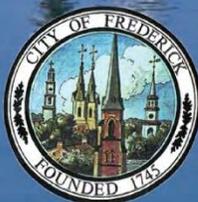




# Frederick Bike Share Feasibility Analysis

November 2013



**Maryland Department  
of Transportation**



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## Executive Summary



Figure 1 – Capital Bikeshare

Bike share implementation has been on the rise across the U.S. Cities are embracing an innovative mobility approaches to help curve the effects of traffic and to help better serve communities. One such approach, bike share ideal for short distance point-to-point trips allowing users to easily connect between self-serve stations while expanding the reach of existing transportation options. Bike share has also been seen to positively affect how residents, employees, and visitors experience a city, as it allows for more people to access cycling for short trips, replacing vehicle use, cycle for fitness and recreation, and for tourists and residents alike to explore a city.

Frederick is a unique cycling community due to its historic downtown area, rural roads, and extensive mountain bike trails. High density, mixed-use development in the immediate downtown area, set on a grid system, make connectivity easy for bikes and pedestrians. Frederick's mountain bike trails are located just six miles from downtown, and offer some of the best mountain biking in the Mid-Atlantic Region. . Because of the

region's growing bicycle culture, continued investment in bicycle infrastructure, and the City's commitment to becoming a bicycle friendly community, the City of Frederick is exploring the feasibility of implementing a bike share system.

Frederick exhibits many of the characteristics that are conducive to establishing a bike share program. Those include:

- A **supportive policy environment** that has activated significant growth in bicycling and the amount of bike facilities.
- An **increasingly changing population and employment** offering a mixed market of residents, employees, students, and visitors as well as nodes of activity at key destinations linking these two markets.
- Relative **proximity** to one of the largest and oldest existing bike share markets in the U.S., and a substantial, well-supported tourist base from the Washington and Baltimore regions.
- Very **flat and uniform geographic conditions** that are conducive for bicycling.

While Frederick exhibits a variety of conducive characteristics for bike share, there are also some challenges. While its bicycle infrastructure continues to grow, there are still some connectivity issues that would be best mitigated by providing a more robust network of comfortable bike routes between neighborhoods and centers of employment like Fort Detrick. Furthermore, the City should continue to promote increased access to inter-jurisdictional transit as many of its residents work in other jurisdictions around the Washington-Baltimore area.

Based on a comprehensive analysis of population and employment data, review of existing conditions, evaluation of existing plans and regulations, as well as a complete stakeholder engagement and public input, this analysis finds that the City has the potential to support a bike share system that includes 250 to 300 bicycles and between 25 to 30 stations in four phasing areas. The proposed system would begin implementation in Downtown Frederick and expand to include

western areas along the Patrick Street Corridor with further expansion expected in the northeast and southwest areas of the city. These locations offer the highest potential demand for bike sharing. See map for more information.

The City should consider subscribing to the Capital Bikeshare system through existing regional partnership agreements within the Metropolitan Washington Council of Governments. This is recommended as many residents commute every day to various employment centers within the Washington

region that offer Capital Bikeshare service.

Because of the general way that Capital Bikeshare is already being operated, it is recommended that the City consider a general business model that includes a combination of public ownership and administration, with operations left to a private operator.

There are however obstacles to implementing a bike share program in Frederick. The largest obstacle is the existing organizational capacity and staffing, as the City does not currently have a full time employee that can dedicate most of their time to implementing the program. It is recommended that the City look into various funding mechanisms including Federal funding, to be able to increase their staff and address the lack of staffing capacity. Finding the appropriate funding for the program might also curtail implementation. The City may be able to address this issue by allowing for advertising throughout bike share stations which may be able to bring in additional revenue to be invested into the system. A complete business model analysis is provided through Phase B of this study.

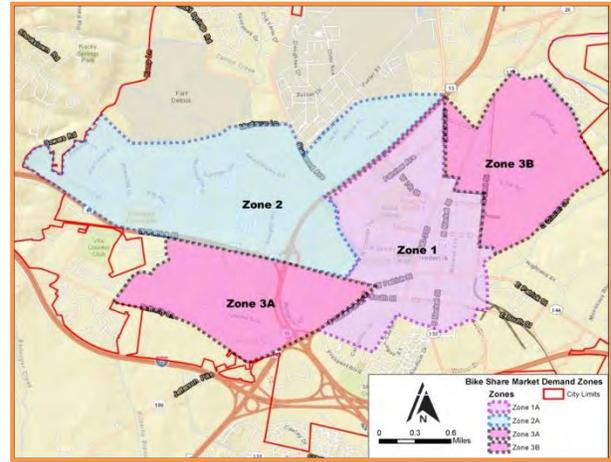


Figure 2 - Recommended phasing for the City of Frederick

## Introduction

### Purpose of This Study

This Feasibility Study assesses the readiness of the City of Frederick for a bike share program – WHETHER a bike share program can be successful in Frederick and WHAT, if any, recommendations are made to enhance the City’s readiness and likelihood for success. To evaluate the feasibility of a bike share program, we evaluate the following factors both specific to Frederick and, when applicable, in relation to comparable jurisdictions that have implemented or are implementing bike share programs:

#### Existing Conditions Evaluation

- Geography and Climate
- Demographics
- Bicycle Infrastructure
- Public Transit
- Policies and Plans

#### Public and Stakeholder Engagement

- Public Input
- Stakeholder Engagement

#### Potential System Demand, Size and Funding

- Demand Analysis
- Potential Service Area
  
- Potential Funding Sources



Figure 3 - Boulder B-cycle

For each of these factors, we identify opportunities and challenges, and if applicable, recommend steps that should be taken to address the challenges. Following the recommendations for each section, we make an overall evaluation as to the feasibility of bike share in Frederick.

To guide this analysis the consultant team was advised by the City, community stakeholders, and members of the community at large. The feedback received provided key direction and input to the study process and helped with the broader engagement process in both identifying key stakeholder audiences and promoting the public engagement opportunities to their constituencies.

## Background

### What is Bike Share?

Bike share is an innovative transportation program, whereby system subscribers have access to bicycles through self-service kiosk locations around the community. The system is accessed through low-cost subscriptions ranging from a few dollars for one-day to annual memberships that generally cost less than a bicycle tune-up.

Bike share is ideal for short distance point-to-point trips providing subscribers access to bicycles at any self-serve bike station to use and return to any bike station within the system’s service area. Most existing systems allow subscribers to make as many trips as often as they like, without additional charge, provided they return the bicycles to a system station within 30 to 60 minutes. Operators generally begin to charge gradually increasing fees after this free period; to discourage users from

holding onto the bicycles when they are not being used, encouraging turnover and ensuring that bicycles are readily available for other system subscribers. In cities across the U.S., bike share systems have proven very popular and successful by giving residents and visitors alike a fast, affordable, and easy to use transportation option that can make getting around town fun.

### Characteristics of a bike share program:

- It is oriented to short-term, point-to-point use: most U.S. operators record the average ride at 15 to 20 minutes and between one-to-three miles long.<sup>1</sup>
- The bicycle can be returned to any number of self-serve bike share stations - including the original check out location.
- Generally, the bicycles are one style and easy to operate with simple components and adjustable seats.
- The rental transaction is fully automated and there is no need for on-site staff.

### History of Bike Share

The history of bike share implementation can be traced through three generations:

1. **Free Bike Programs:** The free bikes generation started in the 1960s in Amsterdam, with the implementation of the White Bikes program, which offered distinctly colored, free unlocked bicycles throughout the city. Unfortunately, due to a variety of issues, including theft and damages to the bicycles, the bike plan failed soon after its launch.

2. **Coin Deposit Systems:** Coin deposit systems started in the 1970-80's and offered bikes for hire throughout designated docking stations containing coin slots and small deposit boxes which reimbursed the coins when the bicycles were returned. Although the deposit boxes increased the chances for success of the programs, the programs were still vulnerable to theft and vandalism, due to their lack of user accountability and low deposits (which did not guarantee that the bikes would be returned).



Figure 4 - Yellow Bikes MN

3. **Automated self-serve kiosks:** The third generation of bike share programs promoted the use of bicycles using automated self service kiosks at every station. These systems have also required a higher level of accountability for the user (through the requirement of a credit card) as well as robust bicycle re-distribution programs that respond to user patterns and demand. Furthermore, third generation systems have included physically distinct bicycles, advanced radio frequency identification (RFID) technology (i.e. Smartcards, magnetic fobs, etc.) and specialized wireless technology that give users the ability to check out a bike whenever and wherever they find a stocked bike station. Some of the current third generation systems now include GPS technology which allows the tracking of real time ridership patterns, which provide useful data for planning and redistribution purposes

<sup>1</sup> Bike Sharing in the United States: State of the Practice and Guide to Implementation. Federal Highway Administration. United States Department of Transportation. September 2012.

## Benefits of Bike Share

Bike share systems have evolved as a means to make bicycle travel in urban areas available to a wider range of people. A bike share program makes both spontaneous and planned urban trips possible by bike, and can be an ideal complement to transit trips, as it provides first mile and last mile connections. This section provides a short summary of some of the economic, transportation/mobility, environmental, and health benefits of bike share:

### Economic Benefits

Compared to other transportation modes, bike share is a relatively inexpensive and quick to implement urban transportation option. In jurisdictions with existing bike share programs, the relative costs of launching and implementing a bike share system have been considerably less than investments in other modes.<sup>5</sup> For users, bike share has been known to reduce the personal cost of urban transportation.<sup>6</sup> Jurisdictions have also benefited from the flexibility of bicycle share programs; as they can be installed and open for business in months rather than years.<sup>7</sup>

Item	Capital Cost
One lane-mile of urban highway	\$2.4 million to \$6.9 million <sup>2</sup>
One transit bus	\$371,000 to 533,000 <sup>3</sup>
Entire Capital Bikeshare system	\$6.2 million <sup>4</sup>

Previous research on funding for bike share programs has indicated that U.S. jurisdictions have allocated only a small part of funding from their local funds to use for bike share implementation. To date, a high proportion of the total funding allocated for existing programs has come through State and Federal grants, reducing the local contributions to a minimum. Additional forms of funding have included private donations, corporate sponsorships, and user revenues.

Existing U.S. bike share programs have also had a very positive “farebox recovery” (i.e. costs vs. revenues), compared to other modes of transportation (i.e. bus, rail), relying less on local subsidies and funding. For example Boulder, CO, a city that has implemented a small system (23 bike share stations) farebox recovery has hovered around 30 to 40%. This compares to Capital Bikeshare in the Washington D.C. area where the farebox recovery is around 90%. In those jurisdictions where cost recovery is not as high, jurisdictions have leveraged their partnerships and sponsorship agreements with various organizations to maintain an optimum level of service.

<sup>2</sup> Rails To trails – Cost of constructing one mile of highway. Retrieved from <http://www.railstotrails.org/resources/documents/whatwedo/policy/07-29-2008%20Generic%20Response%20to%20Cost%20per%20Lane%20Mile%20for%20widening%20and%20new%20construction.pdf> on August 21, 2013.

<sup>3</sup> Transit Bus Life Cycle Cost and Year 2007 Emissions Estimation Federal Transit Administration. U.S. Department Of Transportation. Retrieved from [http://www.fta.dot.gov/documents/WVU\\_FTA\\_LCC\\_Final\\_Report\\_07-23-2007.pdf](http://www.fta.dot.gov/documents/WVU_FTA_LCC_Final_Report_07-23-2007.pdf) on August 21, 2013.

<sup>4</sup> Interview with Jim Sebastian. Bicycle Planning Director. District Department of Transportation

<sup>5</sup> Hernandez, Mauricio. Multimodal debate – Cost comparison of implementing a bike share program vs. a bus rapid transit system. University of Maryland. December 2011.

<sup>6</sup> Capital Bikeshare commuters share why they ride — and its drawbacks. Retrieved from [http://www.washingtonpost.com/local/capital-bikeshare-commuters-share-why-they-ride--and-its-drawbacks/2012/01/26/gIQAQzdGjQ\\_story.html](http://www.washingtonpost.com/local/capital-bikeshare-commuters-share-why-they-ride--and-its-drawbacks/2012/01/26/gIQAQzdGjQ_story.html). Washington Post online. March 2013.

<sup>7</sup> Bike Sharing in the United States: State of the Practice and Guide to Implementation. Federal Highway Administration. United States Department of Transportation. September 2012.

The cost of bike share to the user can be very low and usually only includes the membership fee (typically between \$50 and \$100 per year), and ridership fees which may be free if the user utilizes the bicycle within the free period. This compares to the annual costs of running and maintaining a car which are around \$7,000 – \$10,000.<sup>8</sup>

The implementation of a bike share program also has the potential to bring economic development and increased economic activity to cities.<sup>9</sup> Recent studies indicated that there has been increased economic activity associated with Nice Ride bike share stations and increased accessibility to business transactions. Positive attitude towards bike share by local businesses has also been observed, as there has been an increase of economic activity in businesses located with close proximity to bike share stations.<sup>10</sup> This same phenomenon has been present in Miami Beach, where around 80% of Deco Bike users were more likely to patronize a business with a bike share station close-by.<sup>11</sup>

### **Transportation / Mobility Benefits**



**Figure 5 - Capital Bikeshare**

Because bike share represents an additional mobility option to provide last mile connections to and from transit, existing programs have reported an increase in the number of transit users. Bike share has also improved connectivity to different parts of the city where transit did not reach (64% of Capital Bikeshare survey respondents reported that they would not have otherwise made the trip if bike share was not available)<sup>12</sup> and has created increased demand for bicycling<sup>13</sup>,

while helping decrease the number of personal vehicle trips. Bike share can also help introduce people to cycling as a mode of transportation, especially to people who don't usually ride. In Minneapolis for example, approximately one-third of system users cycled less than once per month before signing up with Nice Ride.<sup>14</sup>

### **Health Benefits**

Bike share is an addition to the active transportation options in a city. In recent years, increased numbers of American children and adults are sedentary and obese. It is well documented that engaging in light to moderate physical activity reduces the risk heart

<sup>8</sup> What that car really costs to own. Knowing a vehicle's cost over time can save you thousands in the long haul <http://www.consumerreports.org/cro/2012/12/what-that-car-really-costs-to-own/index.htm>

<sup>9</sup> Capital Bikeshare becoming an economic development tool. Accessed from [http://washingtonexaminer.com/capital-bikeshare-becoming-an-economic-development-tool/article/2531458?custom\\_click=rss](http://washingtonexaminer.com/capital-bikeshare-becoming-an-economic-development-tool/article/2531458?custom_click=rss) on June 10, 2013.

<sup>10</sup> Schoner, Jessica E.; Harrison, Andrew; Wang, Xize; Lindsey, Greg. Sharing to Grow: Economic Activity Associated with Nice Ride Bike Share Stations. Technical Report. September 2012

<sup>11</sup> Colby Reese. Deco Bike president. ProWalk ProBike 2012 presentation.

<sup>12</sup> 2011 Capital Bikeshare Customer Survey. Retrieved from <http://capitalbikeshare.com/assets/pdf/Capital%20Bikeshare-SurveyReport-Final.pdf> on April 28, 2013.

<sup>13</sup> Montgomery County Parking Credits for Bikeshare

<sup>14</sup> 2010 Nice Ride MN Member Survey. Retrieved from [https://www.niceridemn.org/news/2010/11/09/26/2010\\_season\\_comes\\_to\\_a\\_close\\_with\\_over\\_100000\\_rides](https://www.niceridemn.org/news/2010/11/09/26/2010_season_comes_to_a_close_with_over_100000_rides) on April 30, 2013.

disease, stroke, and other chronic and life-threatening illnesses. Physical activity can also improve mental health and even lower health care costs.<sup>15</sup> Throughout many existing U.S. programs including Nice Ride MN, Spartanburg B-cycle, San Antonio B-cycle and Denver B-Cycle, the health benefits component has attracted interest from the health care industry, in particular health care providers, which have become major sponsors for each of the programs.

The Great Frederick Fair's Health Awareness Initiative and Frederick Memorial Hospital's Wellness initiatives have promoted mobility and exercise initiatives, and programs that target changes in behavioral health. These organizations and programs could be a great conduit for implementing a bike share program in the City of Frederick.

### ***Environmental Benefits***

Bike share programs have minimal impacts on the environment. As many third generation bike share stations tend to be solar powered, bike share offers a transportation alternative that is virtually carbon neutral. Additionally, bike share programs have been known to cause a shift in the transportation mode utilized by private individuals, therefore decreasing CO<sub>2</sub> emissions. For example Denver B-cycle reported an offset of 729,783 lbs of CO<sub>2</sub> in 2011<sup>16</sup>.

When redistribution of bicycles is required, various cities have been known to use cargo bikes or electric vehicles to move bicycles from station to station. See figure below for reference.



**Figure 6 - Redistribution vehicle in San Antonio B-cycle**

This low impact solution ties into the City's 2009 Sustainable Practice Action Plan, which calls for the reduction of the carbon footprint of current City facilities and fleet, increasing the use of energy efficient outdoor fixtures, and the promotion of transportation options such as bicycle trails, commute trip reduction programs, and increasing the incentives for carpooling and the use of public transportation.<sup>17</sup>

### ***Safety Benefits***

Given the relatively short time period of crash data available from existing programs, most existing U.S. programs have reported experiencing very low crash rates, compared to crashes

<sup>15</sup> Health benefits of Bicycling. Pedestrian and Bicycle Information Center. Accessed from [http://www.bicyclinginfo.org/why/benefits\\_health.cfm](http://www.bicyclinginfo.org/why/benefits_health.cfm) on April 30, 2013.

<sup>16</sup> 2011 Annual Report. Bicycle Denver. Retrieved from [http://www.denverbikesharing.org/files/DBS\\_2011\\_Annual\\_Report.pdf](http://www.denverbikesharing.org/files/DBS_2011_Annual_Report.pdf) on May 1st, 2013

<sup>17</sup> City of Frederick 2009 Sustainable Practice Action Plan. Accessed from <http://www.cityoffrederick.com/DocumentCenter/Home/View/1415> on August 6th, 2013.

among bicyclists riding their personal bikes.<sup>18</sup> For example, as of May 2013, the largest systems in the U.S. (i.e. Capital Bikeshare, Nice Ride and Deco Bike) only reported 20 crashes overall with no fatalities or major incidents. When compared to the number of rides by the three systems in the same period (around 2.5 million) the accident rate is lower than 0.05 %, which again is lower than the injury rate. Some of the factors contributing to this safety record include:

- Heavier bicycles with more robust tires and gearing, causing riders to go at slower speeds
- Drum brakes in most bikes which make slowing a bicycle easy and efficient
- Integrated flashing lights in every bike
- Safety in numbers effect and increased driver awareness
- Design of the bicycle - with low step over height which makes it easier for the user to regain their balance quickly.
- Regular bicycle inspections by the bike share program operator

### Comparable Cities

Most of the major North American Systems started around 2010. Many of these systems began with the idea of offering an additional modal option for users in their corresponding jurisdiction. Four peer systems were identified from among the active systems based on similarities in both geographic size and program scale. The peer systems selected to profile for the updated system recommendations were the following:

- Boulder B-cycle – Boulder, CO (125 bicycles/23 stations)
- Capital Bikeshare – Arlington County, VA/Alexandria, VA/ Washington DC/ Montgomery County, MD (2000 bicycles/244 stations)
- Chattanooga Bicycle Transit System – Chattanooga, TN (250 bikes/31 stations)
- Spartanburg B-cycle – Spartanburg, SC (50 bicycles/4 stations)



Figure 7 - Spartanburg B-cycle

These programs were selected to highlight different operational and ownership models, as well as to offer highlights from different experiences in different market sizes. The following is a matrix profiling a few comparable jurisdictions with existing programs:

<sup>18</sup> Bike Sharing in the United States: State of the Practice and Guide to Implementation. Federal Highway Administration. United States Department of Transportation. September 2012.

## Program Profiles

	Boulder , CO	Chattanooga, TN	Spartanburg, SC	DC/Arlington
<b>System Name</b>	Boulder B-cycle	Bike Chattanooga	Spartanburg B-cycle	Capital Bikeshare
<b>Web Address</b>	boulder.bcycle.com	bikechattanooga.com	spartanburg.bcycle.com	capitalbikeshare.com
<b>Start Date</b>	20-May-11	23-Jul-12	7-Jul-11	20-Sep-10
<b>Number of Bikes</b>	125	250	50	1408
<b>Number of Stations</b>	22	31	4	140
<i>Bikes per station</i>	5.68	8.1	12.5	10.1
<i>Service Area (Sq. Mi)</i>	10.64	2	2.72	42.3
<i>Station Density*</i>	2.10	15.2	1.47	3.3
<i>Core Operating Area (Sq. Mi.)</i>	10	2	1.47	4.1
<i>Core Operating Stations</i>	15	31	4	32
<i>Core Station Density</i>	7.80	6.21	1.47	7.9
<b>Casual Membership</b>	9,059	5,054	1,384	134,495
<b>Annual Membership</b>	869	566	97	17,048
<b>Annual Subscriber Trips</b>	13,568	8,754	755	1,676,811
<b>Annual Casual Trips</b>	11,786	8,555	1,521	372,765
<b>Total Annual Trips</b>	25,354	17,309	2,276	2,049,576
<i>Annual Trips per Bike</i>	203	69	56.9	1,456
<i>Annual Trips per member (casual)</i>	1.30	1.7	1.10	2.8
<i>Annual Trips per member (annual)</i>	15.6	15.5	7.78	98.4
<i>Average Trips per Day</i>	93.90	47	6.24	5,615
<i>Average Trips per Bike per Day</i>	0.75	0.2	0.16	4
<b>Membership Fees</b>				
<i>Annual Membership</i>	\$65	\$75	\$30	\$75
<i>30 Day Membership</i>	Not Available	Not Available	\$15	\$25
<i>Weekly Membership</i>	\$20	Not Available	Not Available	
<i>3 Day Membership</i>	Not Available	Not Available	Not Available	\$15
<i>Daily Casual</i>	\$7	\$6	\$7	\$7
<i>First Half-Hour</i>	Not Available	\$5	Not Available	\$0
<i>Second Half-Hour</i>	Not Available	\$10	\$1	\$1.50
<i>Third Half-Hour</i>	\$4.50	\$15	\$1	\$4.50
<b>Reported Bikeshare Thefts</b>	0	0	0	9
<b>Reported Bikeshare Crash</b>	0	0	0	14
<b>Operating Practices</b>	Seasonal	Year-Round	Year-Round	Year-Round
	5 am - Midnight	24 hrs a day	5 am - 10 pm	24 hrs a day
<b>Days Operating 2012</b>	270	365	365	365
<b>Average Summer Temp</b>	70	80° F	78	78° F
<b>Average Winter Temp</b>	35	41° F	44	38° F
<b>Average Monthly Precipitation Summer</b>	1.94	4.91	4.24	3.48
<b>Average Monthly Precipitation Winter</b>	0.85	4.9	4.27	2.86
<b>Equipment ownership</b>	Non Profit owned	Jurisdiction owned	Non Profit owned	Jurisdiction owned
<b>Business Model</b>	Non Profit Managed	Municipally Owned/ Managed	Non Profit Managed	Municipally Owned/ Managed

\* Number of stations per square mile within the service area

Table 1 - Existing Programs in Comparable Cities

## Existing Conditions

The first stage of assessing feasibility of bike share is evaluating current conditions in Frederick.

## Geography, Climate and Land Use



Figure 8 - View of Downtown Frederick

Founded in 1745, and located less than an hour from Washington DC, Baltimore, Gettysburg and Antietam Battlefields, Frederick is at the crossroads of many historical sites and events marking its development and growth. Frederick is dissected by a few major roadways including I-270, I-70 and US 15. The City's fifty block Historic District includes monuments, museums and historic cemeteries that tie its compact historical development together. Frederick's downtown is also

home to more than 200 specialty shops, art galleries and restaurants, in addition to its premier arts and entertainment establishments. Fort Detrick, Hood College and the Frederick Community College, also located within city boundaries, represent large centers of employment and housing for the City.

According to the U.S Census Bureau, the City has a total combined area of 22.2 square miles of which, 21.99 square miles is land and 0.21 square miles is water in the form of the Monocacy River, Carroll Creek and several small ponds and lakes.

Frederick exhibits the typical climate of the Mid Atlantic Region: summers tend to be hot and humid with frequent afternoon storms. Spring and autumn are warm, with spring being the wettest season in terms of the number of precipitation days. Winters are cool, but variable, with sporadic snowfall. The average daily temperature in summer is 80 degrees and throughout the winter it is 33 degrees.

Demand for a bike share program tends to be impacted by extreme temperatures (both hot and cold). The City's weather conditions are such that winter operations should be considered, as the temperatures are not too extreme within the City, but the final decision should be left to the City and a potential operator, which should negotiate on how to address snow removal and operations during inclement weather.

### *Challenges:*

- Major roadways and interstates can cause some disconnection of the streets between neighborhoods

### *Opportunities:*

- Increased redevelopment throughout the City – with an increased focus on mixed use development and more walkable and bikeable streets
- Increased density and mixture of land uses - especially throughout Downtown, US40 corridor, and N. East Street which provide the highest density of jobs and housing, mix of land uses, increased entertainment and retail districts, increased tourist accommodations, and significant transportation hubs serving transit
- Well-connected and relatively grid-like streets
- Generally flat topography

*Conclusions / Recommendations:*

There are no geographic or climatic challenges in Frederick that are greater than other cities that have successfully implemented bike share. The flat topography and general mix of land uses makes Frederick’s geography a good setting for bike share.

### Demographics and Employment

Bike share demand is probably most strongly influenced by the density and mix of land uses. The city of Frederick has numerous neighborhoods where the mix of population and employment are in close proximity and are ideally suited for short bike share trips. Downtown, Hawthorne Ridge, Commons of Avalon and Taskers Chance are neighborhoods with above average density and solid mix of housing and jobs.

	Area (mi)	Population	Density (per sq Mi)
<b>Frederick</b>	22.2	64,593	2,990
<b>DC</b>	68.3	632,323	9,258
<b>Boulder</b>	25.7	101,808	3,961
<b>Chattanooga</b>	142.2	171,279	1,204
<b>Spartanburg</b>	19.2	37,401	1,948

Table 2 - Peer Comparison Population Density

### Population Density

Situated in northwestern Maryland, Frederick is an outlying community of the Washington DC Metropolitan Statistical Area. The City holds the county government seat and is home to more than 66,000 people according to the 2012 Census data.<sup>19</sup> Frederick’s city-wide population density is approximately 2,990 persons per square mile, which is much higher than other comparable small to medium sized cities with existing programs (Table 2)

According to census figures, the City’s population grew by almost 25% in the time period between 2000 and 2010, making it the fastest growing incorporated area in Maryland with a population of over 50,000. The highest populated areas in the City include Downtown along Market Street; and the neighborhoods of Hawthorne Ridge, Commons of Avalon, and Taskers Chance all with population densities of 11,000 to 25,000 people per square mile.<sup>20</sup> Figure 9 shows the population density in Frederick.

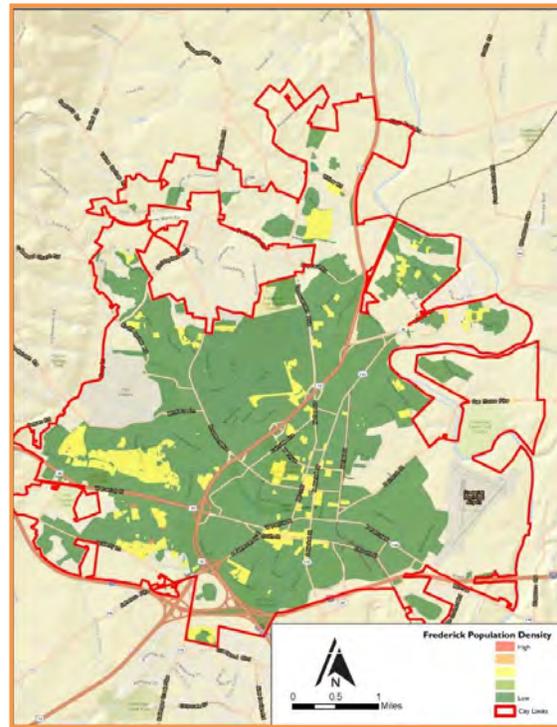


Figure 9 - Frederick Population Density

### Age, Sex and Demographic Distribution

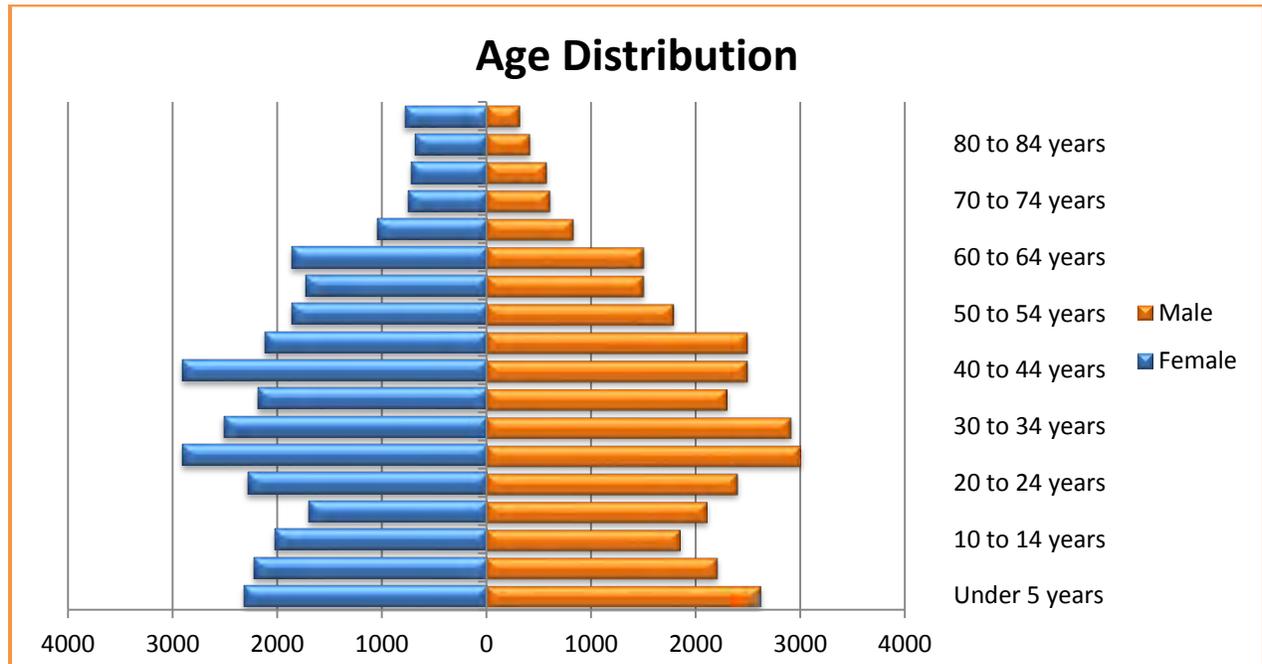
The median age in Frederick is 33 years of age, according to Census figures (see Figure 10 for complete age distribution). Additionally the city continues to attract younger urban professionals, who are typically early adopters for a bike share program. Medium household income is around \$66,000 (higher than other comparable size cities in Maryland), and around 22% of residents either carpool, bike, walk or use public transportation to

<sup>19</sup> US Census Bureau. 2012 Population Estimates. Accessed from [http://factfinder2.census.gov/faces/nav/jsf/pages/community\\_facts.xhtml#none](http://factfinder2.census.gov/faces/nav/jsf/pages/community_facts.xhtml#none) on August 6, 2013

<sup>20</sup> US Census Bureau. 2010 American Community Survey. File S2301.

get to and from work, all prime users to target as possible early bike share members.

The City is also home to both Hood College and Frederick Community College, both of which have a combined student population of over 8,000. Targeting initial bike share system deployment in areas with universities, colleges, and concentrations of young urban professionals, will help maximize potential ridership and early success of a bike share program.



**Figure 10 - City of Frederick Age Distribution**

The distribution between men (49 percent) and women (51 percent) is comparable to Maryland cities like Rockville (48 percent men vs. 52 percent women) and Gaithersburg (49% men vs. 51% women). This composition does differ with existing programs, where the majority of customers tend to be male: the Capital Bikeshare 2013 Member Survey Report<sup>21</sup>, 57% of survey respondents were male, which compares to 62% of Nice Ride customers.<sup>22</sup>

The demographic composition of the City of Frederick compares to other highly educated cities where both the technology and medical fields are the largest employers. The three largest demographic groups in the City include White (55%), African Americans (19.8%), and Hispanic or Latino (17.7%). This is similar to the demographic composition of Chattanooga, TN where Bike Chattanooga opened in early 2012.

<sup>21</sup>Capital Bikeshare 2013 Member Survey Report . Accessed from <http://capitalbikeshare.com/assets/pdf/CABI-2013SurveyReport.pdf> on June 4, 2013.

<sup>22</sup>Nice Ride Minnesota: Three-Month Update. Accessed from [https://www.niceridemn.org/news/2010/09/15/21/3\\_month\\_update](https://www.niceridemn.org/news/2010/09/15/21/3_month_update) on April 2, 2013.

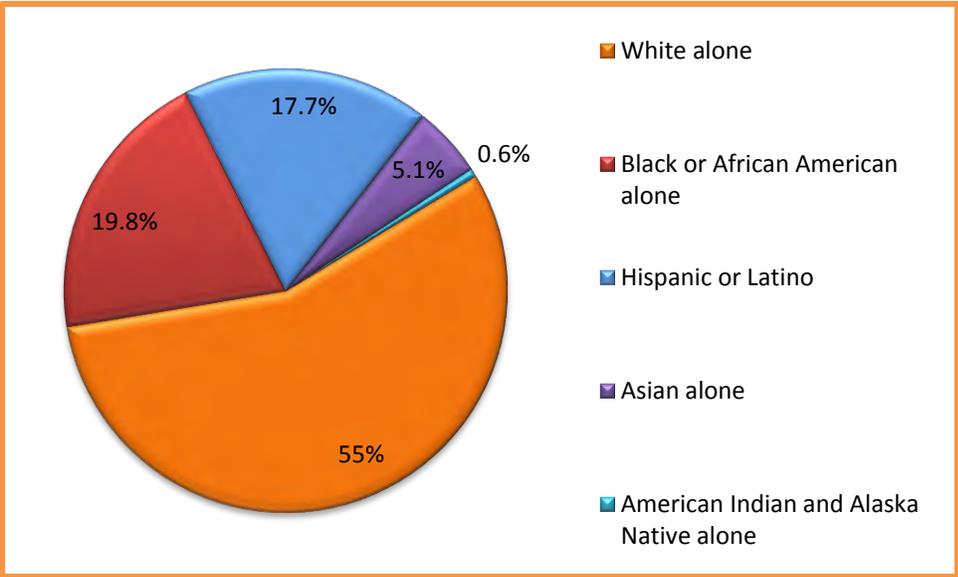


Figure 11 - City of Frederick Demographic Composition

**Employment**

Frederick’s relative proximity to Washington, DC has always been an important factor in the development of its local economy, and particularly in recent years it has greatly affected its growth. The City is part of the Interstate 270 Technology corridor and home to Fort Detrick, one of the largest Army bases in Maryland. More recently, its economy has been influenced by it being a center for cancer research.

As the seat of county government, the City and its surrounding areas are home to 75% of Frederick County’s employment opportunities. From bioscience and advanced technology, to high-tech manufacturing and professional services, the City has a diverse economic and business community. Fort Detrick represents Frederick’s largest employer with over 9,000 jobs in 2012 alone. Additionally as the administrative head of Frederick County, the City employs over 7,000 residents working for the Frederick County government within City limits. Other large

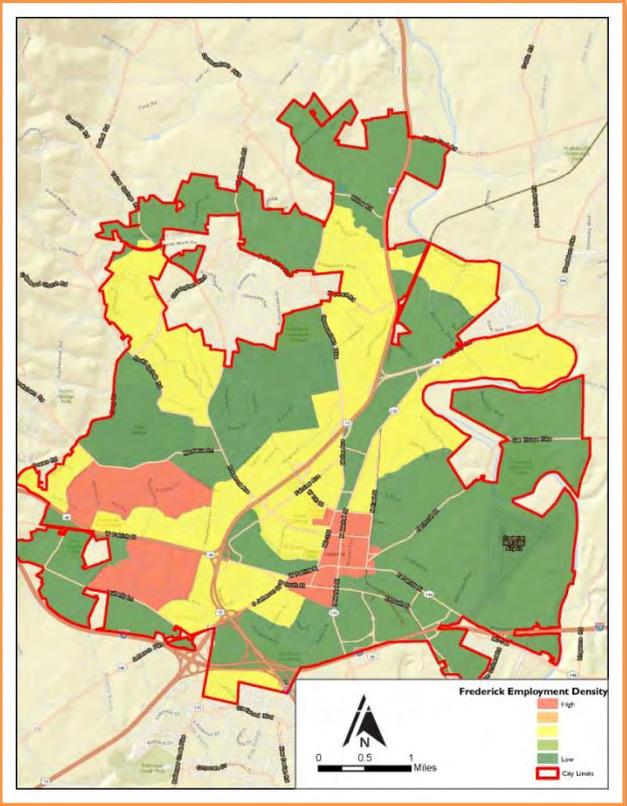


Figure 12 - Frederick Employment Density

industries in the City include education, government, health care, banking, and engineering.

Frederick's historic downtown contains more than 200 retailers, restaurants and antique shops along Market, Patrick and East streets. The restaurants feature a diverse array of cuisines and cultures, as well

as a number of nationally recognized dining establishments like Volt and the Tasting Room, which attract countless tourists generating millions of dollars in revenue.

**Table 3 - Top 10 Employers in the City of Frederick<sup>23</sup>**

Employer	Employees
Fort Detrick	9200
Frederick County Board of Education*	5538
Frederick Memorial Healthcare System	2300
Frederick County Government	2130
SAIC - Frederick	1965
Wells Fargo Home Mortgage	1881
Frederick Community College	899
Frederick City Government	852
United Health Care	832
State Farm Insurance Company	793

\* Note: Not all Frederick County Board of Education jobs are located within the City of Frederick

In addition to the great influence of county jobs in the local economy, major employers within the City include Wells Fargo Home Mortgage, United Healthcare and State Farm Insurance Company, among others (See Table3 for more details).

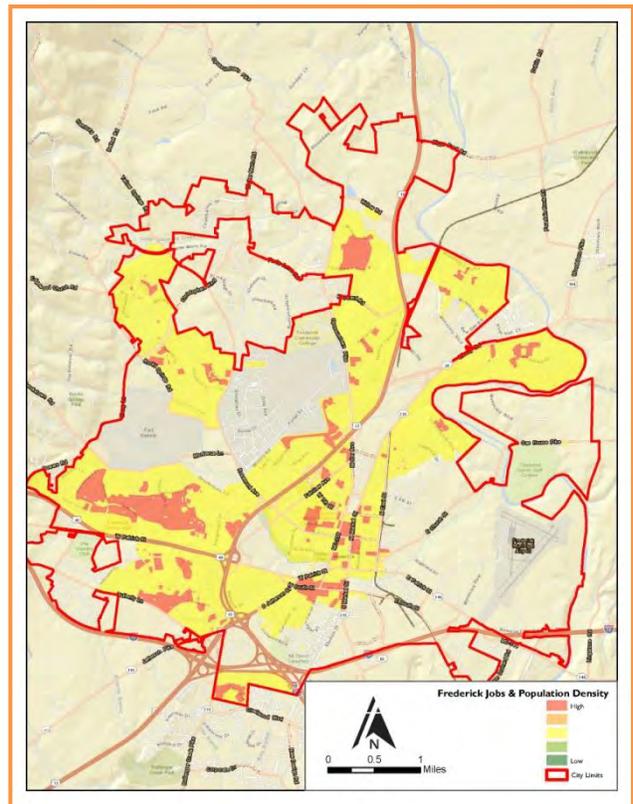
The density of jobs has a strong influence on the potential for bike share. Station locations that serve high volume job centers not only provide an extension to local transit connections, but also facilitate opportunities for short-distance work related trips such as off-site meetings, dining out for lunch, or running mid-day errands during breaks. Figure 12 shows the distribution of employment density across the city of Frederick.

### Mixed Use Population and Employment Density

To better understand the impact of the employment or population density on the potential for supporting bike share, it is important to evaluate these densities in regard to the mix of land use. High population density will only be truly conducive to bike share, if the housing is in close proximity to destinations. Additionally job centers are best served by bike share if people are able to live, work and shop without leaving the neighborhood. Figure 13 shows an index reflecting both the density and mix of population and jobs across the city of Frederick

#### Challenges:

- Population density lower than



**Figure 13 -Frederick Population and Employment Density Index**

<sup>23</sup> City of Frederick Comprehensive Annual Financial Report. 2012. Accessed from <http://www.cityoffrederick.com/DocumentCenter/Home/View/1737> on August 2, 2013.

Mid-Atlantic dense cities, but similar to small- to medium-sized cities that have implemented bike share systems

- Small population in comparison to other Mid-Atlantic cities

*Opportunities:*

- Young, urban professionals, especially living within the Market Street, West Patrick and East Street corridors
- Higher median income than other comparable size cities in Maryland
- Comparatively affordable housing stock
- Students living on or near Hood College and Frederick Community College
- Many large employers, particularly in the Northwest part of the city, Downtown, Lindsen Hills and Overlook Neighborhoods, that may be able to provide support in the form of members and sponsorship

*Conclusions / Recommendations:*

Although there are some challenges (lower population density), overall demographic and employment statistics indicate a positive setting for a bike share system.

## Bicycle Infrastructure

Frederick is a unique cycling community due to its historic downtown area, rural roads, and extensive mountain bike trails. High density, mixed-use development in the immediate downtown area, set on a grid system, make connectivity easy for bikes and pedestrians. Frederick's mountain bike trails are located just six miles from downtown, and offer some of the best mountain biking in the Mid-Atlantic Region.

Frederick's most significant investments for bicycling in the past year included the \$4.9M extension of the Carroll Creek Park Shared-Use Path, designing East Street Rails with Trails, and local planning for an additional six miles of on-street bicycle lanes. The extension of the 10 foot wide Carroll Creek shared-use path system has also included storm water management and re-grading of the trail area, as well as the inclusion of interpretive markers used as way-finding. To complement the shared use path and to share Frederick's rich history, the City also implemented a 10 mile bicycle loop around the historic Downtown. This signed bike route highlights structures, character sketches, and stories representative of the 18th, 19th, 20th, and 21st centuries. History Bicycle Loop (See Figure 14).

The City however has a limited but progressively expanding bicycle network. Its mode share while still low (2% as of 2011), has steadily been increasing along with its walking (3%) and its transit ridership (3%).<sup>24</sup> The following table indicates the number of miles of existing and planned bicycle facilities:

**Table 4 - Existing Bicycling Facilities in Frederick**

Facilities	Current Miles	Planned Miles
<b>Bike Facilities</b>	0.5	6
<b>Sharrows</b>	1	4
<b>Paved Shared use Paths</b>	13	17
<b>Natural surface shared use paths</b>	27	17
<b>Single Tracks</b>	37	1

While there is still a lack of separated bicycling infrastructure, the City has a strong and growing bicycling culture, exemplified by its Bronze Level Bicycle Friendly Community designation, growing participation in events like Bike to Work Day, the Frederick Clustered Spires High Wheel Race, "Ride with the Mayor", *Gran Fondo* National Championship, Tour de Frederick, Ride of Silence

<sup>24</sup> 2011 TPB Geographically-Focused Household Travel Surveys Initial Results. Retrieved from <http://www.mwcog.org/uploads/committee-documents/Z11eV1hZ20120406133342.pdf> on October 17, 2013.

and Car Free Day. Additionally, the City is home to increasing advocacy and education efforts by the Frederick Bicycle Coalition.

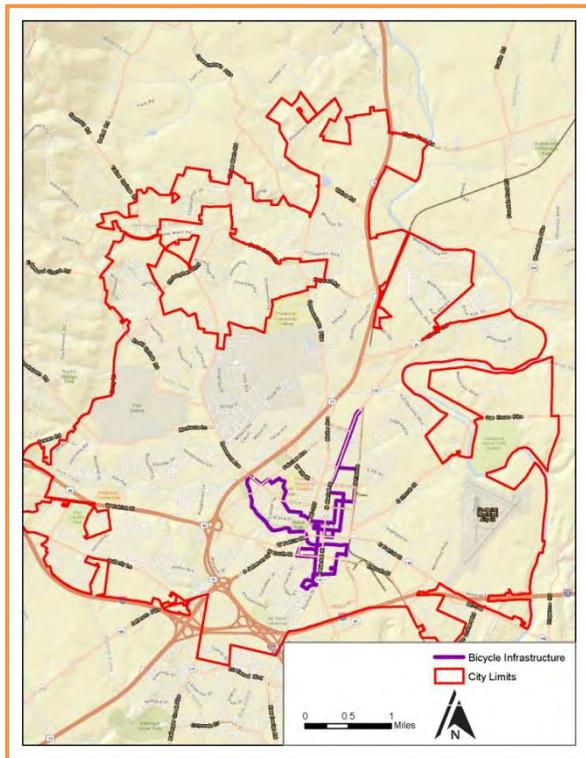


Figure 14 - Existing and Proposed Bicycle Facilities

The Frederick Bicycle Coalition, works with the City and County as well as local organizations and individuals to promote greater access to quality bicycling facilities in the City and Frederick County. As a very active advocacy organization, the FBC advises the City and County on issues related to bicycling access and safety, provides educational opportunities like safe cycling classes, help on bicycle related fundraising events, and advocates for more access to safe and secure bicycle facilities.

The City has two bicycle shops which specialize in serving the mountain and road cycling community. Additionally, the City has a very intricate bicycle registration program run by the police department, which facilitates the location of stolen or lost bicycles around the City. On the other hand, the City does not currently have a bicycle rental and/or bicycle tours business which could help promote and increase the use of bicycles for tourists looking to experience some of the facilities in and around Frederick. This may be beneficial for the initial

phasing a bike share program, as there will not be any opposition from existing bicycle rental businesses (which have presented opposition to bike share in some cities, but evidence has demonstrated that bike rental and bike shop businesses have thrived along with bike share programs).<sup>25</sup>

As the administrative head of Frederick County, the City adopted and is implementing a Shared Use Path Plan, which goes in line with Frederick County's Bikeways and Trails Plan. This Plan addresses both on-street bicycle facilities and off-street trails, and proposed a county-wide network of 334 miles of on-street bikeways and 174 miles of off-street trails.<sup>26</sup> In 2010, this plan was updated to include a pedestrian component. The update focused on improving cyclists and pedestrian safety by identifying priority project needs throughout residential and commercial growth areas, school zone areas, high-crash locations, and high traffic volume roadways. Specifically this plan called for:

- Extended Pathway on MD340 from the City of Frederick to Brunswick
- Proposed new shared use path from the City of Frederick to Middletown
- Proposed new shared use path from the City of Frederick to Thurmont
- On-street bikeways on Market Street and Rosemont Avenue
- Extension of multi-use trail on Carroll Creek

<sup>25</sup>What is the difference between Bike and Roll and Capital Bikeshare? Press Release. Bike and Roll. Release date: April 12, 2011. Accessed from <http://bikethesites.com/Press-Releases/bike-and-roll-or-capital-bike-share> on August 23, 2013

<sup>26</sup> City of Frederick. Shared Use path System factsheet. Accessed from <http://www.cityoffrederick.com/DocumentCenter/Home/View/730> on August 7, 2013.

The draft document is under review by the County Planning Commission and the Board of County Commissioners.

Having an extensive bikeway network is not essential to launching a bike share program. However, providing a core network of low-stress bikeways that connect various neighborhoods will help promote the success of the system. There are numerous thriving neighborhoods throughout Frederick where bicycling is already a popular transportation choice. A bike share system will need to be supported by safe, convenient connections within and between these neighborhoods, including overcoming barriers such as freeways (US15), railroads, and river corridors that often separate and disconnect these communities. While north-south connections will be complemented by planned on-street bikeways on Market Street and Rosemont Avenue, the City should promote the implementation of a more low stress East-West connection between Downtown Frederick and high employment areas around West Patrick Street.

Based on the experience of existing programs, bike share systems can give additional impetus to efforts to improve bicycle infrastructure<sup>27</sup> However, it is important that the City provide these connections to help increase the number of bicyclists in the City and consequentially help achieve a much larger mode-shift.

## Tourism



According to the City of Frederick's Department of Economic Development, tourism continues to play a major role in the City's economic well-being. In 2009, over 1.5 million visitors spent in excess of \$367 million while on excursion around the City. Tourism also accounted for nearly 5,200 industry-related jobs.<sup>28</sup> One of the chief attractions is Frederick's dynamic 50-block historic district, with its nationally renowned architecture, variety of historic sites, 130 retailers and 50 restaurants and cafes. Other City visitor attractions include notable Civil War landmarks, the National Civil War Medicine Museum and the Harry Grove Stadium, home to minor league

baseball. Additional data from the 2011 Economic Impact of Tourism in Maryland report indicated that visitor spending contributed a combined \$81.1-million in local, State and Federal taxes<sup>29</sup>.

Tourists can provide an important revenue stream for bike share systems, providing approximately 2/3 of the system revenues between short-term (or casual) membership fees and overtime usage fees.

### Challenges:

- Addressing some key East-West connections between activity centers

<sup>27</sup> Bike Sharing in the United States: State of the Practice and Guide to Implementation. Federal Highway Administration. United States Department of Transportation. September 2012.

<sup>28</sup> The City of Frederick – A Great American Business Destination. Department of Economic Development Brochure. Accessed from <http://www.cityoffrederick.com/DocumentCenter/Home/View/1135> on August 8, 2013.

<sup>29</sup> 2011 Economic Impact of Tourism in Maryland report Maryland Office of Tourism

- Developing a stronger tourism market which could eventually help pay for bike share
- If a program is implemented, the City should continue to invest in infrastructure that can support additional urban bicycling to complement and increase success of a bikeshare program

*Opportunities:*

- Change in bicycling culture – with increasing bicycling trends
- Additional investment in alternative forms of transportation
- Increased focus on sustainability and carbon reduction
- No existing bicycle rental organization/business
- Strategic Station Placement to support key tourist destinations
- Neighborhood engagement for station planning

*Conclusions / Recommendations:*

It is recommended that the City take the following steps to prepare for bike share implementation. These steps can be taken while moving forward on other aspects of bike share:

- Partner with local bicycle shops, downtown businesses and the Visitor’s center to initiate a bicycle rental business. Bicycle rental businesses tend to introduce many novice bicyclists to bicycling around a city. Additionally, jurisdictions with existing bike share programs have bicycle rental businesses that tend to complement the services of bike share program.
- Promote partnerships between its Department of Economic Development, convention and tourism agencies such as Visit Frederick, to capitalize on the existing goal of positioning Frederick as an exciting destination for active tourism. This would also be complemented with the promotion of bicycle rental businesses.
- Engage neighborhood groups to provide input to site station locations at key destinations with an emphasis on proximity to quality bicycling routes.
- Undertake the City’s first bicycle master plan, based on its Shared Use Path Plan to address key issues and gaps in the network, and identify infrastructure and funding strategies that are consistent with the growing popularity of bicycle transportation in Frederick.

## Public Transit

Public transit in Frederick is composed of three services: County Bus (TransIT), Connector Bus (TransIT) Commuter Bus (MTA RT991) and the MARC train (Brunswick Line), which are under the supervision of Frederick County and the Maryland Transit Administration (MTA). TransIT operates nine Connector buses throughout Frederick County most of which have bus stops along many parts of the City of Frederick.

Frederick County TransIT operates nine Connector Route throughout the City of Frederick; and the urbanized areas of Frederick County serving medical, employment, education and shopping centers. Six Connector

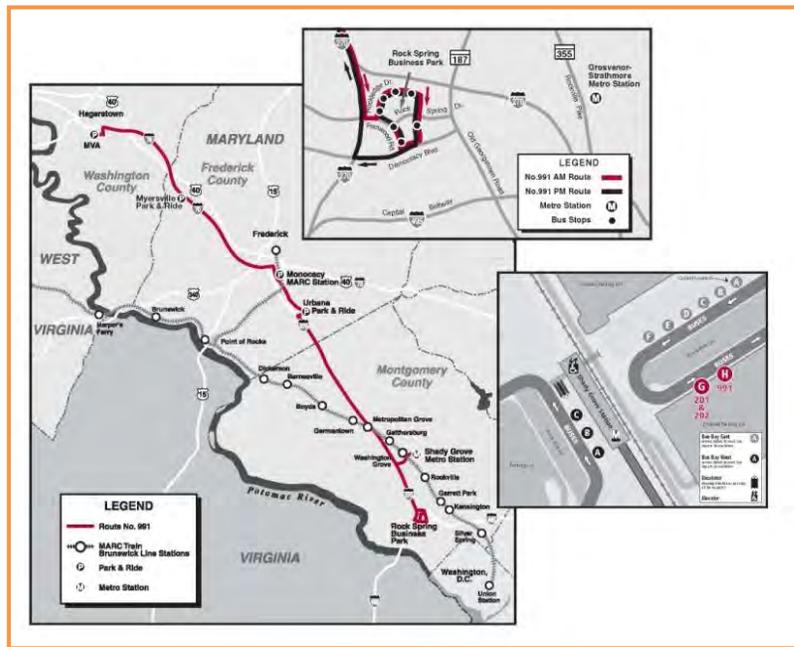


Figure 15 - MTA Commuter Bus (RT 991)

Routes serve deviated routes within 3/4 mile corridor of the route for passengers with disabilities. TransIT also operates weekday commuter shuttles between the City Frederick and Brunswick/Jefferson, Emmitsburg/Thurmont, Spring Ridge, and the Route 85/Crestwood Boulevard business corridor. In addition to this service, two commuter shuttles serve the downtown MARC station, and one shuttle serves the Point of Rocks train station.<sup>30</sup>



Figure 16 - MARC Train Service (Brunswick Line)

throughout 18 stations, and averages 7,000 daily trips. MTA's 2015 Growth and Investment Plan calls for incremental capital investments to fund a projected passenger increase of 1,400-2,000 additional passengers for the upcoming years.<sup>31</sup>

MTA operates the Commuter bus and MARC Train. MTA operates the 991Commuter Bus route on weekdays during the morning and evening rush hours. This route provides a direct commuter connection from the Monocacy MARC Station to the Shady Grove Metro Station (see Figure 15). The MARC train (Brunswick Line) provides a direct connection between the Frederick MARC station and DC's Union Station. The service operates Monday through Friday only during peak morning and afternoon commuting hours (See Figure 16). The line provides uninterrupted service for 75 miles,

<sup>30</sup> Frederick County TransIT. Accessed from <https://frederickcountymd.gov/index.aspx?NID=198> on August 12, 2013.

<sup>31</sup> MARC Train Growth and Investment Plan. Maryland Transit Authority. Accessed from <http://mta.maryland.gov/sites/default/files/marc%20plan%20full.pdf> on August 12, 2013

TransIT and MTA have recognized that bicycling may enhance its service by expanding its already extensive network. While MTA's Commuter buses do not offer dedicated bus space for bicycles, most of TransIT buses are equipped with bike racks. This demonstrates support of the idea of bicycling and potentially bike share as a last mile transit option.

There is a significant opportunity for a bike share program to complement existing transit services. A significant number of people who live and work in Downtown Frederick, along the Route 40 corridor, and around Hood College, utilize transit (MARC, Commuter Bus and TransIT bus) as a viable transportation option. This could be complemented by a bike share program which could transport additional people while allowing them to move around spontaneously throughout the day, helping curb CO<sub>2</sub> emissions.

*Challenges:*

- None identified

*Opportunities:*

- Stations should be located close to (visible, where possible) major transit hubs such as the Frederick MARC Station in Downtown and other high ridership stops
- The potential location of bike share stations near high ridership bus stops should also be considered, as they may act as feeder hubs connecting people from neighboring locations to transit. Additionally, a bike share program may help increase connectivity for residents of neighborhoods where transit service is limited
- Coordination with MTA will be essential for placement of any potential station at the Monocacy MARC station.

*Conclusions / Recommendations:*

The existing transit options present no identified challenges, and the corresponding transit agencies could potentially serve as a partner to the bike share system.

## **Plans and Regulations**

There are a number of plans, policies and statutory regulations that may impact the operation of a bike share scheme in the community. Plans and policies can be important measures of program compatibility with local initiatives, such as goals for encouraging healthy and active transportation, reduced greenhouse gas emissions, or providing low cost transportation options among transit-dependent populations.

A number of current plans and policy initiatives in the City of Frederick provide support for the potential of bike share in the city.

### **Plans**

The following is a review of existing and future bicycle infrastructure related plans and policies that may influence the implementation of a bike share program in the City of Frederick.

#### **Frederick County Bikeways and Trails Plan (1999)**

The Frederick County Bikeways and Trails Plan is the comprehensive plan for bicycle and trail facilities in Frederick County. The document establishes the vision for the County, identifies corridors for increased funding and possible improvements; develops design standards; and

develops implementation strategies for all projects contained within. The Plan establishes goals for the future including developing corridors and facilities that meet the needs of cyclists and other users in addition to providing pedestrian and bikeway access along with bicycle parking to transit.

The Draft document for the update to the 1999 Bicycle and Pedestrian Plan was not completed in time for this report. The Plan focuses on improving cyclist and pedestrian safety by targeting residential and commercial growth areas, school zone areas, high-crash locations, and high-volume roadways.

### City of Frederick Shared Use Path Plan

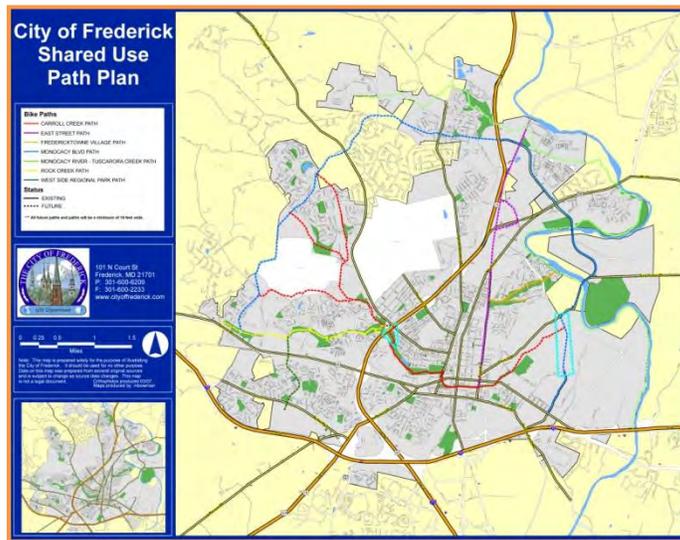


Figure 17- City of Frederick Shared Use Path Plan

The Plan provides recommendations for improvements to the existing pathway system to allow residents to travel throughout the City of Frederick without the need or use of an automobile. The plan also integrates the recommendations put forth by the Frederick County Bikeways and Trails plan. The plan makes recommendations for six corridors: Carroll Creek, East Street, Fredericktown Village, Monocacy Boulevard, Monocacy River and Rock Creek.

While the plan calls for a number of new bicycle connections throughout

While the plan calls for a number of new bicycle connections throughout

### City of Frederick Comprehensive Plan

This document delineates the transportation goals for the City of Frederick<sup>32</sup> The document puts forth goals for improving pedestrian facilities along City streets and planned open space network. It delineates the policies requiring sidewalks in conjunction with new street construction. Additionally the document provides the objective to increase bicycle usage and expand opportunities for recreational cycling. To this regard it talks about the appropriate standards, tools and possible upgrades to the existing infrastructure to create a more unified bicycle network.

### Frederick County Master Transportation Plan

The Master Transportation Plan provides a countywide focus on transportation needs and more importantly supports a multi-modal approach in addressing the mobility needs of the County.<sup>33</sup> With regards to bicycle and pedestrian mobility, the MTP includes the following components: TDM strategies for reducing single occupancy vehicle trips throughout Frederick County; development

<sup>32</sup> City of Frederick Comprehensive Plan. Accessed from <http://www.cityoffrederick.com/index.aspx?NID=445> on August 14, 2013.

<sup>33</sup> Frederick County Master Transportation Plan. Accessed from <https://frederickcountymd.gov/documents/7/150/MasterTranPlan.pdf> on August 14, 2013.

of more interconnected street pattern providing convenient access to various neighborhoods; increasing pedestrian friendly transit oriented development; upgrade of existing roads to incorporate safe and comfortable pedestrian and bicycle facilities; construct an on-street bikeway network on 334 miles of roadways including county, municipal, and state roads; increase accessibility to transit stations and park and ride lots; and increase connectivity to and from job centers.

Many aspects of this plan including its call for increase connectivity to jobs and population centers, as well as the provision of convenient access to various neighborhoods and transit, will play a pivotal role in helping promote the possible implementation of a bike share program in the City.

## Policies and City Ordinances

Bike share is a relatively new idea and the nature of the equipment and operations do not easily fit into existing framework for permitting and installation procedures. How the system is designed, owned and operated will have a significant impact on the process for siting and permitting station locations. Additionally, the operational model for short term subscription-based memberships and potential sponsorship and advertising agreements used to fund the system, can be greatly constrained by local policies and regulations governing permitted uses with public funding or within the public right-of-way.

There are several ordinances and regulations that could have an impact on the potential implementation of a bike share system, and may require special attention to address:

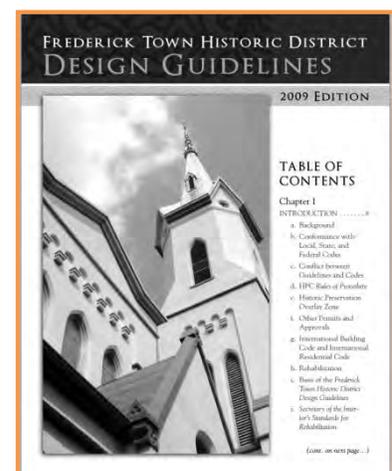
### Frederick County Bicycle Parking Design Guide

Adopted in January 2010, this Guide provides guidance on the specific requirements for providing bicycle parking, including the potential location, design and possible materials. The Guide also establishes bicycle parking minimums for different zoning and land uses. In commercial areas, the requirements call for 1 bicycle rack for each 20 car spaces, at a maximum of 10. In transit centers and rail stations the Guide calls for a minimum of 10 bike parking spaces.<sup>34</sup>

This Guide may enable the City to offer parking credits to those developers that provide capital for the implementation of a bike share program, in lieu of providing automobile parking spaces in new developments (bike share parking credits).

### City of Frederick Historic District Design Guidelines (2009)

The Guidelines assist the Historic Preservation Commission with the review of the exterior rehabilitation of historic properties, new construction and demolition in the Frederick Town Historic District.<sup>35</sup> Infrastructure elements included and protected under these guidelines include the paving, utilities, sidewalks, lighting, yards, parks, memorials, streets, alleys, parking lots and



<sup>34</sup> Frederick County Bicycle Parking Design Guide. Obtained from <http://frederickcountymd.gov/documents/7/150/BicycleParkingguidelines01192010.PDF> on August 12, 2013.

<sup>35</sup> 2009 City of Frederick Historic District Design Guidelines. Obtained from <http://www.cityoffrederick.com/DocumentCenter/Home/View/497> on August 13, 2013.

all development along Carroll Creek. Prohibited landscape and streetscape construction includes decks, planks for paved surfaces and gravel yards.

With regard to street furniture (i.e. benches, trash receptacles, ash trays, commercial mail boxes and drinking fountains in public Right of Way) the Guidelines prohibit vending machines and publication racks on the streets and sidewalks in the Historic District, and cannot be visible from any public right of way. Street furniture must blend with the historic nature of the streetscape (plastic and other non-historic materials are not acceptable).

The City may need to revisit or modify some of its existing protocols on street furniture to allow for the placement of bike share stations within the Historic District's right of way

### City of Frederick Land Management Code



Figure 18 - Carroll Creek Park

The Land Management Code was adopted to help implement the policies put forth by the Comprehensive Master Plan. The Code is geared towards controlling congestion in the streets; promoting health and the general welfare; promoting the conservation of natural resources; and facilitating the adequate provisions of transportation, among others.

Article 4 of the Code establishes the zoning regulations that apply to the City, including use, dimensional and design regulations for each district. The code also delineates the permitted encroachments on public right of way. This includes

a height restriction of no more than 150 ft in total above ground. Additionally, the Code restricts all height encroachment within the Historic District Overlay unless the Reviewing Authority reviews and approves encroachment.<sup>36</sup>

Article 6 establishes the Design and improvement standards for all developments in the city including sidewalks and some bicycle facilities. The code establishes the requirements for sidewalk width (minimum of 5ft), ADA compliance, location and standards for furniture. With this regard the document establishes that "no planting, wall, fence, sign, or other obstruction to motorists' vision shall be planted, erected or maintained higher than two and one-half (2 ½) feet above the adjoining street curb grade within a Sight Triangle Area."<sup>37</sup> The Article also establishes the number of parking lanes required for each street type and planned development.

Section 612 and 864 establish regulations for all signs in public right of way. With this regard "no signs other than an official traffic-related sign shall be located within or project into a public right-of-way, except otherwise specified."<sup>38</sup> However, with regard to changeable copy signs, twelve (12)

<sup>36</sup> City of Frederick Land Management Code. Article 4 Zoning. Accessed from <http://www.cityoffrederick.com/DocumentCenter/Home/View/428> on August 12, 2013.

<sup>37</sup> City of Frederick Land Management Code. Article 6 Design and improvement Standards. Accessed from <http://www.cityoffrederick.com/DocumentCenter/Home/View/430> on August 14, 2013.

<sup>38</sup> City of Frederick Land Management Code. Article 8 Supplemental Use Regulations. Accessed from <http://www.cityoffrederick.com/DocumentCenter/Home/View/432> on August 14, 2013.

square feet (per side) of changeable copy board may be added to any permanent freestanding sign within the only a few zoning districts for the exclusive purpose of advertising temporary sales, promotions or events or expressing a noncommercial message. No sign shall be subject to any limitation based on the content of the message contained on such sign. However, site plans designating amount and location of signs are required. Before any exterior sign shall be placed or altered in size, height, or location, a zoning certificate must be issued. Any way-finding signs that are part of a City-sponsored and coordinated program and approved by the Mayor and Board, shall be exempt.

## Regulations and Permitting

As previously stated, the zoning code, and historic preservation ordinances may potentially enable the City to offer parking credits to developers providing capital for the program and may encourage additional bicycle and pedestrian improvements, both conducive to the implementation of a bike share program.

### Encroachment Permit

An encroachment permit is required for any installation within the existing right of way (ROW). Permits have the potential to impact the use of sponsorship or advertising in funding the system. However, the Land Management Code permits the use non-permanent way-finding and advertising panels that are no bigger than 12 square feet per side. Additionally, related to any encroachment permitting required, depending on the type of business and ownership model, the City might consider permanent station locations as the permitting process tends to be easier and avoid the annual review of permitting. Finally, the City should consider the costs (if any) of obtaining permits for utilizing the public Right of Way and any parking space losses that implementing a bike share program might entail.

### Maryland Traffic Laws for Bicyclists<sup>39</sup>

The City of Frederick follows the descriptions and regulations that the State of Maryland has provided for bicyclists and motorists. More specifically Maryland Bicycle traffic laws call for:

- Riding on the right hand side of traffic, if riding slower than the speed of traffic. When lane is narrow or the bicyclist is operating on a one-way street, the bicyclist may take the full lane.
- A bicyclist riding at the speed of traffic can operate in any lane, just as any other vehicle can. Where there is not a bike lane, a bicyclist may also use the shoulder of the roadway.
- Riding a bicycle in the lane is prohibited where the posted maximum speed limit is more than 50 miles an hour; however, bicycles may be operated on the shoulder of these roadways.
- Bicycles may not be operated on expressways
- Drivers shall exercise the three (3) feet law when passing a bicycle or motor scooter if the bicycle is operated in a lawful manner.

### Challenges:

- Required encroachment permitting, Historic District Design Guidelines and Land Management code in the Historic Downtown District might have an effect on the placement of informational/advertising panels on bike share stations, and therefore the

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<sup>39</sup> Bicycle Safety Program. State Highway Administration. Maryland Department of Transportation. Accessed from <http://www.roads.maryland.gov/Index.aspx?PageId=357> on August 12, 2013.

ability for the system to be able to obtain private funding through sponsorship and/or advertising.

*Opportunities:*

- State, County and City policies and plans show support for bicycle initiatives, indicating that overall political support for the system. Local signage and advertising codes will not be an impediment to implementing a bike share program, except in the Historic Preservation District. The City should consider codifying the allowable use of advertising space in bike share stations within the Historic Preservation District before implementation begins.

*Conclusions / Recommendations:*

Prior to undertaking system procurement, local agency staff should research ordinances and regulations of potential concern and undertake responses necessary to make sure a bike share system and appropriate sponsorship / advertising structure is possible.

## Existing Organizational Capacity

There is significant support among community members for bike share in Frederick. Prior to implementation, however, the City must identify an entity to undertake the sponsorship, procurement, and implementation of a potential bike share program. Two potential structures that are relevant to Frederick are a non-profit organization formed to undertake bike share management, and direct management by the City.

Creating a non-for profit organization specifically charged with managing operations and service of a bike share system, is a viable way for smaller jurisdictions to implement such a program. Through this governance system, funding for equipment typically comes in the form of public and private sources, and the ongoing financial liability for operations and additional equipment falls under the non-for-profit organization, which is responsible for both fundraising and managing operational revenues. Through this approach, funding might be obtained from organizations promoting bicycling, the Historical Society, local churches and even advocacy groups.

The other likely potential structure is for the City to directly own and implement the program, the structure under which, jurisdictions that make part of the Capital Bikeshare system have selected. Such a structure gives full control to the City, and allows for simplest potential integration with Capital Bikeshare, as described below. Administration of a small system should require only part of one employee after system launch. However, presently the City does not have enough organizational capacity to implement such program, and would be required to add one more staff person to oversee the implementation of this program.

*Challenges:*

- There is no single current organization that is yet identified to undertake the procurement and the sponsorship for the system
- The City does not currently have a dedicated full time employee who may be able to manage a potential program.

*Opportunities:*



- There are at least two viable alternatives that can be seriously considered to manage the bike share system

*Conclusion / Recommendations:*

The City should consider whether it has the organizational capacity to manage the system. If so, such a structure leaves open the opportunity to integrate into the regional system and is the simplest to implement.

## Integration with Capital Bikeshare



Figure 19 - Capital Bikeshare

Capital Bikeshare is the large regional bike share system operating in the Metropolitan D.C. area. To this date, the jurisdictions subscribed to the system include Washington DC, Arlington County, City of Alexandria and Montgomery County. There are significant potential advantages if Frederick were to become part of the Capital Bikeshare network. There are also some potential disadvantages.

According to the Metropolitan Washington Council of Governments, each jurisdiction adjoined to the

Capital Bikeshare brand, owns the stations within its boundaries and the number of bicycles it

purchases.<sup>40</sup> To subscribe to the system, each new jurisdiction has had to sign a Memorandum of Understanding with Capital Bikeshare jurisdictions where all responsibilities and benefits are specified. Each jurisdiction is financially liable for their share of their system including the following:

- Capital Costs: cost of new stations and bicycles, installation of stations and replacement of equipment
- Operating expenses: these costs oscillate around \$150-200 per bicycle per month. Costs include operations 24/7/365, inspection and maintenance of bicycles, distribution costs, customer service call center and operating costs for the regional system website
- Marketing Costs: these costs include the general program marketing costs spread over all participating jurisdictions, plus any location specific marketing

Each jurisdiction also shares the revenues from the system according to a pre-determined formula based on share of the program, memberships from its jurisdiction and rides initiated within its jurisdiction. Each jurisdiction designates a representative to undertake in day-to-day management of the system for tasks including operator management, special events, marketing, pricing and other administrative decisions. Under the current MOU, while the Capital Bikeshare system may have various jurisdictional stakeholders, the Program has one sole contractor which operates the entire regional system.

According to City of Frederick officials, 60% of Frederick’s workforce commutes to Northern Virginia, Montgomery County and Washington DC, where Capital Bikeshare is already available. While it is not

<sup>40</sup> How Jurisdictions can Join Capital Bikeshare. Obtained from <http://www.mwcog.org/uploads/committee-documents/aF5WWV9Z20110609085152.pdf> on September 3, 2013.

expected that users of a potential bike share program will ride from Frederick to Washington DC, the City could consider the potential for branding its system differently while utilizing the same equipment and/or contractor so as to provide an integrated single key access to Capital Bikeshare and a Frederick System, which could provide first mile and last mile service to its residents therefore helping curb the use of cars and consequentially emissions.

*Challenges:*

- The City would be committed to a specific equipment provider, sole operator and already established costs
- Loss of control over many system decisions because of larger stakeholders

*Opportunities:*

- Expanded membership and service for Frederick residents working in or near Washington DC where Capital Bikeshare stations are prevalent
- Larger user base for Frederick as potential DC tourists become regular weekend users in Frederick
- No need for “reinventing the wheel”
- Program management and staffing needs are smaller than starting a program from scratch

*Conclusion / Recommendation:*

Integration with Capital Bikeshare is recommended for the City to expedite the implementation of its bike share program and expand the membership and service of its residents. Integration to the regional system can be achieved through the existing Metropolitan Washington Council of Governments (MWCOG) agreement under which all jurisdictions in the DC region with bike share stations are subscribed to. It is recommended that the City begin to reach members of the existing agreement and the vendor for possible inclusion into the regional system.

## Public Input and Stakeholder Engagement

### Public Input

This study effort included a broad approach to community engagement that included a number of approaches to engaging the community about the potential for bike share in Frederick. The focus of the engagement plan included a public meeting, targeted information gathering from key stakeholders, an online survey, and interactive web-based mapping tool to gather feedback about desired locations for bike share stations.

### Community Workshop

A public meeting was held at the Municipal Annex Bldg on August 1<sup>st</sup>, 2013. The meeting was attended by 18 stakeholders who were provided a presentation of the study purpose and preliminary findings. Attendees were also invited to participate in a guided discussion with project staff who were on hand. Finally, community members were asked to utilize dot stickers to make suggestions for locations for bike share stations.



Figure 20 - Bike share presentation at community workshop

The general feedback from attendees was one of enthusiasm for the concept of bike share, with many conversations revolving around how bike share could be used to incentivize tourism around Frederick, possible integration to the existing bike share program in Washington DC, as well as other logistics and operational considerations for a possible bike share program in the City.

Community members also supported a bike share program to help make Frederick more attractive to a young, creative and diverse group of businesses and residents. Additional attributes that a bike share program can bring to the community include linking key attractions and extending transportation options in the urban core.

### Online Survey

On Wednesday, July 17, 2013, a brief survey that included twenty-three (23) questions was released for the general public to review and answer. The purpose of the survey was to gauge the public attitude towards bicycling, and the possibility of implementing bike share program in the City.

The survey was divided into three major areas; respondents current bicycle usage, respondents opinions on bike share feasibility, and demographic and employment information. City staff disseminated the survey throughout various avenues, including press releases, newspaper and radio interviews. There were over 110 total responses from mid-July to early September, 2013. Additional details can be found in Appendix 2

### Current Bicycle Usage

The first four (4) questions asked respondents about their current bicycle usage. The questions included:

- Do you currently have access to a working bicycle? (79.7% yes)
- How often do you ride a bicycle? (41.1% a few times/week, 20% a few times/month, and 10% daily)
- Which of the following best characterizes your bicycling behavior? (65.9% seasonal versus 34.1% at all times of year/weather)
- What types of trips do you currently use a bicycle for? (94.4% recreation, 38.9% social visits, 37.8% shopping, and 28.9% work)

### Opinions on bike share and its feasibility

There were eight (8) questions asked respondents their opinions regarding bike share programs. The questions included:

- Have you had an opportunity to use an existing bike share system before? (58% yes)
- Do you think bike share is a good idea for the City of Frederick? (82% yes)
- If bike share were available, throughout Frederick what types of trips do you think you would use the bikes for? (52.3% errands, 45% shopping/dining, 44% meeting family and friends, 38.5% exercise, 24.8% riding to MARC/Commuter Bus, 21.1% going to meetings, and 13.8% going to work)
- About how often do you think you would use bike share? (37.8% once a month, 25.5% once a week, 21.6% never, 15.3% other, and 2.7% once a day)
- What price would make you likely to subscribe to bike share in Frederick? (Annual Average - \$69.90, Weekly Average - \$13.08, and Daily Average - \$6.75)

It is important to note that since the survey went out primarily through organizations and individuals who support bicycling, the number of respondents with access to a bicycle, usage, behavior, and trips is most likely higher than the general population of the City and surrounding communities. However, this summary does reflect a strong, growing bicycle culture within Frederick.

### Demographic and Employment Information

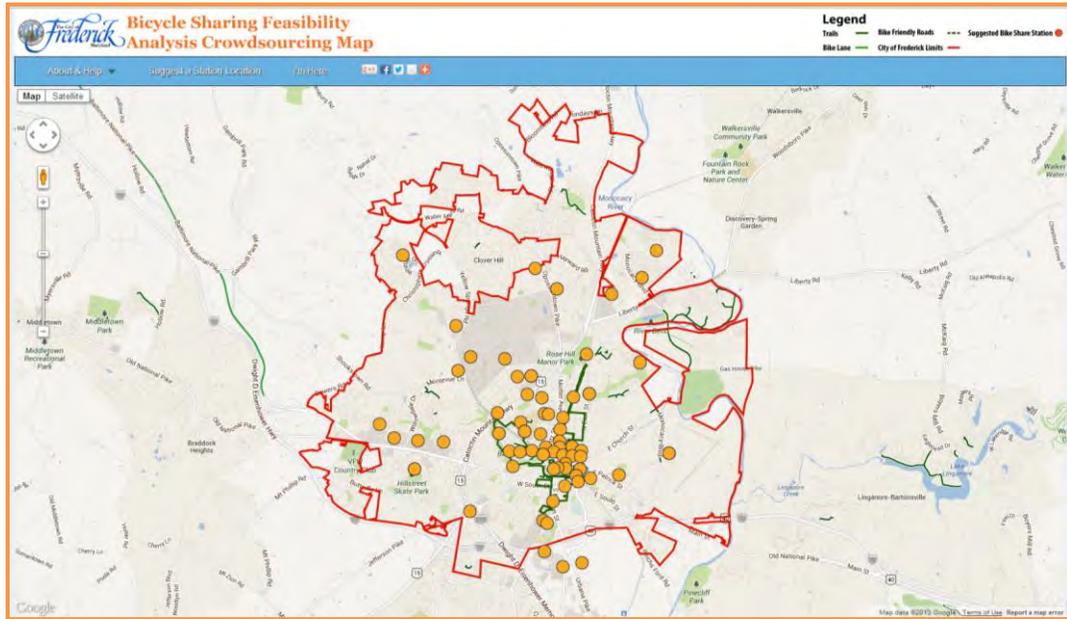
Seven (7) questions were asked about demographic and employment information of the survey respondents. The questions ranged from:

- Year of birth (average was 1969)
- Sex (55% female and 45% male)
- Ethnicity (of those responding: 90% white, 5.5% other, 1% black/African American, 1.8% Hispanic/Latino, and 1.8% Asian)
- Currently employed (85.7% yes)
- Annual household income (31.8% - \$120k+; 14% - \$100k-\$120K; 21.5% - \$80K-\$100K; 12.2% - \$60k to \$80k, 6.5% - \$40k to \$60k; and 14% less than \$40K)

### Interactive Web-Based Mapping Tool

In addition to the on-line survey the project website ([www.frederickbikeshare.com](http://www.frederickbikeshare.com)) included a link to an interactive web map that provided an opportunity for the public to suggest locations where they think bike share stations would best serve the community. Figure 21 shows a screenshot of the interactive map.

Figure 21 - Screenshot of interactive on-line map hosted on project website



Around 100 station suggestions were submitted using the mapping tool, with many locations being endorsed by multiple users who were able to support an existing suggestion by choosing to “like” the suggestion (similar to the format for liking content posted on the Facebook social media website).

All of the suggested locations with likes and comments were able to be exported as a Geographic Information System (GIS) shape file, and were mapped and analyzed by the project team. This feedback was aggregated along with the other existing mapped data to produce the demand analysis map in the next section of this report

### Stakeholder Survey

An online stakeholder survey was distributed to various agencies, businesses and private sector representatives, identified by the City during the feasibility study. The survey was completed by 16 stakeholders. Selected stakeholders included representatives from various government agencies including Fort Detrick as well as County and City officials, bicycling and pedestrian advocates, local businesses and elected officials, among others. A full list of questions and stakeholders interviewed can be found in Appendix 3.

The stakeholder survey reaffirmed several assumptions that existed prior to launching the feasibility study for bike share and shed light on additional opportunities and challenges for the City. There is great interest for bike share in Frederick among the stakeholder groups surveyed. Many felt that bike share could help elevate Frederick’s reputation for visitors, potential residents and companies while increasing bicycle usage.

The majority of the organizations surveyed are interested in seeing an active bike share system in Frederick. Overall, there is strong support for continuing to gain an understanding of the feasibility of bike share and interest in understanding how a potential program could integrate to

existing/proposed plans from nearby jurisdictions (ex. Capital Bikeshare in the DC region and Charm City Bikeshare in Baltimore).

Stakeholders most commonly support a bike share program to increase connections for local residents as well as help make Frederick more attractive to visitors and the existing young, creative and diverse group of businesses and residents. Additional attributes that a bike share program can bring to the community include extending transportation options in the urban core while helping increase the economic vitality of downtown and decrease its traffic congestion. Most stakeholders ranked station sponsorship as the most important way to help fund the program, and while their organization could be open to the possibility of providing said sponsorship, many stakeholders exhibited some reservations due to low budgets available for possible sponsorship. Stakeholders also supported the program with a focus on promoting healthier lifestyles. The desire to utilize the bike share program to increase bicycling numbers and bicycle tourism around the area was also ranked highly.

There is some hesitation on how a program could be implemented due to low number of continuous and safe bicycling infrastructure and culture in and around the City. Stakeholders also expressed some concern about the lack of available information on estimated costs for implementing the system, especially as it relates to possible sponsorship. Concerns focused on operating the system in a way that would be responsive to customer needs, nimble and cost effectively. Ongoing operating support was a greater concern than upfront capital costs. Despite these concerns, stakeholders remain interested in supporting the investigation of establishing a bike share program in Frederick.

#### *Challenges:*

- Input received was predominantly from current bicyclists or cycling enthusiasts who are most likely to support bike share
- Input received was predominantly from higher income, white members of the community, which is not completely representative of the City's demographic composition
- Hesitation remains due to the lack of bicycling infrastructure and culture
- Stakeholders expressed concern about the lack of available information on estimated costs for implementing the system. Concerns focused on operating the system in a nimble and cost effective way
- Increase awareness of biking in Frederick

#### *Opportunities:*

- Based on public input feedback, there is significant support for bike share in Frederick
- Pricing indicated that people would be willing to pay market prices for bike share. This also indicated that if regional integration into the existing Capital Bikeshare system is considered, the general public would be willing to pay the existing prices.
- Ongoing operating support was a greater concern than upfront capital costs. Despite these concerns, stakeholders remain interested in supporting the investigation of establishing a bike share program in Frederick.

#### *Conclusions / Recommendations:*

During implementation stage, there should be a larger effort to gain input from a wide range of Frederick population to better represent the existing socio-economic and racial composition of the City's population. Larger efforts should also try including both cyclists and

non-cyclists. No input given during this stage poses any major issues for a system implementation.

The implementation stage should also take into account the following priorities, as a funding mechanism is being sought:

*Operational Priorities:*

- Customer service focus – front and center
- User friendly interface – easy to use membership / rental
- Tech savvy systems operators
- Attractive to younger users
- Clean / well-maintained bikes and stations
- Safety – bikes, helmets and stations

*Organizational Priorities:*

- Tech savvy – nimble operating organization
- Bike share expertise
- Customer service oriented
- Sufficient organizational capacity

*Sponsorship Opportunities:*

- Corporate / group memberships
- Sponsoring bike stations
- Bikes

## Evaluating Demand, System Size and Funding Sources

Key questions to answer in evaluating the feasibility of bike share program are concerned with who will use it, where will people need it, where will people use it, and how will it be implemented and paid for. To address these questions, a demand analysis was undertaken to evaluate the potential service area and market for bike share. This analysis also provided an outline of different potential funding sources.

### Demand Analysis

A demand analysis was performed using data obtained from the U.S. Census and the City of Frederick. The demand analysis was used to measure the best suitable location for implementing a bike share program and bike share stations. Areas with high potential demand for bike share were identified through a heat mapping exercise that allocated “points” to where people live, work, shop, play, and take transit. Launching a bike share program in the highest demand areas tends to maximize the success of the program.

### Indicators

The following is a list of indicators selected to construct the demand analysis because of their individual effect on potential demand and relative success of a bike share program.

#### Employment Density

Employment density helps understand the location of most people during the day. It is also utilized to help measure the intensity of commuting patterns and help understand where increased service will be needed.

#### Population Density

Increased population density tends to support bike share demand by providing a pool of potential users. The higher density in a particular location, the greater the number of potential users of a bike share program will be. It is important to note that retail employment density was included in this indicator because of its function as a trip attractor throughout the day.

#### Proximity to Transit

Bike share programs are often organized to provide links to and from transit. Throughout existing programs higher bicycle mode share in a particular location tends to promote increased bike share usage.

#### Proximity to Parks, Libraries, Schools and Tourist Attractions

Parks tend to be a bike friendly land use and most cyclists are comfortable biking in parks. Parks serve as a destination for both residents and tourists. All of these locations tend to act as trip attractions and tend to be destinations for bike-share users. The degree to which each location affects bike share ridership varies on the basis on whether the selected business model allows for longer “free” service periods.

#### Proximity to Bicycle Infrastructure

Bicycle lanes, bike boulevards, cycle tracks and shared use paths provide supporting infrastructure for bike share users. The presence of bicycle friendly infrastructure is correlated with higher rates of bicycling or willingness to cycle.

### Public Comments

Bike share stations are usually located where they get the most use. Analysis of the suggested station locations is helpful in defining the bike share market zones.

### Methodology

The bike share demand map (Heat Map) was created by aggregating various population, employment, and proximity data, which tend to affect the success of a bike share program. Each factor was weighed based on its perceived impact on bike share demand. Additional data in this study included the location of parks, libraries, schools, businesses, as well as location of bicycle trails. Certain factors are area-based data (e.g. Census Blocks and/or Tracts). The data was assigned weights based on criteria affecting the different factors. Table 5 provides a complete breakdown of weighed values for each data item. Other factors are points or linear features. These factors were evaluated by creating buffers surrounding these features at pre-determined distances and assigning scores to each buffer (e.g. Areas within .1 mile of an attractions are given 3 points, within .25 mile are given 2 point).

	Point Allocation				TOTAL POINTS	Factor Weight
	Census Tract	.1 mi	.25 mi	.5 mi		
<b>Employment</b>	20	-	-	-	20	20%
<b>Population</b>	20	-	-	-	20	20%
<b>Existing Bicycle Network</b>	-	10	4	1	15	15%
<b>Transit (MARC)</b>	-	10	4	1	15	15%
<b>Bike Loop Points of Interest</b>	-	10	5	-	15	15%
<b>Colleges and Schools; Arts/Entertainment; Visitor Center, Parks</b>	-	5	2	1	8	8%
<b>Public Comments</b>	7	-	-	0	7	7%

Table 5 - Weighting Factors for Bike Share Heat Map

All factors were then combined utilizing GIS into one feature layer containing all individually evaluated and assigned points. Finally, the weighed scores were summed up to produce geographic scores which were used to assemble the “heat map” on Figure 22.

### Demand Estimates

The resulting outputs from the analysis provide a more general assessment of the potential for bike share displayed as a “Heat Map” shown in Figure 22. The Heat Map provides a snap shot of the city, and was used to guide the study team in defining appropriate market areas for launching a bike share program that are described in the next section of the report.

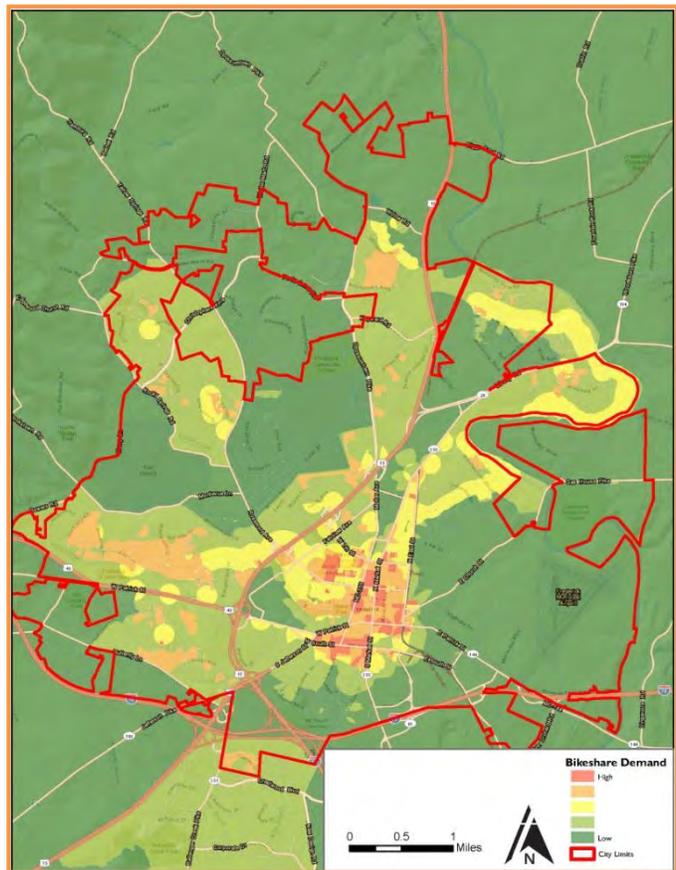


Figure 22 - Frederick Bike Share Demand "Heat Map"

## Recommended System Service Area and Size

### Bike Share Market Recommendations

Based on the analysis of existing conditions and the feedback from the community engagement process, various areas of the City have been identified as having high potential for being conducive to implementing a bike share program. To this end, various zones have been developed for recommended bike share implementation in Frederick. The map below shows proposed market areas overlaid on the bike share demand map.

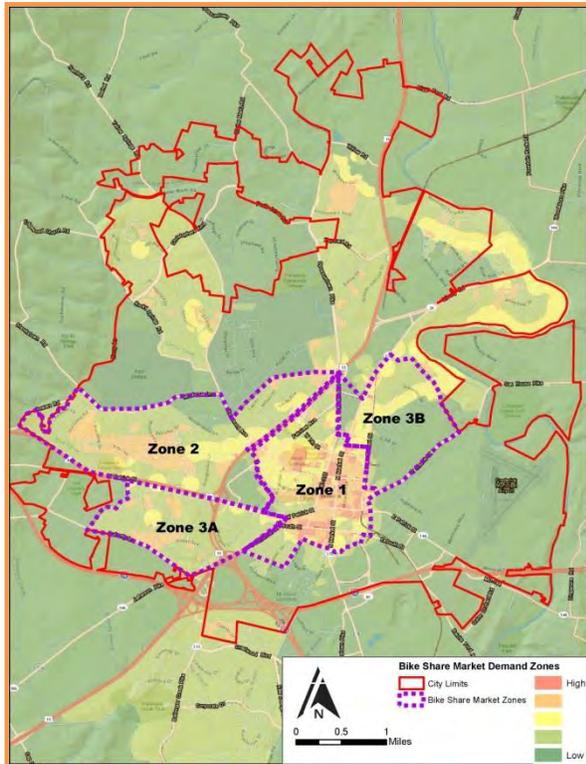


Figure 23 - Proposed Bike Share Market Zones

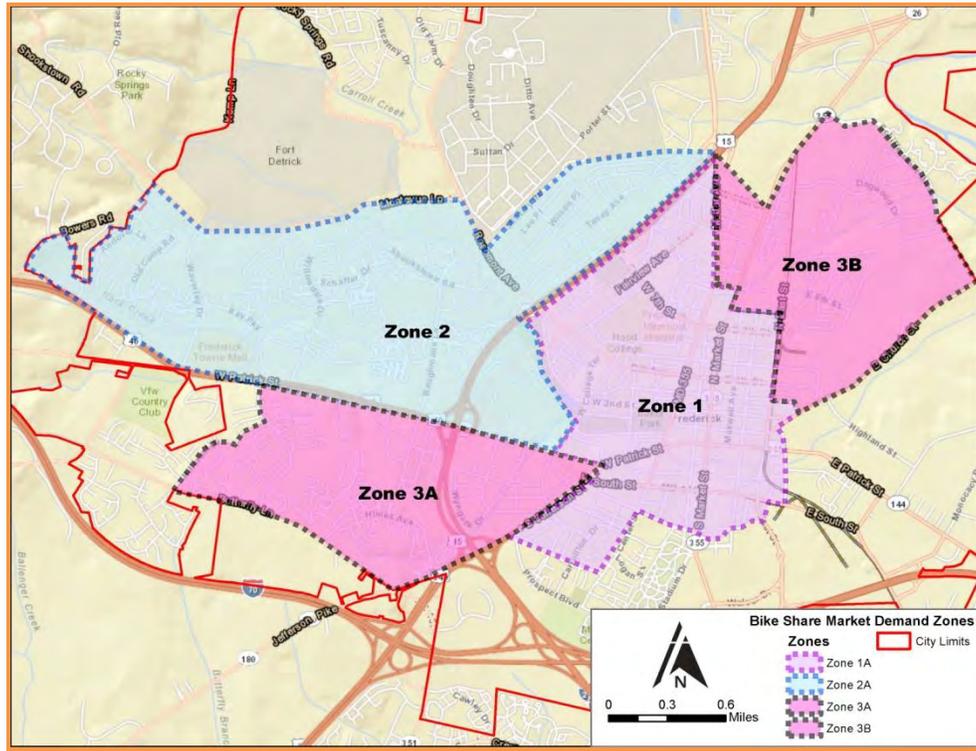
The recommended system boundaries have been divided up into three zones and various deployment phases (shown as subzones) based on deployment beginning in core market areas and gradually expanding into the adjacent neighborhoods during the first few years of system implementation.

The zones and the recommended phasing (Figure 23) are based on modest assumptions for assembling the capital to build out the planned system over a three to five year period, beginning in 2014. The subzones have been developed based on market characteristics, geographical breaks and system operating characteristics, with recommendations for the optimal number of bikes and stations within each. These recommendations are presented as a range of system size and scale opportunities, from the lowest number of bikes and stations needed to support a system- to an optimal size for a large scale system appropriate for Frederick.

The proposed zones represent the initial phasing for developing a bike share system in Frederick. Ongoing planning should occur as the system becomes operational to identify expansion opportunities beyond the primary market areas. These should include coordination with multiple jurisdictions to capture markets both within the City and into adjacent communities beyond the city limits.

It is important to note that any siting of bike share stations along State Highway Administration (SHA) maintained roadways will be subject to permit and design review by SHA.

Figure 24 - Proposed Market Areas for Initial Bike Share Service in Frederick



Zones 1 and 2 are what constitute the core market areas for the bike share system. Frederick’s Historic downtown has the highest potential demand for bike share, and should be the focus for Year One of implementation. Depending on funding availability, the system should consider expanding westward through the W. Patrick Street Corridor in the following years. If launching each zone independently, the downtown zone should be selected based on geographic positioning at the core of the system, as well as its role as the region’s hub for both transportation and tourist destinations.

Zones 3A and 3B represent the expanded bike share market for Frederick. This Phase of the program would represent a less dense station deployment, to extend the network into more residential neighborhoods and better connect to the core Downtown market.

### Service Boundary and Station Density

Analysis of the peer systems show core market densities that range from 1.5 to 7.88 stations per square mile, with a four-system average of 5.91 stations per mile. The system-wide densities of the peer systems range from around 1.5 to 6.21 stations per square mile, with a four-system average of 4.24 stations per square mile.

Table 6 Core and Expanded Market Station Densities of Peer Bike Share Systems

System	Core Market Area	Expanded Market Area
<b>Boulder</b>	7.39 Stations/Sq. mi.	4.79 Stations/Sq. mi.
<b>Chattanooga</b>	6.88 Stations/Sq. mi.	6.21 Stations/Sq. mi.
<b>DC/Arlington</b>	7.88 Stations/Sq. mi.	4.52 Stations/Sq. mi.
<b>Spartanburg</b>	1.47 Stations/Sq. mi.	1.47 Stations/Sq. mi.
<b>4-system Average</b>	5.91 Stations/Sq. mi.	4.24 Stations/Sq. mi.

Based on the existing system averages presented above, in addition to analyzing population and employment density, it is recommended that the City take a conservative and phased approach to implementing of a bike share system based on the parameters presented in Table 8:

**Table 7 - Recommended Service Area and System Characteristics**

	Service Area (Sq. Mi.)	Stations	Bicycles	Station Density (per Sq. Mi.)
<b>Zone 1</b>	1.68	8-12	80-120	5.95-7.14
<b>Zone 2</b>	2.49	8-9	80-90	3.21-3.61
<b>Zone 3A</b>	1.18	4-5	40-50	3.39-4.24
<b>Zone 3b</b>	1.18	3-4	30-40	2.59-3.45
<b>Total</b>	6.51	25-30	250-300	4.61

**First Phase: Zone 1**

Zone 1 represents the core market area of Downtown Frederick and the first phase of deployment for the bike share system. At just over one and one half square miles, this area represents the heart of the system. This first phase when completed will represent the highest density of stations and include 8 stations and 80 bikes in the low bound scenario and up to 12 stations and 120 bikes in the upper bound scenario. The station density of Zone 1 will range from 5.95 to 7.14 stations per mile. Please note that higher densities should be implemented in the heart of Downtown Frederick, while allowing for lighter density around the periphery.

**Second Phase: Zone 2**

Zone 2 will extend the system westward along the West Patrick Street Corridor to help better connect the Historic Downtown to Western Parts of the City, and to Fort Detrick one of the biggest employers in Frederick. The Zone 2 expansion will add around an additional 2.49 square miles of service area, bringing the total system build out to just over four square miles.

The implementation of the Phase 2 market will add 8 stations and 80 bicycles in the low bound scenario to 9 stations and 90 bicycles in the upper bound scenario, increasing the system total to a total of 180 to 210 bicycles and 18 to 21 stations when completed. The station density for the second phase will range from 3.21 to 3.61 stations per square mile. It is recommended that the highest density within this Phase is maintained in close proximity to Zone 1, and throughout West Patrick Street, an important commercial corridor for the City. This is consistent with the system-wide densities occurring with comparable current U.S. bike share programs.

**Third Phase: Zone 3**

Zone 3A and 3B to be implemented will extend the system to 1) the south along the West Patrick Street Corridor, and 2) north from Frederick’s Historic Downtown. The Zone 3 expansion will add just under 2.5 square miles of additional service area, bringing the total system build out to just over 6.5 square miles.

The final deployment of this Phase will add 70 bicycles and 7 stations in the low bound scenario to an additional 90 bicycles and 9 stations in the upper bound scenario, increasing the system total to a total of 250 to 300 bicycles and 25 to 30 stations when completed. The station density for the third phase will range from 2.59 to 3.45 stations per square mile with the highest density throughout the commercial district along West Patrick Street and North Market Street.



## Key Demographics of the Bike Share Service Area

Overall the Frederick bike share system will serve an area with 44,343 residents and 33,060 jobs. The bike share service area represents a diverse cross section of Frederick in terms of age, race, income, and education. The proposed bike share service area covers a variety of land uses, as well as population and employment densities. This proposed service area would encompass a population density of 3,545 and an employment density of 5,078 per square mile. The proposed service area has a greater population density than the city on the whole and exceeds the population density of the other small to mid size cities in Maryland. Table 9 provides a summary of select market demographics for each of the proposed market areas.<sup>41</sup>

Table 8 - Select Demographics for System Phases

	Zone 1	Zone 2	Zone 3A	Zone B	Frederick
<b>Population</b>					
2010 Census population	12,633	14,796	8,326	8,588	66,382
<b>Employment</b>					
Jobs	6,933	10,105	2,947	5,064	51,273
<b>Race</b>					
White	9,291	9,814	6,069	5,607	38,480
Black	2,247	2,077	897	1,186	11,028
Asian	197	594	102	236	3,975
Hawaiian/Pacific Island	3	14	3	4	95
Other	107	655	34	240	190
Multiple Race	276	380	141	210	1,465
Hispanic	327	1,087	165	435	9,015
<b>Gender</b>					
Male	5,536	6,501	3,456	3,596	27,615
Female	6,616	7,096	3,800	3,904	38,767
<b>Age</b>					
Under 5 years	664	1,089	548	598	5,178
5 to 9 years	1,642	2,122	1,278	1,564	5,311
10 to 14 years	849	732	237	342	3,385
15 to 19 years	1,528	2,090	808	970	3,585
20 to 24 years	1,857	2,459	1,456	1,527	4,448
25 to 34 years	1,719	1,915	1,120	1,144	11,019
35 to 44 years	1,888	1,565	888	739	8,829
45 to 54 years	2,005	1,625	921	616	9,360
55 and up	-	-	-	-	15,268
<b>Housing</b>					
Units	5,751	6,225	3,079	2,865	26,103
Vacant	464	388	123	97	596
Owner Occupied	2,273	2,397	1,912	1,562	14,107
Renter Occupied	3,014	3,440	1,044	1,206	11,400
<b>Area</b>					
Square Miles	1.68	2.49	1.18	1.80	22.2

The proposed bike share service area while comprising about 1/3 of the city area, encompasses more than half of the population and more than 60 percent of the city's jobs. Additionally the proposed market areas provide a balance of equity addressing underserved populations. Zones 2 and 3B have significant proportions of nonwhite populations including (30-60 percent respectively). The proposed market areas also capture a lower percentage of households who rent (49% rent overall compared to city rate of 54%).

<sup>41</sup> Source: U.S. Census Bureau, 2010 DP02, DP03 Files

Overall, the proposed market area provides the greatest opportunity to reach likely users while providing equitable opportunity for the system to be utilized by persons who can most benefit to low-cost transportation options for short trips. This includes persons of low to moderate incomes as well as a large number of university age students who live in close proximity to Hood College, and a large number of people working in Fort Detrick.

## Potential Funding Sources

There are significant public and private potential sources of funding for a bike share system for Frederick.

### Public Sources:

#### Federal:

Unlike other transit modes which have dedicated funding sources, bike share largely relies on discretionary grant programs such as Congestion Mitigation Air Quality (CMAQ) and Transportation Investment Generating Economic Recovery (TIGER) for public funding. Many cities, including Washington DC, Chicago, Chattanooga, San Francisco, Pittsburgh and Las Vegas, have utilized or are utilizing, CMAQ funding for bike share system implementation, both from FTA and FHWA. Such funding requires a local match, typically around 20 percent. Matching funds can come from sponsorship, or other state/local funding. A complete list of available sources of Federal funding can be found in the table below.<sup>42</sup>

	NHS	STP	HSIP	SRTS	TEA	CMAQ	RTP	FTA	TE	BRI	402	PLA	TCSP	JOBS	FLH	BYW
Bicycle parking facilities																
Bicycle share (capital costs only, operations not eligible)																
Bicycle storage/service center																

Table 9 - Existing USDOT Funding Streams for Bike Share Implementation

There are a number of factors to consider before pursuing federal funds:

- There is a significant amount of competition for federal funds and grants from various cities looking for funding for bike share. A detailed understanding of the application process is often required.
- These sources are generally less flexible than other funding sources, and may only be used for capital expenditures, not for launch and operations. For example, FTA funding may only be used for specific capital expenditures (i.e. bike share docks and equipment) not including the bicycles, whereas FHWA funding can be used for to purchase all equipment including bikes. Furthermore, there are only a few grants available to cover the costs of operations.
- “Buy America” provisions, NEPA assessments, and accessibility considerations are among the additional requirements a jurisdiction must subscribe to in order to access Federal funding.

<sup>42</sup> General Funding Requirements. Federal Highway Administration. Accessed from [http://www.fhwa.dot.gov/environment/bicycle\\_pedestrian/guidance/bp-guid.cfm#bp4](http://www.fhwa.dot.gov/environment/bicycle_pedestrian/guidance/bp-guid.cfm#bp4) on August 22, 2013.

- Federal funds can be less flexible in terms of disbursement/reimbursement timeframe and delays are common. This can make deployment more difficult, particularly given the high profile nature of bike share roll out in many jurisdictions.<sup>43</sup>

### State and City:

Although not as common as using federal funding, some cities have been able to use state and/or city funding for bike share. For example, cities like Columbus used 100% city funding for their 300-bike system. Boston used some state funding for a portion of their capital costs. The City may be able to access some funding from MDOT's bikeways program.

### Private Sources:

Private funding is a key component of various existing systems in the U.S. Private foundation grants and private donations are typical revenue streams for systems owned and operated by non-profit organizations. While private funding is an intense and arduous process which can require a large percentage of staff time to fundraise, there is also more flexibility in how the funding can be spent. The City should consider how much staff time will be available for looking into different sources of private funding.

There are many potential sources for sponsorship in Frederick to help support capital and operations. For major funding, system sponsorship must be sought, and potential sponsors are typically larger companies, institutions and the biggest employers in a jurisdiction. The top private employers in Frederick include Wells Fargo Home Mortgage, United Health Care State, Farm Insurance Company Frederick and the Memorial Healthcare System. In addition, Hood College and Frederick Community College could help sponsor stations providing additional connections to their campuses.

For support on operations once major funding is secured, there are numerous smaller businesses (or businesses who can't support a major sponsorship) that can help with station sponsorships and corporate memberships in support of a bike share system. Some cities have also negotiated contracts where one side of the ad panel is sold to an outdoor advertising company, who in turn sells that space to advertiser. Such contracts have offered operations support or expansion to bike share systems.

A searchable database of private foundations in the area can be found at:

<http://foundationcenter.org/findfunders/foundfinder/>

### Challenges:

- Based on data from other small systems, the Frederick bike share system will not be self-supporting on system revenues alone
- Securing the appropriate funding mechanism for capital and operating costs

### Opportunities:

- There are numerous potential public and private funding sources for a bike share system in Frederick
- There are numerous small businesses which could potentially help sponsor/fund individual bike share stations

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<sup>43</sup> Bike Sharing in the United States: State of the Practice and Guide to Implementation. Federal Highway Administration. United States Department of Transportation. September 2012.

*Conclusions / Recommendations:*

The City should also consider posting a Request for Information (RFI), Invitation for Bids (IFB), or a Request for Expression of Interest (RFEI) for interested parties to provide advertisement throughout any potential bike share stations. Through this mechanism, the City may be able to increase revenues which can help fund the implementation and operations of the program. Examples can be found in <http://bikeshare.com/marketplace/rfps/>. Based on the responses received, the City may want to undertake securing additional federal or state funding for capital and operational expenditures.

## Feasibility Recommendation

The Challenges, Opportunities and Recommendations identified in this Feasibility Study are summarized below.

**Table 10 - Challenges, Opportunities, and Recommendations**

Item	Challenges	Opportunities	Conclusion / Recommendation
Geography, Climate and Land Use	Major roadways and interstates can cause some disconnection of the streets between neighborhoods	<ul style="list-style-type: none"> <li>Increased redevelopment density and mixture of land uses throughout the City</li> <li>Well-connected and relatively grid-like streets</li> <li>Generally flat topography</li> </ul>	There are no geographic or climatic challenges in Frederick that are greater than other cities that have successfully implemented bike share.
Demographics and Employment	<ul style="list-style-type: none"> <li>Low population and population density</li> </ul>	<ul style="list-style-type: none"> <li>Young, urban professionals and high number of students near Hood College and Frederick Community College</li> <li>Relatively high median income and comparatively affordable housing stock</li> <li>Many large employers, particularly in the Northwest part of the city, Downtown</li> </ul>	Overall demographic and employment statistics indicate a positive setting for a bike share system
Bicycle Infrastructure	<ul style="list-style-type: none"> <li>Address connectivity between activity centers</li> <li>Additional bicycle infrastructure investment is recommended</li> </ul>	<ul style="list-style-type: none"> <li>Change in bicycling culture</li> <li>Additional investment in alternative forms of transportation</li> <li>Increased focus on sustainability and carbon reduction, improving community health</li> <li>No existing bicycle rental organization/business</li> </ul>	Undertake update of the city bicycle plan to address key issues and gaps
Public Transit	None identified	<ul style="list-style-type: none"> <li>Stations locations close to high ridership transit hubs</li> <li>Coordination with MTA essential for placement of any stations at MARC station.</li> </ul>	None identified
Policies, Plans and Regulations	Required encroachment permitting, and advertising guidelines might have effect on revenues	State, County and City policies and plans show support for bicycle initiatives	Local agency staff should review the aforementioned ordinances and regulations to prevent any potential conflicts
Organizational Capacity	<ul style="list-style-type: none"> <li>No single organization identified to undertake procurement and sponsorship</li> <li>No dedicated city staff available for program implementation</li> </ul>	There are at least two viable alternatives that can be seriously considered to manage the bike share system	The City should consider whether it has the organizational capacity to manage the system. If so, such a structure leaves open the opportunity to integrate into the regional system and is the simplest to implement.
Integration with Capital Bikeshare	<ul style="list-style-type: none"> <li>Commitment to sole operator and already established costs</li> <li>Loss of control over many system decisions</li> </ul>	<ul style="list-style-type: none"> <li>Expanded membership and service for Frederick residents, as well as larger user base for Frederick as potential DC tourists</li> <li>Program management and staffing needs are smaller than starting a program from scratch</li> </ul>	Integration with Capital Bikeshare is recommended
Public Engagement	Concerns over available infrastructure, bicycling culture, weather conditions and road conditions	<ul style="list-style-type: none"> <li>There is significant support for bike share in Frederick</li> <li>Ongoing operating support was a greater concern than upfront capital costs.</li> </ul>	Prioritize operations, organizational stability and sponsorship identification
Service Area	The two major core areas are not contiguous.	Large and diverse service areas.	Phase 1 area comprises Downtown area; Phase 2 should comprise West Patrick Street Corridor. Phase 3A and B represent the expanded bike share market East and South of Downtown.
Funding Sources	<ul style="list-style-type: none"> <li>System will not be self-supporting on system revenues alone</li> </ul>	<ul style="list-style-type: none"> <li>Numerous potential public and private funding sources for a bike share system in Frederick</li> <li>Numerous small businesses which could sponsor individual stations</li> </ul>	The City should to consider posting RFI, IFB or RFEIOI for interested parties to provide advertisement throughout any potential bike share stations.

Based on the evaluation above, implementing a bike share system within the City of Frederick has been found to be feasible. The system should include between 250 and 300 bikes and between 25 and 30 stations in four defined market areas split within three implementation Zones. However, there are considerable obstacles to implementing such program including the existing organizational capacity of the City and the availability of funding for capital and operational expenses.

## Appendices

### Appendix 1 – Methodology of study

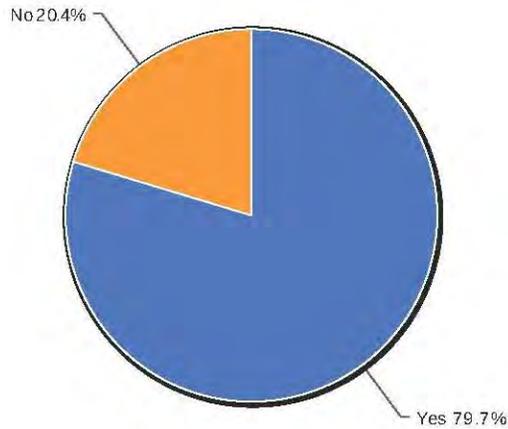
Using data provided by the City of Frederick and the U.S. Census Bureau in July 2013, the consultant team constructed a demand analysis heat map depicting the areas in Frederick that are more potential bike share program in the City. The demand maps were created by aggregating numerous factors relate to Bike Share and weighting each factor by its perceived impact on bike share. Certain factors are area-based data (e.g. Census Blocks and Tracts). These data are assigned weights to the specific areas of the data that meet the criteria (e.g. 5 points are given to Census Tracts that have a bike mode share that is greater than 3.5%). Other factors are points or linear features. These factors are evaluated by creating buffers surrounding these features at pre-determined distances and assigning those buffers scores (e.g. Areas within .1 mile of a park are given 3 points, within .25 mile are given 1 point). When all of the factors have been evaluated and assigned points individually, they are combined via GIS union into one feature. Then the scores are summed together in the table and this is the final Demand score that is represented on the map. The following table presents the full weighing scale:

Data Item	Point Allocation				TOTAL POINTS	Factor Weight
	Census Block	.1 mi	.25 mi	.5 mi		
High Employment	5	3	2	1	11	17%
RTA Station		5	4	1	10	16%
Mode share	5				5	8%
High Density Residential	5	2			7	11%
Existing Bicycle Network		4	2	1	7	11%
Funded Bicycle Network		3	1	1	5	8%
Income	3	2			5	8%
Medium High Density Residential	4				4	6%
Schools		3	1		4	6%
Parks		3	1		4	6%
Libraries/Community Buildings		2			2	3%

## Appendix 2 – Online Survey questionnaire and Summary of Results

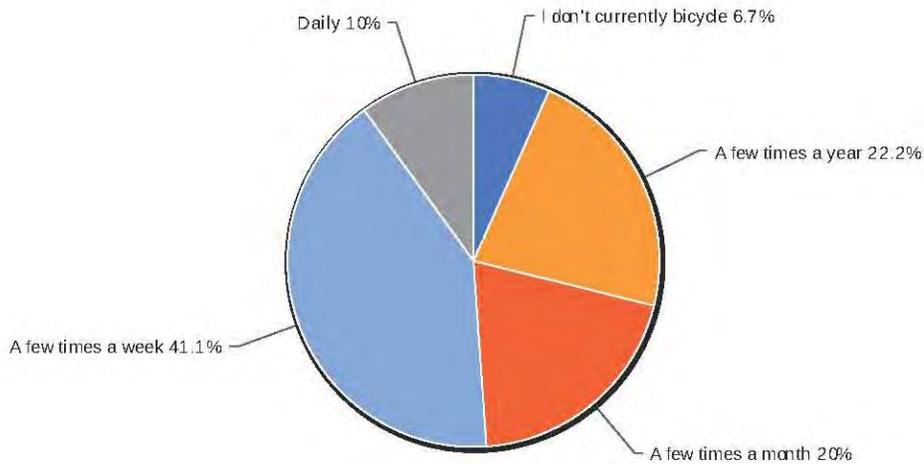
The following is a summary of input received through the online survey that was linked to the Frederick Bike Share Feasibility Study website [www.frederickbikeshare.com](http://www.frederickbikeshare.com).

### 1. Do you currently have access to a working bicycle?



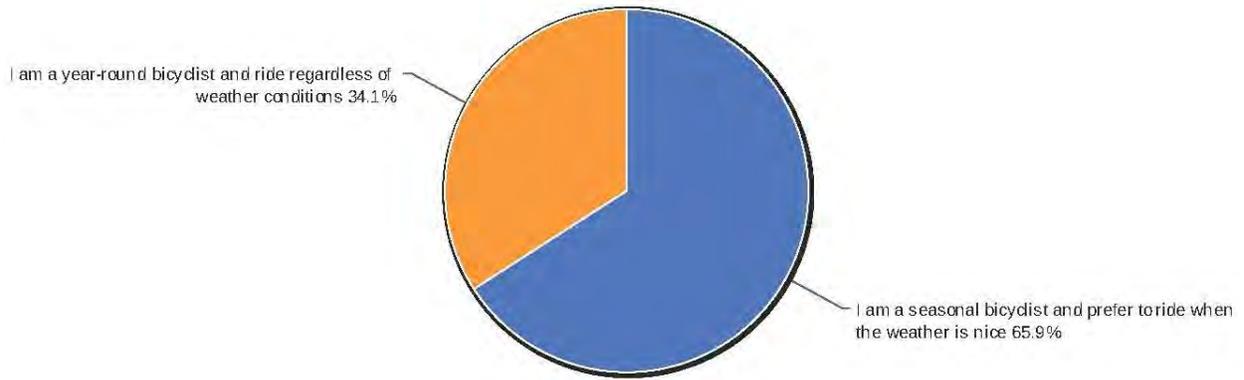
Value	Count	Percent
Yes	90	79.70%
No	23	20.40%
<b>Total Responses</b>		<b>113</b>

### 2. How often do you ride a bicycle?



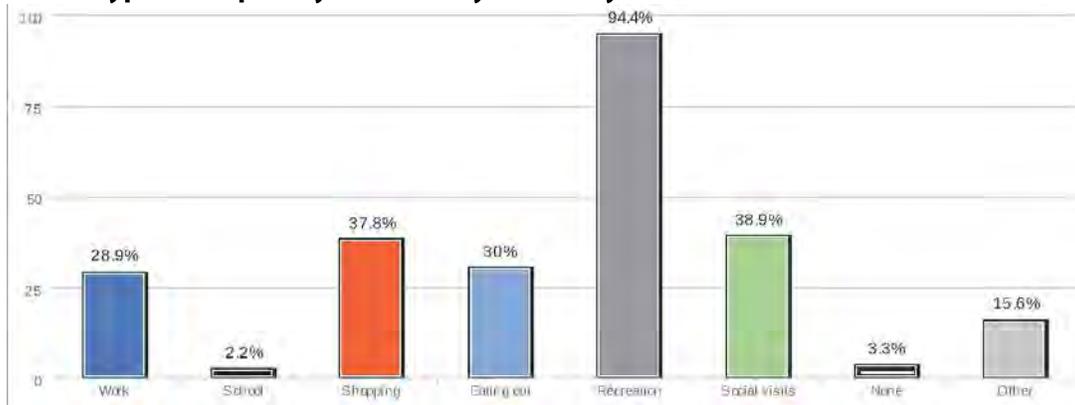
Value	Count	Percent
I don't currently bicycle	6	6.7%
A few times a year	20	22.2%
A few times a month	18	20.0%
A few times a week	37	41.1%
Daily	9	10.0%
<b>Total Responses</b>		<b>90</b>

### 3. Which of the following best characterizes your bicycling behavior?



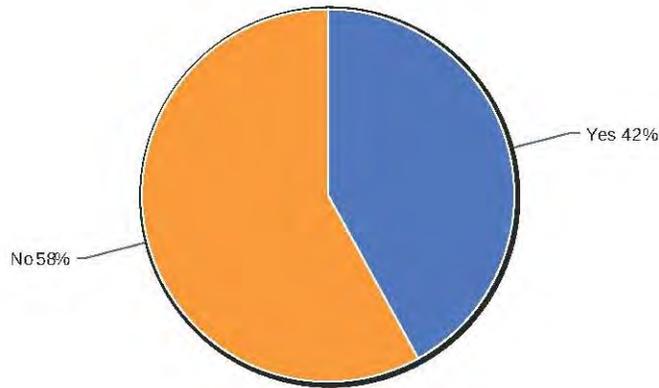
Value	Count	Percent
I am a seasonal bicyclist and prefer to ride when the weather is nice	58	65.90%
I am a year-round bicyclist and ride regardless of weather conditions	30	34.10%
<b>Total Responses</b>		<b>88</b>

### 4. What types of trips do you currently use a bicycle for?



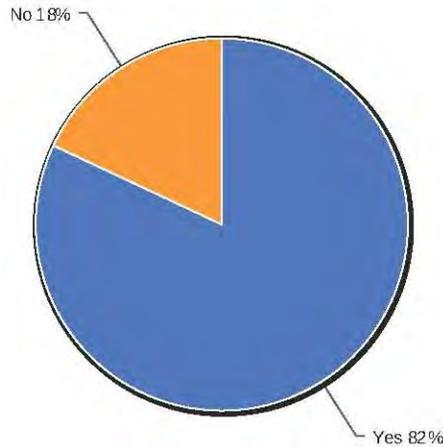
Value	Count	Percent
Work	26	28.90%
School	2	2.20%
Shopping	34	37.80%
Eating out	27	30.00%
Recreation	85	94.40%
Social visits	35	38.39%
Attending worship	0	0%
None	3	3.3%
Other	14	15.6%
<b>Total Responses</b>		<b>90</b>

**5. Have you had an opportunity to use an existing bike share system before?**



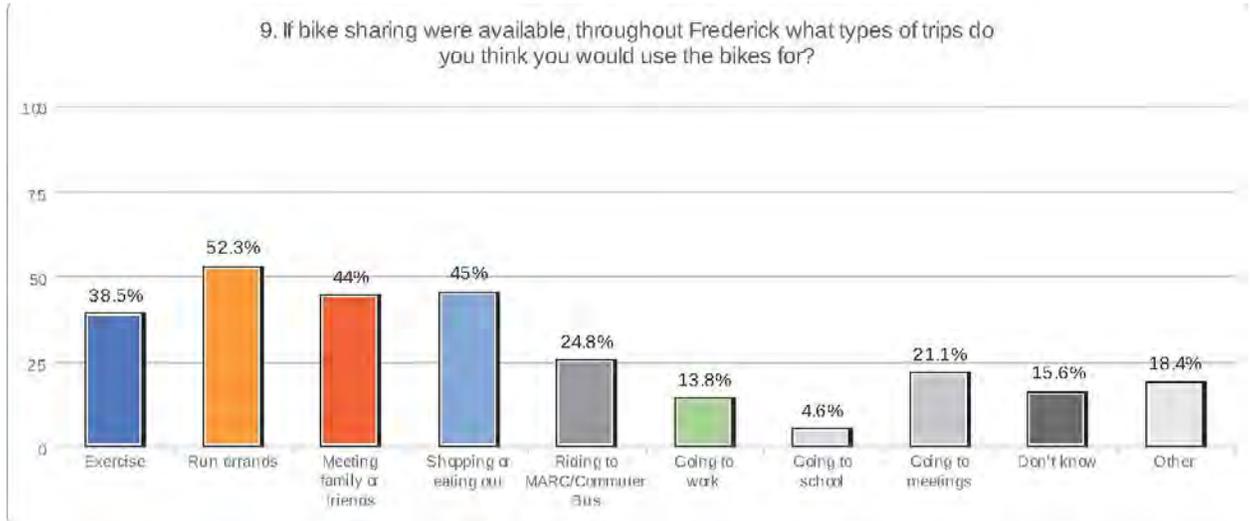
Value	Count	Percent
Yes	47	42.0%
No	65	58.0%
<b>Total Responses</b>		112

**6. Do you think bike sharing is a good idea for the City of Frederick?**



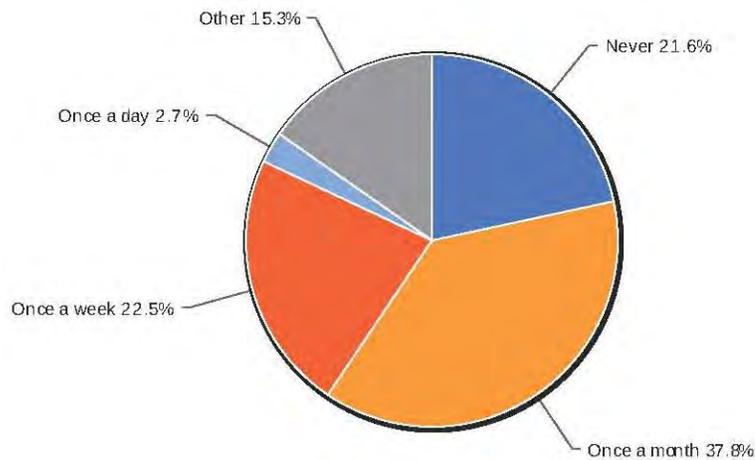
Value	Count	Percent
Yes	91	82.0%
No	20	18.0%
<b>Statistics</b>		
<b>Total Responses</b>		111
<b>Skipped</b>		6
<b>Unanswered</b>		124

**7. If bike sharing were available throughout Frederick, what types of trips do you think you would use it for?**



Value	Count	Percent
Exercise	42	38.5%
Run errands	57	52.3%
Meeting family or friends	48	44.0%
Shopping or eating out	49	45.0%
Riding to MARC/ Commuter Bus	27	24.8%
Going to work	15	13.8%
Going to school	5	4.6%
Going to meetings	23	21.1%
Don't know	17	15.6%
Other	20	18.4%
<b>Total Responses</b>	<b>109</b>	

**8. About how often do you think you would use bike share?**

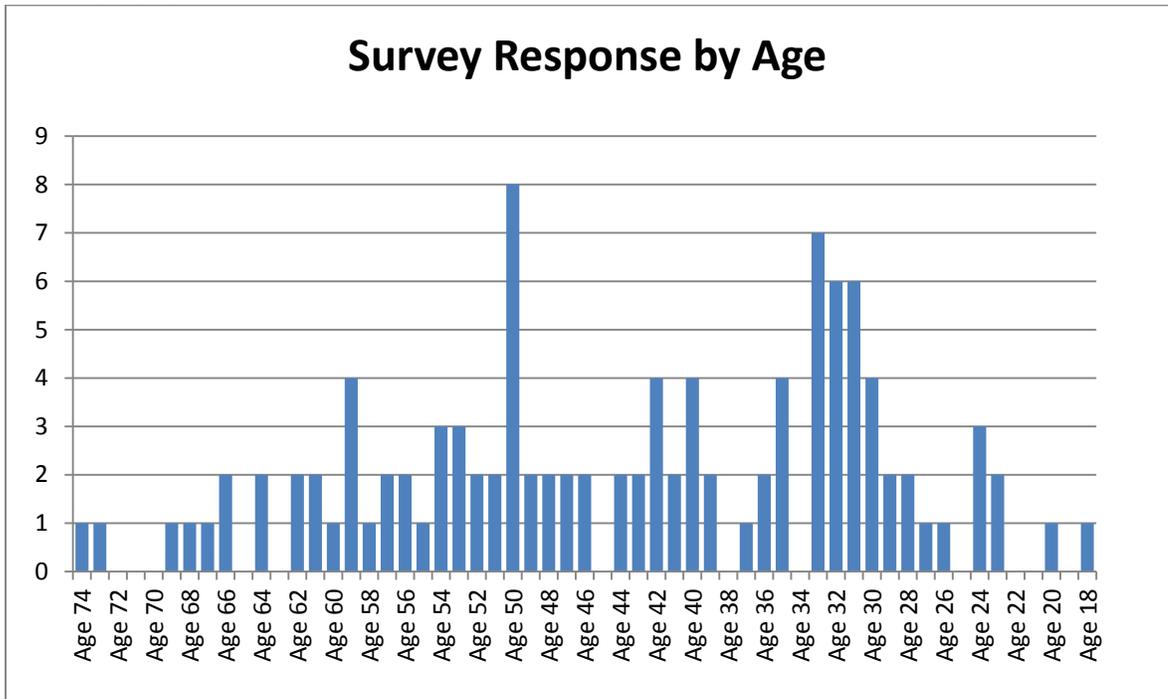


Value	Count	Percent
Never	24	21.6%
Once a month	42	37.8%
Once a week	25	22.5%
Once a day	3	2.7%
More than once a day	0	0%
Other	17	15.3%
<b>Total Responses</b>		111

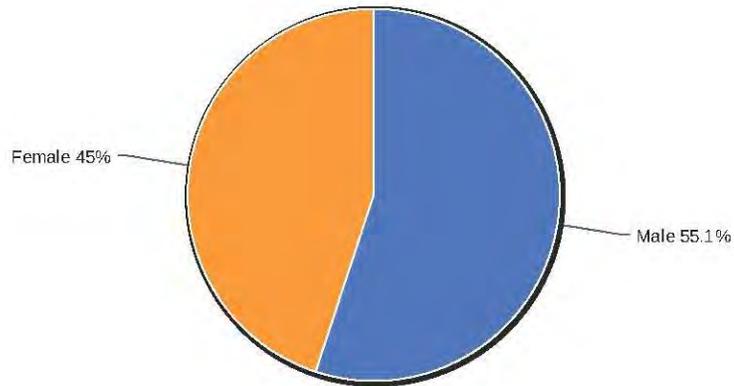
**9. What price would make you likely to subscribe to bike share in Frederick?**

Type of Fee	Averages
<b>Annual subscription fee:</b>	Average Rank 69.90  <ul style="list-style-type: none"> <li>Count: 89</li> <li>Min: 0 / Max: 200</li> <li>StdDev:45.02</li> </ul>
<b>Weekly subscription fee:</b>	Average Rank 13.08  <ul style="list-style-type: none"> <li>Count: 66</li> <li>Min: 0 / Max: 75</li> <li>StdDev:12.81</li> </ul>
<b>Daily or casual subscription fee:</b>	Average Rank 6.75  <ul style="list-style-type: none"> <li>Count: 88</li> <li>Min: 0 / Max: 35</li> <li>StdDev:5.87</li> </ul>

10. Year of birth

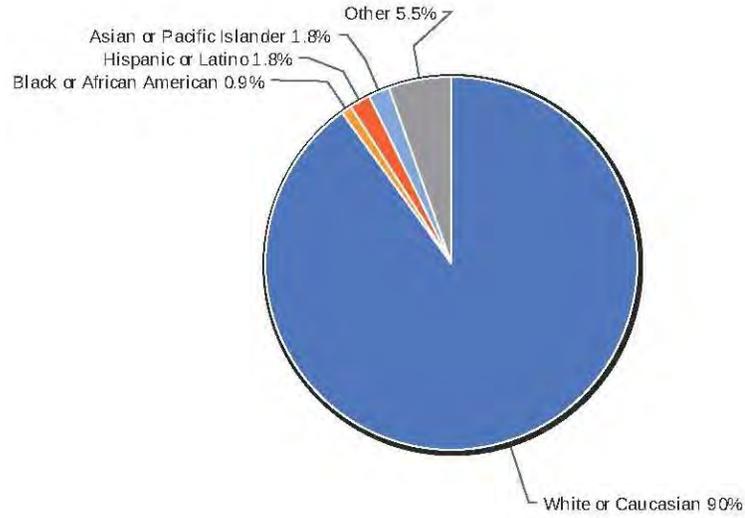


11. Sex



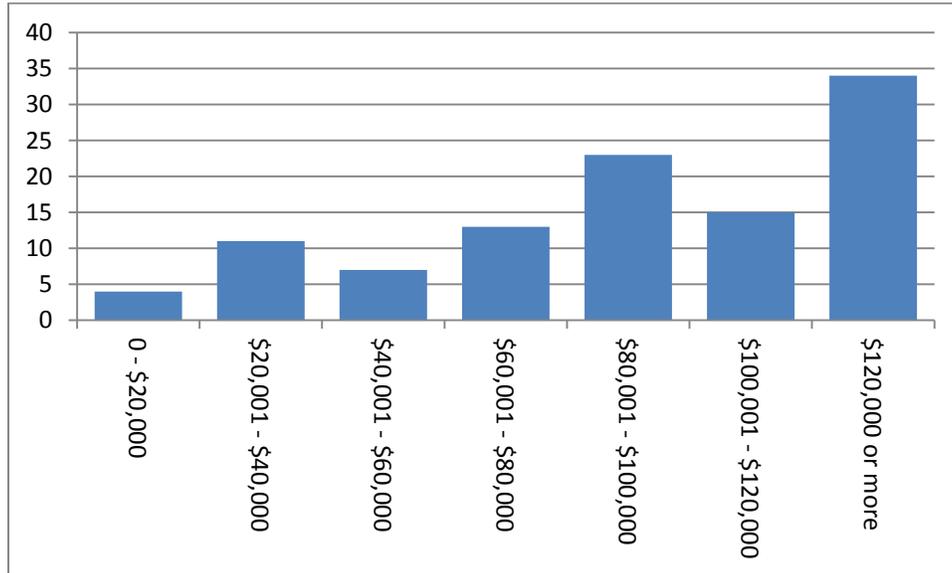
Value	Count	Percent
Male	60	55.1%
Female	49	45.9%

## 12. Self-Reported Ethnicity



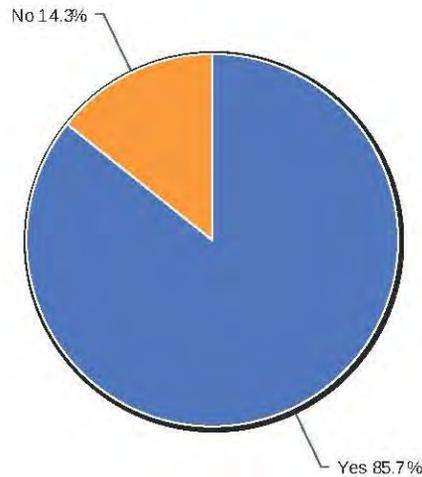
Value	Count	Percent
White or Caucasian	570	81.3%
Black or African American	55	7.9%
Hispanic or Latino	20	2.9%
Asian or Pacific Islander	24	3.4%
Native American Indian	2	0.3%
Other	30	4.3%
<b>Statistics</b>		
Total Responses		701
Skipped		18
Unanswered		156

### 13. What is your annual household income?



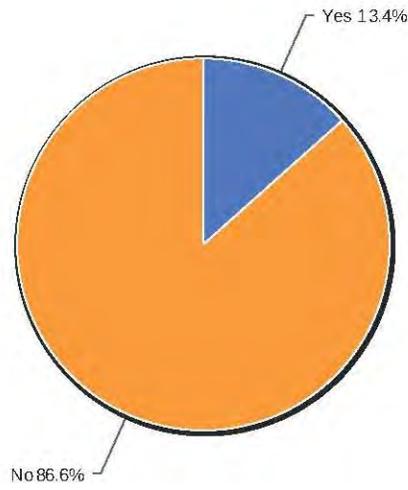
Value	Count	Percent
Less than \$20,000	4	3.7%
\$20,001 to \$40,000	11	10.3%
\$40,001 to \$60,000	7	6.5%
\$60,001 to \$80,000	13	12.2%
\$80,001 to \$100,000	23	21.5%
\$100,001 to \$120,000	15	14.0%
More than \$120,000	34	31.8%
<b>Total Responses</b>	<b>107</b>	

### 14. Are you currently employed?



Value	Count	Percent
Yes	96	85.7%
No	16	14.3%
<b>Total Responses</b>	<b>112</b>	

**15. Are you currently enrolled in school?**



Value	Count	Percent
Yes	15	13.4%
No	97	86.6%
<b>Total Responses</b>		<b>112</b>

### Appendix 3 – Stakeholder Engagement Survey

The following is the full list of questions for the Stakeholder Engagement Survey. The survey was distributed to pre-selected stakeholders via email on September 3, 2013.

1. What opportunities do you see with a implementing a bike share program in Frederick?
2. What challenges do you foresee for a bike share program start-up in Frederick?
3. What are your organization’s objectives that a bike share program could help support? Do you have any thoughts on how sponsorship of the program in some way would tie in with those objectives?
4. How would you describe your organization's level of interest in being a partner or sponsor or the bike share program?
5. Let us know are your thoughts on the following 3 sponsorship models are:
  - a) Corporate memberships for X number of people
  - b) Sponsoring a station, and/or bicycles
  - c) Advertising opportunities
6. We recognize that infrastructure to support a strong biking community is still being expanded in Frederick. How do you see a bike share program impacting or being impacted by the lack of bicycle infrastructure in the City?
7. What critical aspects of success or core competencies do you see are essential for a successful bike share program here in Frederick?
8. Bike share ownership models vary from location to location. Of the specific ownership structures below, please rank the options below from 1-5 in terms of what makes most sense for Frederick
  - a) Government owned and operated
  - b) Government owned and privately operated
  - c) Government owned and non-profit operated
  - d) Non-profit owned and operated
  - e) Non-profit owned and privately operated
  - f) Privately owned and operated
9. We recognize that infrastructure to support a strong biking community is still being expanded in Frederick. How much (if any) additional infrastructure do you believe would be needed to support a bike share program in Frederick?
10. How important is it that Frederick's bike share system be integrated with Capital Bikeshare, the bike share system serving Washington, DC, Arlington County, the City of Alexandria and Montgomery County?

The following organizations were identified by the City to participate in the Stakeholder Survey:

- Dairy Maid Dairy
- Hood College
- Life Technologies
- Ft. Detrick
- FMH
- Planning Commission
- Historic Preservation Committee
- McCutcheon Apples / East Frederick Rising
- Brewers Alley
- Wells Fargo
- Cluster Spires High wheelers
- Spokes Magazine
- Wheelbase Bikes
- Habitat for Humanity
- City of Frederick Government
- Frederick County Commissioner
- City of Frederick Department of Economic Development
- Trail House



- Downtown Frederick Partnership
- City of Frederick Tourism Office
- City of Frederick Elected Officials
- Bicycle and Pedestrian Advisory Committee
- Neighborhood Advisory Committees
- Transportation Services Advisory Council
- Frederick County Government
- Bicycle Escape
- Frederick Alliance of Small Businesses