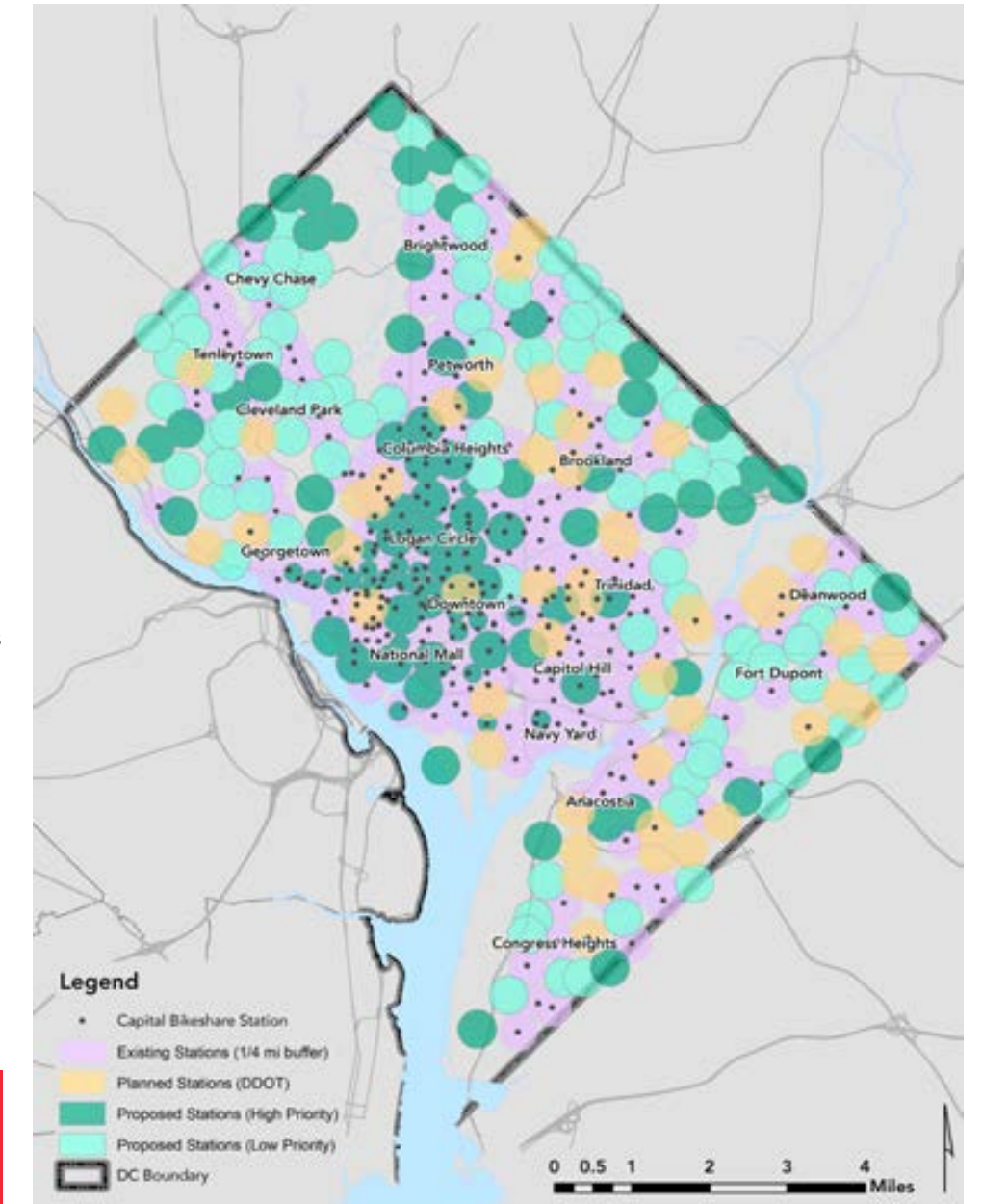
# financial plan

**The following chapter presents detailed financial projections for the maintenance and expansion of the District's Capital Bikeshare system.** Bikeshare costs can be divided into capital and operating budgets. The capital budget covers any expenses for equipment, parts, site planning, and installation. The operating budget encompasses all day-to-day expenses, including administration, marketing, and operating fees paid to the vendor or vendors. The financial figures here represent year of expenditure dollars and account for cost inflation. All costs are displayed by the District's fiscal year, which runs from October 1 to September 30.

# ASSUMPTIONS

The study team made a series of assumptions in order to create these financial projections. Some of these (e.g., revenue per user, ridership) are based on a wealth of historic data. Other future-year assumptions, such as maintenance costs, are forecasts based on limited end-of-life data and are at this time merely our best estimates. All operating and capital costs have been inflated to year of expenditure dollars at a 2 percent annual rate.

## Capital Cost Assumptions

**Equipment Costs:** The capital costs in this budget were developed based on current equipment costs borne by Capital Bikeshare. Equipment includes the three basic components of the bikeshare system: station fixed costs, such as the kiosk and solar array ($12,000 per station), station variable costs, such as docks and base plates ($1,500 per dock), and bicycles, including conventional bicycles ($1,200 per bicycle) and e-bikes ($2,400 per bicycle). The expansion plan assumes the average size of a new station is 19 docks.

The study team assumed that stations at the end of their useful life would not be replaced outright but receive an extensive refurbishment that covers core components of the station. The assessment assumes an average fixed cost for refurbishing a station of $6,785, which includes refurbishing 85 percent and replacing 15 percent of kiosks and replacing the station base plates. The variable cost of refurbishing a station is assumed to be $1,100 per dock and would cover the replacement of the docking mechanism.

**Installation:** Capital costs also assume that every station will incur installation and site planning fees. Ten percent of stations are projected to require construction of a concrete pad or incur additional siting fees to obtain private easements, making the average installation cost per station $3,300 in FY2020. Ensure adequate street lighting in the vicinity of the bikeshare station.

**State of Good Repair:** The cash flow model considers long-term state of good repair (SGR) costs. It assumes that equipment has a certain probability of replacement in any given year. Conventional bicycles would be replaced at between nine and 12 years of age, with the replacement schedule projected out from existing bicycle usage data. E-bikes are assumed to have a shorter lifespan due to the limited operating history of these types of bicycles in large urban bikeshare programs—all e-bikes would be replaced between year six and year nine. Stations would be refurbished between nine and 12 years after initial installation. See **Table 12** for a breakdown of life cycle assumptions by equipment type.

**COVID-19:** The analysis presented in this report includes data through late 2019. This report does not include data or analysis related to the COVID-19 pandemic that was underway when the report was released. The results of the analysis included in the report, including the financial plan update, may be impacted as a result of the pandemic.

| Conventional Bicycles | | | | |
|---|---|---|---|---|
| Years After Initial Deployment | 9 | 10 | 11 | 12 |
| Proportion of Fleet | 15% | 25% | 35% | 25% |
| E-bikes | | | | |
| Years After Initial Deployment | 6 | 7 | 8 | 9 |
| Proportion of Fleet | 15% | 50% | 25% | 10% |
| Stations | | | | |
| Years After Initial Deployment | 9 | 10 | 11 | 12 |
| Proportion of Stations | 10% | 30% | 30% | 30% |

## Table 12: Equipment Life Cycle Assumptions

## Operating Cost Assumptions

Operating costs are based on DDOT's current operating contract with Motivate. Operating costs are calculated based on a per-dock fee of $99 per month. In addition to the per-dock fee, DDOT pays a fixed annual sum of approximately $803,000 for marketing and optional services.

## System Revenue Assumptions

Ridership: The District's Capital Bikeshare ridership per bicycle is projected to remain flat over the six-year period. Ridership has declined slightly over the last year, reversing over five years of year-over-year growth. A zero-percent assumption was considered conservative in light of declining ridership and the unknown impact of introducing e-bikes. The breakdown of ridership between casual users, or bikeshare users who purchase a short-term membership of one or three days, and registered members, bikeshare users who purchase a long-term membership of one or 12 months, as well as peak and off-peak season trips is based on historic and existing ratios.

Monthly trips at new stations are projected based on two variables. First, ridership rates vary depending on where the station is located. The market study (Chapter 3) and scenario planning exercise identify three unique market typologies. Second, ridership fluctuates based on whether a month falls into bikeshare's peak season (April through October) or off-peak season (November through March). **Table 13** displays the calculated average rate of trips per bike per day and the percentage of trips taken by registered users and casual users by market typology; different rates and percentages were assigned for peak and off-peak months.[1]

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[1] Ridership and trip rate assumptions are based on June 2018 to May 2019 trip data.

| Market Typology | Trips per Day/Bike | | Registered User Share | |
|---|---|---|---|---|
| | Peak Months | Off-Peak Months | Peak Months | Off-Peak Months |
| Access | 0.74 | 0.42 | 85% | 91% |
| Ridership | 4.60 | 2.82 | 84% | 91% |
| Revenue | 5.93 | 2.45 | 44% | 56% |
| Years After Initial Deployment | 6 | 7 | 8 | 9 |

**User Revenue:** User revenue is generated through membership fees, usage fees for trips lasting more than 30 minutes, and e-bike per-minute fees. User revenue is calculated according to the ridership assumptions listed in **Table 13**. Membership is calculated by taking total ridership and dividing it by average trips per registered and casual membership. Historical revenue data was used to identify how many user fees the average rider incurs per trip. Annual memberships generate $72 a year per member and an average of $3.41 per casual user. Based on current user data, registered annual member usage fees were calculated at an average of $0.16 per trip and casual user fees were calculated at $2.42 per trip. No historical data exists for e-bike revenue. The team looked at peer data from the City of Philadelphia to make a reasonable assumption, arriving at an assumed net revenue of $0.50 per trip.

Capital Bikeshare is a regional system with a revenue sharing agreement with the Cities of Alexandria, Fairfax, and Falls Church as well as Arlington, Montgomery, and Prince George's Counties. Revenue sharing was incorporated by setting the average revenue per membership and trip to solely the share received by the District.

**Advertising:** The model assumes a minimum guaranteed revenue of $231 per month per map panel under the District's current contract.

# FISCALLY CONSTRAINED FINANCIAL PLAN

## Expansion Capital Investments

The constrained expansion plan will cost $5.45 million to complete over the next six years (**Table 15**). Capital costs include new stations, bicycles, site planning, and installation costs. Over the next six years, the financial plan calls for DDOT to add 81 stations, and 850 bicycles to the program. The number of stations installed in any given year is constrained by the amount of state of good repair needs. In FY2022 and FY2023, station and bicycle replacement needs will peak, limiting DDOT's ability to expand the program in those years. As part of system expansion and state of good repair replacement, DDOT would purchase 1,311 e-bikes (**Table 14**).

| | FY20 | FY21 | FY22 | FY23 | FY24 | FY25 |
|---|---|---|---|---|---|---|
| Stations | 331 | 346 | 347 | 347 | 363 | 380 |
| Conventional Bicycles | 3304 | 3230 | 2997 | 2737 | 2621 | 2518 |
| E-bikes* | 11 | 243 | 487 | 747 | 1030 | 1311 |
| Docks | 6411 | 6696 | 6715 | 6715 | 7019 | 7342 |

| | FY20 | FY21 | FY22 | FY23 | FY24 | FY25 |
|---|---|---|---|---|---|---|
| # of New Stations | 32 | 15 | 1 | 0 | 16 | 17 |
| # of New Conventional Bicycles | 336 | 79 | 5 | 0 | 84 | 89 |
| # of New E-bikes | 0 | 79 | 5 | 0 | 84 | 89 |
| | | | | | | |
| Equipment Purchases | $1,831 | $975 | $65 | $0 | $1,102 | $1,194 |
| Installation Costs & Startup | $108 | $51 | $4 | $0 | $58 | $63 |
| SUBTOTAL | $1,939 | $1,026 | $69 | $0 | $1,161 | $1,257 |

Table 14:
System Size
By Year

Table 15:Capital
Costs for Expansion
Investments
FY2020- FY2025
($thousands)

## State of Good Repair Investments

In addition to the cost of new capital, the system must prepare for equipment replacement and state of good repair costs, estimated in **Table 16**. Capital Bikeshare was one of the first bikeshare programs in the country, and equipment is at the end of its life cycle. Bicycles are expected to last approximately 10,000 trips before needing to be replaced; based on current ridership rates, the first cohort of bicycle replacements will occur in FY2020, with bicycle replacement needs peaking in FY2023. In addition, payment kiosks and other station infrastructure are assumed to need replacement every nine to 12 years, leading to end of life station replacement costs peaking in FY2023. State of Good Repair costs are expected decline from their peak in FY2023 before climbing again in the late 2020's. This pattern is driven by the original rate of program expansion (see **Figure 25**).

**Table 16: State of Good Repair Costs ($thousands)**

|  | FY20 | FY21 | FY22 | FY23 | FY24 | FY25 |
|---|---|---|---|---|---|---|
| **Stations Rehabilitated** | 10 | 32 | 44 | 54 | 31 | 24 |
| **Conventional Bikes Purchased** | 77 | 218 | 298 | 315 | 252 | 242 |
| **E-bikes Purchased** | 11 | 158 | 248 | 275 | 220 | 218 |
|  |  |  |  |  |  |  |
| **Station Rehabilitation** | $278 | $969 | $1,342 | $1,650 | $925 | $728 |
| **Bicycle End-of-Life Replacement** | $40 | $551 | $876 | $974 | $762 | $748 |
| **Vandalism and Theft Replacement** | $81 | $93 | $101 | $110 | $124 | $139 |
| **Installation** | $29 | $99 | $138 | $173 | $99 | $79 |
| **TOTAL** | $428 | $1,712 | $2,457 | $2,906 | $1,911 | $1,693 |



Figure 25: 15-Year State of Good Repair Costs
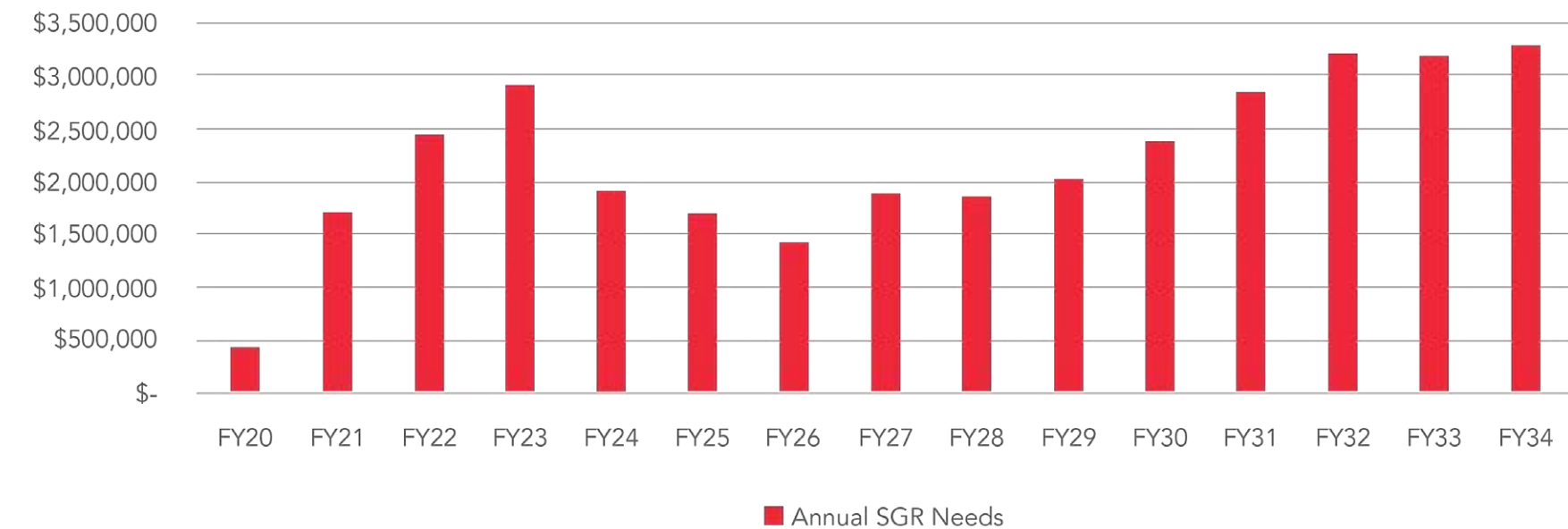
## Operating Costs and Ridership

**Table 17** summarizes the projected operating revenue for Capital Bikeshare in the District over the next six years. The program is expected to recover 90 percent of its operating costs from advertising, proffer, and user revenue in FY2020 of the plan; the cost recovery ratio is anticipated to increase to 96 percent by FY2025. Though the revenue model assumes stagnant ridership over the next six years, the introduction of e-bikes will add a new source of revenue for the program, helping drive growth in operating revenue. (see **Figure 26**).

Table 17: Operating Revenue FY2020-25 ($thousands)

| | FY20 | FY21 | FY22 | FY23 | FY24 | FY25 |
|---|---|---|---|---|---|---|
| **Annual Ridership (1,000s)** | 3598 | 3784 | 3827 | 3828 | 3916 | 4058 |
| | | | | | | |
| **User Revenue** | $6,070 | $6,536 | $7,139 | $7,283 | $8,041 | $8,498 |
| **Advertising Revenue** | $873 | $942 | $961 | $962 | $988 | $1,034 |
| **Development Proffer Revenue** | $340 | $347 | $354 | $361 | $368 | $375 |
| **Operating Revenue Subtotal** | $7,283 | $7,825 | $8,453 | $8,605 | $9,396 | $9,907 |
| | | | | | | |
| **Contractor Variable Costs** | $7,252 | $7,967 | $8,287 | $8,462 | $8,859 | $9,450 |
| **Contractor Fixed Costs** | $803 | $819 | $835 | $852 | $869 | $886 |
| **Operating Cost Subtotal** | $8,055 | $8,786 | $9,122 | $9,314 | $9,728 | $10,336 |
| **Cost Recovery Ratio** | 90% | 89% | 93% | 92% | 97% | 96% |
| **OPERATING BALANCE** | -$772 | -$961 | -$669 | -$709 | -$332 | -$429 |

Figure 26: Breakdown in Projected Revenue Sources, FY2020-25
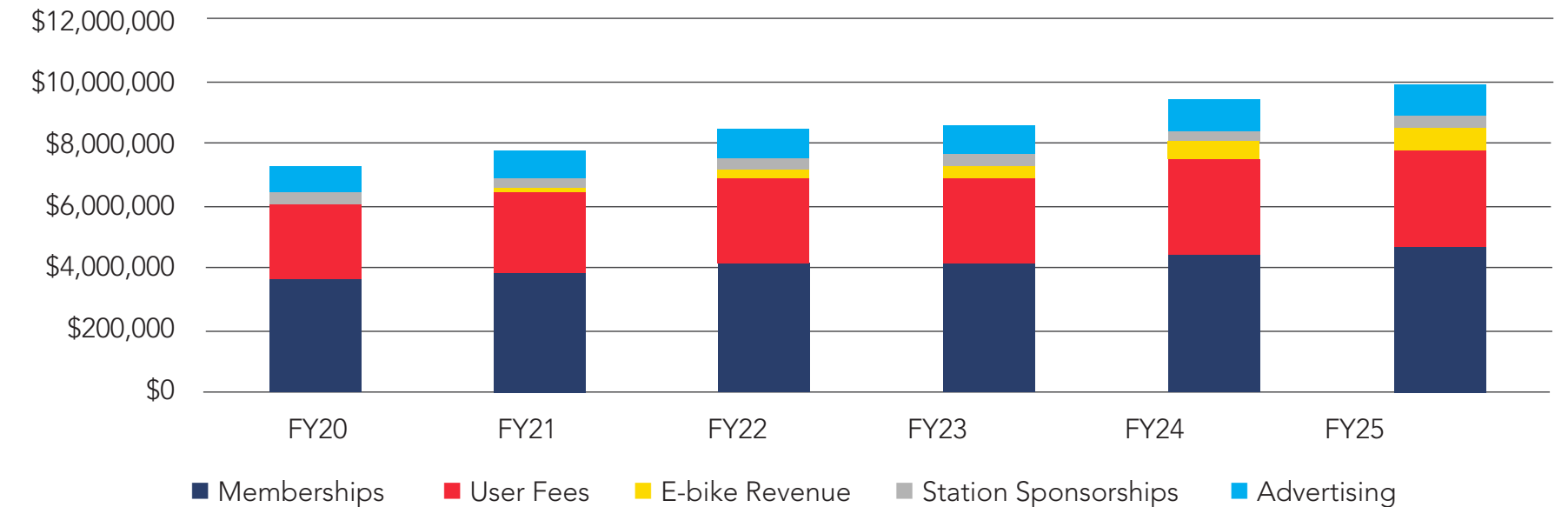
## Constrained Funding Balance

The constrained capital plan assumes that the amount of public funding support for the Capital Bikeshare system will remain flat at 2019 levels. Adjusted for inflation, this means the share of public funds used to support operating and capital costs will decline as a percentage of the program's total budget. DDOT's Capital Improvement Plan allocates $2.217 million a year to bikeshare capital costs in FY2020 and FY2021. The model carries that amount of funding forward through the life of the plan. On the operating side, DDOT covers any shortfall in the operating budget through General Fund revenue; the constrained capital plan assumes that the amount of General Fund revenue available may not exceed $1.2 million a year. Capital funds cannot be spent on operating expenses; however, any surplus of operating funds can be spent on capital needs.

The constrained capital program was driven by two factors: the number of expansion stations added in each given year and the ridership typology in which those expansion stations were placed. These factors were adjusted to yield as close as possible to a zero cumulative funding balance by FY2025. See **Table 18** for more details.

**Table 18: Operating Revenue FY2020-25 ($thousands)**

| | FY20 | FY21 | FY22 | FY23 | FY24 | FY25 | 5-Year Total |
|---|---|---|---|---|---|---|---|
| Annual Capital Fund Contribution | $2,217 | $2,217 | $2,217 | $2,217 | $2,217 | $2,217 | $13,302 |
| Annual Capital Need | $2,367 | $2,738 | $2,526 | $2,906 | $3,071 | $2,950 | $16,559 |
| Cumulative Net Capital Revenue | -$150 | -$671 | -$980 | -$1,669 | -$2,523 | -$3,257 | |
| | | | | | | | |
| Operating General Fund Contribution | $1,200 | $1,200 | $1,200 | $1,200 | $1,200 | $1,200 | $7,200 |
| Annual Operating Budget Need | $772 | $961 | $669 | $709 | $332 | $429 | $3,871 |
| Cumulative Net Operating Revenue | $428 | $667 | $1,199 | $1,690 | $2,558 | $3,329 | |
| | | | | | | | |
| NET CUMULATIVE FUNDING BALANCE | $279 | -$4 | $219 | $21 | $34 | $72 | |

# CONCLUSION

The projections show that DDOT will have to slow the pace of Capital Bikeshare's expansion to ensure funds are available to maintain and replace equipment reaching the end of its useful life. The program has adequate funding to expand by 81 stations, or 30 percent. Half of those stations would be placed in infill locations with high demand or revenue potential and the other half would be used to expand Capital Bikeshare's geographic coverage. Introducing e-bikes is expected to increase the program's operating revenue through the additional fees charged for e-bike trips. Other fund sources, including advertising, public capital funds, and general fund revenue, are anticipated to remain flat or track simply with inflation and system size.

## Managing Unknowns

Planning for the long term in a rapidly changing industry like micromobility is challenging. The competitive dynamics and cost pressures are constantly changing. As Capital Bikeshare was one of the first large-scale bikeshare programs in the country, DDOT will also be one of the first agencies to grapple with large-scale equipment rehabilitation and replacement needs. The expansion plan (Chapter 4) proposed by this study is structured to help guide DDOT in instances where there are additional resources available for system expansion. There are a few key unknowns that could positively or negatively impact Capital Bikeshare's costs and revenue.

## Contracting Structure

DDOT currently uses a fixed-priced contract for operating Capital Bikeshare. Motivate is reimbursed a fixed fee per dock to operate the program; all program revenue goes directly to DDOT and is then used to offset the costs of program operations. If this contracting structure was to change (see business plan, Chapter 6), the funding outlook for Capital Bikeshare could change as well.

## E-bike User Revenue

The financial model assumes that e-bikes will become an important source of operating revenue growth. DDOT and the other jurisdictional partners have not yet procured e-bikes for Capital Bikeshare, and the initial re-launch of e-bikes in the system will consist wholly of bicycles owned and operated directly by Lyft. No details exist yet as to how a mixed e-bike fleet of privately- and publicly-owned bicycles will function.

## State of Good Repair Costs

The biggest unknown impacting the financial plan are future state of good repair investments. The team prepared a cost estimate based on the best information available today. However, since the bikeshare mode emerged relatively recently, there is no robust data available on the useful life of equipment. Equipment degradation and failure rates do not follow a linear line, and equipment could reach a tipping point where components begin to degrade or break at a more rapid rate. In other words, the failure rate of a nine-year-old dock could be a poor predictor of the failure rate of an 11-year-old dock.

State of good repair costs are also driven by changes in bikeshare technology. This financial model assumes that Capital Bikeshare will continue to operate as a station-based system, but move toward a mixed fleet of conventional and electric assist bicycles. If Capital Bikeshare transitioned entirely to a stationless system or phased-out conventional bicycles entirely, the capital costs for the program would change substantially.

capital bikeshare

# business plan

**The Capital Bikeshare Development Plan update provides DDOT an opportunity to revisit the business model for Capital Bikeshare, specifically program funding, technology, governance, and operations.** The study team held meetings with DDOT and the Capital Bikeshare board, which consists of representatives from all member jurisdictions, to develop a better understanding of the strengths and shortcomings of the program. These discussions highlighted some ongoing issues the program faces, such as how to simplify the existing fee structure for users, make the program more competitive with dockless micromobility services, improve decision-making, and suitably align incentives with responsibilities across the various entities in charge of overseeing and operating Capital Bikeshare.

The Business Plan is intended to provide DDOT guidance on a variety of organizational and operational decisions that may arise over the next five years. Based on discussions with DDOT and its Capital Bikeshare partners, the Business Plan is divided into the following sections:

• Fee Structure

• Technology

• Governance

• Operations

In developing the Business Plan, the study team wants to recognize the ways Capital Bikeshare stands apart from other micromobility providers in the District, notably:

• As a publicly-funded program, Capital Bikeshare is mission-driven as opposed to profit-driven. The program can invest resources in subsidized pass options and make system planning decisions based on public policy and the social good.

• The system has a large and stable base of annual members who form its core ridership.

• Private providers have greater freedom to experiment with pricing and "pivot" their business model. As the District's largest and oldest micromobility provider, Capital Bikeshare has an incentive to evolve in a somewhat conservative fashion in order to ensure the program does not alienate its customer base.

• As a regional program, DDOT must be sensitive to how decisions it makes impacts all other participating jurisdictions.

# FEE STRUCTURE

Capital Bikeshare's existing fare structure is designed to incentivize the quick turnover of bikes and encourage riders to join as long-term members. Users have the option to purchase memberships of various lengths, which entitle riders to free bikeshare trips below 30 minutes. Capital Bikeshare also offers a $2 single-trip fare. All fares begin charging users fees after their first 30 minutes, with fees escalating the longer a bike has been out. The discount associated with a monthly or annual membership over a short-term membership, coupled with the short average trip times, means that registered users pay only $0.80 per trip compared to $4.71 for casual users. While registered users account for approximately 77 percent of trips, they generate a little over a third of total revenue.

There are several challenges associated with the current fee structure.

• Registered users provide a minority of revenue but a majority of riders. As Capital Bikeshare has one of the lowest annual fees for a major bikeshare system, there is room to increase prices. Chicago's Divvy and Boston's Blue Bikes both charge $99 per year, Philadelphia's Indego, $156 a year, and New York's Citi Bike, $169 a year.

• Escalating fees are difficult to understand and penalize unfamiliar riders. Instead of charging a flat rate for every additional unit of time, Capital Bikeshare's user fees increase the longer the bicycle has been out. The first extra 30 minutes of a trip costs $2 for casual users while each additional 30 minutes after 90 minutes of riding cost $8. A first-time user may be dissuaded from using the system after incurring a higher-than-expected bill. Likewise, the pricing structure incentivizes riders to game the system by returning and taking out bicycles midway through a journey to avoid fees.

• The existing fee structure creates a higher barrier to entry than the per-minute pricing of dockless competitors. The average casual user trip on Capital Bikeshare costs $4.71, lower than what the equivalent trip would cost if priced like a competitor such as JUMP; approximately half of that cost is attributed to fixed membership fees. Unlike JUMP, which charges solely per minute, Capital Bikeshare users must first purchase a single trip for $2 or a day pass for $8.

I really love Capital Bikeshare. It saves me money, is a super enjoyable way to get places, and is good for the environment. Perhaps Capital Bikeshare could lobby for more bike lanes. Would probably encourage more people to bike.

—User survey response

## Competitor Prices

An important starting point for determining the ideal pricing for Capital Bikeshare is to evaluate the prices charged by competing private micromobility providers. Dockless bikeshare and scooter operators all charge users per minute, with all but JUMP and Bolt also charging a flat $1 unlock fee.

## Table 19: Pricing by Competitor Micromobility Providers

| Company | Unlock Fee | Cost per Minute | Cost of a 20-Minute Ride |
|---|---|---|---|
| Bird | $1 | $0.39 | $8.80 |
| Bolt | None | $0.30 | $6.00 |
| JUMP | None | $0.25 | $5.00 |
| Lime | $1 | $0.24 | $5.80 |
| Lyft | $1 | $0.24 | $5.80 |
| Razor | $1 | $0.24 | $5.80 |
| Skip | $1 | $0.25 | $6.00 |
| Spin | $1 | $0.25 | $6.00 |
| Capital Bikeshare | N/A | N/A | $0.64-$2.30[1] |

Source: The Washington Post

1 Based on average utilization by pass type. Cost varies by pass type.

# POSSIBLE CHANGES TO PRICING

Capital Bikeshare has steadily lost casual users, even as the District has seen significant growth in overall micromobility ridership in the last two years. Simplifying the fare structure for casual users could help make Capital Bikeshare more competitive with dockless systems. The challenge is to ensure that any changes to pricing do not negatively affect the user revenue going into the system. More significant changes to the pricing structure, such as moving entirely to a per-minute price for casual users, would likely require some adjustment to registered user pricing too.

The study team modeled out the following scenarios to better understand how pricing changes would impact revenue. These findings are based on the existing distribution of trips by user type and duration. Due to the lack of suitable data, no price elasticity is considered; in other words, the analysis does not increase or decrease ridership based on the price charged.[2]

- **Option 1:** Move toward a uniform price per 30 minutes for casual users. Keep registered user pricing the same.

- **Option 2:** Move toward a per-minute price for casual users. Registered users after the first 30 minutes would pay a per-minute user fee.

- **Option 3:** Eliminate memberships and move entirely to a per-minute fee structure

Instead of comparing the impact across the various pass options, the assessment looked merely at the impact of price changes on the average casual and registered user revenue.

Capital Bikeshare jurisdictions mentioned a few additional pricing options we do not recommend. One was to eliminate the annual membership and shift toward only offering casual users a monthly pass. Today, the monthly pass has very low participation rates, with annual members accounting for the vast majority of trips. Eliminating the annual option may result in users leaving the system; moreover, a monthly membership structure would incentivize users to cancel their memberships during the winter months, potentially depressing off-peak ridership.

The second option discussed was increasing the fee-free period to 60 minutes. Assuming the program wants to remain revenue neutral, increasing the fee-free period would lead to higher pass prices. As a large share of trips are under 30 minutes, it is in the program's interest to reduce barriers to use for short discretionary trips.

## Option 1: Simplified Casual User Pricing

Under this scenario, casual user pricing would be simplified so riders pay only per 30 minutes of ride time. No changes would be made to registered user ridership. To remain revenue neutral, shorter casual trips would become more expensive, while longer trips would become cheaper. The study team estimates that under this option, Capital Bikeshare would need to charge approximately $3.50 per 30 minutes to generate the same amount of casual revenue as the current system pricing. This amount represents an approximately 53 percent increase in fares for casual user trips below 30 minutes (based on existing average pass revenue per casual trip), but a decrease in fares for users taking trips over 60 minutes.

Thirty-minute incremental pricing is challenging to compare to the per-minute pricing of dockless competitors. A 20-minute long trip at $0.25 per minute costs $5, 43 percent more than the same Capital Bikeshare trip under this pricing model. Dockless services would be cheaper for trips under approximately 10-15 minutes.

## Option 2: Per-Minute Casual User Pricing and Higher Registered User Pricing

Another option for changing Capital Bikeshare's fee structure is to adopt a similar per-minute price as dockless services for casual users. In order for Capital Bikeshare's per-minute pricing to remain competitive with dockless micromobility and remain revenue neutral, annual and monthly membership prices would also have to increase. For example, DDOT could achieve a similar amount of total user revenue under the following pricing structure:

- a $1 unlock fee and $0.15 per minute user fee for casual users

- a 25 percent increase in annual and monthly passes combined with a $0.15 per minute user fee after the first 30 minutes for registered users.

Fifteen cents per minute was considered competitive with dockless services as Capital Bikeshare conventional bikes would be competing with dockless e-bikes and scooters. An additional surcharge of $0.10 per-minute could bring the price of future Capital Bikeshare e-bikes in line with local competitors.

The benefit of Option 2 is that Capital Bikeshare's pricing becomes more similar with dockless operators without eliminating Capital Bikeshare's annual option. Registered users form the base of Capital Bikeshare ridership and renew at a high rate. Eliminating registered member options could alienate a large segment of Capital Bikeshare users. The low cost of the existing membership, combined with higher membership prices in all peer cities, points to the feasibility of increasing registered user prices without significantly impacting ridership.

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2 There is a limited research on micromobility price elasticity. Rates from other modes such as public transit are likely a poor comparison to Capital Bikeshare due to the differences in pricing models, trip lengths, and user incomes. The most relevant previous research on price elasticity is Kaviti, S. 2018, PROFILES, PREFERENCES, AND REACTIONS TO PRICE CHANGES OF BIKESHARE USERS: A COMPREHENSIVE LOOK AT CAPITAL BIKESHARE DATA. The study found greater price sensitivity among single-trip users than annual users. The study estimates that a 25 percent increase in single-trip prices would lead to a 33 to 48 percent decrease in single-trip ridership and a 14 percent increase in annual membership prices would lead to a 30 to 39 percent decrease in ridership. These findings have limited applicability for Capital Bikeshare due to the study being conducted before dockless competition emerged and the reliance on stated-preference surveys to calculate elasticities as opposed to observed changes in ridership.

## Option 3: Uniform Per-Minute Pricing for All Users

The most radical change to system pricing outlined here is to eliminate the registered user membership and move entirely to a per-minute pricing model. Assuming the existing level of ridership and average trip duration, Capital Bikeshare would have to charge $0.10 per minute (with no unlock fee) to remain revenue neutral. This price would be substantially cheaper than dockless competitors. Capital Bikeshare could offer per-minute prices below those outlined in Option 2 because of the higher revenue generated per registered user trip, combined with the reduced impact of inter-jurisdictional revenue sharing on DDOT revenue.[3] The average registered user trip generates only $0.80 in revenue, largely due to the high number of trips per pass sold (112 trips) and small amount of overage fees generated by these riders.

This option addresses the key shortcomings of the current pricing structure but also carries the most risk. As previously stated, registered users form Capital Bikeshare's core users, and eliminating an annual member option may drive riders to other micromobility services. Under this option, there would be less market differentiation between Capital Bikeshare and other services.

## E-BIKE USAGE CHARGES

As outlined in the expansion plan, the study team recommends that Capital Bikeshare introduce e-bikes to the system. The market shows a strong preference for e-bikes and in other systems e-bikes are used at a much higher rate than conventional bicycles. To offset the cost of purchasing and operating e-bikes, Capital Bikeshare should charge an additional fee for e-bike trips. Prices of around $0.10 to $0.15 per minute would allow Capital Bikeshare's e-bikes to remain competitive with other micromobility services.

## CAPITAL BIKESHARE FOR ALL

Capital Bikeshare is committed to making the program accessible and affordable to all District residents. Five dollar annual memberships are available through the Capital Bikeshare for All program for residents who qualify for a variety of low-income assistance programs, including the Supplemental Nutrition Assistance Program (SNAP) and Temporary Assistance for Needy Families (TANF). These discounted memberships can be purchased through several methods that accommodate cash-based, pre-payments, and debit. Capital Bikeshare program staff work with Community Partner organizations to connect low-income residents with discounted memberships. A full list of partner organizations and program details is available at https://www.capitalbikeshare.com/pricing/for-all.

Capital Bikeshare for All understands the importance of providing e-bike discounts and will work to increase marketing and outreach efforts to promote low income assistance programs.

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3 DDOT receives all usage fees for trips starting or ending in the District. Membership revenue is split among Capital Bikeshare jurisdictions based on their share of docks and member billing zip code, regardless of where actual bikeshare trips start or end.

# TECHNOLOGY

Capital Bikeshare's technology platform has changed little since 2010. The widespread adoption of smartphones, app-based mobility services, lower battery costs, and the development of dockless micromobility technology have all had major impacts on bikeshare. Over the next five years, Capital Bikeshare should continue to invest in its technology platform to ensure the system is competitive with other mobility options.
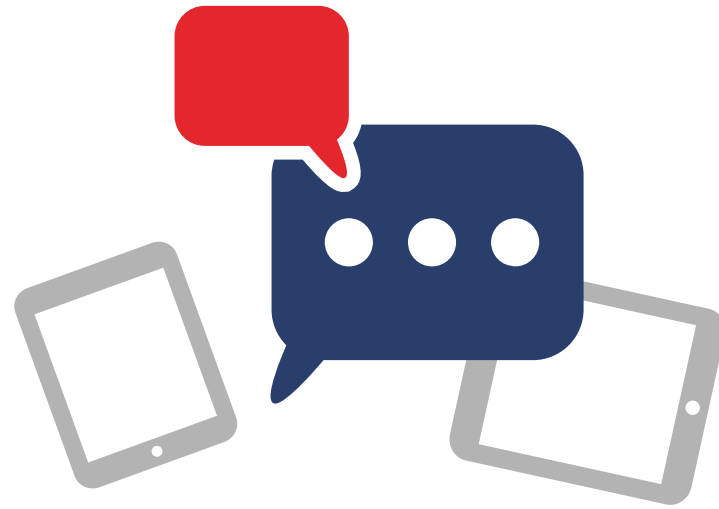
## Electrification

In the 2019 Capital Bikeshare user survey, the re-introduction of e-bikes was a highly requested improvement to the system. While Lyft already plans to phase their latest e-bike model into Capital Bikeshare, these bicycles will be owned by Lyft, and additional user charges to unlock them would go directly to Lyft. DDOT should procure its own sub-fleet of e-bikes to ensure the District is positioned to capture ridership and revenue generated by the shift from conventional to e-bike trips. The introduction of e-bikes poses certain organizational and financial challenges, notably:

- How would DDOT, Lyft, and other jurisdictions in the Capital Bikeshare system distribute revenue generated by e-bikes?

- How can DDOT ensure that Motivate equitably manages Lyft-owned and DDOT-owned e-bikes, especially if there is a revenue differential to Lyft for trips on their own e-bikes versus jurisdiction-owned e-bikes.

- How should DDOT price e-bike trips compared to conventional Capital Bikeshare trips (see discussion in previous section)?

- How can Capital Bikeshare effectively manage a mix of conventional station-based and electric hybrid dockless bicycles?

## Mobile App Integration

Capital Bikeshare was launched before smartphones and mobile apps were as ubiquitous as today. The primary method of accessing the system is through a key-fob for registered users or through the kiosk for casual users. Lyft and Motivate are working to further integrate Capital Bikeshare into the Lyft platform. DDOT should work with Lyft to expand mobile-app integration, notably integrating the ability to locate and unlock bicycles into popular trip planning and mapping platforms. Better app integration will allow Capital Bikeshare to provide riders the same low barrier of use as dockless competitors.

As Capital Bikeshare aims to attract low-income and minority groups, key fobs and cash payment systems will remain as an option for accessing Capital Bikeshare.

## Light Stations

The latest generation of Capital Bikeshare e-bikes can be locked to themselves, to a fixed object like a bike rack, or in a Capital Bikeshare dock. This hybrid technology makes "light" stations that consist merely of signage and bicycle racks feasible. Such stations would require significantly less space than traditional stations and cost a fraction of the price.

Light stations would allow Capital Bikeshare to densify the system and cost-effectively add stations in lower-demand areas. Like electric bicycles, light stations raise a number of operational and management questions:

- Should Capital Bikeshare permit hybrid bicycles to end trips at any bicycle rack or be limited to classic and light stations?

- Would light stations double as public bike racks or be reserved exclusively for Capital Bikeshare bicycles? If the latter, how can these stations be effectively designed and branded to ensure the public does not mistake them for regular bicycle racks?

- How can the program effectively communicate to users that only some Capital Bikeshare bicycles have the capability to be parked at light stations?

It's important that DDOT and its partners take leadership in deciding how future hybrid bicycles and stations will be deployed. Lyft will be introducing hybrid bicycles and the deployment of these bicycles will likely guide how any future DDOT-owned equipment is integrated into Capital Bikeshare.

# GOVERNANCE

While for the user, Capital Bikeshare presents itself as one unified system, the program is operated in a decentralized manner. Each jurisdiction participating in the program directly contracts with Motivate, the program operator. Stations and equipment are owned by individual jurisdictions, not collectively. User revenue is shared between jurisdictions based on a number of factors, from the home address of the user to each jurisdiction's share of systemwide docks. Any decisions impacting the system are made jointly by the Capital Bikeshare board, which consists of representatives from all participating jurisdictions.

This fairly informal governance model has served Capital Bikeshare well over time. The structure has allowed the system to grow and expand to new jurisdictions, but it also presents some key challenges for the program. Capital Bikeshare functions on a de facto consensus model, which can make it harder to move forward major changes to the system. Distributing responsibility for the system across multiple local governments also makes Capital Bikeshare less nimble. Member jurisdictions agree that the current structure sometimes impedes a rapid response to issues. As DDOT has the largest share of Capital Bikeshare stations, they often are left with the task of making decisions that impact the whole program and set important precedents.

## Centralized Approach to Management

The first alternative is to implement centralized management and oversight of the program. In this alternative, a public body or non-profit would be responsible for managing Capital Bikeshare on behalf of all participating jurisdictions. Each jurisdiction would have voting representation in the organization. Decisions could require majority approval instead of consensus among all member jurisdictions. Instead of each jurisdiction independently procuring and overseeing their portion of Capital Bikeshare, one organization could hold responsibility for day-to-day management, procurement, and budgeting.

While centralized management would respond to the shortcomings of the program's existing governance model, it raises new concerns. Any new organization responsible for managing the program regionally would generate its own administrative costs and require ongoing funding. Centralized management of the program also creates greater distance between the jurisdictions that are responsible for funding the system and daily decision-making. It's unlikely that a centrally managed Capital Bikeshare program could obligate jurisdictions to fund investments not agreed to by consensus. Presently, if DDOT wants to address a shortcoming in the program, they can take on responsibility for funding and implementing changes within their portion of the network. This direct relationship between funding and implementation responsibilities would be weakened in a centralized management approach.

## Decentralized Approach to Management

DDOT and Capital Bikeshare's other jurisdictions can address the shortcomings of the existing governance model without completely abandoning its decentralized structure. One strategy mentioned by member jurisdictions is to revisit and expand the standard operating procedures (SOPs) for Capital Bikeshare so that member jurisdictions and Lyft can more quickly and consistently respond to issues as they arise.

The Capital Bikeshare board could have the power to review and veto any proposed procurement of new equipment or operations services to ensure future investments conform with a common station and bicycle specification.

To improve nimbleness in decision-making, Capital Bikeshare could also establish a chain of command among member jurisdictions. For example, member jurisdictions could elect a board president and deputize that person to respond to emergencies or other quick-response issues that arise outside the normal reporting structures.

# OPERATIONS

Since its launch in 2010, Capital Bikeshare has relied on a third-party vendor to operate the program. Each jurisdiction contracts out with Lyft/Motivate to run the system in exchange for a fixed fee per dock. While this structure has worked well for the member jurisdictions, there are still opportunities to improve how operations are structured and contracted to more suitably align incentives with responsibilities.

## Net-Cost Payment Structure

DDOT currently budgets for Capital Bikeshare based on the total cost of operating the program, not the net cost. This means that as the system expands, DDOT must increase the budget authorization for the program, even if the net cost of operating the program remains the same. If DDOT could modify the contract so that the vendor only charges the agency for net operating costs, the budget authorization necessary for Capital Bikeshare would be significantly less.

## Incentivizing Performance

DDOT and other Capital Bikeshare jurisdictions raised concerns that the existing operating contract does not include suitable mechanisms for enforcing performance contracts and incentivizing the operator to meet or exceed the contract's service level agreements (SLAs). The public sector has made substantial investments in capital equipment and operating subsidies for bikeshare, but the overall delivery of service and upkeep of equipment falls on the operator. Jurisdictions have limited recourse if the operator fails to meet any agreed-upon measures such as charging liquidated damages or penalties. Moreover, the operator lacks a direct financial stake in ensuring

the program generates strong ridership and revenue. There are a variety of strategies that could be deployed in the next contract to ensure DDOT has greater power to enforce operating standards:

- Include in the contract an option to charge a penalty or fine for failure to meet SLAs.

- Provide the operator a fee bonus for exceeding certain performance measures.

- Outline liquidated damages in the contract.

- Require the operator to provide a performance bond or security as guarantee for contract performance.

- Implement cost or risk sharing measures (see following section) to better incentivize contractor performance.

## Risk and Cost Sharing

Increasingly, the industry is moving away from fee-for-service operating contracts toward greater cost/risk sharing. Vendors are taking on responsibility for sponsorship and advertising revenue acquisition, as well as member recruitment and retention. While the current operating contract incentivizes the operator to maintain operating costs below a certain level, there are no incentives in place for them to increase revenue or ridership. Today DDOT is responsible for paying Lyft the same per-dock operating cost, regardless of ridership or operating revenue.

A contract with greater cost and revenue sharing could help transfer some risk to the operator while better aligning incentives with the operator's existing scope of work. There are a few

different ways such contracts are structured. Some cities follow a franchise or concession model where the operator runs the bikeshare program at no cost to the public in exchange for a greater degree of control over revenue generation. For example, New York neither owns the equipment nor subsidizes the operations for Citi Bike. In exchange for funding the Citi Bike system, its operator (Motivate) receives all operating revenue, including a highly valuable outdoor advertising presence and title sponsor.

Other programs still retain a greater degree of control over the system but engage in revenue and cost sharing. For example, DDOT could enter into an operating contract where the operator agrees to run the system in exchange for a public subsidy and a share of operating and ancillary (e.g. sponsorship, advertising) revenue. In such a scenario, DDOT would only be responsible for subsidizing operations up to a certain point. If the program saw a shortfall in rider revenue over what was initially budgeted, the operator could be responsible for covering some or all of the shortfall. Conversely, if revenue was higher than expected, that additional revenue could flow directly to the operator. In a risk sharing model, the operator would be directly incentivized to both lower operating costs and increase revenue. The operator would share the risk associated with any major changes to Capital Bikeshare's business model and pricing structure.

Cost and risk sharing arrangements also allow DDOT to tap into private capital. The operator could be required to provide capital for expansion and state of good repair in exchange for a share of future revenue. DDOT has already agreed to something similar through Lyft's introduction of e-bikes to the system: Lyft is providing these bikes at no cost to DDOT in exchange for revenue from additional unlock fees and out-of-station charges.

## Downside to Cost and Risk Sharing

DDOT's existing contracting model gives the District extensive control over the direction of the Capital Bikeshare program. Moving toward a cost and risk sharing contract will mean that the operator will have a greater say in operations, including potentially any decisions around capital and operating.

Sharing costs and revenue with a private entity exposes DDOT to a new set of risks. If Lyft were to walk away from operating Capital Bikeshare today, DDOT would simply have to procure a new vendor for the program. While such a process would be disruptive, the basic business model for the program would be unchanged. Under a cost and risk sharing model, a vendor may prematurely terminate a contract or abruptly exit the bikeshare market, saddling DDOT with unexpected new costs or the loss of equipment. The micromobility market has seen a great deal of turnover as companies enter and exit the market.

Finally, any change to the fundamental contract structure could jeopardize the integrity of the regional Capital Bikeshare system. The economics of operating bikeshare in the suburbs is very different from within the District, which may necessitate different types of operating contracts between each jurisdiction and the operator.

# CONCLUSION

Since the last Capital Bikeshare Development Plan was completed, the District's micromobility market has changed significantly. The arrival of private dockless bikes and scooters has introduced direct competition to Capital Bikeshare. The District's public now has a variety of micromobility options to choose from. Over the last year, Capital Bikeshare ridership growth has stagnated, with dockless operators capturing a larger share of the users who generate the most revenue for Capital Bikeshare—casual users. This Business Plan recognizes that Capital Bikeshare today must effectively compete with and differentiate itself from other micromobility providers in the District to remain relevant.

**Pricing** is the first area where Capital Bikeshare can evolve to better compete. The program's pricing structure today creates a high upfront cost barrier for casual users, and the escalating user fee structure is not as intuitive as the flat per-minute pricing used by most dockless services. Simplifying the fee structure will invariably lead to some losers and winners. Today, casual users pay nearly four times as much per trip as registered users, and many of the options for simplifying the fare structure will result in an increase in registered user fees and a decrease in casual user fees. Capital Bikeshare will have to be careful to not alienate its core ridership base of registered users. The cost of an annual membership today is substantially lower than many of Capital Bikeshare's peers, and the price increases modeled in this report would still result in fees that compare favorably to dockless services in the District and bikeshare programs in other major cities.

Adopting new **technology** is another strategy to reverse Capital Bikeshare's ridership decline. The introduction of e-bikes was the top requested improvement in the 2019 member survey. All the private dockless services offer electric scooters or bicycles. Other bikeshare programs have reported that e-bikes, even when priced at a premium, outperform conventional bicycles in trips per bike. While electrification is a key improvement for the program, Capital Bikeshare should also explore ways to make the bikeshare user experience more seamless, including better mobile app integration.

Changes to Capital Bikeshare's **governance** structure can help make the program more responsive to market changes and competitive pressure. Today the program operates on a de facto consensus model. Strengthening the program's standard operating procedures, creating a more centralized board or governance structure, and deputizing a jurisdictional representative to make decisions are all ways to streamline program governance.

Finally, the program's **operating** model could be revised to improve contractor performance and responsiveness. DDOT has a variety of options at its disposal, from implementing stronger penalties or fees for failing to meet contract targets, to adopting a risk/cost sharing contract model. The ideal contracting model will depend on a variety of factors, including DDOT's appetite for risk, private sector interest in alternative contracting options, and input from other member jurisdictions.

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a

## Table A-1: Factors, Normalization Method & Weighting

| Measure | Normalization | Weighting | | |
|---------|---------------|-----------|---|---|
| | | **High Ridership** | **High Revenue** | **Public Welfare** |
| A) Bikeshare Trip Generation Index | Proportional method, constrained at 0 as the minimum, and the 99.5 percentile (3.26) as the max score of 1. | 1 | | |
| B) Motorized Trips Under 3.5 Miles | Proportional method, constrained at 0 as the minimum, and the 99.5th percentile (346 trips / acre) as the max score of 1. | 1 | | |
| C) Density of WMATA Boardings | Proportional method, constrained at 0 as the minimum, and the 95th percentile (3,678 transit boardings ) as the max score of 1. | 1 | | 1 |
| D) Density of Bicycle Infrastructure | Proportional method, constrained at 0 as the minimum, and the 95th percentile (8,758 ft of bicycle lane/path) as the max score of 1. | 1 | 1 | |
| E) Density of Retail and Hospitality Employment | Proportional method, constrained at 0 as the minimum, and the 90th percentile (1,862 jobs per square mile as the max score of 1. | 1 | 1 | |
| F) Density of Hotel Rooms | Proportional method, constrained at 0 as the minimum, and the 99th percentile (1,520) as the max score of 1. | | 2 | |
| G) Attendance at Major Tourist Destinations | Destinations classified by attendance. Locations with fewer than 1 million visitors/year =0.33; Under 4.17 million visitors = 0.67; Above 4.17 visitors = 1. | | 2 | |
| H) Designation as National Mall | Destinations coded as in or outside the National Mall. Binary variable of 0 for no and 1 for yes | | 2 | |
| I) EJ Population – Poverty Population Density | Proportional method, constrained at 0 as the minimum, and the 99th percentile (31,186) as the max score of 1. | | | 2 |
| J) EJ Population – Minority Population Density | Proportional method, constrained at 0 as the minimum, and the 99th percentile (20,565) as a max score of 1. | | | 2 |
| K) High Obesity Populations | Proportional method, constrained at 0 as the minimum, and the 99th percentile (13,724) as a max score of 1 | | | 2 |
| L-1) Total Population Density | Based on the following density breakpoints: Less than 3,333/ sq mile = 0; 3,333-6,666/ sq mile = 0.2 ; 6,666-10,000/ sq mile = 0.4 ; 10,000-15,000/ sq mile=0.6; 15,000-30,0000/ sq mile = 0.8; higher than 30,000 people/ sq mile = 1.0 | 2 | .5 | 1 |
| L-2) Employment Density | Based on the following job density breakpoints: no jobs = 0; 1-10/acre =0.2; 11-75/ acre; 0.6; 76-150/acer =0.8; 150+=1 | 2 | .5 | 1 |
| M) Density of Public Services and Grocery Stores | Greater than 2=4; 1-2= 0.5 | | | 1 |
| N) Change in Elevation | 99.5% (164) | -1 | -1 | -1 |
| O) Density of Dockless Trips | Proportional method, constrained at 0 as the minimum, and the 99th percentile (5,605) as a max score of 1 | 1 | 1 | |
| P) Bicycle Commuter Density | Proportional method, constrained at 0 as the minimum, and the 99th percentile (3,051) as a max score of 1. | 1 | | |

Figure A-1: Bike Commuter Propensity
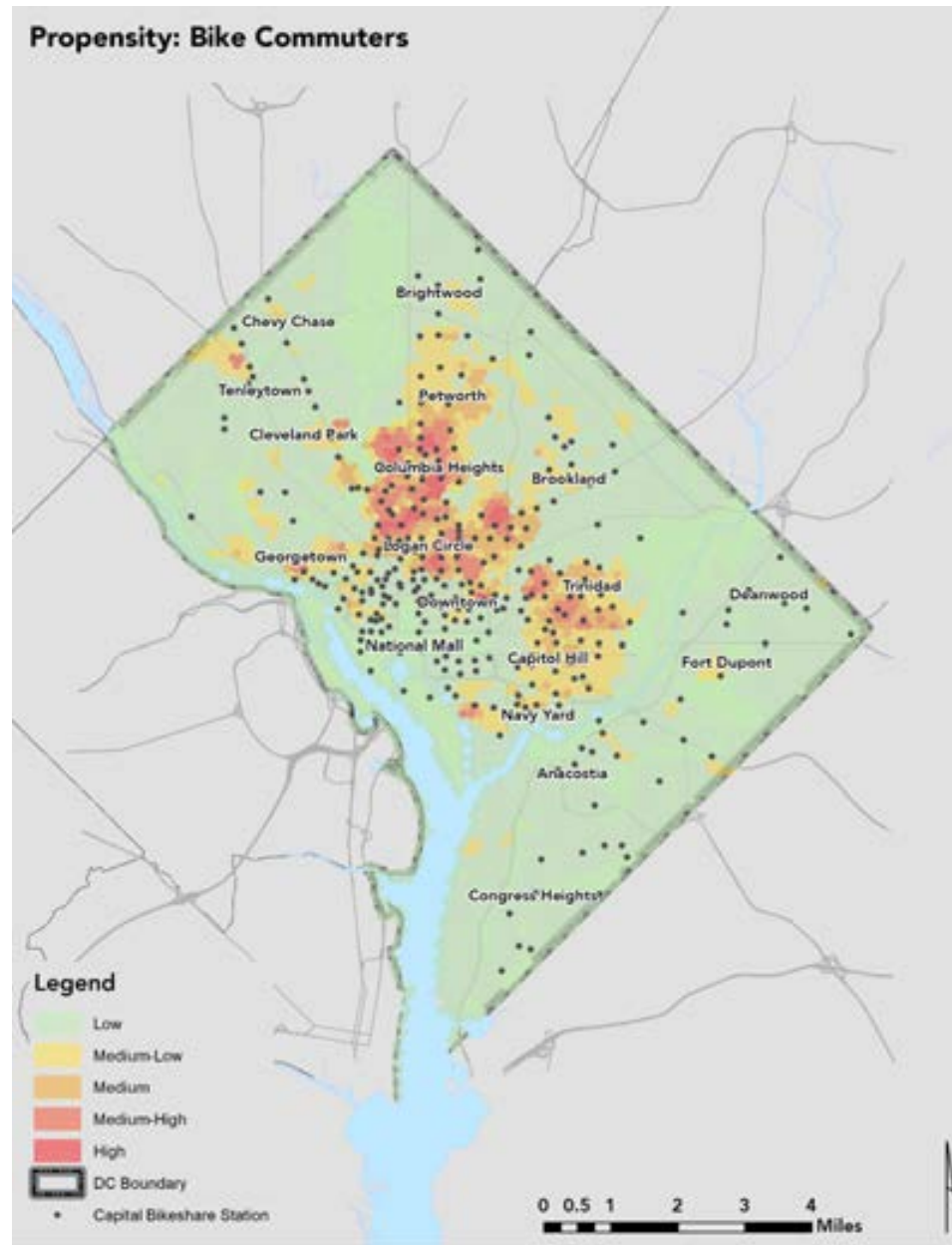
The following maps show the individual propensity members after they have been normalized. These maps illustrate the distribution of data and do not map directly to a value such as population density.
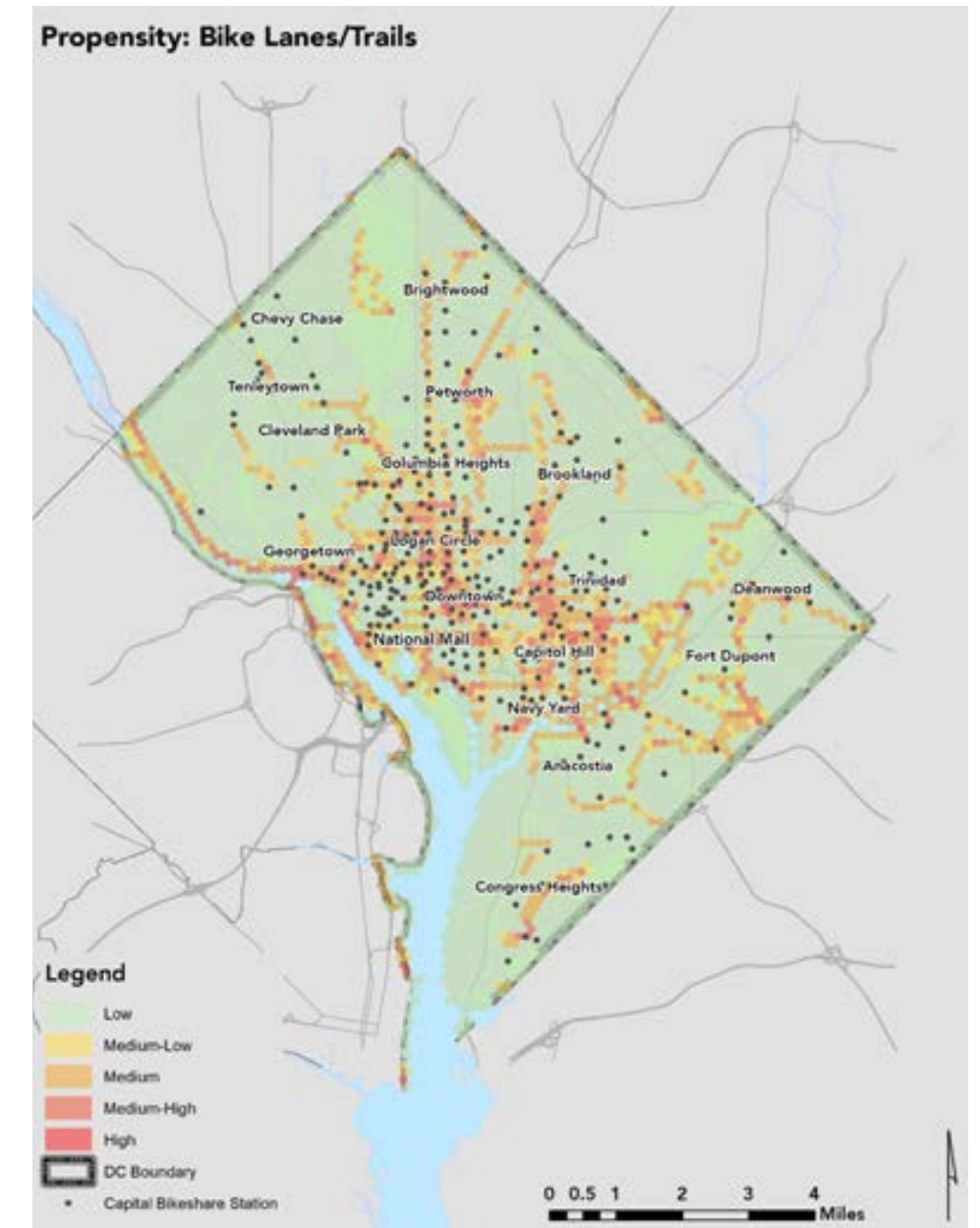


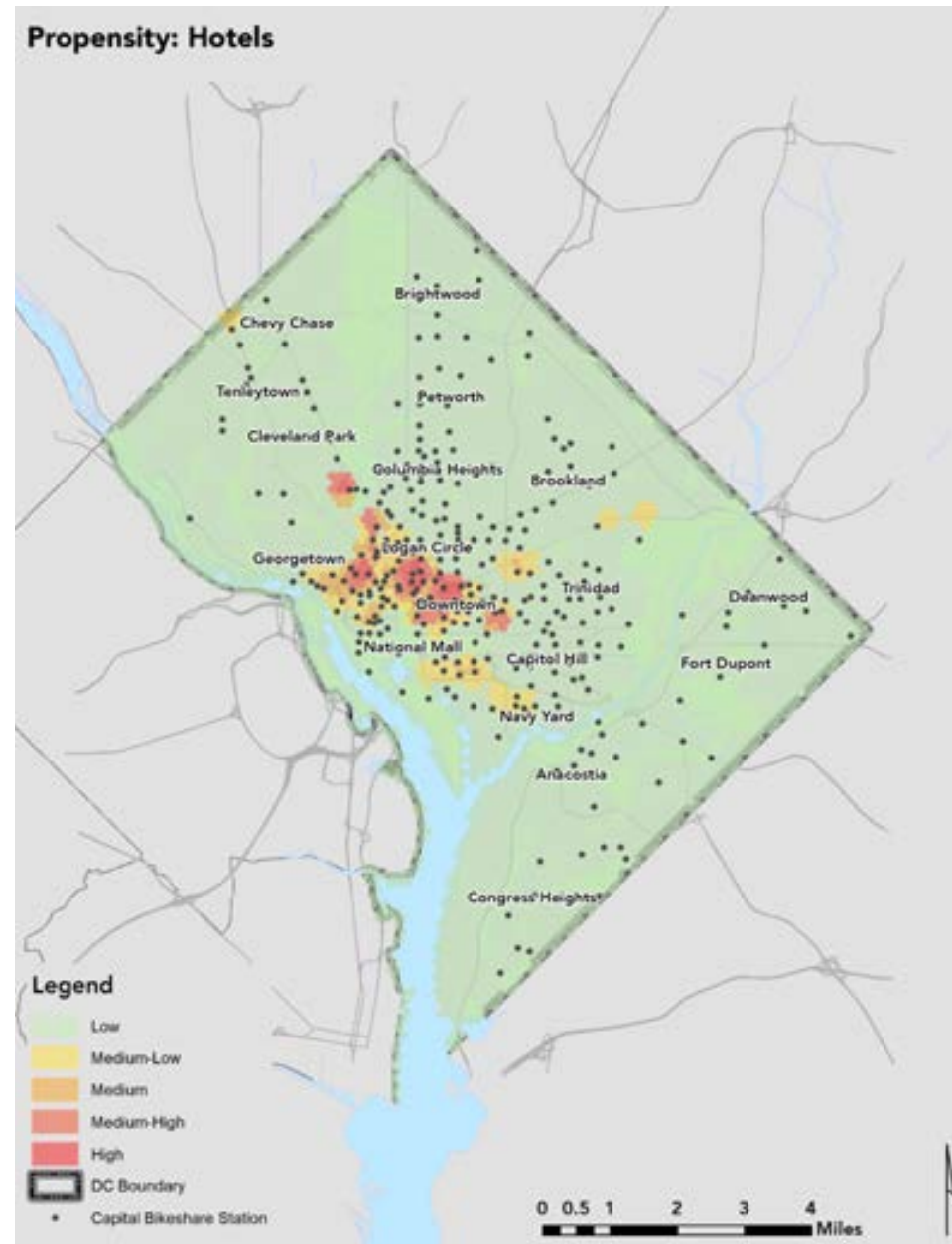Figure A-2: Bike Lanes/ Trail Density
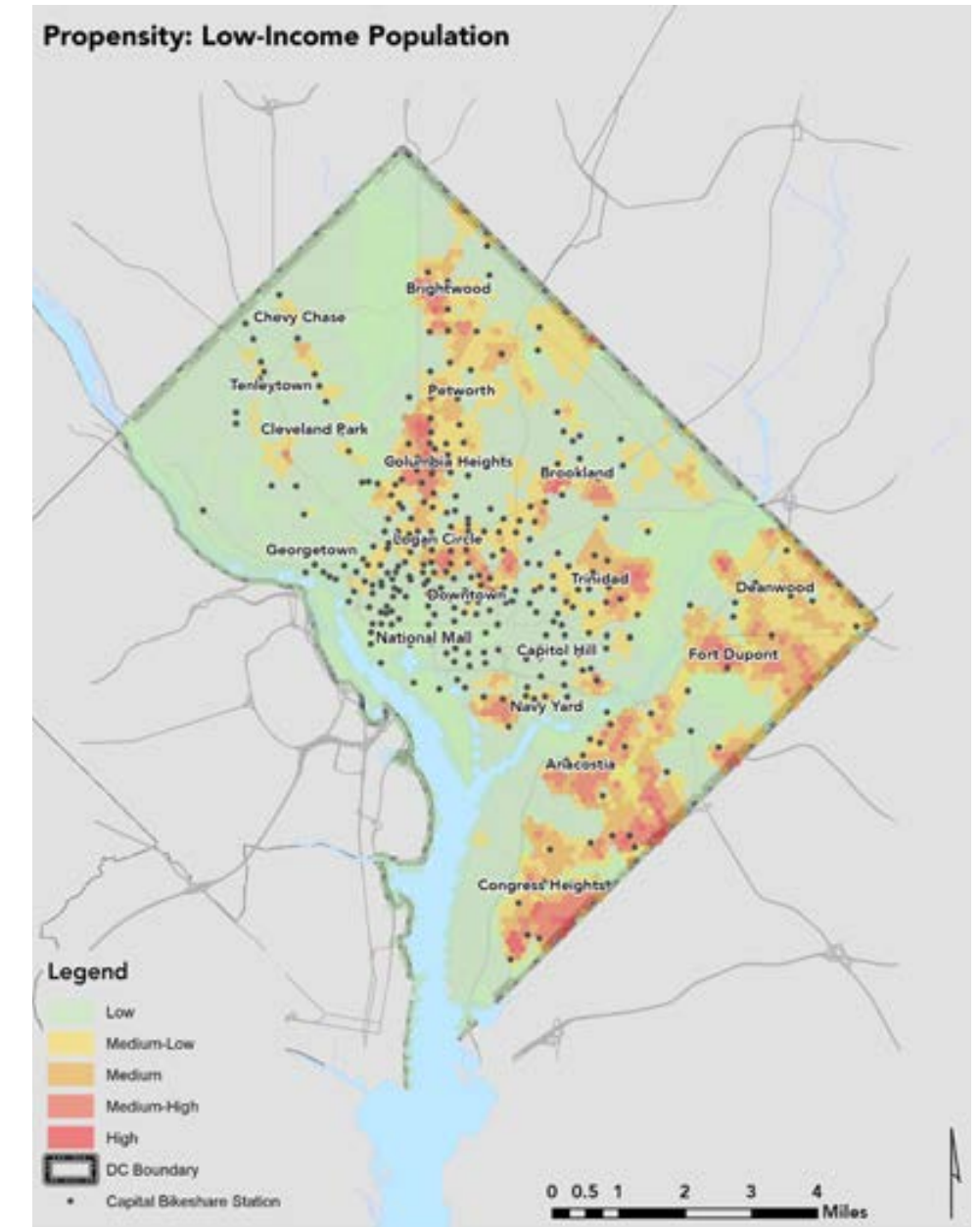
Figure A-3: Hotel Property by Number of Rooms
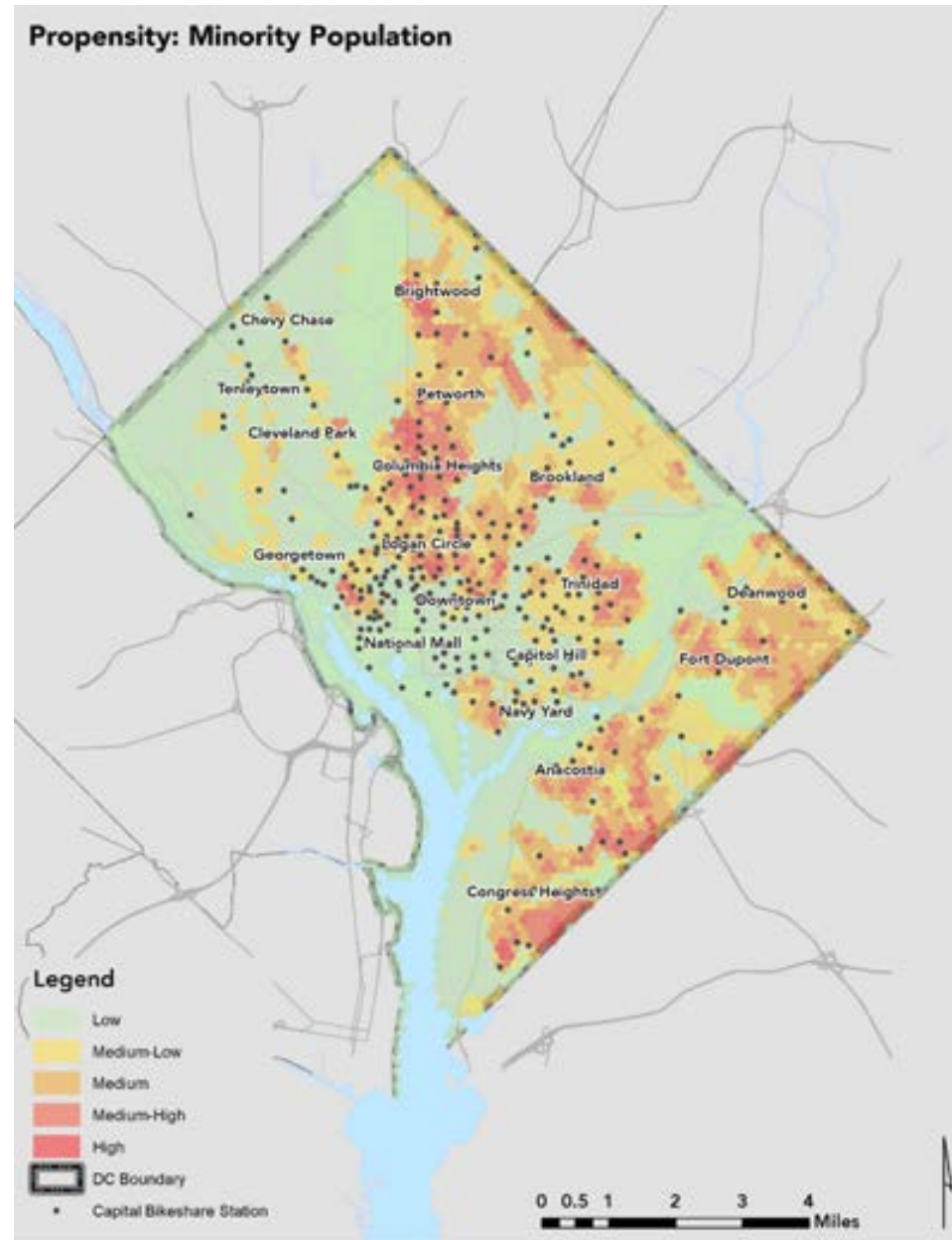


Figure A-4: Low-Income Population Propensity
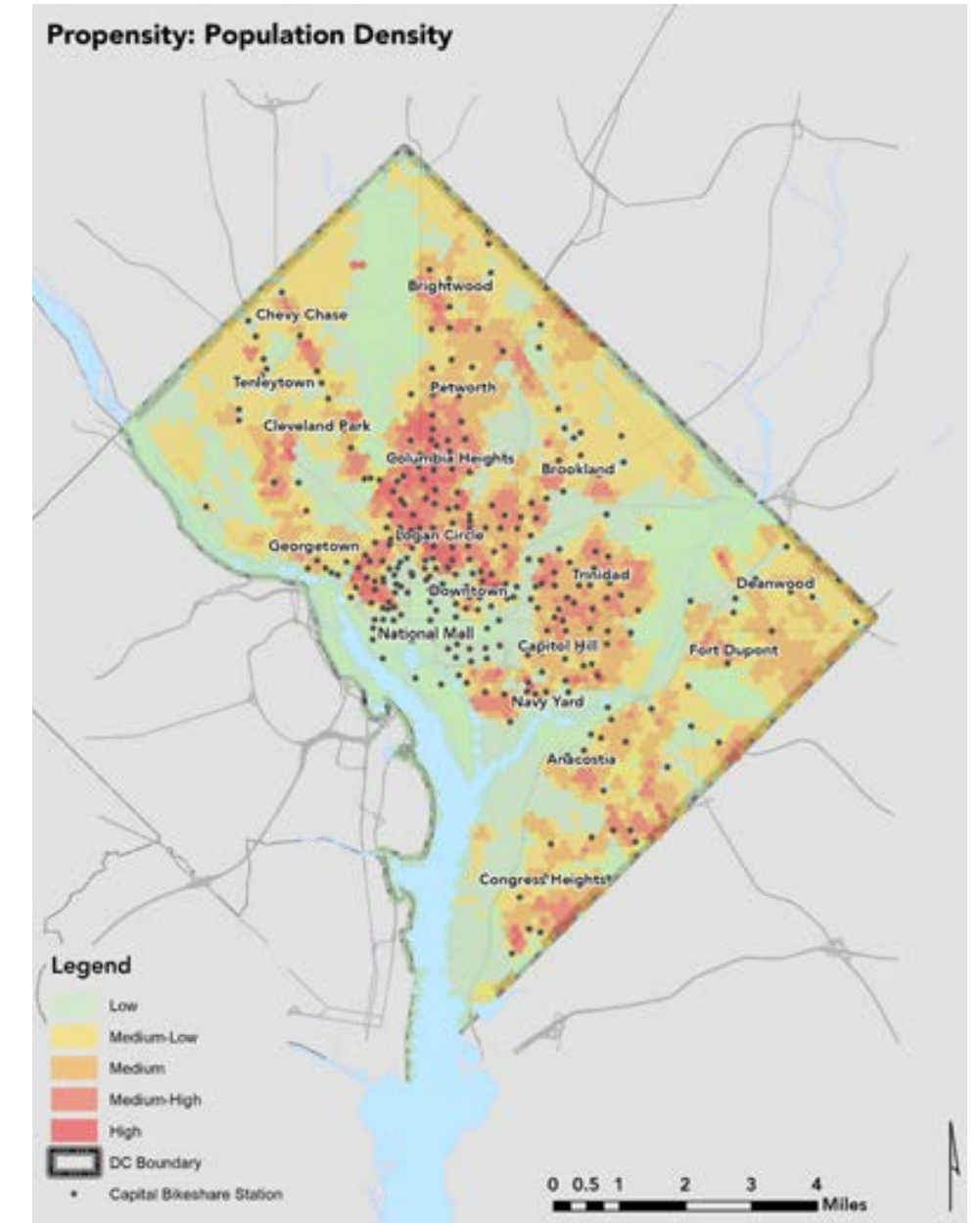
Figure A-5: Minority Population Propensity
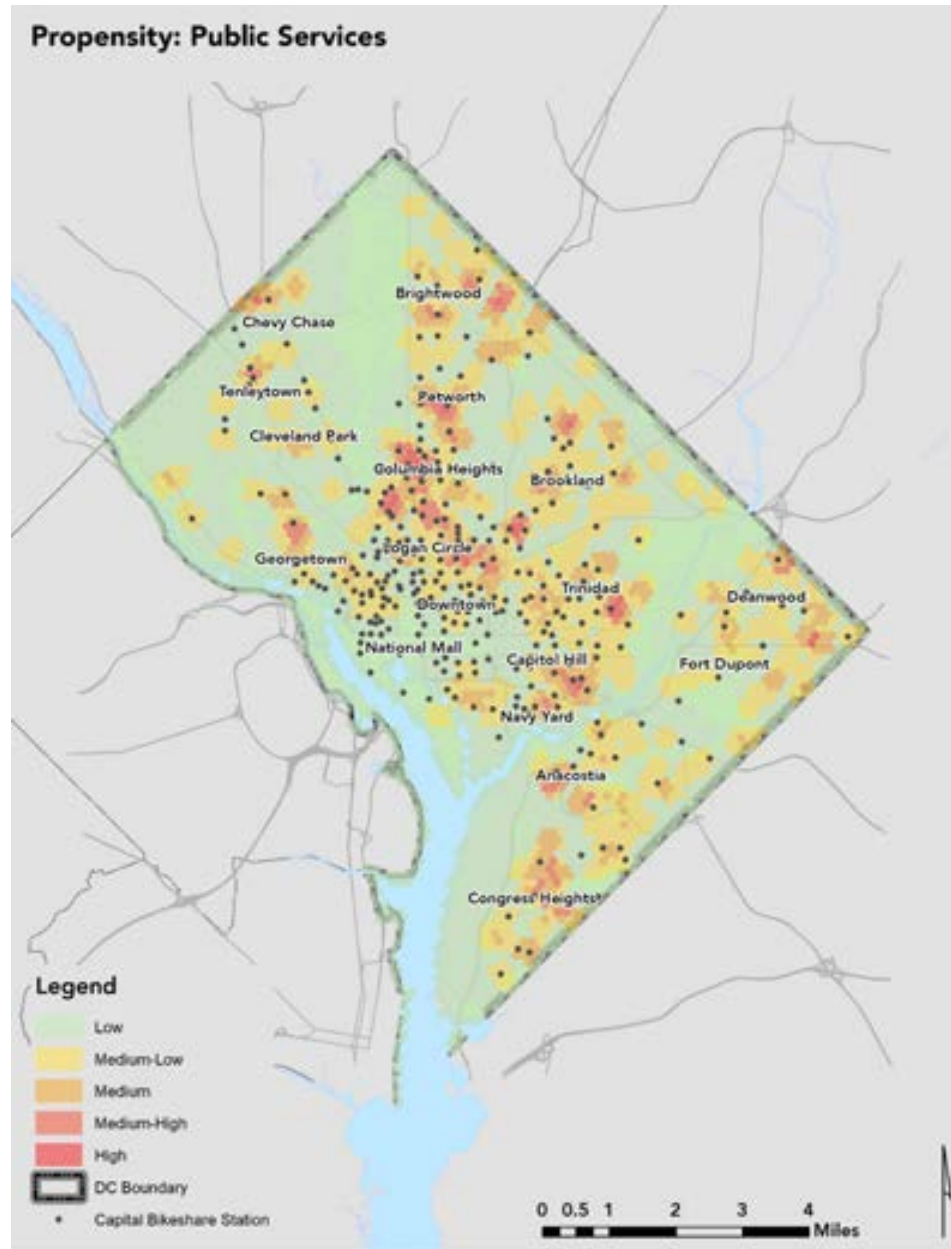


Figure A-6: Population Density Propensity

Figure A-7: Public Services Propensity
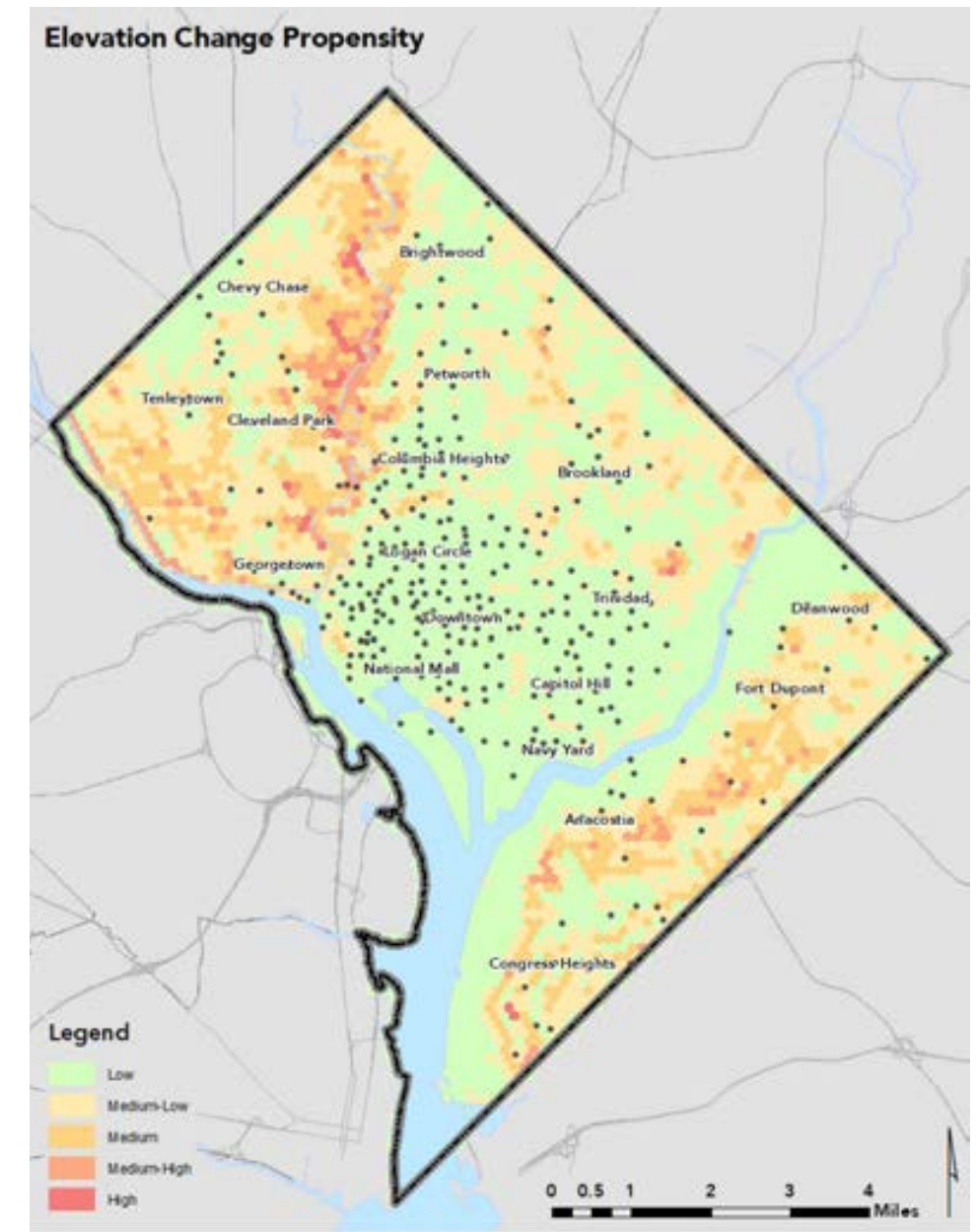


Figure A-8: Topography Propensity
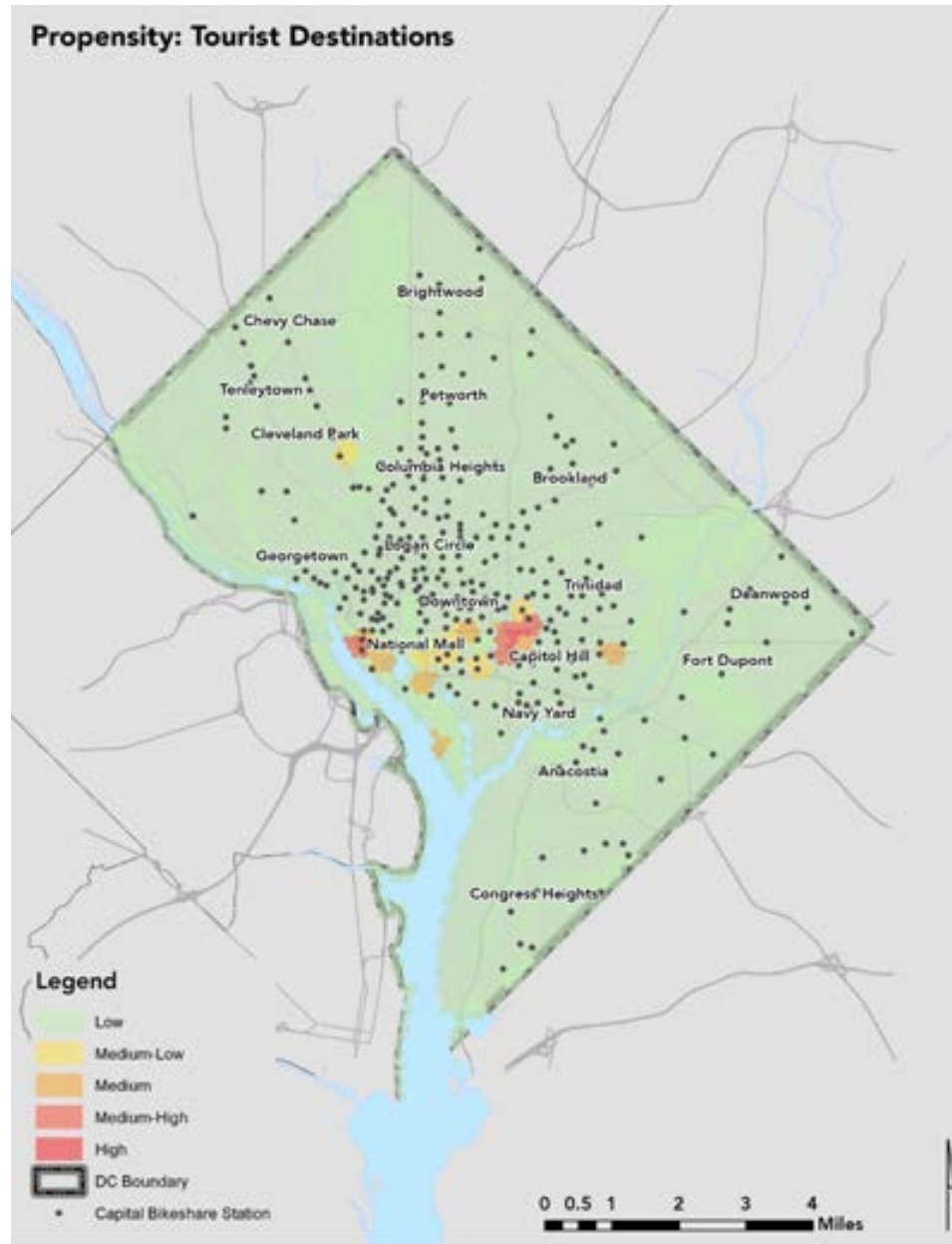
Figure A-9: Tourist Destination Propensity
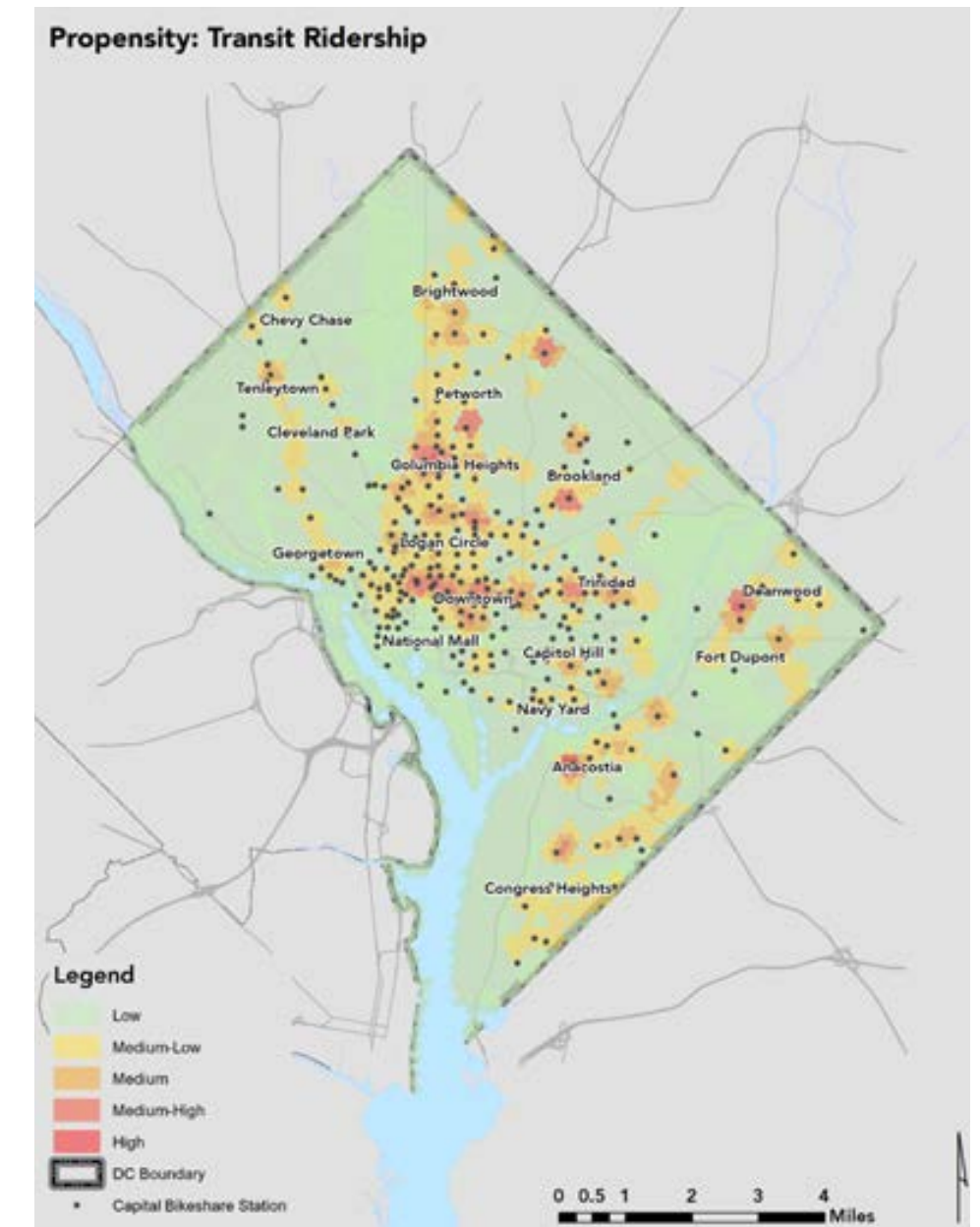


Figure A-10: Transit Ridership Propensity

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APPENDIX B

Figure B-1: Constrained Expansion Plan View 1

**Legend**
- · Capital Bikeshare Station
- Planned Stations (DDOT)
- Proposed Stations (High Priority)
- Proposed Stations (Low Priority)
- DC Boundary

**Market Typology**
Equity & Access | Revenue | Ridership

0   0.35   0.7 Miles
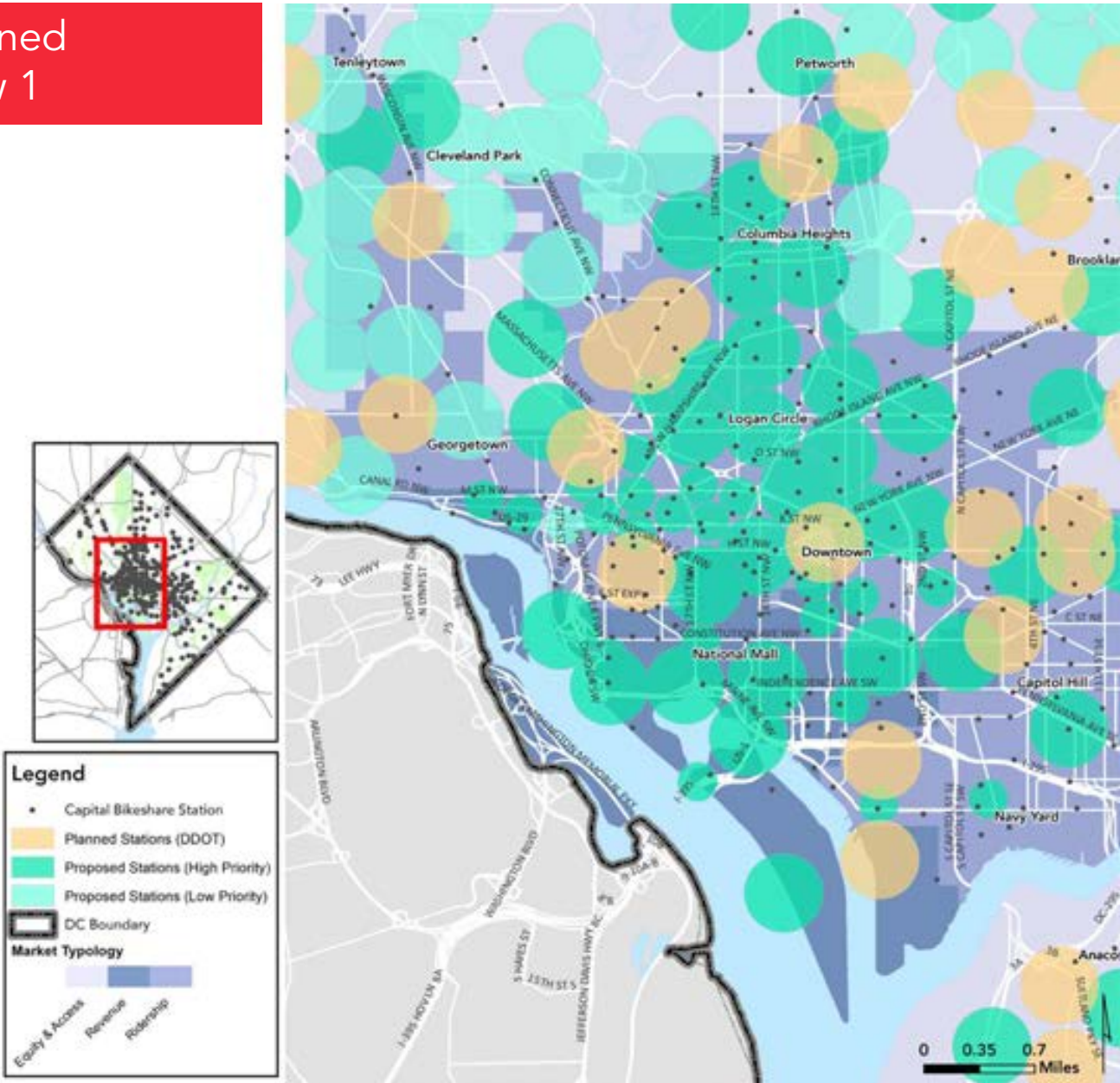
Figure B-2: Constrained Expansion Plan View 2
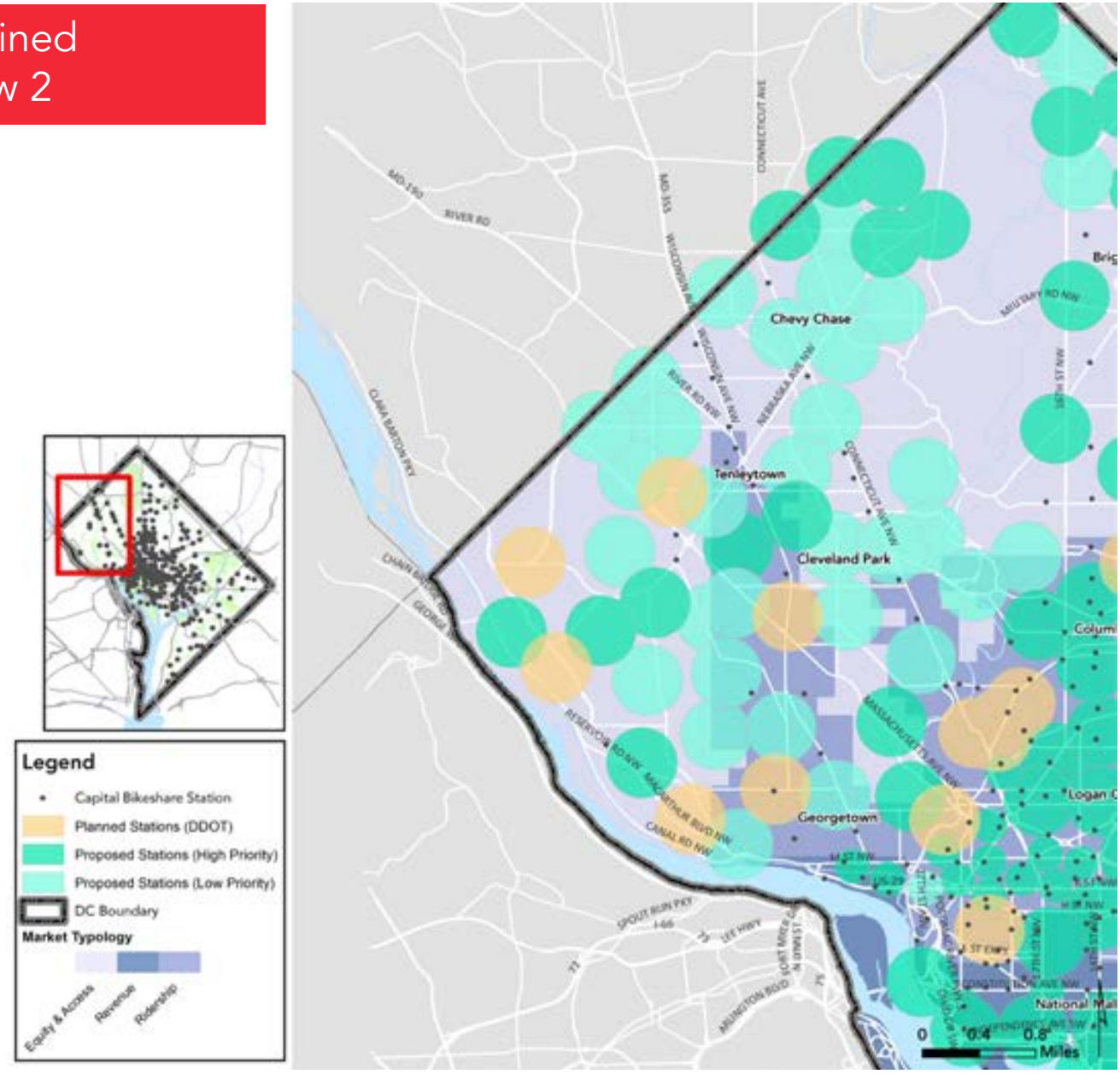


Figure B-3: Constrained Expansion Plan View 3
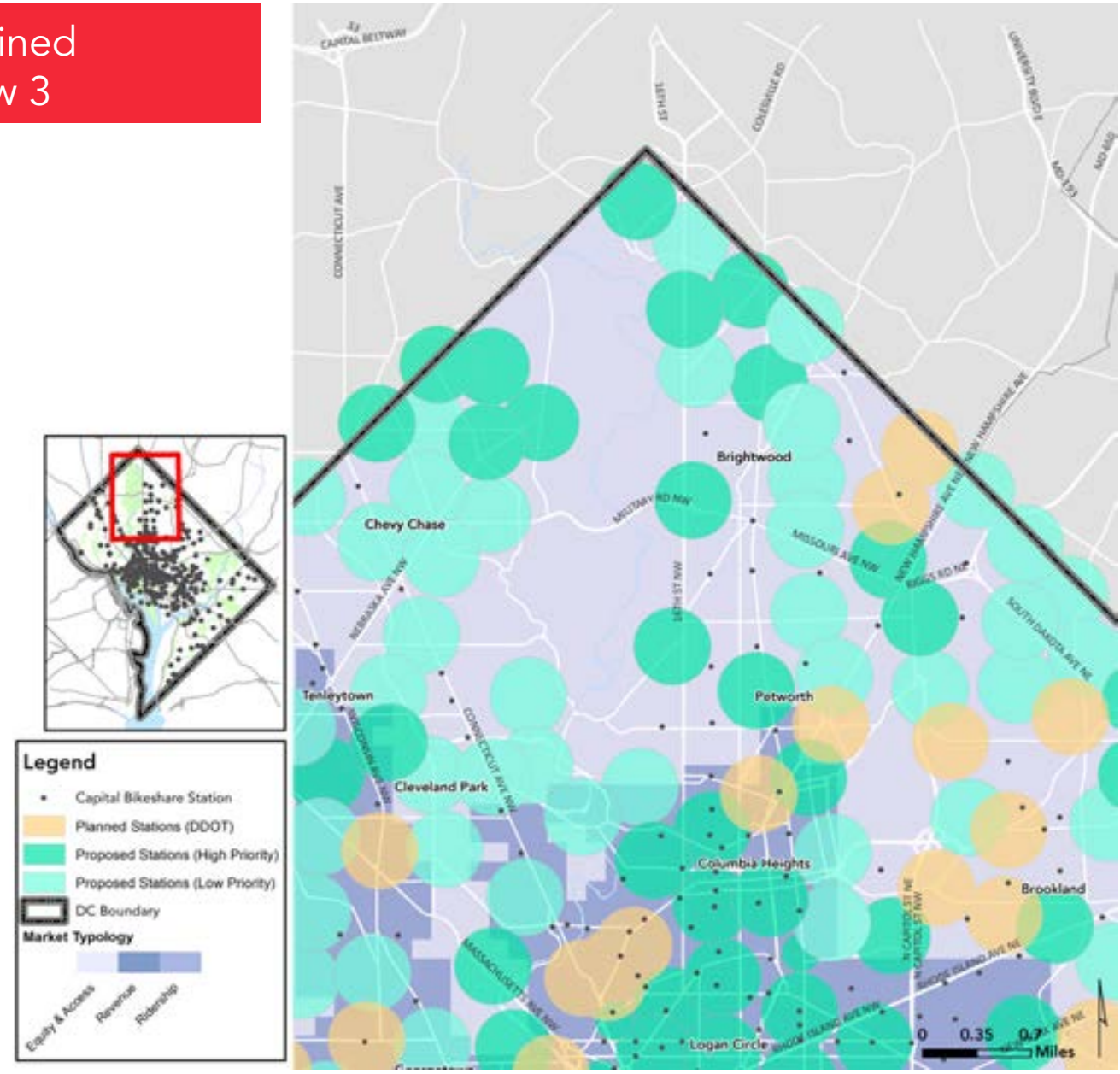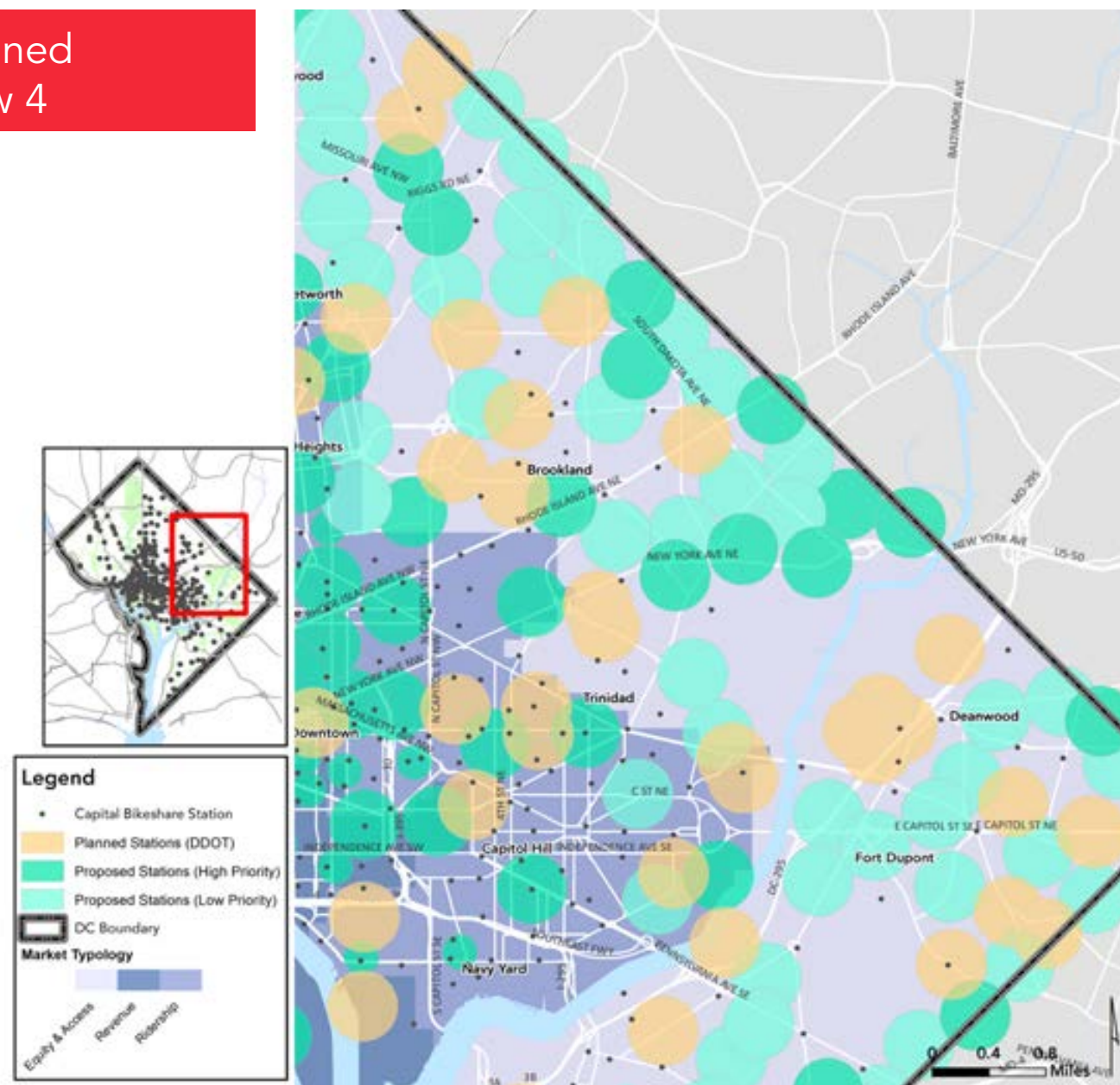
Figure B-4: Constrained Expansion Plan View 4
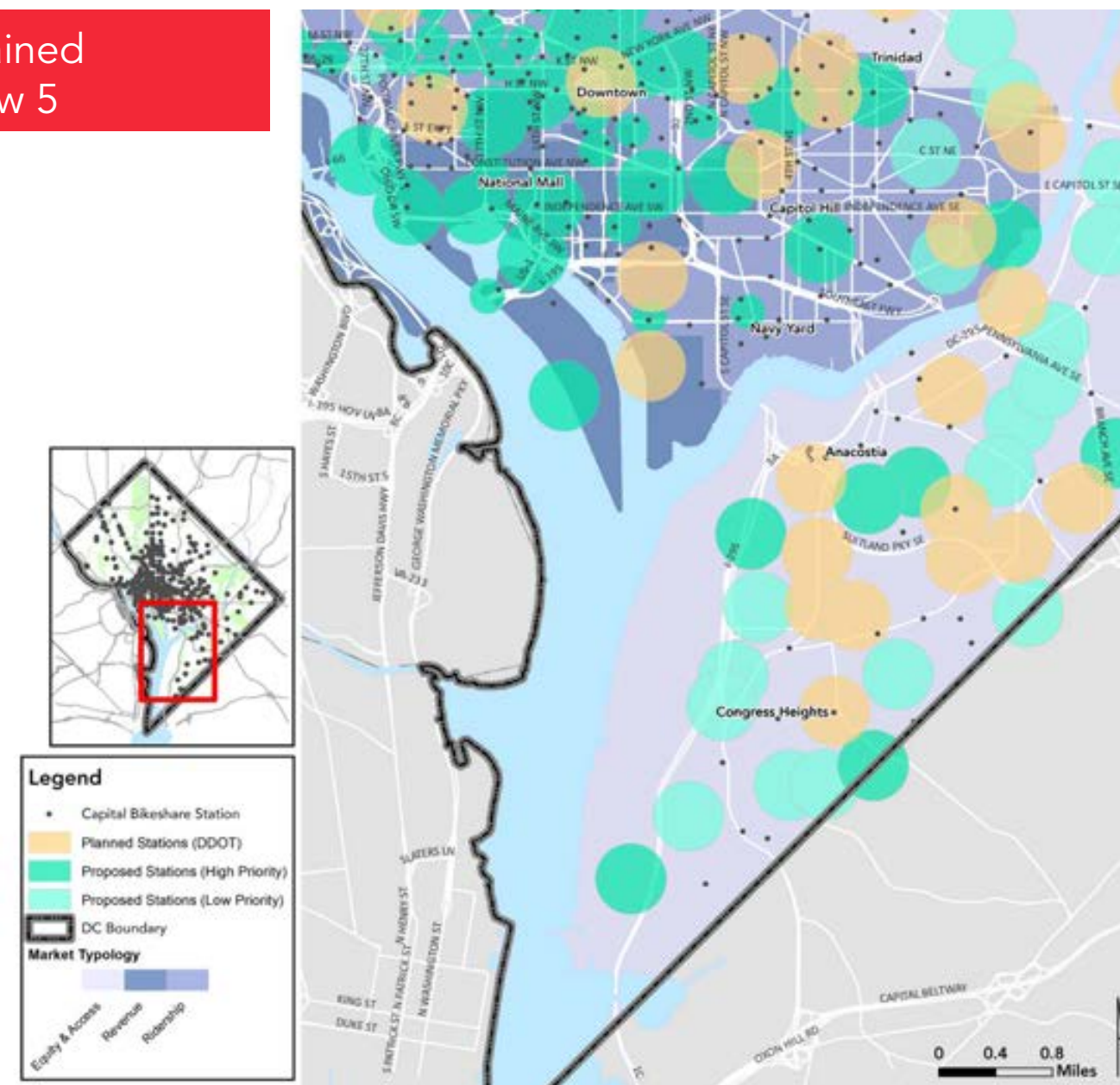


Figure B-5: Constrained Expansion Plan View 5

Figure B-6: Constrained Expansion Plan View 6

Legend

- Capital Bikeshare Station
- Planned Stations (DDOT)
- Proposed Stations (High Priority)
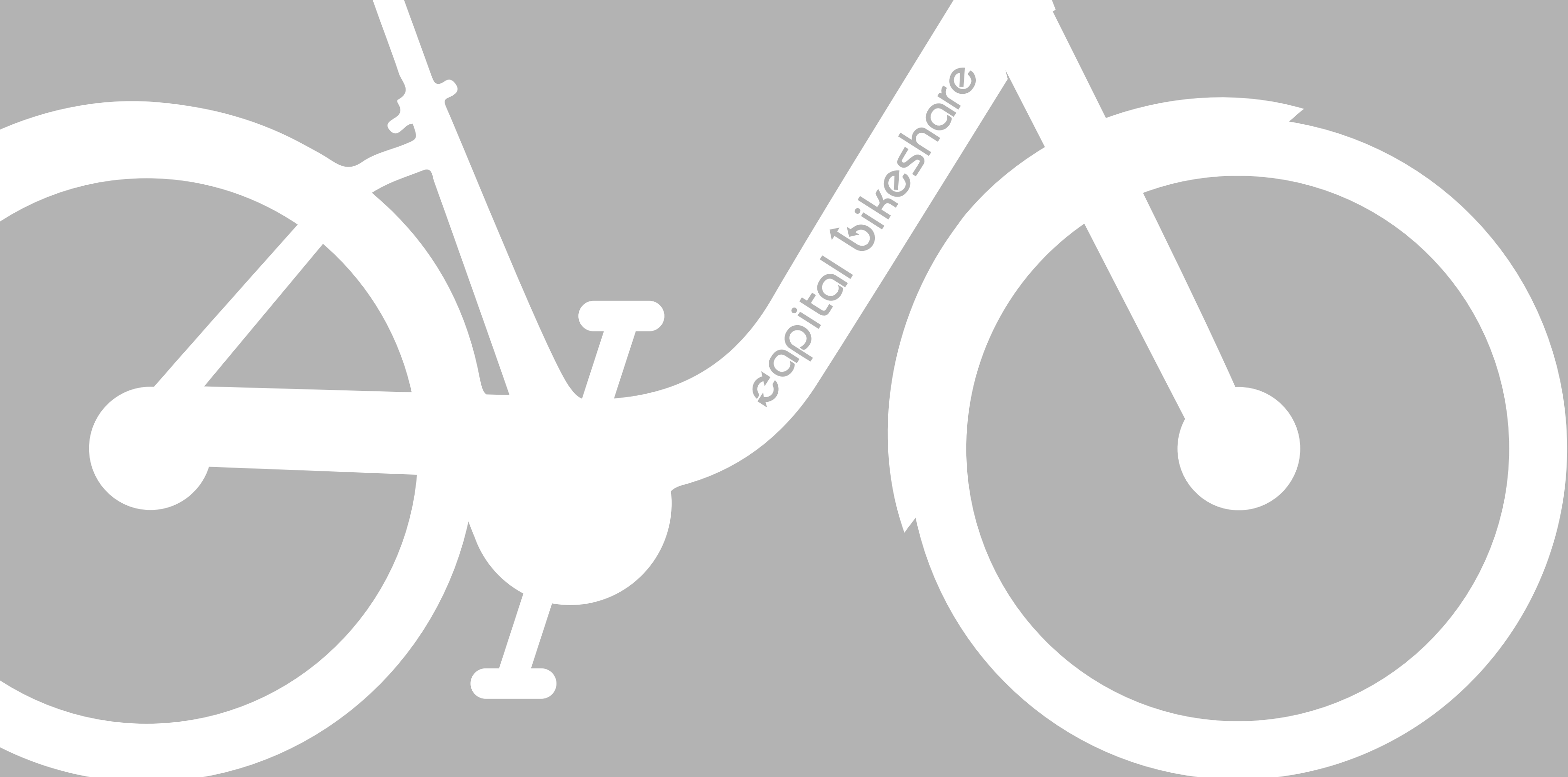- Proposed Stations (Low Priority)
- DC Boundary

Market Typology

Equity & Access
Revenue
Ridership

capital bikeshare
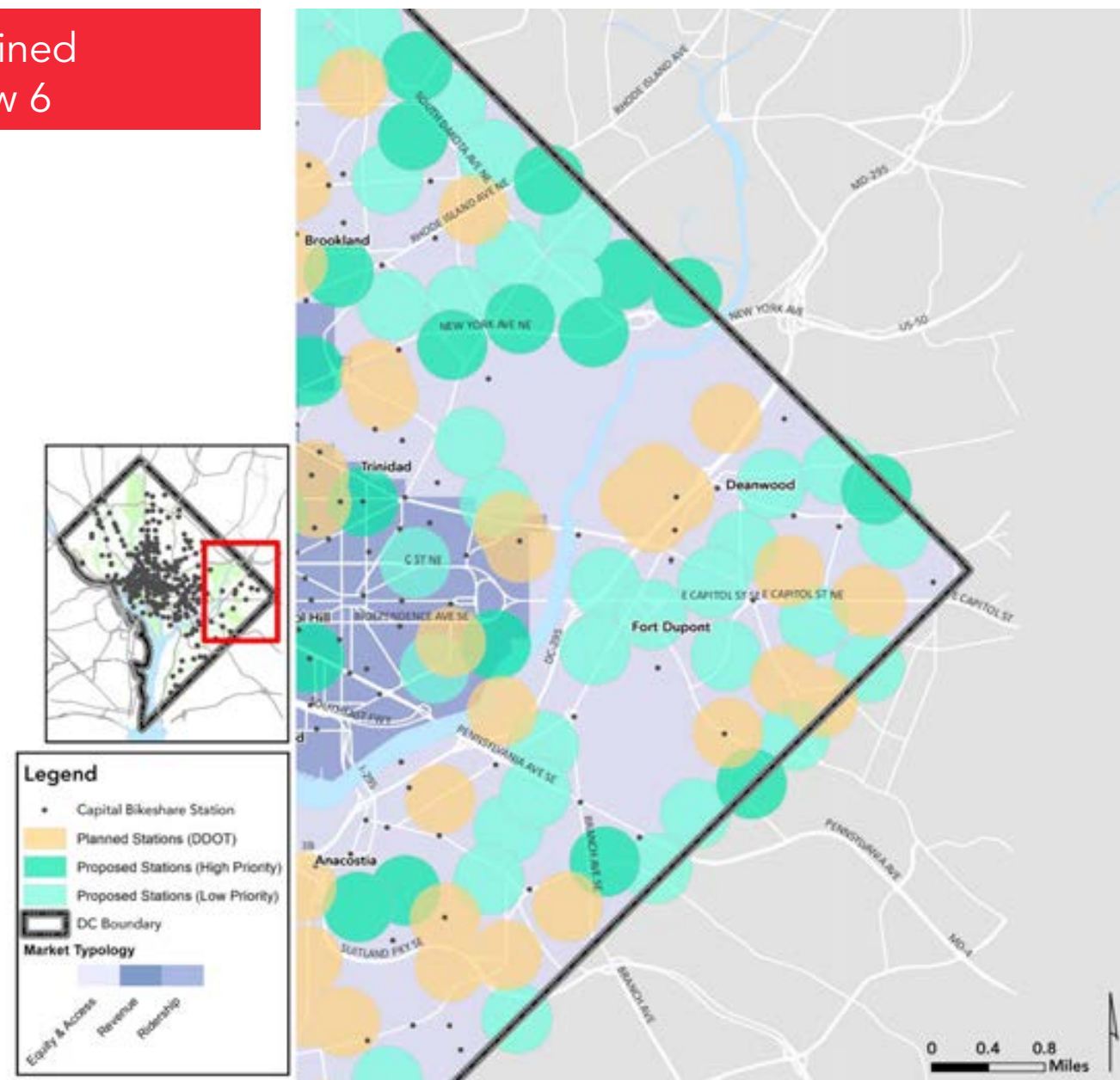
APPENDIX C

# GLOSSARY OF TERMS

**Casual User:** Riders using a short-term pass option such as a single trip or day pass.

**Core Area:** The zone that attracts a net gain in trips during the morning and net loss in the afternoon.

**Dockless:** Shorthand to describe any private micromobility service operating within the District of Columbia, including scooter and electric-assist bikeshare.

**Downtime:** Length of time or percentage of average day that a station is non-functioning, completely full, or empty. Measure is indicative of operational or capacity issues.

**Micromobility:** Umbrella term for any shared personal mobility mode, including bikeshare and scooter share.

**Overtime:** Any trip duration beyond the first 30 minutes. This is the period when usage fees kick in.

**Registered User:** Long-term monthly or annual subscriber.

**Trip Imbalance:** The difference in trip volumes in both directions for a station or neighborhood pair.

**Trips per Bicycle Per Day:** Basic measure of bikeshare productivity. Defined as the number of trips starting at a station divided by the number of days the station has been active during the analysis period and average number of bicycles the station holds (50 percent of dock count).