Hamilton

INFORMATION REPORT

TO: Mayor and Members General Issues Committee	**WARD(S) AFFECTED:** CITY WIDE
COMMITTEE DATE: March 20, 2013	
SUBJECT/REPORT NO: Public Bike Share Transit System Implementation Plan (PW13015a) - (City Wide)	
SUBMITTED BY: Gerry Davis, CMA General Manager Public Works Department **SIGNATURE:**	**PREPARED BY:** Peter Topalovic Project Manager, Transportation Demand Management (905) 546-2424, Extension 5129

Council Direction:

The General Issues Committee, at its meeting on February 25, 2013, considered the following recommendations:

(a) That the implementation of a public bike share transit system be approved, as outlined in Appendix "A" to Report PW13015, subject to finalization of an agreement to secure a system supplier and operator through a Request for Proposals (RFP) process;
(b) That staff report back to Council with the results of the RFP process;
(c) That the General Manager of Public Works be given delegated authority to negotiate with potential system sponsors and enter into agreements for the purpose of fully offsetting the operating costs of the system for a minimum period of three years;
(d) That the capital and start-up costs of the Public Bike Transit System, as outlined in Appendix "A" to Report PW13015, be funded from the Rapid Transit Capital Reserve (108047) to an upset limit of $1,600,000, subject to available funding and approval from Metrolinx.

Report PW13015a pertains to the Motion approved at the February 25, 2013, General Issues Committee meeting as follows:

(Ferguson/Pearson)
That Report PW13015 respecting Public Bike Share Transit System Implementation Plan be referred to staff for report back to the General Issues Committee with further information on similar systems in other municipalities, legal risks, and possible alternative uses for funding.

This report will answer the questions in the Motion, providing information on other North American Bike Share systems, legal risks and possible alternative uses for funding.

1. North American Bike Share System Comparison

There are various bike share systems operating in North America and nine of these operators report to the U.S. Department of Transportation Federal Highway Administration. The attached report "Appendix A - Assessing the Proposed Hamilton Bike Share System", details the following information on these systems:

- Who runs the system
- Who owns the infrastructure
- Who provided the infrastructure
- Business model
- Funding model
- System Size
- Amount of supporting infrastructure

Broadly, the results show that the majority of systems are either owned by the local or regional government or a not-for-profit organization. System infrastructure is largely supplied by two manufacturers: Public Bike Share System Urban Solutions (known under the Bixi brand in some jurisdictions), a non-profit Canadian company started by the Montreal Parking Authority and B-Cycle, a for-profit company owned by Trek Bicycle Corp.

The detailed comparison contained in Appendix A to Report PW13015a demonstrates that Hamilton's public bike share transit system is viable, given our current:

- population density,
- employment density,
- residential density,
- level of walking, cycling and transit modal split in the service area,
- key destinations, BIAs and employment nodes served,
- operating model and,
- geography and climate.

The following table summarizes the results of this comparison and includes three Canadian systems for comparison.

City	Operator Name	Equipment Provider	Equipment Ownership	Business Model	Funding Sources
Minneapolis, MN	Nice Ride MN	PBSC Urban Solutions	Nonprofit owned	Nonprofit owned and managed	Federal: FHWA funds through local program. Private: Blue Cross-Blue Shield, other private investors, and station sponsorships. User fees.
Arlington, VA Washington, DC	Capital Bikeshare	PBSC Urban Solutions	Jurisdiction owned	Jurisdiction owned and operated	Federal: CMAQ. Local: vehicle decal fee, commissions from transit fare media sales. Private: business sponsorship. User fees.
Miami Beach, FL	Deco Bike LLC	Deco Bike LLC	Privately owned	For profit owned and operated	Private investment. Membership and usage fees. Advertising space.
Boston, MA	Alta Bikeshare	PBSC Urban Solutions	Jurisdiction owned	Advertising & sponsorship	Federal: CMAQ and FTA. State: Public Health Grant. Private: Direct system sponsor and other smaller sponsors. User fees.
Denver, CO	Denver Bikesharing	B-cycle	Nonprofit owned	Nonprofit owned and operated	Federal: EECB Grant Program; Transportation Community Preservation Program. State: Vehicle Registration Tax, FASTER program. Membership and usage fees.
San Antonio, TX	San Antonio Bikeshare	B-cycle	Jurisdiction owned	Nonprofit managed	Federal: EPA (EECBG), CDC Obesity Reduction Grant; Advertising and Corporate Sponsorships; User fees.
Boulder, CO	Boulder B-cycle	B-cycle	Nonprofit owned	Nonprofit owned and operated	Sources not specified. Sponsorships - 22%, Grants - 56%, Gifts - 10%, MS and usage fees - 12%
Toronto, ON	Bixi Toronto	PBSC Urban Solutions	Bixi owned	For profit owned and operated	Capital Loan, Telus/Dejardins sponsorshipand user fees
Ottawa, ON	Capital Bixi	PBSC Urban Solutions	NCC owned	NCC owned	National Capital Commission (NCC), municipal capital funding, sponsorship & user fees.
Montreal, Que.	Bixi Montreal	PBSC Urban Solutions	City owned	City operated	Municipal tax dollars, Telus/Dejardins sponsorhip and user fees
Spartanburg, SC	Partners for Active Living	B-cycle	Nonprofit owned	Nonprofit owned and managed	Local Grants: City of Spartanburg, Mary Black Foundation, and JM Smith Foundation. Membership and Usage Fees.

As compared to these systems, Hamilton's planned system is representative of its peer group average in terms of system size, service area, municipal bike infrastructure, and operational model. In terms of capital funding for the systems in the peer group, most were funded primarily through US Federal grants. In some cases sponsorships or grants from various organizations augmented capital costs or were used to expand the system. In other examples the municipalities themselves paid a portion of capital costs. Operating costs were generally recovered by memberships and usage fees (referred to above as user fees) and where start-up costs were high, sponsorships were secured to reduce and operating deficits.

Ridership, Vandalism and Safety

The City of Toronto is the closest geographical bike sharing city to Hamilton, has similar cycling infrastructure and a similar climate. Results from their program along with results from other Canadian and similar American cities will help with the bike share system comparison, as requested in the Motion being addressed by this report. The data quoted here is over the life of the systems.

Vandalism and Theft - less than 1% of all stations and bikes (Toronto and Montreal)

Composition of users and Ridership (averages in Toronto and Montreal) -

- Under 15% of all users report that they used a bike or walked for their commute to work before using Bixi.
- 30% - 50% of users report being transit users
- 35% - 50% did not bike, walk or take transit for their daily commute before using Bixi

This demonstrates that bike share is not just for cyclists. It has a mass appeal because of the fixed nature of the infrastructure and its on-demand capacity.

Collision Rates (various Cities) - Bike sharing systems have lower collision rates than regular bicycle collision rates in most North American Cities, as can be seen in the following chart:

	BIXI Montreal	Barclay's Cycle Hire (London, UK)	NiceRide Minneapolis	Capital BikeShare (Washington DC)
Number of Trips	1.1 million	1.6 million	37,000	330,000
Number of Collisions/injuries	5	10	0	7

About half of bike share users choose to wear helmets according to surveys from Minneapolis and Washington DC.

Economic Benefits Reported by other Cities

In addition to social, environmental and health benefits, bike sharing has proven economic benefits in the various cities with bike share systems including:

- Increasing transit ridership by acting as a feeder system for A-Line and B-Line transit routes

- Economic benefits for local business along bike share transit corridors
- Benefits for BIAs: business improvement areas benefit financially from becoming more cycle and pedestrian friendly
- Tourism benefits, as the system provides visitors with an alternative to using an automobile to get around the City, especially where access to the Waterfront and other destinations are concerned.
- Improves citizen access to green spaces and trails not directly served by transit
- Serves all areas of the cities: In other bike share cities, the Bike Share system is used by residents and employees that work the bike share service area, as those working in these areas have access to the bike share transit system for business purposes, running errands on breaks or accessing transit.
- Method of Commuting: serves both place of residence and place of work, thereby expanding its scope to not only those living in the service area, but also to those working downtown and living in other areas of the bike share cities.
- Facilitates connections: all North American systems use their bike share configuration to connect key destinations, employment nodes and institutional lands. In Hamilton's situation this would include both GO stations, James Street North and South, the waterfront, the escarpment, Pan Am stadium, McMaster University, McMaster Innovation Park, McMaster Downtown Centre, Mohawk College, St. Joseph's Hospital (both campuses), Hamilton General Hospital, City Hall and public buildings, Jackson Square and Farmer's Market, downtown neighbourhoods and the brow lands.

2. Legal and Risk Analysis

Investigation into the risk of using a third party operator for the bike share system has demonstrated that there is minimal risk or similar risk to that of other municipal infrastructure. According to Legal Services and Risk Management for the City of Hamilton, the establishment of a public bike share system would not affect the City insurance program, nor would the City incur any additional premiums.

The following table describes various tertiary claim scenarios and the risk associated with various elements of the bike share project and compares the risk relative to the risk of other municipal infrastructure such as roads, sidewalks and transit use. City of Hamilton legal and risk services have confirmed these results. In discussions with the City of Toronto regarding the risk of its public bike share program, the same conclusions were confirmed.

Tertiary Claims	Risk Mitigation Strategy	Risk		
		Low	Similar	High
Cyclist injury due to a malfunctioning bike share vehicle	Bike share operator is required to have a $5 million liability insurance rider and they are responsible for the correct operation of bike share infrastructure. This was implemented similarly in the Toronto Bixi program.	☑		
Cyclist injury on a municipal road way due to issues with infrastructure (such as uneven pavement)	The risk of an accident while using municipally supplied and maintained infrastructure is the same as if the user was on their own bike, a bike share bike or walking on the street.		☑	

The details of the risk mitigation strategies will be covered in the request for proposals process, reviewed by Legal Services and Risk Management, and presented to council before approving any contract with a system supplier or operator.

3. Possible Funding Alternatives

A) Quick Wins Funding

In 2008, the City of Hamilton received $29.8 million from Metrolinx "Quick Wins" to be used for transit capital expenditures to support A-Line and B-Line transit ridership growth initiatives, according to bylaw number 08-085 (part 2a):

> The payment of $29,800,00 shall be: (a) used for capital expenditures for transit vehicles and infrastructure to support B-Line improvements, King - Main Corridor and A-Line improvements, James - Upper James Corridor.

City-wide transit projects that do not specifically support B-Line or A-Line improvements would not be eligible.

The Public Bike Share Transit system was identified as a project that meets the goals of this grant funding program and received agreement from Metrolinx staff as a project that the City could move forward with. The bike share transit system was designed in such a way as to promote ridership growth in the A-line and B-line corridor. The non-fixed, moveable nature of bike share stations means that they can be configured in various ways, along various corridors. Stations have been designed to be in areas with higher transit ridership, cycling rates and walking rates, especially for work commutes. There is high potential to install stations easterly in preparation for the Pan Am Games and establish a southerly connection to Mohawk College and the business district at Upper James and Fennel.

B) Potential Alternative Quick Wins Projects

It should be noted that the current Rapid Ready and Transportation Division work plan already addresses the following items:

- Improved A-Line and B-Line bus shelters (Quick Wins)
- Improved shelters on other routes

- Mohawk Transit Terminal (Quick Wins)
- Downtown Bus Only lane (Quick Wins)
- Mountain Transit Centre park-and-ride (Quick Wins)
- Continuous investment in cycling and pedestrian infrastructure
- Multimodal transportation smartphone application
- Real time transit data
- Hamilton CarShare expansion facilitation
- Pan Am stadium transportation improvements, where Bike Share will help improve stadium access

As stated above, Quick Wins funds must be used for A/B Line capital projects. Alternative projects that could be funded with the proposed bike share funds include:

- Additional busses in the A/B Line corridors
- More A/B Line passenger and stop improvements

While these additions would encourage and enhance ridership, the range of Quick Wins projects have been selected as an appropriate package that best enhances mobility choices along the A and B-Line. Bike Sharing is an on-demand form of transit that fills the gap between trips that are too short to drive and too far to walk; making it an important complement to the transit system. Bike Share Transit is intended to fill this gap and help mitigate the situation whereby 55% of all trips in Hamilton are under 5 Km but almost 80% of these trips are taken by automobile. Bike share is better suited to address this issue. The bike share system also satisfies active transportation goals aimed at achieving positive health outcomes and disease reduction.

Furthermore, without a $1.6 M core system that is large enough to obtain the annual, monthly and daily ridership calculated in the business plan (attached to report PW13015 as Appendix A), the revenue-neutrality of the system would be jeopardized. In the RFP process, operating efficiencies may be found to offset these costs. It is intended that the City will get the lowest possible capital price by selecting the lowest qualifying bid through the RFP process. This means that the projected capital as outlined in the business plan (attached to report PW13015 Appendix A) may be lower than projected and are meant to be a worst case scenario.

APPENDIX A
REPORT PW13015a

Assessing the Proposed Hamilton Bike Share System

A Case Study Comparison of Select Metrics

CCS urban research

DRAFT
February 2013

The Centre for Community Study (CCS) is a social enterprise focusing on urban and community research. The CCS provides services to the public, not-for-profit and private sectors with expertise in a variety of areas including: Urban trends and analysis; community renewal strategies; media policy analysis; organizational and strategic planning.
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1.0 Introduction

Bike sharing is a non-motorized transportation service, typically structured to provide users a transportation option for short distance trips (under 5km). It provides users the ability to pick up a bicycle at any self-serve bike sharing station in the network and return it to any other bike sharing station, including the place of origin.[1] The City of Hamilton is proposing to implement a bike share system with assistance from the Ontario transportation agency, Metrolinx. As part of the planning and implementation, a business plan was developed that outlines characteristics of the proposed system including expected membership and infrastructure requirements such as the number of bikes and stations. As a complement to the business plan, this report was commissioned to review some of the metrics used in the planning of the proposed system.

The method chosen for analysis was a case study comparison. This allows some of the assumptions used in the Hamilton system to be compared to other systems already in operation. The analysis looked beyond membership statistics to see how the potential service area in Hamilton compares to other systems. Unfortunately, as many bike share systems are relatively new, gathering a number of comparable metrics from other cities is difficult. For example, while many systems report on membership numbers, the method of calculation can differ from city to city depending on how they define a user. Likewise, while the number of bikes in systems tend to be readily available, more detailed information about their service areas, including population densities, is harder to find.

However, some recent research conducted by the U.S. Department of Transportation Federal Highway Administration, completed in September 2012 provides several metrics on a number of American systems that can act as a suitable basis for a comparison (Table1). Further, while relatively new, the systems included in the U.S. research are either sustaining their current size or growing which makes their comparison with Hamilton useful. The following case-study analysis compares the characteristics of the proposed Hamilton bike share system to these nine other systems already in operation in the United States. This analysis is a complement to the more detailed business plan the City of Hamilton is preparing and is intended to provide additional insight to aid in the planning and implementation of the proposed Hamilton system.

Table 1: Selected U.S. Bike Share Systems

City	System Name	Opening Date	Operational
Arlington, VA/ Washington, DC	Capital Bikeshare	September 20, 2010	Year-Round
Minneapolis, MN	Nice Ride	June 10, 2010	Seasonal (Closed Nov-March)
Denver, CO	Denver B-Cycle	April 22, 2012	Seasonal (Closed Dec-March)
Boston, MA	Hubway	July 28, 2011	Seasonal (Closed Dec-March)
Miami Beach, FL	Deco Bike	March 15, 2011	Year-Round
San Antonio, TX	San Antonio B-Cycle	March 1, 2011	Year-Round
Boulder, CO	Boulder B-Cycle	May 20, 2011	Seasonal (Closed Dec-March)
Spartanburg, SC	Spartanburg B-Cycle	July 7, 2011	Year-Round
UC, Irvine	Zotwheels	October 1, 2009	Year-Round

Source: U.S. Department of Transportation Federal Highway Administration[2]

1.1 Data Sources

Unless otherwise stated, the sources for all data concerning the American bike share systems is from the U.S. Department of Transportation Federal Highway Administration while population data is derived from the US Census Bureau. All Hamilton demographic data is from Statistics Canada while the proposed Hamilton bike share data is from the City of Hamilton. Please note that the Hamilton bike share data used was from the 2nd year of the system business plan which is the point at which the system is projected to be financially sustainable. It should also be noted that some data from the Arlington, VA/Washington, DC bike share system is significantly larger than other systems (e.g. service area, membership) and therefore skews some averages in the analysis.

1.2 Metrics Used for Case Study Comparison

The analysis used several primary measures to conduct the comparison, from which additional metrics were derived. In general, metrics fall into two groups: system characteristics and service area characteristics. System related information is useful as it provides a basis for comparing Hamilton's proposed system from the infrastructure (e.g. number of bikes/stations) and membership perspectives. In addition, density of infrastructure can help provide a basis for comparing systems and cities of different sizes.

Service area characteristics are useful to compare the scale and nature of the potential market from which a Hamilton bike share will draw users. For the analysis, this includes both the residential and working populations in the potential service area:

System characteristics

- System service area
- Number of bikes in the system
- Bike density
- Number of stations in the system
- Station density
- Number of annual members or subscribers
- Number of estimated casual subscribers (includes hourly, daily, weekly or monthly users)
- Membership density
- Uptake levels

Service area characteristics

- Total employment
- Employment density
- Median household income
- Total housing units
- Housing density

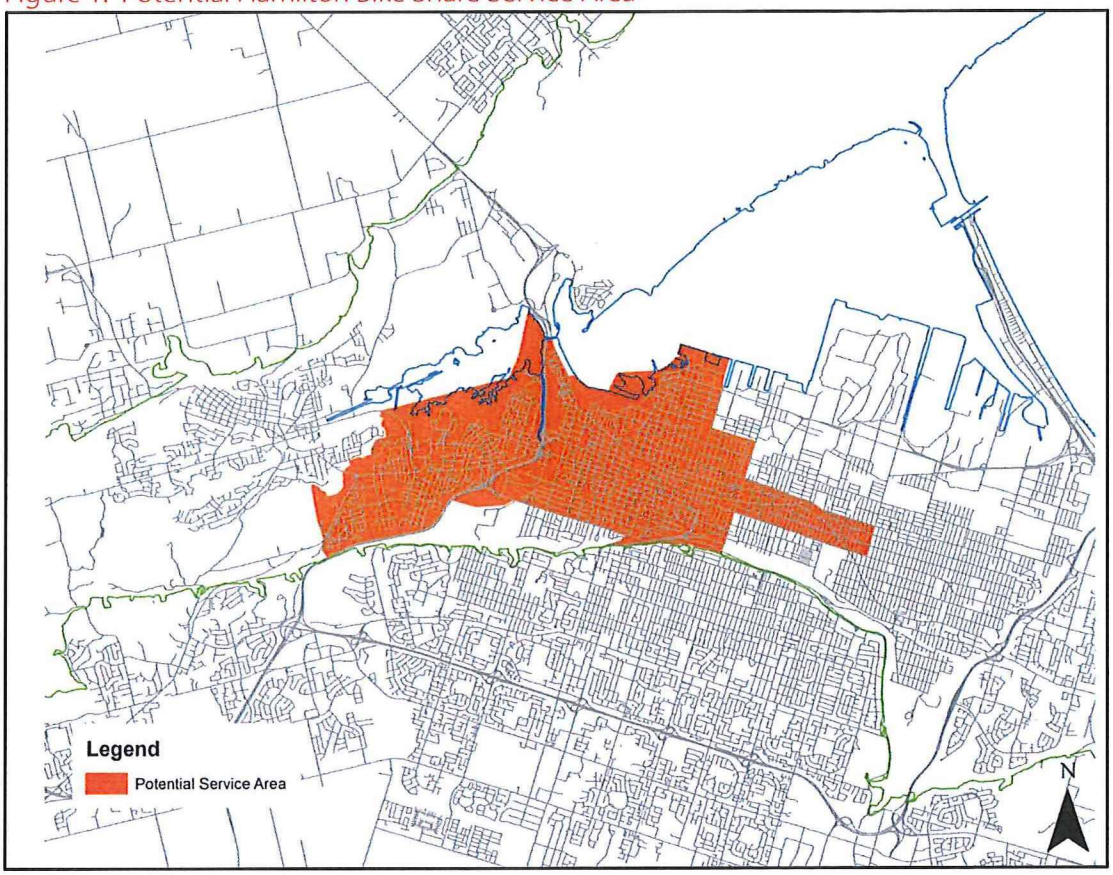
1.3 Defining the Service Area

For the purpose of the analysis, a service area for a Hamilton bike share was defined based on the rates of non-vehicular commuting in Census Tracts (CTs) across the city. Two thresholds were used to set the market area:

1. CTs where commuting by transit, walking and cycling was at least 25% of the total (the city average is approximately 15%)
2. Of those CTs that met the first threshold, the level of walking and cycling alone was at least 10% (the city average is approximately 6%)

The rationale for the thresholds was to determine the current Hamilton geography of alternative transportation. In other words, what areas of the city are already the most conducive to using non-vehicular forms of transportation to commute to work . This is not to say that people who currently commute by car would not switch to cycling if a bike share system were available. Further, this does not mean that other areas of Hamilton would not generate potential demand for a bike share system. Instead, the thresholds were used to determine a conservative estimate of the potential service area for the purpose of the case study comparison. Figure 1 shows the approximate geographic extent of Hamilton's CTs that meet the thresholds listed above. A full list of the CTs that are part of this region are provided in the appendix.

Figure 1: Potential Hamilton Bike Share Service Area



Source: CCS Urban Research

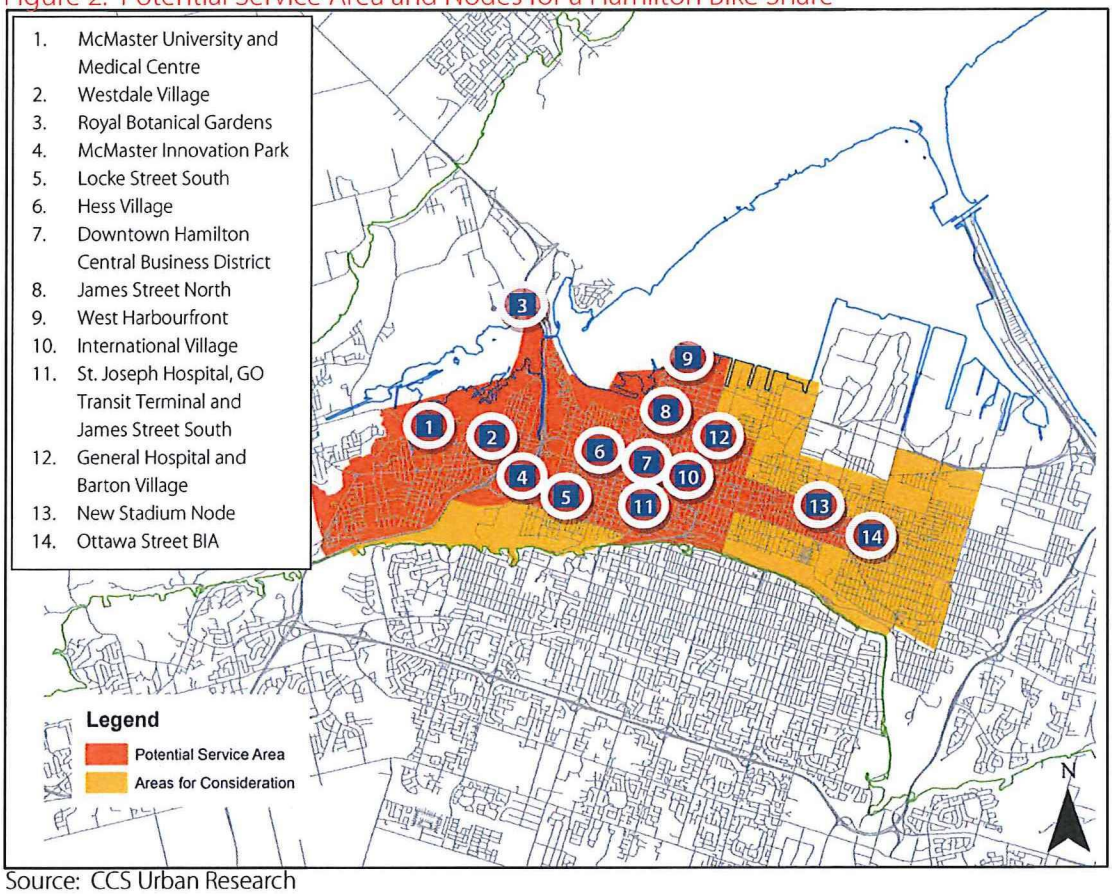
Figure 1 shows a service area that roughly extends from Osler Drive and the neighborhoods surrounding McMaster University in the west to Ottawa Street in the east. North-south, this service area extend from just below the Niagara Escarpment to Cootes Paradise and the west harbourfront, tapering to the areas between King and Main Streets closer to Ottawa Street.

1.4 Service Area Destinations

As a second-level evaluation, it is useful to look at the nodes captured by the proposed service area that will be used in the analysis to see if it fulfills a number of characteristics typically found in other successful bike share service areas (Figure 2).[3] Further, while Figure 1 illustrates the CTs that met the set thresholds, there are adjacent CTs that could be considered as part of the service area upon implementation of the system as they might have just missed meeting the thresholds, or they contain important cycling network links.

Figure 2 shows that there are multiple destination nodes for employment including post-secondary institutions, hospitals, and the central business district. Popular shopping districts are captured as well including Westdale Village, Locke Street South, James Street North, and Ottawa Street. In addition, there are a number of tourist nodes including the west harbourfront, the Pan Am Stadium, Royal Botanical Gardens, as well as the cultural attractions in the downtown core such as the Art Gallery of Hamilton. Finally, this area contains some of the highest transit accessibility ratings in the entire city along with population and employment densities.[4,5]

Figure 2: Potential Service Area and Nodes for a Hamilton Bike Share



Source: CCS Urban Research

Physical barriers such as the Niagara Escarpment, represented by the green line on the map, are another consideration when looking at other potential nodes for a bike share system. In this case, Mohawk College, Hamilton Psychiatric Hospital, Juravinski Hospital , and the Concession Street BIA would be natural nodes for future consideration, but the barrier of the escarpment presents connectivity challenges that need to be adequately addressed before they could be considered part of a contiguous potential service area. While the totality of these nodes are important to note as they all have the potential to generate trips for a bike share system, for the purpose of the case-study comparison, the major employment nodes are of immediate concern as jobs are one of the primary metrics of the analysis.

2.0 Case Study Comparison - Service Area

The following tables (2-4) compare all bike share systems, including Hamilton, on a number of service area characteristics including size of service area, employment total, and housing unit total.

Table 2: Service Area Size Comparison

City	Population: City/Metro	Service Area (sq. mi.)
Arlington, VA/Washington, DC	207,627+ 601,723 / 5,582,170	35.95
Minneapolis, MN	382,578 / 3,279,833	33.3
Denver, CO	600,158 /2,543,482	12.57
Boston, MA	617,594 / 4,552,402	11.79
Hamilton	**519,949 / 721,053**	**8.45**
Miami Beach, FL	87,779 / 5,564,635	6.3
San Antonio, TX	1,327,407 / 2,142,508	4.77
Boulder, CO	97,385 / 294,567	4.69
Spartanburg, SC	37,013 / 284,307	1.42
UC, Irvine	212,375 / 3,010,232	1.29
Average	n/a	12.05

Sources: Statistics Canada, 2001, Census Bureau, 2010[6]

The projected Hamilton service area is just below the average size of the case studies, ranked as the 5th largest at approximately 8.45 square miles (Table 2). To provide some further context, population figures are provided. In this regard, Hamilton is comparable to many of the city populations, however the metro populations show much more variation which is a function of the fact that while Hamilton's CMA consists of Hamilton, Burlington, and Grimsby (one mid-sized city and two smaller cities), American metros often consist of several mid-to-large sized cities.

From an employment perspective, Hamilton has the 4th highest employment total in the proposed service area, above the average surveyed (Table 3). However, Hamilton's employment density is more than double the average, 2nd only behind Boston in the comparison. Hamilton's average household income in the service area is slightly higher than the average, but in order, the city ranks 6th. Note that the U.S. income data is from 2012 while the Canadian data is from the 2006 Census so the Hamilton figures are likely to differ for 2012.

Table 3: Employment and Household Income in Service Areas

City	Total Employment	Employment per sq. mi.	Median Household Income
Arlington, VA/ Washington, DC	180,110	5,010	$ 66,508.00
Minneapolis, MN	104,462	3,137	$ 44,011.00
Boston, MA	83,520	7,084	$ 54,832.00
Hamilton	**57,780**	**6,838**	**$ 49,065.96***
Denver, CO	42,373	3,371	$ 56,039.00
Miami Beach, FL	21,578	3,425	$ 53,808.00
San Antonio, TX	7,489	1,570	$ 27,732.00
Boulder, CO	8,381	1,787	$ 51,767.00
Spartanburg, SC	3,568	2,513	$ 24,540.00
UC, Irvine	2,009	1,557	$ 45,548.00
Average	51,126.99	3,405	$ 47,385.10

Sources: U.S. Department of Transportation Federal Highway Administration, Statistics Canada
*Statistics Canada, 2006 Census

Table 4: Comparison of Housing Units in Service Areas

City	Total Housing Units	Housing Units per sq. mi.	Housing + Employment*
Arlington, VA/ Washington, DC	228,067	6344	408,176
Minneapolis, MN	127,805	3,838	232,268
Boston, MA	109,777	9,311	193,297
Denver, CO	95,306	7,582	137,679
Hamilton	**45,527**	**5,388**	**103,307**
Miami Beach, FL	40,471	6,424	62,049
Boulder, CO	10,759	2,294	19,140
Spartanburg, SC	8,237	5,801	11,806
San Antonio, TX	6,940	1,455	14,429
UC, Irvine	2,603	2,018	4,612
Average	67,549	5,045	118,676

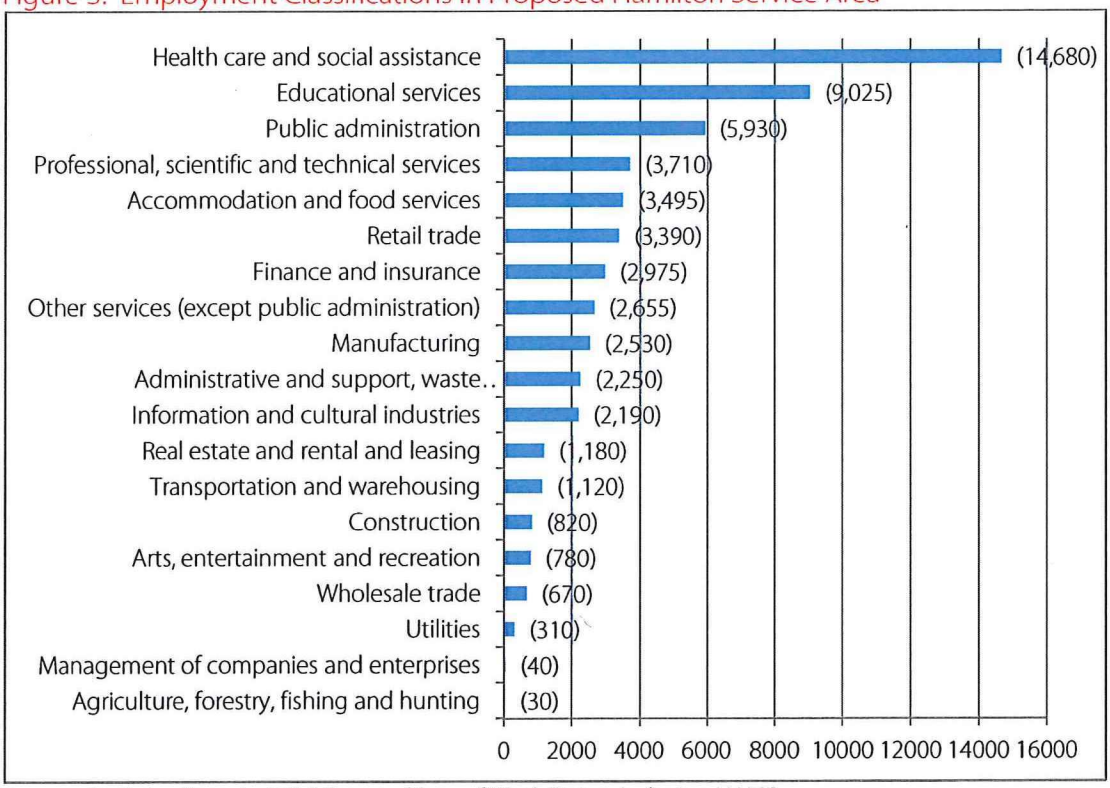
Sources: U.S. Department of Transportation Federal Highway Administration, Statistics Canada
*Employment figures from Table 3

For housing units, Hamilton sits 5th in the comparison, below the average with just over 45,500 units (Table 4). However, housing density shows that Hamilton is sixth on the comparison, albeit still above the average. Finally, in terms of the combined housing and employment figures, Hamilton sits just below the average with approximately 103,300, giving the community the 5th highest total, about in line with other overall statistics. However, if you exclude Arlington/Washington with its significantly higher number compared to the rest, Hamilton is comfortably above the average.

2.1 Service Area Employment Categories

To provide further insight on the make-up of the potential Hamilton market, Figure 3 shows the breakdown of the employment categories found in the proposed service area. The top categories of employment are health care and social assistance, education services and public administration which reflect that fact that there are three major hospitals, a university and a cluster of government offices (municipal, provincial, and federal) in the service area.

Figure 3: Employment Classifications in Proposed Hamilton Service Area



Source: Statistics Canada, 2006 Census, Place of Work Status, Industry -NAICS

3.0 Case Study Comparison - System Membership

System membership is the next point of comparison in the case-study analysis. Two metrics were used: Annual membership and casual membership. In general, casual members are defined by daily/hourly, weekly, or monthly users. Please note that definitions of casual member differ slightly depending on what payment systems are offered by each network, but for the purpose of this comparison, they are all treated as casual members. Table 5 compares these membership statistics across all systems.

Table 5: System Membership Statistics

City	Annual Membership	Annual Membership per sq. mi.	Casual Membership	Casual Membership per sq. mi.
Arlington, VA/ Washington, DC	19,200	534.08	105,644	2,938.64
Boston, MA	3,600	305.34	30,000	2,544.53
Minneapolis, MN	3,521	105.74	37,103	1,114.20
Hamilton	**3,000***	**355.03**	**15,900***	**1,881.66**
Denver, CO	2,659	211.54	40,600	3,229.91
Miami Beach, FL	2,500	396.83	338,828	53,782.22
Boulder, CO	1,171	249.68	6,200	1,321.96
San Antonio, TX	1,000	209.64	2,800	587.00
Spartanburg, SC	127	89.44	828	583.10
UC, Irvine	100	77.52	None reported	n/a
Averages	3,687.80	253.48	64,211.44	7,553.69

Sources: U.S. Department of Transportation[7], Hamilton Bike Share Business Plan
*Projected in year 2013 of Business Plan

The comparison shows that with 3,000 members, Hamilton would be below the average of all systems. However, the Arlington/Washington system has such a high number that the average is skewed. Setting that system aside, the Hamilton membership figure is above average in the comparison. The membership density comparison shows Hamilton on the high-end of the scale likely due to a high membership to service area ratio. It should also be noted that the Hamilton business plan estimates that the system will eventually grow to 4,500 members which would place it near the top in the comparison and this should be taken into account in planning the system.[8]

Further, the casual membership projected for Hamilton, which includes hourly, daily, 3-day, and monthly members is estimated to be 15,900. This is well below the average, but it should be noted that there are significant fluctuations in the casual membership amount given the differing circumstances of cities. For example, Miami Beach has a significantly higher casual amount likely due to tourism and Boulder has the influence of the University of Colorado. Nonetheless, the casual figure for Hamilton is low compared to peer communities, as is the casual member density. As the current analysis doesn't take into account the potential for tourism-related users, the numbers could turn out to be higher depending on the location of bike share stations that would appeal to a more casual market such as the tourist nodes of the West Harbour, Royal Botanical Gardens or the new stadium for the Pan Am Games.

3.1 Uptake Comparison

Table 6 shows systems ordered by uptake calculated using the metrics used to determine the market size: Housing units and employment. This comparison provides a general sense of whether the projected annual membership for Hamilton is reasonable, give the market size and the experience of other systems. On this measure, Hamilton is below the average in uptake level at 2.9 percent when considering both housing and employment. When just using housing units as the metric, the uptake level is just above the average. However, given that the proposed service area has a relatively high employment density and includes large employment nodes such as McMaster University, the St. Joseph's and General Hospital zones, and the downtown employment area, the first metric is a more holistic basis for comparison.

Table 6: System Membership Statistics and Uptake Levels

City	Annual Memberships	Housing + Employment	Memberships Per HU+E*	Memberships Per HU*
San Antonio, TX	1,000	14,429	6.93%	14.41%
Boulder, CO	1,171	19,140	6.12%	10.88%
Arlington, VA/ Washington, DC	19,200	408,176	4.70%	8.42%
Miami Beach, FL	2,500	62,049	4.03%	6.18%
Hamilton	**3,000**	**103,307**	**2.90%**	**6.59%**
UC, Irvine	100	4,612	2.17%	3.84%
Denver, CO	2,659	137,679	1.93%	2.79%
Boston, MA	3,600	193,297	1.86%	3.28%
Minneapolis, MN	3,521	232,268	1.52%	2.75%
Spartanburg, SC	127	11,806	1.08%	1.54%
Averages	3,687.80	118,676.25	3.32%	6.07%

Sources: U.S. Department of Transportation[9], Statistics Canada, Hamilton Bike Share Business Plan
*HU = Housing Units, E = Employment

4.0 Case Study Comparison - System Infrastructure

The final area for comparison in the analysis is system infrastructure. Factors of relevance include the number of bikes and stations and density of that infrastructure. Table 7 summarizes the results of this comparison.

Table 7: System Infrastructure Statistics

City	Bikes (Start)	Bikes (Current)	Bikes per sq. mi.	Stations (Start)	Stations (Current)	Stations per sq. mi.	Annual Memberships
Minneapolis, MN	1200	1300	36.04	116	145	3.48	3,521
Arlington, VA/ Washington, DC	1100	1200	30.60	110	140	3.06	19,200
Miami Beach, FL	500	800	79.37	50	91	7.94	2,500
Boston, MA	400	600	33.93	40	60	3.39	3,600
Denver, CO	400	520	31.82	40	52	3.18	2,659
Hamilton (Projected)	**300**	**n/a**	**35.50**	**35**	**n/a**	**4.14**	**3,000**
San Antonio, TX	200	200	41.93	20	23	4.19	1,000
Boulder, CO	110	110	23.45	15	15	3.20	1,171
UC, Irvine	28	28	21.71	4	4	3.10	100
Spartanburg, SC	14	14	9.86	2	2	1.41	127
Averages	425.20	n/a	34.42	43.20	n/a	3.71	8 to 24

Sources: U.S. Department of Transportation[10], Hamilton Bike Share Business Plan

Table 7 shows that with 300 bikes, Hamilton's system would be below the average as compared to other cities, but about the average when it comes to the density of bikes given the service area. However, while the Hamilton system would be below the average for the number of stations, it would have above average station density when you consider the service area, with the third highest amount. These metrics are useful for system planning as they provide insight on whether the estimated infrastructure requirements are more or less in line with other systems in operation. In addition, it is useful to look at membership targets in comparison to infrastructure to see how the proposed Hamilton system measures up. In this regard, Hamilton would have fewer bikes than other systems with comparable membership levels.

4.1 Bike Facility Characteristics and Business Models

Table 8 provides some more contextual information for the case-study analysis by looking at the bike facility characteristics in cities (e.g. bike lanes) and the business models employed. In comparison to other communities, Hamilton has a good level of cycling infrastructure with about 65 miles of bike lanes and 108 miles of signed shared bike lanes. However, this number is city-wide and does not look at the amount of infrastructure simply within the proposed service area. In addition, it is interesting to note that the most popular business model appears to be nonprofit owned and operated.

Table 8: Bike Facility Characteristics and Business Models

City	Bike Facility Characteristics	Business Model
Miami Beach, FL	Sharrows throughout city. Pathway along 35-85th street.	For profit owned and operated
San Antonio, TX	Growing network of bike lanes, signed bike routes, and trails	Nonprofit owned and operated
Minneapolis, MN	40 miles on street bike lanes when program began, 80 miles by end of year	Nonprofit owned and operated
Boston, MA	50 miles of bike lanes; 50 miles off street.	Advertising and sponsorship concession with profit-sharing
Boulder, CO	300+miles of bike lanes,routes, designated shoulders, and paths	Nonprofit owned and operated
Denver, CO	76 miles of bike lanes, 30 miles of sharrows, 82 miles of paved trails.	Nonprofit owned and operated
UC, Irvine	Sharrows, on inner university ring with one side for bike and one side for pedestrians, Trails, dedicated bike lanes	University Owned
Arlington, VA/Washington, DC	48 miles of marked bike lanes. Growing network of lines, signed bike routes, and trails.	Jurisdiction owned and managed
Spartanburg, SC	3.6 miles of bike lanes and signed routes; 2.7 miles of sharrows; 24.38 miles of trails; 7 miles of mountain bike trails; 172 bike racks	Nonprofit owned and operated
Hamilton	**65 miles of bike lanes, 108 miles of shared on-street (signed) bikes lanes city-wide**	**n/a**

Sources: U.S. Department of Transportation[11], City of Hamilton[12]

5.0 Analysis and Conclusions

The case study comparison shows the general parameters of the proposed Hamilton bike share system in relation to nine other systems analyzed by the U.S. Department of Transportation. The comparison helps put the proposed Hamilton system in context and can help with planning and implementation. The following are some key points from the analysis:

Comparator Systems

- The systems included in the U.S. research used for the comparison are all relatively new, having launched between 2009-2011.

- The existing systems contain a mix of year-round and seasonal operations comparable to Hamilton`s climate.

- Further, while relatively new, the systems are either sustaining their current size or growing.

Service Area

- The proposed Hamilton service area used for the analysis extends from Ottawa Street in east to the area just past McMaster University in the west. In addition, it covers the area just north of the escarpment to the west harbourfront. This area contains many of the major employment nodes of the city including McMaster University, three hospitals and the downtown core.

- The size of the proposed Hamilton service area used for the analysis is below the overall average, but is in the middle (5 out of 10) when looking at the ranking of systems.

This would suggest that the service area is a reasonably sized and located for the analysis.

Potential Market

- The number of jobs in the proposed service area and the density of those jobs is higher than the average, while the number of housing units in the proposed service area is below the average in the comparison (although the density of housing is higher).

- While the combined housing and employment figures are below the average in the comparison, the total figure is in the middle when looking at the ranking of systems. In addition, Hamilton is comfortably above the average when you exclude the skewing impact of Arlington/Washington.

- Average household income is higher than the average in the comparison and of the jobs located in the proposed service area, the top categories are: Health care and social assistance, educational services, public administration, professional, scientific and technical services.

This would suggest that the proposed Hamilton service area used in the analysis has a reasonable base from which to draw potential users.

Membership Targets

- The annual membership targets for the proposed Hamilton bike share system are about average when you remove the largest system (Arlington, VA/Washington, DC) as it significantly skews the calculated average. Conversely, Hamilton`s casual membership projections are significantly lower than the average indicating that this source of members, as associated revenue, could be conservatively stated.

- When factoring in the housing and employment figures in the proposed study area, the projected annual membership level represent a 2.9% uptake level which is just below the average of in the comparison.

This would suggest that the projected Hamilton membership numbers are achievable. However, the Hamilton system would need to outperform systems with similar membership numbers which have lower uptake levels.

System Infrastructure

- The number of bikes and stations planned for the Hamilton system appear below the average in the comparison.

- The density of bikes and stations are slightly higher than the average.

This would suggest that the number of bikes and stations for the proposed Hamilton system are suitable for the service area size used in this analysis. However, growth might be required in the future to match the infrastructure offered by systems with membership levels comparable to the Hamilton projections.

In conclusion, the parameters of the proposed Hamilton bike share system compare favourably in the case study analysis. However, this does not automatically mean that a Hamilton system would be successful. While the scope of this analysis was focused on particular set of metrics, there are other factors, such as market demographics that are equally important to consider. In this respect, the breakdown of employment (Figure 3) and median household income (Table 3) are useful, but this only scratches the surface. A more fulsome demographic analysis would look at other factors including age, sex and educational attainment of both the residential and working populations in the proposed Hamilton service area.

Further, while the potential for a market may exist, reaching that market is another question which involves a robust communication and marketing campaign which could include further targeted market research. In this regard, the totality of nodes found in the eventual service area will translate into a potential market that includes not just commuters, but tourists and students as well. This means that additional factors such as the placement of stations and ease of use and payment will be equally as important for success. Finally, the analysis also showed a variety in the size of bike share systems and it will be important for Hamilton to find the right scale to ensure sustainability. Ultimately, strategic implementation of the system, leveraging the full potential of the local market will be the overriding determining factors in the sustainable success of a Hamilton bike share system.

6.0 Appendix - Potential Service Area Census Tracts

Table 9: Service Area Census Tracts and Alternative Commuting Levels

Census Tract	Total Commuters	Walking/ Cycling	Public Transportation	Total Alt. Trans
5370034	2,455	405	595	1000
5370035	1,635	175	445	620
5370036	N/A	N/A	N/A	N/A
5370037	1010	175	310	485
5370042	1565	210	205	415
5370043	1635	210	260	470
5370044	2080	215	410	625
5370047	1260	225	125	350
5370048	625	160	180	340
5370050	1,445	155	300	455
5370051	1,550	175	280	455
5370052	1,775	180	375	555
5370053	1,580	155	240	395
5370062	1,315	150	215	365
5370063	1,160	160	245	405
5370064	780	150	100	250
5370065	1,075	140	140	280
5370066	2,190	240	410	650
5370038	1,540	325	320	645
5370039	2,765	585	560	1145
5370040	1,165	245	160	405
5370041	1075	245	190	435
5370045	1780	560	180	740
5370046	1475	260	205	465
5370049	780	180	120	300
Totals	35,715	5,680	6,570	12,250

Source: Statistics Canada, 2006 Census

7.0 References

[1] U.S. Department of Transportation Federal Highway Administration, *Bike Sharing in the United States: State of the Practice and Guide to Implementation*, September 2012 Prepared by Toole Design Group and the Pedestrian and Bicycle Information Center, p. 4. http://www.bicyclinginfo.org/promote/bikeshareintheus.pdf

[2] Ibid., p. 35-43.

[3] Ibid., p. 17

[4] Centre for Community Study, Walkability and Economic Development, http://www.communitystudy.ca/pdfs/Walkabilty_EcDev.pdf, p. 10.

[5] Statistics Canada, Hamilton CMA: Distribution of the Employed Labour Force by Place of Work or Place of Residence by 2006 Census Tracts (CTs), http://www12.statcan.gc.ca/census-recensement/2006/as-sa/97-561/maps-cartes/CMA-CT/WorkplaceResidence/HamiltonPOW_PowPor_ec.pdf

[6] Statistics Canada, Census Profile, http://www12.statcan.gc.ca/census-recensement/2011/dp-pd/prof/search-recherche/frm_res.cfm?Lang=E&SearchText=hamilton&SearchType=Begins&SearchPR=01&TABID=1&G=1&Geo1=CMA&Code1=537&Geo2=PR&Code2=35

U.S. Census Bureau, www.census.gov/compendia/statab/2012/tables/12s0020.xls

[7] U.S. Department of Transportation Federal Highway Administration, *Bike Sharing in the United States: State of the Practice and Guide to Implementation*, September 2012. , p. 35-43.

[8] City of Hamilton, *Hamilton Bike Share Cash-Flow Analysis*, Provided by Peter Topalovic, Project Manager, Transportation Demand Management, City of Hamilton, December 2012.

[9] U.S. Department of Transportation Federal Highway Administration, *Bike Sharing in the United States: State of the Practice and Guide to Implementation*, September 2012. , p. 35-43.

[10] Ibid. , p. 35-43.

[11] Ibid. , p. 35-43.

[12] City of Hamilton, Shifting Gears, 2009, p.45, http://www.hamilton.ca/NR/rdonlyres/C9325371-2B64-460B-A00D-B0038F6677F9/0/FinalShiftingGears2009May1611lrgprintChp4.pdf

Appendix: Bikeshare Ownership, Business Model and Funding Comparison

City	Operator Name	Equipment Provider	Equipment Ownership	Business Model	Funding Model (Public, private investment, Advertising & Sponsorship, Membership Fees)	Funding Sources
Minneapolis, MN	Nice Ride MN	PBSC Urban Solutions	Nonprofit owned	Nonprofit owned and managed	Public, private, sponsorship, membership and usage fees	Federal: FHWA funds through local program. Private: Blue Cross-Blue Shield, other private/nonprofit investors, and station sponsorships. Membership and usage fees.
Arlington, VA/ Washington, DC	Capital Bikeshare	PBSC Urban Solutions	Jurisdiction	Jurisdiction owned and operated	Public, sponsorship, membership and usage fees	Federal: CMAQ. Local: vehicle decal fee, commissions from transit fare media sales. Private: business sponsorship. Membership and usage fees.
Miami Beach, FL	Deco Bike LLC	Deco Bike LLC	Privately owned	For profit owned and operated	Private, advertising, membership and usage fees	Private investment. Membership and usage fees. Advertising space.
Boston, MA	Alta Bikeshare	PBSC Urban Solutions	Jurisdiction owned	Advertising and sponsorship concession with profit sharing	Public, sponsorships, membership and usage fees	Federal: CMAQ and FTA. State: Public Health Grant. Private: Direct system sponsor and other smaller sponsors. Membership and usage fees.
Denver, CO	Denver Bikesharing	B-cycle	Nonprofit owned	Nonprofit owned and operated	Public, private, membership and usage fees	Federal: Energy Efficiency and Conservation Block Grant Program; Transportation Community Preservation Program. State: Vehicle Registration Tax, FASTER program. Private: local match. Membership and usage fees.
San Antonio, TX	San Antonio Bikeshare	B-cycle	Jurisdiction owned	Nonprofit managed	Public, advertising and sponsorships, membership and usage fees	Federal: EPA (EECBG), CDC (Communities Putting Prevention to Work), Obesity Reduction Grant; Advertising and Corporate Sponsorships; Membership and usage fees.
Boulder, CO	Boulder B-cycle	B-cycle	Nonprofit owned	Nonprofit owned and operated	Private, sponsorships, membership and usage fees	Sources not specified. Sponsorships - 22%, Grants - 56%, Gifts - 10%, MS and usage fees - 12%
UC, Irvine	Transportation and Distribution Services, University of California, Irvine	Collegiate Bicycle Company; Central Specialties, Lt.	University owned	University owned	Private (university, institutional)	Revenue (parking fees, citations) - Transportation and Distribution Services
Spartanburg, SC	Partners for Active Living	B-cycle	Nonprofit owned	Nonprofit owned and managed	Public, private, membership and usage fees	Local Grants: City of Spartanburg, Mary Black Foundation, and JM Smith Foundation

Source: U.S. Department of Transportation Federal Highway Administration