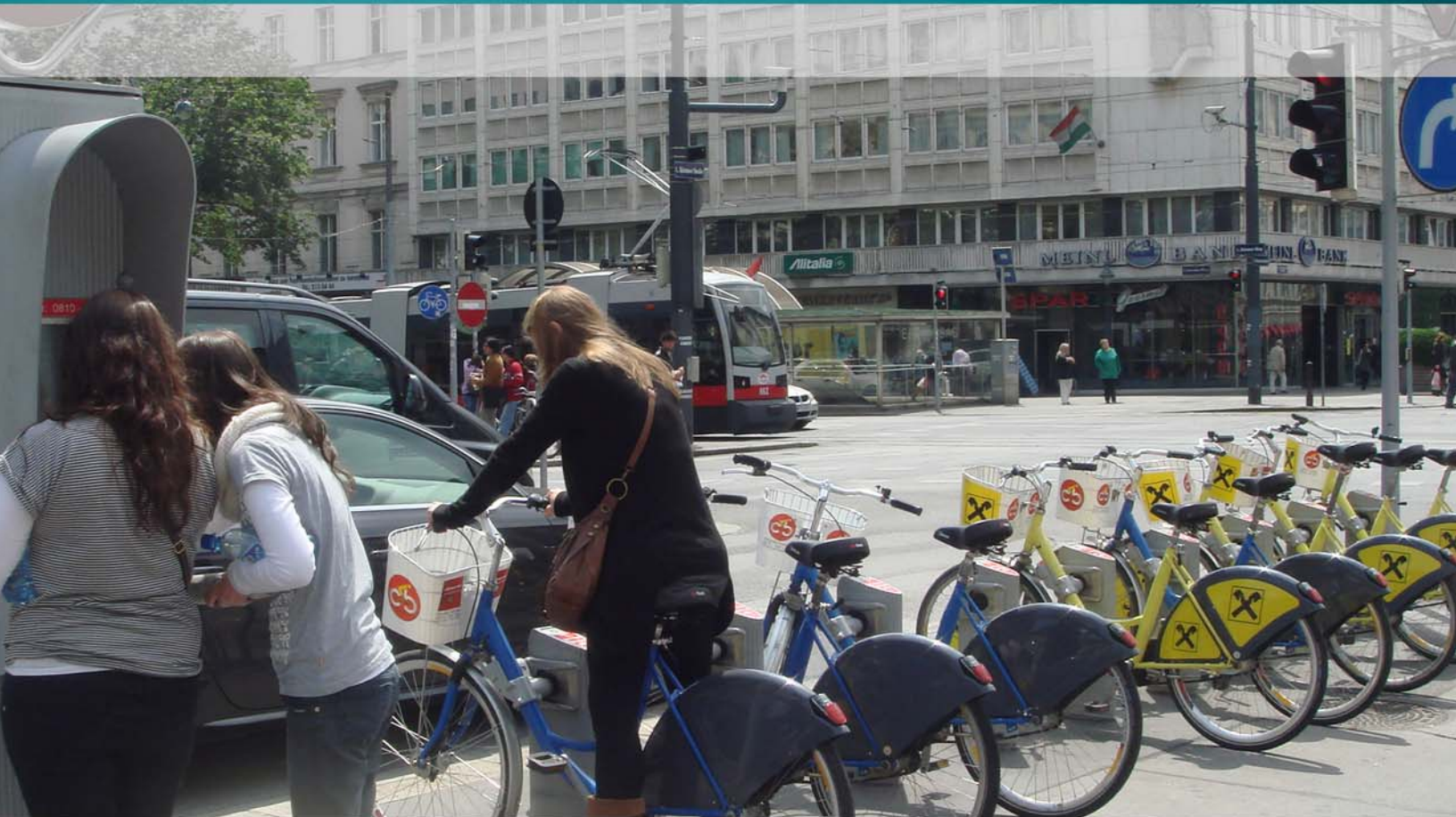


# Automated BICYCLE

## Rental System and Parking Plan Study



PREPARED FOR



PREPARED BY



Kimley-Horn  
and Associates, Inc.

**Miami-Dade Metropolitan Planning Organization**  
presents

**Automated Bicycle Rental System and  
Parking Plan Study**



*Prepared by:*

**Kimley-Horn and Associates, Inc.**



**Kimley-Horn  
and Associates, Inc.**

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## INTRODUCTION

Vehicular congestion in Miami-Dade County continues to be a problem as the community grows and travel patterns change. Increasing alternative travel mode usage is imperative to decreasing the number of single-occupant vehicle trips and improving traffic congestion and mobility. Increasing bicycle commuting is part of the solution. Bicycling is a viable mode of transportation for short-distance trips in urban areas. According to the National Household Travel Survey, nearly half of all trips are less than three miles in length. In fact, approximately 28 percent of trips are less than one mile. As such, bicycling has the potential to serve a much greater proportion of trips than it currently does in Miami-Dade County.

The synthesis of bicycling and public transit increases the effectiveness of the bicycle as an urban mobility tool even more. Studies show that the average person is willing to walk one-fourth of a mile to transit services. However, the average person is willing to bike 3 miles or more to transit services. Accordingly, communities nationally and internationally



*McDonald's Cycle Center (Chicago) – Bicycle Parking Transit Center*

have discovered that the integration of bicycle and transit facilities can generate new ridership for both bicycle and transit modes. The development of facilities such as bicycle parking transit centers can improve the ability of existing and programmed transit services to capture and serve trips which incorporate bicycling. Bicycle parking transit centers provide secure bicycle storage near a transit facility where members can park their bicycles during the work day or overnight and utilize transit for regional travel. These centers often offer indoor parking, changing rooms, staffed security, and repair centers. Some centers offer showers, restrooms, and internet access. Bicycle rentals/sharing sometimes are offered as an additional amenity.



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*B-Cycle Chicago – Automated Bicycle Rental Station*

Bicycle sharing systems can also be a component of a multimodal transportation system. Many localities across the world have established automated bicycle rental systems that feature prepaid memberships and automated bicycle pick-up and drop-off services. These types of systems allow a user to take a bike conveniently from their point of origin and return it to the system at a different location. These automated rental systems allow people to shift easily from other modes of

transportation to bicycles and back again. The central concept of many of the systems is free or affordable access to bicycles for intra-city trips to reduce the use of automobiles for short trips within the city. The majority of automated bicycle rental systems are established by companies or vendors that specialize in providing these systems in partnership with local government. Advertising revenue potential is a significant attractor for many of these companies and vendors.

Bicycle parking design standards along with bicycle installation location selection requirements of four cities were reviewed to assist in the development of a uniform design standard for bicycle rack selection and installation for Miami-Dade County. Bicycle parking installations should permit the support of the bicycle with at least two points of contact and the locking of the frame and at least one wheel with a standard size lock. The “post-and-ring” design, the “inverted U” design, and the “swerve” design are the preferred



*Post-and-Ring Bicycle Parking*

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bicycle parking designs because they allow two points of contact, encourage proper locking of the bicycle, and are compact enough to minimize space requirements. In general, the guidelines include short-term bicycle parking design standards. Short-term parking design standards require bicycle parking in close proximity to a building's entrance, usually within 50 feet of the main entrance or distributed to serve buildings with multiple main entrances. Long-term parking design standards of the majority of the cities require some type of covered parking. The design standards also include detailed spacing and siting dimensions, including required parking space, aisle, and pedestrian circulation dimensions.



*Bicycle Securely Locked at an Inverted-U Rack*



*Bicycle Parked at a Swerve Rack Placed in Series*

*On-Street Bicycle Parking Shelter with Cycling Map*







## STUDY OBJECTIVE

The primary study objectives are threefold.

- Evaluate feasibility of creating **bicycle parking transit centers** in Miami-Dade County.
- Assess potential market for an **automated bicycle rental system**.
- Establish Countywide **bicycle parking standards**.

This study will define the size and composition of bicycle parking transit centers to serve as guidelines for implementation in future transportation and development projects. Transit centers often include supporting bicycle infrastructure, such as bicycle rental facilities. This study will evaluate the potential market for and feasibility of creating an automated bicycle rental system in Miami-Dade County, which would have rental locations placed at strategic locations around the County to help improve accessibility to bicycling.



*Bicycle Parking Room with Lockers and Light Maintenance Available*



## BACKGROUND RESEARCH

Current information and data about bicycle parking transit centers and automated bicycle rental systems were obtained by interviewing and collecting information from both companies and local governments that operate these types of facilities. This information is summarized in Tables 1 and 2.

The Puget Sound Regional Council developed BikeStation Demand Methodology, a tool that predicts how many individuals might use a bicycle parking transit center facility. The project also presents a method to feasibly develop regional bikestations and integrated bicycle parking programs at transit centers. The project developed a methodology and a level-of-service matrix that can be used by local transit providers as a means of estimating bicycle parking demand at transit stations to determine appropriate facility development, in response to the needs of bicycle/transit commuters. This methodology was reviewed and summarized as a part of this study to determine the tool's applicability in Miami-Dade County.

### Bicycle Parking Centers

As illustrated in Table 1, six bicycle parking transit center programs were summarized for this report:

- BikeStation (several cities including Washington DC, Hillsboro OR, and 5 cities in California)
- Toronto (Toronto Union Station Bicycle Station)
- Chicago (McDonald's Cycle Center)
- Portland (Bike Central)
- Austin (Mellow Johnny's Bike Shop)
- Tempe (Bicycle Cellar)

BikeStation is a private company that is the leading developer and operator of bicycle parking transit centers in the U.S with seven facilities (as of early 2011), including locations in Washington DC, Hillsboro OR (near Portland), Long Beach, Palo Alto, Santa Barbara, Claremont, and Covina. BikeStation plans and designs bicycle parking transit centers and serves as an information





clearinghouse and support system to individual operators that are responsible for the daily operations of each facility, essentially functioning as a bicycle parking transit center franchiser.

Each of the bicycle parking transit centers reviewed is the sole facility of this type in each respective municipality, with the exception of Portland's Bike Central program. Portland's two bicycle parking centers are located in athletic clubs and were planned primarily for bicyclists that commute directly to and from their employment without using transit. Based on available information, the only multi-site network of bicycle parking centers integrated with transit currently in place in the U.S. are the BikeStations (Claremont and Covina) currently operating along the Metrolink commuter rail (San Bernardino line) near Los Angeles. This level of integration is still a relatively new concept in the U.S. Based upon an interview conducted with staff of Toronto's Union Station Bicycle Station, the City of Toronto plans to open additional bicycle parking centers along Toronto's subway system in the next several years, establishing an integrated system of transit bicycle parking centers.

The majority of bicycle parking transit center programs reviewed are subsidized by local governments and organizations, although the level and type of subsidization varies by facility. The BikeStation centers are developed in localities through partnerships with different entities such as local governments and bike shops. After development, the BikeStation centers are typically operated by bicycle companies, but local governments may continue to subsidize the facilities. Chicago's McDonald's Cycle Center was constructed by the City of Chicago but is operated by a bicycle rental and tour company. However, the facility is subsidized by McDonald's, City departments, and bicycle advocacy organizations. The City of Toronto's Union Station Bicycle Station was constructed and is operated by the City of Toronto. The Bicycle Cellar facility in Tempe, Arizona was constructed by Bicycle Cellar, a private company, in a City-owned building. The lease with the City is linked to the amount of revenue generated by the facility. Both the Portland and Austin bicycle parking centers target bicyclists who commute to and from their employment without using transit. As such, both facilities are operated on private property and by private owners. Portland's Bike Central facilities are located in two athletic clubs and are operated by the athletic clubs. Austin's bicycle parking center is located in Mellow Johnny's Bike Shop, a retail bicycle shop and repair center owned by Lance Armstrong, and offers free daily parking. These two facilities were included to illustrate alternative partnerships for developing bicycle parking centers.



## Automated Bicycle Rental Systems

As illustrated in Table 2, seven automated bicycle rental systems were summarized for this report:

- B-Cycle (founded in Denver)
- Bixi (founded in Montréal)
- SmartBike (U.S. pilot: Washington, DC)
- Lexington Yellow Bikes
- Velib Paris
- CityBike Austria (example: Vienna)
- Deco Bike (Miami Beach)

According to *Bike-sharing: History, Impacts, Models of Provision, and Future* (DeMaio, 2009), bicycle sharing systems are in a relatively nascent state of development, although the current third-generation systems include many improvements over previous attempts, such as smartcards, mobile phone access, electronically-locking racks, and on-board bicycle tracking. In the U.S., the first automated bike sharing program was the SmartBike pilot project in Washington, DC, which demonstrated that bikesharing is a viable form of public transportation. Bicycle sharing programs and automated bicycle rental systems vary greatly by size and level of technology utilized. Lexington's Yellow Bike program has three check-out sites whereas Paris' Velib has approximately 1,800 automated rental kiosks. The technology utilized by the reviewed programs varies from in-person rentals (Lexington) to rental terminals with real-time availability (Paris' Velib).

As illustrated in Table 2, almost all automated bicycle rental systems are established by companies or vendors that specialize in providing bicycle rental systems. These companies provide a multitude of technology and support options. A basic level of service for bicycle rental systems includes bicycle parking stations (kiosks and docks), bicycles, installation, and a project website. Additional support options often include ongoing maintenance, program administration, and real-time information of bicycle location and availability.

The companies that specialize in rental systems typically work with local governments to install and run the operating components of the stations. Thus, municipalities establish their own unique

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operations and financing arrangements with the rental system companies. Most of the systems offered by these companies can be established as a turnkey system or integrated with any public transportation or parking network. Most companies can operate the facilities and provide ongoing maintenance. Several municipalities (Montréal as an example) operate the program internally once the system is established. Other programs, like Denver's B-Cycle system, are externally-operated.

The Velib Paris system is perhaps the most comprehensive automated bicycle rental system in the world. The program is unique as the system's startup cost was completely financed by the JCDecaux Advertising Corporation. In return, the City of Paris signed over a substantial portion of the income from on-street advertising revenue and JCDecaux received exclusive control over City-owned billboards. However, the City receives all revenue from the bicycle rental program. A similar arrangement was established between the City of Washington, DC and Clear Channel Outdoor (an advertising company) for the SmartBike pilot program. In early 2011, the 10-station SmartBike program transitioned to the expanded, multi-jurisdictional Capital Bikeshare, which includes approximately 110 stations and 1,100 bicycles on both sides of the Potomac River.

On a local level, the City of Miami Beach launched an automated bicycle rental system in 2010 (DecoBike). DECOBIKE, LLC is providing all funding for the system including maintenance and operations. The City is providing actual location sites and is assisting in marketing and promoting the program. DECOBIKE, LLC shares gross revenue with the City. DecoBike currently is operating from approximately 60 of the planned buildout of 100 solar-powered bike rental stations.



*Deco Bike – Miami Beach*



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**Table 1: Bicycle Parking Transit Center Research Summary**

Company/City	Number of Sites	Services Offered	Transit Connectivity	Property Owner	Typical Parking Capacity	Subsidization and Operations	Fee Types	Fees	Staffed Hours
BikeStation (Cities Include Washington DC, Hillsboro OR, Long Beach CA, Palo Alto CA, Santa Barbara CA, Claremont CA, and Covina CA)	7	Secure 24/7 Indoor Bicycle Parking; Bicycle Repairs; Retail Sales and Accessories; Bicycle Rentals; Lockers; Changing Rooms; Internet; Commuter Information	Each location specifically marketed for transit connectivity; Some located in transit stations	Various (Local government, transit hubs, private store fronts)	30 - 100 spaces	Operated by Bicycle Companies (Bike Shops, Bike Tours, etc); Subsidized by Local Governments; Each member is given a digitally-programmed key fob for access	Annual, Monthly, Daily	Annual Admin Fee: \$20; Annual Service Plan: \$96; Monthly Service Plan: \$12; Daily Service Plan: \$1	Open Weekdays; Some open weekends
Toronto (Toronto Union Station Bicycle Station)	1	Secure 24/7 Indoor Bicycle Parking; Self-Serve Mechanic Stand/Tools; Vending Machine with Bike Necessities and Snacks; Bike Sharing; Washroom Nearby; Expansion Plans include Showers	Located in enclosed pedestrian walkway at transit station	City of Toronto	nearly 200 spaces	Subsidized and Operated by Local Governments; Members have access 24/7 through the use of a key fob	1 Month, 4 Months, Daily	Registration Fee: \$26.91; 1 Month: \$21.53; 4 Months: \$64.57; Daily: \$2.15 Offers 10 % discount at participating bike shops	Monday - Friday: 8 AM - 4 PM
Chicago (McDonald's Cycle Center)	1	Secure 24/7 Indoor Bicycle Parking; Bicycle Repair Shop; Retail; Bicycle Rentals; Showers; Lockers; Changing Rooms; Guided Bike Tours; Access to IGO Car Sharing	Located in Millennium Park and near Chicago Transit Authority hub, McCormick Place Busway, and Metra trains	City of Chicago	300 spaces	Operated by Bike and Roll (Bicycle Rental and Tour Company); Sponsored by McDonald's, City Departments, and Bicycle Advocacy Organizations	Monthly and Annual	Registration Fee: \$20; Annual Pass: \$149; Monthly Pass: \$30 (Membership open to Illinois residents only)	Open Seven Days a Week (Closed Weekends During Winter Season)
Portland (Bike Central)	2	Secure Bicycle Parking; Showers; Lockers; Changing Rooms	Located in Athletic Clubs	Private Property		Operated by Athletic Clubs	Monthly	Monthly Passes: \$15 - \$50 (Monthly shower/locker pass: \$12.50)	Club Hours: Weekdays: 5 AM - 10 PM; Weekends: 7 AM - 7 PM
Austin (Mellow Johnny's Bike Shop)	1	Secure Indoor Bicycle Parking; Bicycle Repairs; Bicycle Rentals; Retail; Showers; Lockers; Changing Rooms; Bicycle Skills Classes	Located in Mellow Johnny's Bike Shop	Private Property		Operated by Mellow Johnny's	Free	Bicycle Parking: Free Shower Pass: \$1	Weekdays: 8 AM - 7 PM; Saturdays: 8 AM - 6 PM; Sundays: 10 AM - 4 PM
Tempe (Bicycle Cellar)	1	Secure Indoor Bicycle Parking (Access from 4 AM - Midnight); Access to Repair Tools; Bicycle Rentals; Showers; Towel Service; Lockers; Changing Rooms	Located at the Tempe Transportation Center, which is a hub for Light Rail Transit and Buses, and is also near Arizona State University	Local Government		Operated by Bicycle Cellar after winning a competitive selection process; Lease is benchmarked to revenue generation	Annual, Monthly, Daily	Annual Membership: \$144; Monthly Membership: \$30; Punch-card 10-Pack: \$10 (Lockers and towel service extra)	Weekdays: 7 AM - 6 PM; Weekends: 9 AM - 5 PM

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**Table 2: Automated Bicycle Rental Systems Research Summary**

Name	Number of Docking Stations	Number of Bikes	Basic Program	Operations and Financing	User Fees	Other Information
B-Cycle Partnership includes Humana, Trek, and Crispin Porter + Bogusky (Founded in Denver, now includes approximately 7 other cities)	50 stations (Denver)	500 bicycles (Denver)	Stations (kiosks and docks); Bikes; Website; Shipping; Installation	B-Cycle, LLC founded by Humana, Trek Bicycle Corporation, and Crispin Porter + Bogusky; B-Cycle offers station siting and prep; Maintenance and operations; Program administration; Spare parts; Monthly cellular service; Denver's program operated by Denver Bike Sharing (nonprofit); additional funding from Kaiser Permanente	Denver: Access Fee: (\$6 / day; \$20 / 7-day; \$30 / 30-day; \$65 / annual) Usage Fees for Each Checkout: (0-30 minutes = Free; 30-60 minutes = \$1; Each add'l 30 mins = \$4)	Built-in GPS reports trip data back to the server
Bixi (Founded in Montreal and expanded to Toronto, Minneapolis, London, Ottawa, and Melbourne)	400 stations (Montreal)	5,000 bicycles (Montreal)	Stations (rental terminals and docks); Bikes; Website; Shipping; Installation	System can be turnkey or integrated with any public transportation or parking network; Station siting and prep; Maintenance and operations; Program administration; Montreal's program operated by City's parking authority	Montreal: Subscription members get unlimited number of rentals (\$5 per day/\$28 per month/\$78 per year); With a subscription, bike rental is free for first 45 minutes of every individual trip; A trip that lasts longer than 45 minutes incurs a charge of \$1.50-\$6, escalating to keep bikes circulating; Credit cards are only method of payment	Solar powered system; wireless communication (no connection to City's electric/communication grid); Subscribers access bikes with an access key; A la carte users access bikes with an access code provided by the paystation
SmartBike (US Pilot: Washington, DC)  Note: In January 2011, the SmartBike DC pilot project was transitioned to the permanent CapitalBikeshare program	10 stations (DC pilot program)	Approx. 150 bicycles (DC pilot program)	Stations (rental terminals and docks); Bikes; Website; Shipping; Installation	System can be turnkey or integrated with any public transportation or parking network; Station siting and prep; Maintenance and operations; Program administration; Clear Channel Outdoor and the District Department of Transportation partnered for DC program; Clear Channel Outdoor operates DC's program; Subscription via online with user card; DC's operating Hours: 6 AM - 10 PM (Bikes can be returned 24 hours)	DC: Annual Subscription: \$40; Replacement fee: \$550 (if bike not returned in 24 hours)	Uses remote processing to analyze condition of bike stations, ensure availability of bikes and parking slots, and then bikes redistributed accordingly
Lexington Yellow Bikes	3 check-out sites	12 bicycles	Yellow Bikes; Check-Out Sites; Membership Card; Lock/Key	Yellow Bikes operator; Three hour rentals; Rent/return same location; Hours vary depending on check-out location	One-time fee of \$10 for a membership card; \$300 fee for lost/stolen/damaged bike	Visit check-out location and present membership card and ID in exchange for a key for bike
Velib Paris	Approximately 1,800 stations	Approximately 20,000 bicycles	Stations (rental terminal and docks); Bikes; Website with Availability	System financed by the JCDecaux Advertising Corporation, in return for the City signing over income from substantial portion of on-street advertising revenue; JCDecaux paid start-up costs \$115 million; City receives all revenue from the program; JCDecaux receives exclusive control over City-owned billboards; Operates 24/7	Subscription required allows unlimited number of rentals (1 euro per day/5 euros per week/29 euros per year; With subscription, bike rental free for first half hour of every individual trip; A trip that lasts longer than 30 minutes is 1 euro-4 euros escalating to keep bikes circulating; Credit card or Maestro debit card with PIN required to sign up for program	Rental terminals display information about neighboring stations, including location and number of available bicycles/open stands; If user arrives with a rented bicycle at station that is full, terminal grants another fifteen minutes of free rental time; Station spacing approximately every 300 meters
CityBike Austria (Example Cities Include Vienna and Salzburg)	Approximately 70 stations (Vienna)	Approximately 1,000 bicycles (Vienna)	Stations (rental terminal and docks); Bikes; Website with Availability	Bikes sponsored by corporations; Operates 24/7	Subscription required (1 euro) to receive CityBike Card; With subscription, first hour free, second hour costs 1 euro, third hour costs 2 euros and every additional hour costs 4 euros; After 5 days, 600 euros for replacement	Terminals equipped with touch screens with access to City's internet pages
Deco Bike Miami Beach	Approximately 60 stations Expansion plans include an additional 25 stations	Approximately 1,000 bicycles	Stations (kiosks and docks); Bikes; Website; System Installation; System Operation; Cell Phone Application	DECOBIKE, LLC providing all funding including maintenance and operations; City providing actual location sites; City obligated to assist in marketing and promotion of program; DECOBIKE, LLC will share gross revenue with City (bike rentals 10% and bike advertisements 25%)	Monthly subscription: \$15 (unlimited trips up to 30 minutes free); Beyond 30 minutes usage fee is \$4 / half-hour; Hourly rentals available without a subscription, available with major credit card on walk-up basis (no pre-registration required); Fees start at \$4 for first 30 minutes and range to \$24 for 8 hours	Solar powered system; website and iPhone application show rental locations and availability of bikes



## **Puget Sound Regional Council Bikestation Demand Methodology**

The Puget Sound Regional Council's (PSRC) *Bikestations Project* is the first in the nation to attempt to estimate demand for bikestation facilities at transit hubs. PSRC developed a tool that predicts how many individuals might use a facility. The project also presents a method to feasibly develop regional bikestations and integrated bicycle parking programs at transit centers. The project developed a methodology and a level-of-service matrix that can be used by local transit providers as a means of estimating bicycle parking demand at transit stations to determine appropriate facility development, in response to the needs of bicycle/transit commuters. Importantly, the tools developed with the project can be adjusted to more accurately estimate the conditions of any locality. Along with the tools, PSRC also developed design guidelines, construction documents, marketing strategy, and a marketing and design tool kit so that agencies have a number of tools to develop and promote high-quality, uniform bicycle parking facilities that are part of a coordinated regional program.

The project goes beyond predicting bicycle parking demand and is unique in emphasizing the role of a coordinated regional effort to prioritize, develop, and market an integrated system of regional bicycle parking facilities. Thus, the project involves more than the development of bikestations. Indeed, the project involves the development of four major products:

1. Demand Methodology – for determining the market for bicycle parking at key stations
2. Assessment Tool – for determining the best means of serving the projected market
3. Design Guidelines – for creating a common and identifiable system of facilities to service these markets
4. Marketing and Operations Guidelines – for getting the best possible fiscal and service performance from the proposed facilities

The Demand Methodology and Assessment Tools are designed so that a transit agency can determine not only the current demand for bicycle parking facilities, but also project use associated with changes in transit service levels, land use, demographics, and access facilities. The Design Guidelines are intended to create an identifiable system of facilities. The Marketing





and Operations Guidelines are designed to unite marketing efforts behind a common outreach program for the entire region.

#### *Bikestation Demand Methodology*

The bikestation demand methodology focuses on the demand for secure parking services. The demand methodology is intended as a flexible tool for use by transit and planning practitioners to determine bicycle parking demand at a given transit facility, even those not considered suitable for a bikestation, although it should be noted that the tool was calibrated at bikestations. A limited number of bikestations are operating in the U.S., making estimating demand difficult and highly subjective. The PSRC reports that only three bikestations were operating at the time its report and demand methodology were developed. According to the PSRC, information on the parking habits and preferences of bicyclists is also limited. Thus, the PSRC designed the demand methodology conservatively. Only hard data and preference surveys from existing bikestations in California, local and national data on bike trips linked to transit, transit route patronage data from local transit agencies, survey results, and census journey-to-work data were used to create this methodology.

The basic premise of the demand methodology developed by PSRC is that the size of a bikestation market is constrained by (1) the number of transit trips and jobs in the area surrounding the bikestation [labeled the “Magnet Zone” and roughly defined as the area within a 0.25-mile radius around the proposed bikestation location], (2) bicycle commuting mode share within 3 miles of the bikestation, and (3) the number of bicycle commuters to the Magnet Zone. These three factors are the key inputs for the basis of bikestation parking estimates. Factors are then applied to these inputs called estimation variables, allowing the tool to predict the number of bicyclists who will park at the bikestation. Due to the uncertainties with limited available data, the demand methodology can predict a range of three output values: a base estimate, a worst-case scenario, and a best-case scenario. These variables and estimation adjustments are illustrated with sample calculations in the demand methodology tool outputs included as Appendix A, and are summarized in Table 3.

**Table 3: Definition of Demand Methodology Terms**

<p><b>Key Inputs:</b> These are data that must be collected from existing sources.</p> <ul style="list-style-type: none"> <li>• Employment data within the Magnet Zone</li> <li>• Bicycle commute mode share data within three miles of the Magnet Zone</li> <li>• Total daily transit boardings within the Magnet Zone</li> <li>• Total daily transit alightings within the Magnet Zone</li> </ul>
<p><b>Estimation Variables:</b> These are percentage values that must be estimated based on local conditions and should be altered over time as more hard data is collected.</p> <ul style="list-style-type: none"> <li>• Percentage of bicycle commuters who will park at bikestation</li> <li>• Percentage of transit boardings accessed by bicycle</li> <li>• Percentage of bike-and-riders who will park at bikestation</li> <li>• Percentage of induced bike-and-ride users due to bikestation</li> <li>• Percentage of transit alightings with a bicycle</li> <li>• Percentage of ride-and-bikers who will park at bikestation</li> <li>• Percentage of induced ride-and-bike users due to bikestation</li> </ul>
<p><b>Output Values:</b> These are the resulting values that the methodology provides.</p> <ul style="list-style-type: none"> <li>• Estimated number of bicycle commuters who will park at bikestation</li> <li>• Estimated number of bike-and-riders who will park at bikestation</li> <li>• Estimated number of ride-and-bikers who will park at bikestation</li> </ul>

Courtesy of Puget Sound Regional Council's Bikestations Project

As highlighted in the output values listed in Table 3, PSRC identified three primary user groups that will account for nearly all of the demand for bikestation parking.

1. Bicycle commuters
2. Bike-and-riders
3. Ride-and-bikers

The latter two are intermodal trips linked to transit. The demand methodology demand allows key inputs and estimation variables to be unique for each type of bikestation user. The resulting number of estimated bikestation users for each type is added to obtain the overall estimation of demand for a potential site. PSRC concluded that although non-commute



bicyclists, recreational riders, and tourists are not discouraged from using the bikestation, the parking demand for these user types constitutes a negligible market for long-term parking services at a bikestation from an estimation perspective.

### Site Assessment

PSRC applies the results of the demand methodology discussed above to a definition of the bicycle parking facility types across a range of demonstrated user demand, environments, and security needs. Three different types of bicycle facilities were defined by PSRC and specific design standards for each are included in the Design Standards section of the document:

1. Type I, or “Basic” – basic bicycle parking product (like an inverted U rack) that serves as a secure place to lock a bicycle. (PSRC recommends that covered parking should be a baseline amenity at transit stations.)
2. Type II, or “Bike Depot” – intended for use in locations where demand might not equal that of a Bikestation location, but where either high levels of service and/or capacity is desirable as compared to current bicycle parking design standards.
3. Type III, “Bikestation” – attended bicycle parking facility with the highest level of security, activity, and ability to support demand.

The evaluation of what type of bicycle facilities to provide at a particular location requires consideration of a few qualitative factors beyond demand methodology. Thus, PSRC developed seven evaluation criteria to aid in the determination of what level of service should be provided at a particular site:

1. Results of bicycle parking demand methodology
2. Safe and convenient bicycle access to proposed site
3. Safe and convenient pedestrian access to proposed site
4. Access to public transportation
5. Surrounding employment and commercial density
6. Special benefits to the community
7. Potential to generate operating revenue





According to PSRC, these evaluation criteria can be thought of as a reality check to evaluate the results of the demand methodology. A matrix was developed that weighs certain criteria more heavily and a scoring mechanism was developed. The level of service guidelines and facility type recommendations are included in Table 4.

**Table 4: Facility Type by Score**

Score	Recommended Facility Type
0.67 – 1.00	Type III, “Bikestation”
0.34 – 0.66	Type II, “Bike Depot”
0.00 – 0.33	Type I, “Basic”

Courtesy of Puget Sound Regional Council’s Bikestations Project

#### Design and Graphic Standards

PSRC developed specific design and graphic standards for each bicycle parking facility type. Location guidelines are also presented for future bikestations. Further, architectural design standards and graphic identity standards were developed to relate the facilities to Sound Transit’s identity, with the goal of maintaining a consistent multimodal image throughout the region. Appendix B presents the design and graphic standards developed by PSRC.

#### Marketing Program

PSRC clearly states that marketing is integral to the success of a regional bicycle parking project. As such, specific marketing strategies were developed and outlined that would be aimed at promoting increased levels of biking to access transit, including specific graphics and a marketing tool kit. These efforts would be regionally coordinated but would be implemented at both regional and local levels. The marketing program relies heavily on forging strong local partnerships with like-minded organizations to implement region wide design standards as well as regional and local marketing efforts. The marketing program includes advertising, billboards, brochures, public service announcements, media outreach, websites, and face-to-face outreach through activities such as fairs, speakers’ bureaus, and civic presentations.



## Bicycle Parking Design Standards

Bicycle parking design standards from several leading cities (in terms of bicycle parking code) in other metropolitan areas around the country were reviewed for this study. Bicycle parking design standards from four cities are summarized in Table 5:

- Cambridge, Massachusetts
- Portland, Oregon
- Oakland, California
- Berkeley, California

In addition, the Bicycle Parking Guidelines published by the Association of Pedestrian and Bicycle Professionals (APBP) were reviewed for this study. APBP provides a set of recommendations for local governments to follow to assist with the selection and placement of appropriate bicycle parking racks for short-term parking.

As presented in Table 5, the bicycle parking design standards for all four cities include bicycle rack system functional and geometric requirements. Racks are required that allow for (typically) two points of contact with the frame (or at least one point of contact with the frame and one point of contact with a wheel). Two of the four cities require a rack that allows locking of the frame and at least one wheel with a standard U-shaped lock. All four cities require the U-shaped rack system. Cambridge also allows post-and-ring racks and swerve racks.

In general, the municipal guidelines include specific design standards for short-term bicycle parking. Short-term parking design standards require bicycle parking in close proximity to a building's entrance, usually within 50 feet of the main entrance or distributed to serve buildings with multiple main entrances. Both Portland and Oakland require an encroachment permit if the main entrance(s) fronts sidewalk. Berkeley requires racks to be parallel to curb to minimize sidewalk encroachment.

Long-term parking design standards of the majority of the cities require some type of covered parking. Cambridge encourages parking in lockers, covered storage areas, parking garages, or indoors. Portland developed detailed location and security requirements. Portland requires



that long-term parking facilities be located on-site or within 750 feet of the site and at least 50 percent covered. Portland requires that these facilities be secure and defines approved security measures:

- Locked room or area enclosed by fence with locked gate
- Within view or within 100 feet of an attendant or guard
- An area monitored by a security camera
- In a location visible from employee work areas.

The design standards of all four cities include detailed spacing and siting dimensions, including required parking space, aisle, and pedestrian circulation dimensions. Parking spaces are required to be 2 ft (or 2.5 ft) by 6 ft by three cities. Aisles are generally required to be 4 or 5 ft wide behind parking to allow for maneuvering. A pedestrian circulation clearance of 5.5 ft is usually required. The design standards of both Cambridge and Berkeley include spacing requirements for racks in relation to a curb. Rack units placed perpendicular to the curb must be at least 48 inches from the curb to the nearest vertical component of the rack. Rack units placed parallel to the curb must be at least 24 inches (Cambridge) or 30 inches (Berkeley) from the curb to the rack.



# Automated BICYCLE

## Rental System and Parking Plan Study



**Table 5: Summary of Bicycle Parking Design Standards and Bicycle Installation Location Standards**

City	Rack selection	Short-term parking	Long-term parking	Spacing and Siting
<b>Cambridge, MA</b>	Acceptable racks: <ul style="list-style-type: none"> <li>▪ Post and Ring Racks</li> <li>▪ U-Racks</li> <li>▪ Swerve Racks</li> </ul> Provide two points of contact with frame	Close proximity to building entrance and visibility	Encourages parking in lockers, covered storage areas, parking garages, or indoors; Encourages sheltered parking with parking attendant	<i>Parking space:</i> 2 ft by 6 ft <i>Parallel rack units:</i> 36 inches apart <i>End to end rack units:</i> 96 inches apart <i>Perpendicular to wall:</i> 48 inches to wall <i>Parallel to wall:</i> 36 inches to wall <i>Perpendicular to curb:</i> 48 inches apart <i>Parallel to curb:</i> 24 inches to curb <i>Perpendicular to pedestrian aisle:</i> 48 inches from rack to aisle, aisle should be 60 inches
<b>Portland, OR</b>	Allow frame and one wheel locked to rack with U-shaped shackle lock, if both wheels left on bicycle	Located within 50 feet of main entrance or distributed to serve buildings with multiple main entrances; Must obtain permit if main entrance(s) front sidewalk	Located on site or within 750 feet of site and at least 50% covered; Security can be achieved by: <ol style="list-style-type: none"> <li>1. in a locked room or area enclosed by fence with locked gate</li> <li>2. within view or within 100 feet of an attendant or guard</li> <li>3. an area monitored by security camera</li> <li>4. in a location visible from employee work areas</li> </ol>	<i>Parking space:</i> 2 ft by 6 ft <i>Aisle:</i> 5 ft wide aisle behind parking for maneuvering <i>Cover:</i> 7 ft above floor or ground
<b>Oakland, CA</b>	Allow frame and one wheel locked to rack with U-shaped shackle lock and provide two points of contact with the frame	Located within 50 feet of main entrance; Must obtain an encroachment permit if main entrance fronts sidewalk	Requires covered parking within 500 ft of main entrance	<i>Parking space:</i> 2.5 ft by 6 ft; <i>Pedestrian circulation:</i> 5.5 ft clearance <i>Aisle:</i> 4 ft wide aisle behind parking for maneuvering <i>Vertical obstruction:</i> 30 inches in all directions



Berkeley, CA	Inverted U-racks (32" to 36" tall by 24" to 30" wide)	Capacity of inverted U-rack is 2 bicycles locked parallel to rack; In general, racks installed parallel to curb to minimize taking up sidewalk space	None listed	<i>Perpendicular to curb:</i> 48 inches apart <i>Parallel to curb:</i> 30 inches to curb <i>Pedestrian circulation:</i> 5.5 ft clearance
Association of Pedestrian and Bicycle Professionals (APBP)	<p>The rack design should:</p> <ul style="list-style-type: none"> <li>Support the bicycle upright by its frames in two places</li> <li>Prevent the wheel of the bicycle from tipping over</li> <li>Enable the frame and at least one wheel to be secured</li> <li>Support bicycles without a diamond-shaped frame with a horizontal top tube</li> <li>Allow front-in parking: a U-lock should be able to lock the front wheel and the down tube of an upright bicycle</li> <li>Allow back-in parking: a U-lock should be able to lock the rear wheel and seat tube of the bicycle</li> </ul> <p>Rack styles that are <u>not</u> recommended:</p> <ul style="list-style-type: none"> <li>Wheel-bender</li> <li>School-yard (comb style)</li> <li>Wave</li> </ul>	<p>The rack area should be:</p> <ul style="list-style-type: none"> <li>Located along a major building approach line and clearly visible from the approach</li> <li>Located no more than a 30-second walk (120 feet) from the entrance it serves</li> <li>Located as close or closer than the nearest car parking space</li> </ul>	Long-term bicycle parking options such as bicycle lockers, bicycle rooms, and bicycle parking garages are also recommended where appropriate.	<p><i>Parking space:</i> 2.5 ft by 6 ft <i>Depth for each row of parked bicycles:</i> 72 inches <i>Minimum separation between aisles:</i> 48 inches apart; 72 inches apart in high-traffic areas where multiple users are expected to be retrieving bikes simultaneously</p>



## DATA COLLECTION AND ANALYSIS

Data collection activities were conducted with the goal to assess the need for long-term bicycle parking (longer than 6 hours) and automated bicycle rental systems. Data collection efforts included a detailed analysis of transit boardings and alightings for Metrorail, Metromover, and Metrobus stations and stops. Socioeconomic data were collected from the Miami-Dade MPO's 2035 Long Range Transportation Plan (LRTP) including employment, population, school enrollment, and hotel rooms by traffic analysis zone (TAZ). In addition, current population and housing data by census block were collected from the 2010 U.S. Census.

### Focus Study Areas

Based on an initial review of potential target areas in Miami-Dade County for long-term bicycle parking transit centers and automated bicycle rental systems, focus study areas were identified and mapped. The initial study areas were presented to the Study Advisory Committee (SAC). Based on input from the SAC, a few more study areas were added to create the final list of focus study areas, which are listed below and mapped in Figure 1.

- Dadeland
- University of Miami
- Coconut Grove
- Coral Gables
- Florida International University (FIU) Main Campus
- Brickell
- Downtown
- Omni / Wynwood / Design District
- Hospital / Civic Center
- Miami Intermodal Center (MIC)
- NE 163<sup>rd</sup> Street Transit Center
- South Beach (evaluated for bicycle parking transit center) [Deco Bike exists]
- North Beach (evaluated for bicycle parking transit center) [Deco Bike expansion plans]

A map series was prepared to illustrate the data collection and analysis task.

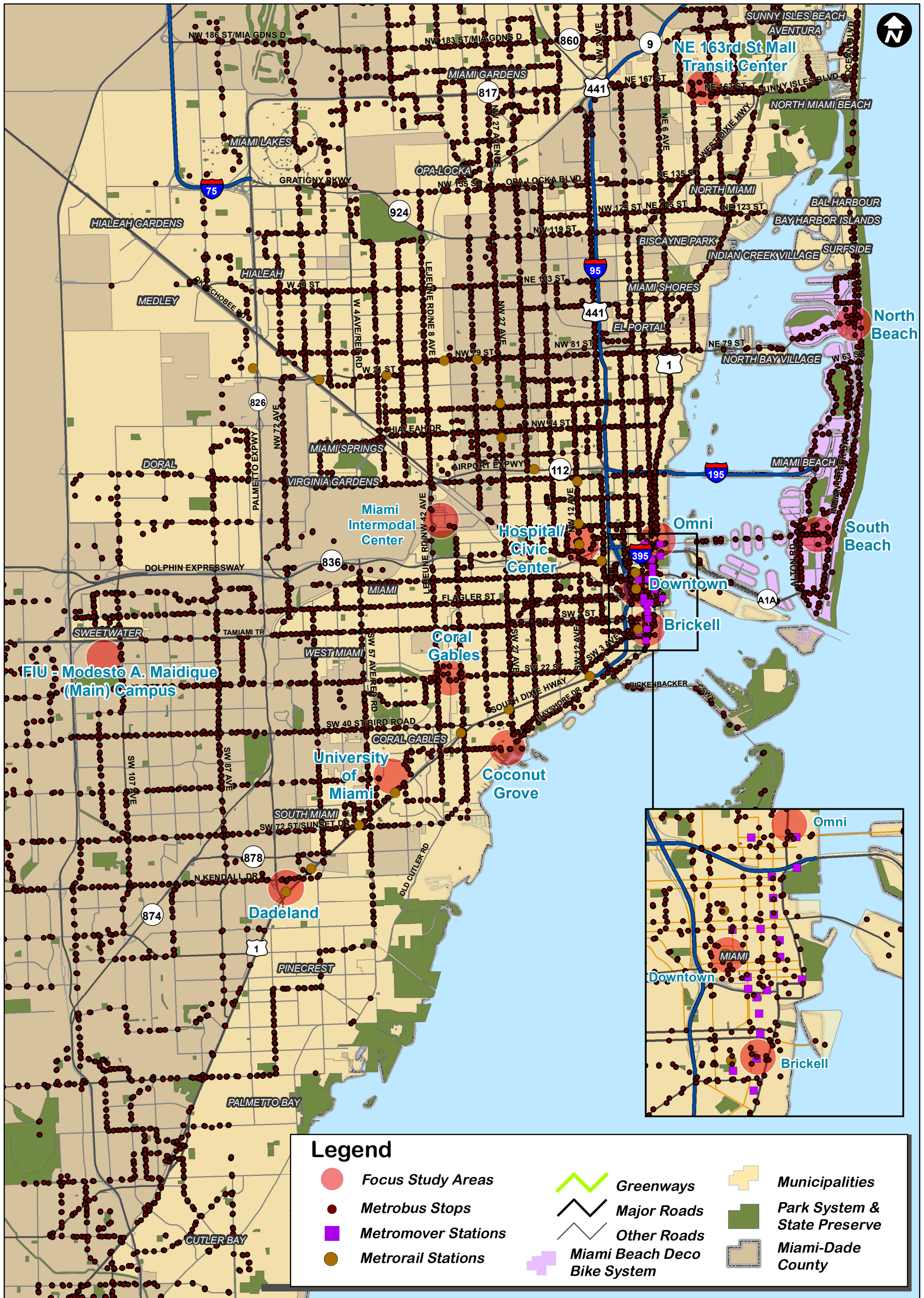








FIGURE 2. METROBUS STOPS AND TRANSIT STATIONS







AUTOMATED BICYCLE RENTAL SYSTEM AND PARKING PLAN STUDY

FIGURE 3. METROBUS RIDERSHIP  
RIDERSHIP RANGE PER STOP

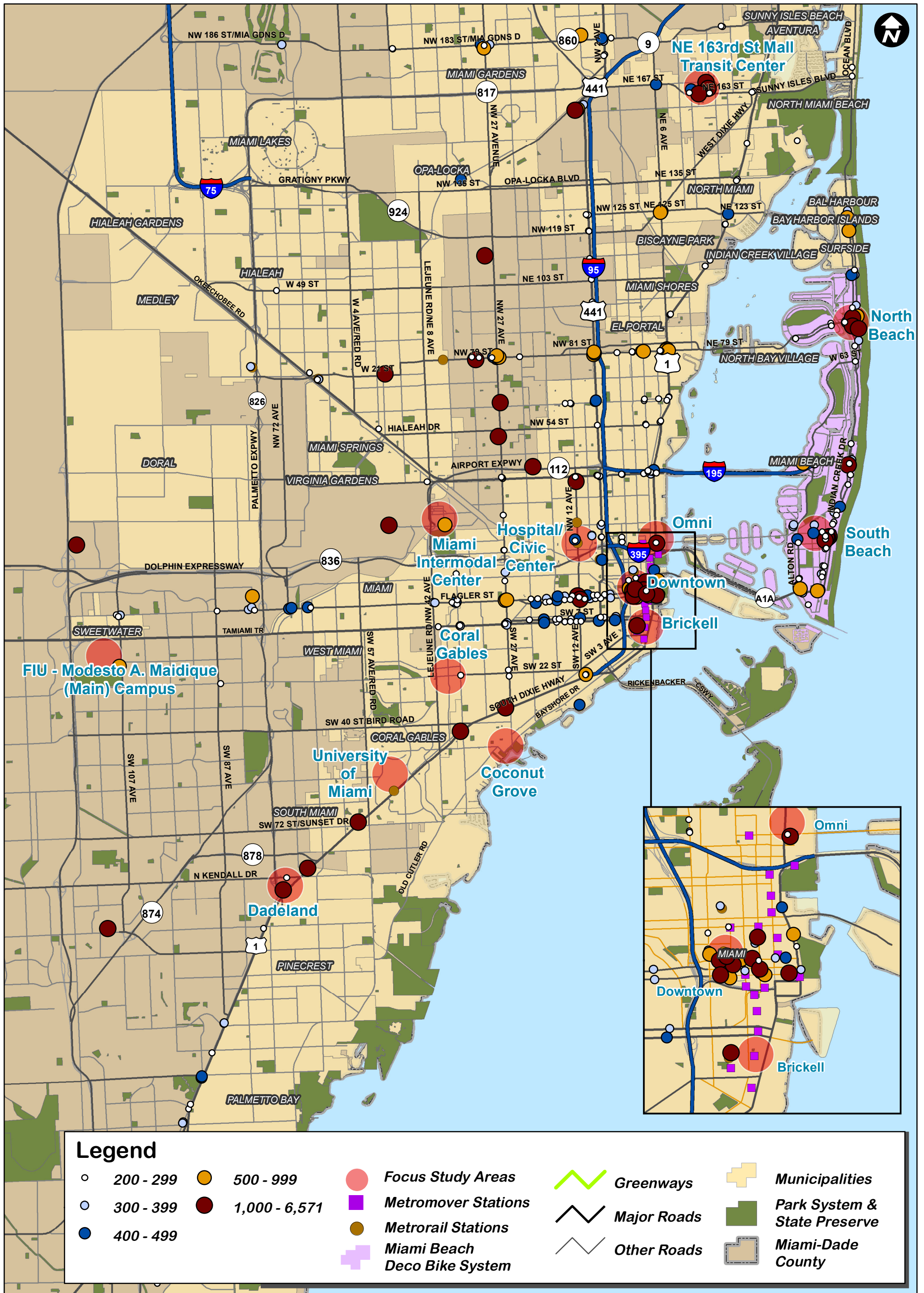




FIGURE 4. 2010 CENSUS  
POPULATION DENSITY

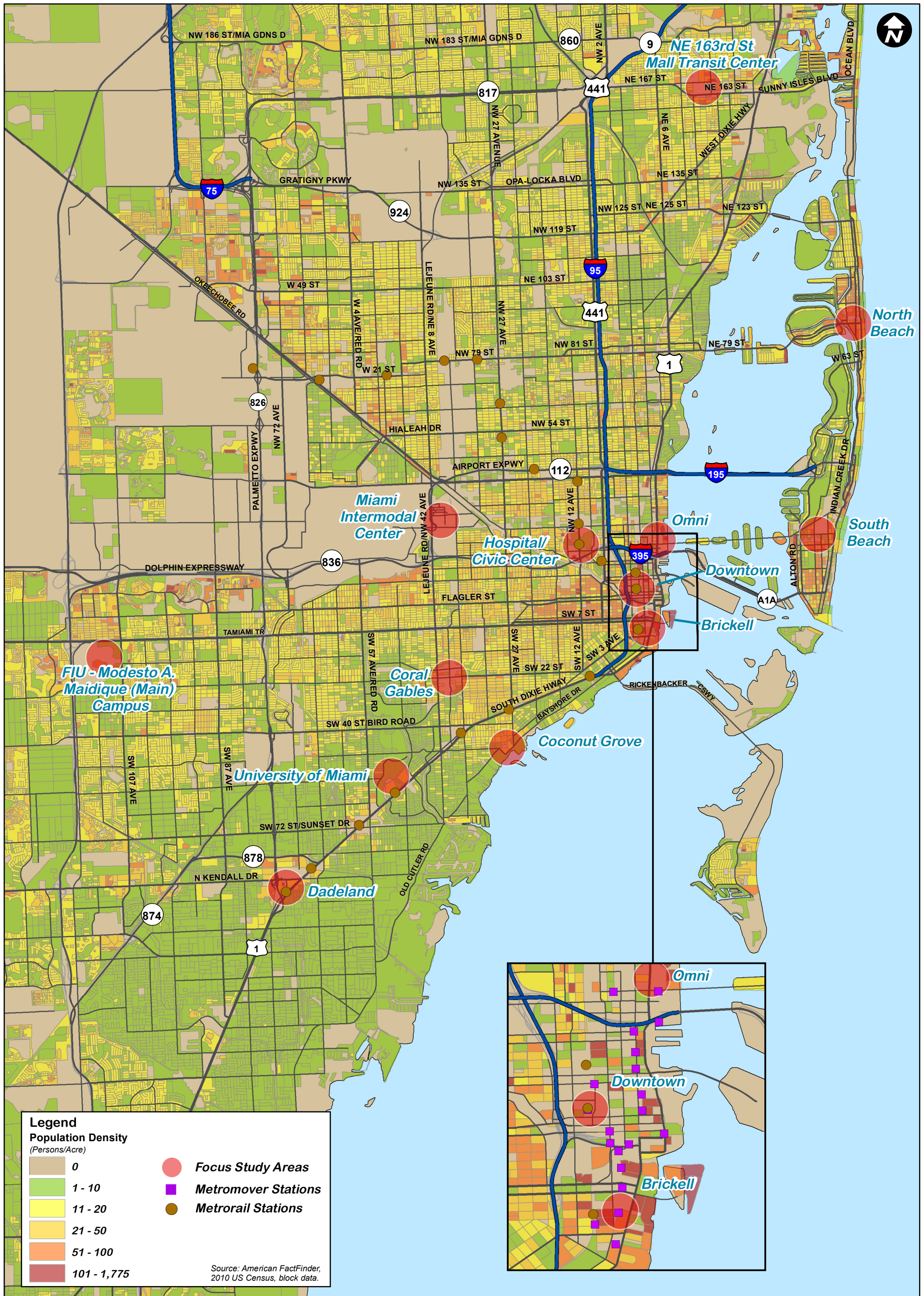




FIGURE 5. 2010 CENSUS  
HOUSING OCCUPANCY

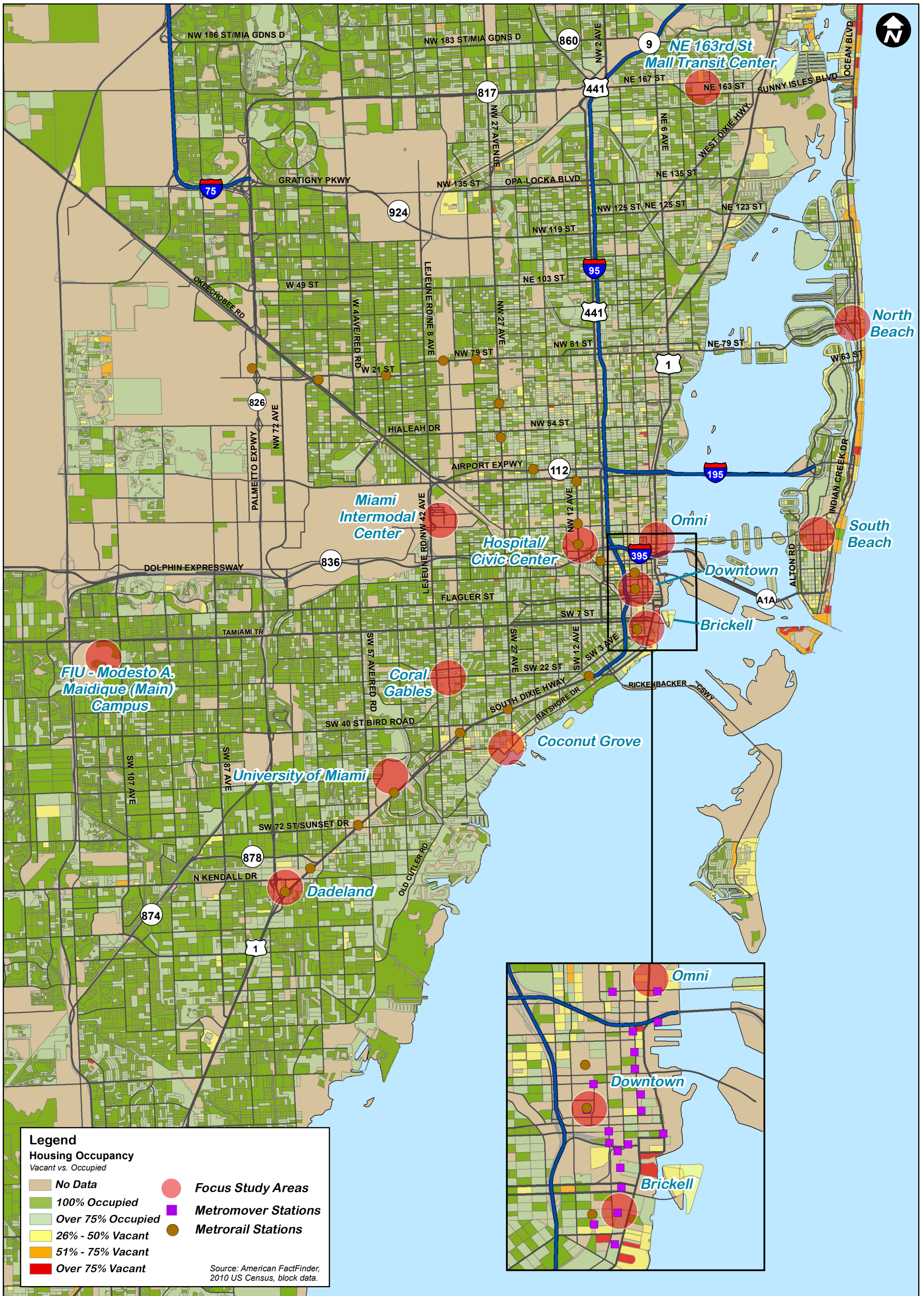
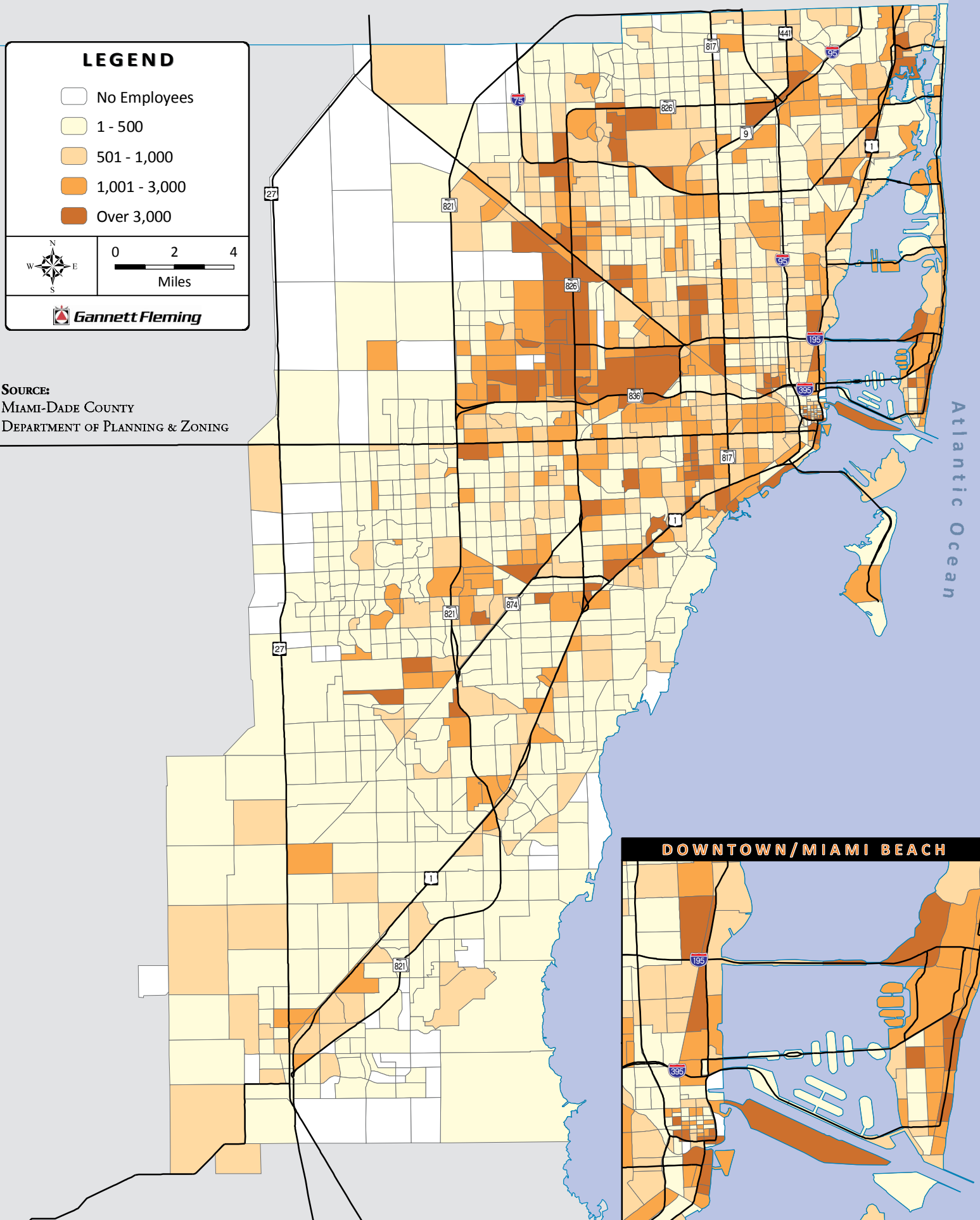




Figure 6. 2005 Total Employment





## Demand Estimation

Based on the socioeconomic data collected for this study from the 2035 LRTP, transit ridership data analysis, and U.S. Census journey-to-work data from the American Community Survey (ACS), a demand estimation was conducted for bicycle parking transit centers for the focus study areas. The demand estimation was based on the methodology developed by the Puget Sound Regional Council's (PSRC) *Bikestations Project* using the base estimate scenario as described in the Background Research section of this report. This estimation, although not validated in the sense that other travel demand models are, represents the most comprehensive known attempt to quantify demand for bicycle parking transit centers.

**Table 6: Bicycle Parking Transit Center Demand – User Group 1 Component  
( Bicycle Commuters that Work in the Focus Study Area )**

Focus Study Area	Total Employment in Focus Area	Bicycle Mode Share Journey-to-Work	Percent of Bicycle Commuters Who Will Park at Bicycle Parking Transit Center	User Group #1 Parking Demand Estimate
Dadeland	11400	0.27%	50%	15.4
University of Miami	8000	2.17%	20%	34.7
Coconut Grove	3700	0.48%	30%	5.3
Coral Gables	5500	0.24%	20%	2.6
FIU Main Campus	3900	0.38%	10%	1.5
Brickell	59000	0.25%	30%	44.3
Downtown	72000	0.99%	20%	142.6
Omni/Wynwood/Design	22000	0.62%	30%	40.9
Hospital / Civic Center	21000	0.51%	30%	32.1
Miami Intermodal Center	28000	0.86%	30%	72.2
NE 163rd St Transit Ctr	7000	0.40%	20%	5.6
South Beach	16000	5.12%	10%	81.9
North Beach	4000	2.28%	20%	18.2



**Table 7: Bicycle Parking Transit Center Demand – User Group 2 Component  
( Bike-and-Riders who bike from home to the transit station and park their bikes )**

Focus Study Area	Total Daily Transit Boardings in Focus Area	Total Relevant Transit Boardings (50% default)	Percent of Transit Boardings Accessed by Bike	Number of Transit Boardings Accessed by Bike
Dadeland	14331	50%	0.61%	43.5
University of Miami	2057	50%	4.88%	50.2
Coconut Grove	802	50%	1.08%	4.3
Coral Gables	1699	50%	0.54%	4.6
FIU Main Campus	740	50%	0.86%	3.2
Brickell	11233	50%	0.56%	31.6
Downtown	30883	50%	2.23%	344.0
Omni/Wynwood/Design	7360	50%	1.40%	51.3
Hospital / Civic Center	9372	50%	1.15%	53.8
Miami Intermodal Center	1005	50%	1.94%	9.7
NE 163rd St Transit Ctr	7556	50%	0.90%	34.0
South Beach	8595	50%	11.52%	495.1
North Beach	3972	50%	5.13%	101.9

Focus Study Area	Number of Transit Boardings Accessed by Bike	Percent of Bike-and-Riders Who Will Park at Bicycle Parking Transit Center	Percent of Induced Bike-and-Ride Users	User Group #2 Parking Demand Estimate
Dadeland	43.5	75%	125%	40.8
University of Miami	50.2	50%	112%	28.1
Coconut Grove	4.3	50%	125%	2.7
Coral Gables	4.6	50%	112%	2.6
FIU Main Campus	3.2	25%	106%	0.8
Brickell	31.6	25%	125%	9.9
Downtown	344.0	25%	125%	107.5
Omni/Wynwood/Design	51.3	25%	125%	16.0
Hospital / Civic Center	53.8	50%	112%	30.1
Miami Intermodal Center	9.7	75%	106%	7.7
NE 163rd St Transit Ctr	34.0	25%	112%	9.5
South Beach	495.1	25%	106%	131.2
North Beach	101.9	50%	106%	54.0





**Table 8: Bicycle Parking Transit Center Demand – User Group 3 Component  
( Ride-and-Bikers who ride transit with their bikes )**

Focus Study Area	Total Daily Transit Alightings in Focus Area	Total Relevant Transit Alightings (50% default)	Percent of Transit Alightings With Bike	Number of Transit Alightings With Bike
Dadeland	14868	50%	0.27%	20.1
University of Miami	2061	50%	2.17%	22.4
Coconut Grove	798	50%	0.48%	1.9
Coral Gables	1623	50%	0.24%	1.9
FIU Main Campus	517	50%	0.38%	1.0
Brickell	11860	50%	0.25%	14.8
Downtown	29734	50%	0.99%	147.2
Omni/Wynwood/Design	7451	50%	0.62%	23.1
Hospital / Civic Center	9194	50%	0.51%	23.4
Miami Intermodal Center	1077	50%	0.86%	4.6
NE 163rd St Transit Ctr	7682	50%	0.40%	15.4
South Beach	8702	50%	5.12%	222.8
North Beach	3698	50%	2.28%	42.2

Focus Study Area	Number of Transit Alightings With Bike	Percent of Ride-and-Bikers Who Will Park at Bicycle Parking Transit Center	Percent of Induced Ride-and-Bike Users	User Group #3 Parking Demand Estimate
Dadeland	20.1	24%	125%	6.0
University of Miami	22.4	16%	112%	4.0
Coconut Grove	1.9	8%	125%	0.2
Coral Gables	1.9	8%	112%	0.2
FIU Main Campus	1.0	8%	106%	0.1
Brickell	14.8	8%	125%	1.5
Downtown	147.2	8%	125%	14.7
Omni/Wynwood/Design	23.1	8%	125%	2.3
Hospital / Civic Center	23.4	16%	112%	4.2
Miami Intermodal Center	4.6	8%	106%	0.4
NE 163rd St Transit Ctr	15.4	16%	112%	2.8
South Beach	222.8	8%	106%	18.9
North Beach	42.2	8%	106%	3.6

**Table 9: Total Estimated Bicycle Parking Transit Center Demand**

Focus Study Area	Bike Commuters that Work in the Focus Area	Bike-and-Ride Users	Ride-and-Bike Users	Total Estimated Bicycle Parking Transit Center Users
Dadeland	15.4	40.8	6.0	62.2
University of Miami	34.7	28.1	4.0	66.8
Coconut Grove	5.3	2.7	0.2	8.2
Coral Gables	2.6	2.6	0.2	5.4
FIU Main Campus	1.5	0.8	0.1	2.4
Brickell	44.3	9.9	1.5	55.6
Downtown	142.6	107.5	14.7	264.8
Omni/Wynwood/Design	40.9	16.0	2.3	59.3
Hospital / Civic Center	32.1	30.1	4.2	66.4
Miami Intermodal Center	72.2	7.7	0.4	80.4
NE 163rd St Transit Ctr	5.6	9.5	2.8	17.9
South Beach	81.9	131.2	18.9	232.0
South Beach Demand Reduction Factor: (A)				-20%
South Beach				185.6
North Beach	18.2	54.0	3.6	75.8
North Beach Demand Reduction Factor: (A)				-20%
North Beach				60.6

(A) – Deco Bike service in Miami Beach is anticipated to reduce the projected demand for bicycle parking transit center due to increased availability of bicycles near employment areas and bus stops.

Individual maps of the focus study areas are provided on the following pages. The maps depict the following key features of the focus study areas.

- The 0.25-mile radius around the focal point of the study area (roughly equivalent to the magnet zone described in the PSRC methodology)
- Bicycle facilities in and near the focus study area
- Multimodal connectivity in and near the focus study area
- Large buildings in and near the focus study area (measured as greater than 4,000 square feet)



Figure 7. Dadeland

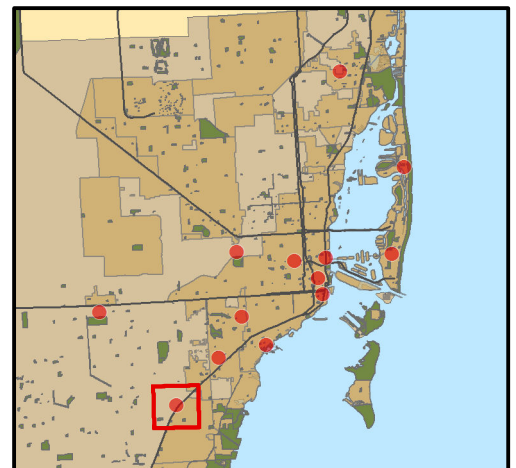
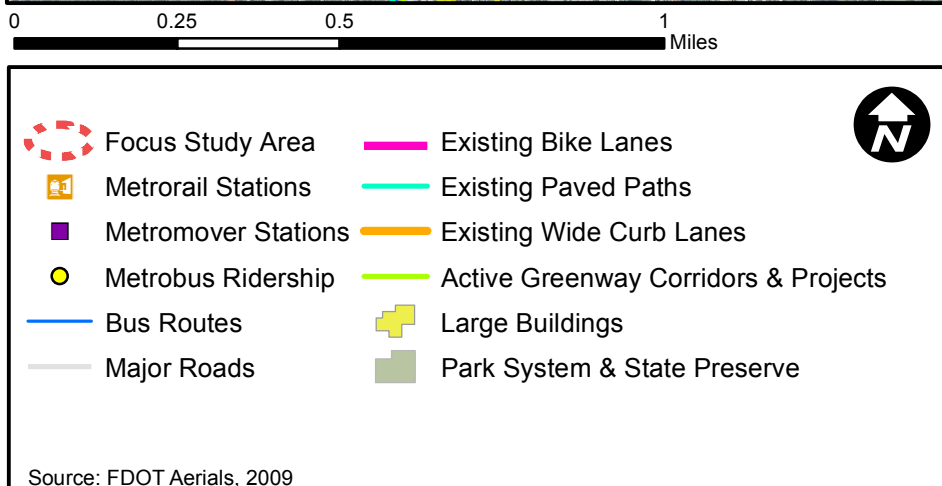
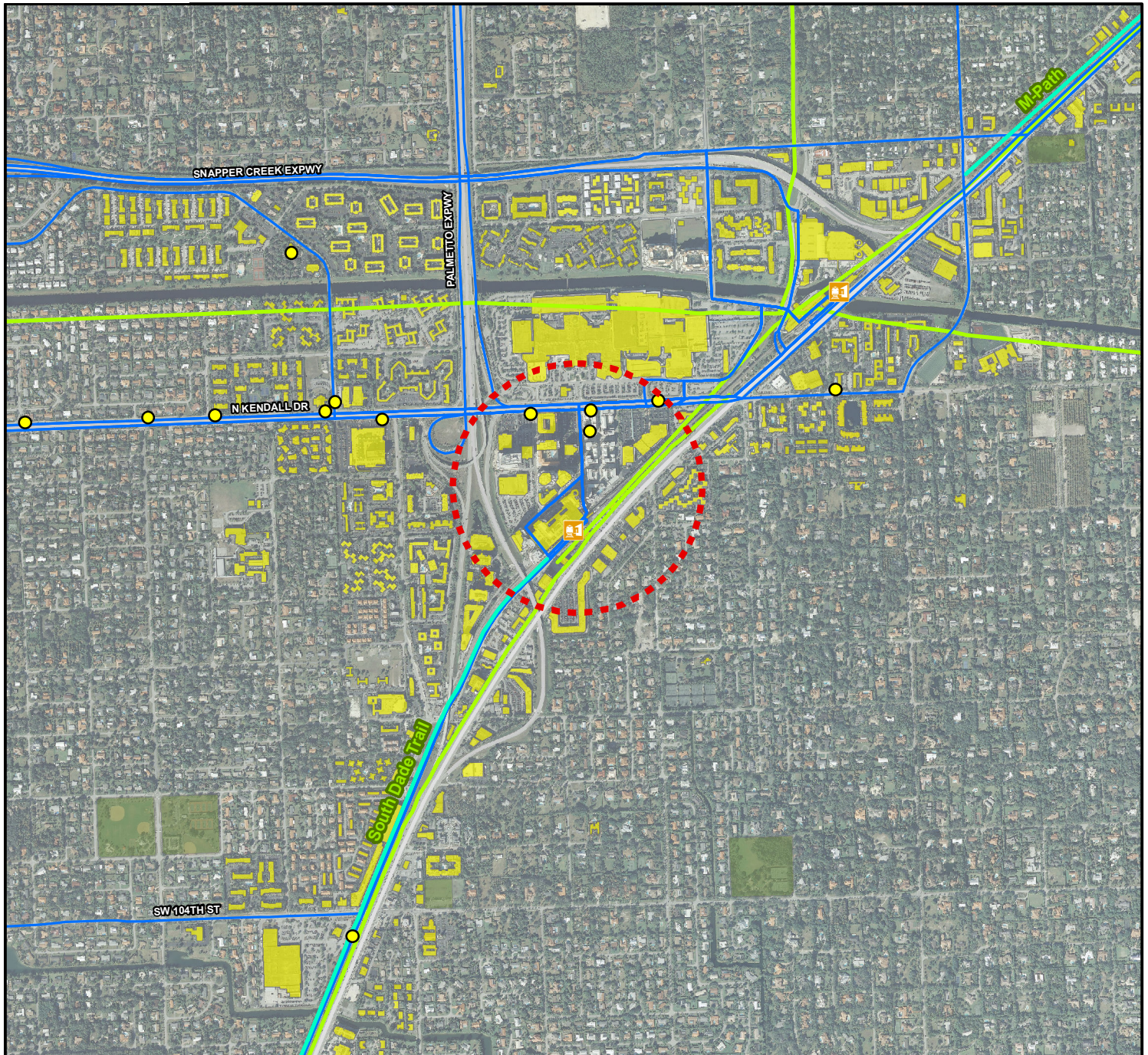




Figure 8. University of Miami

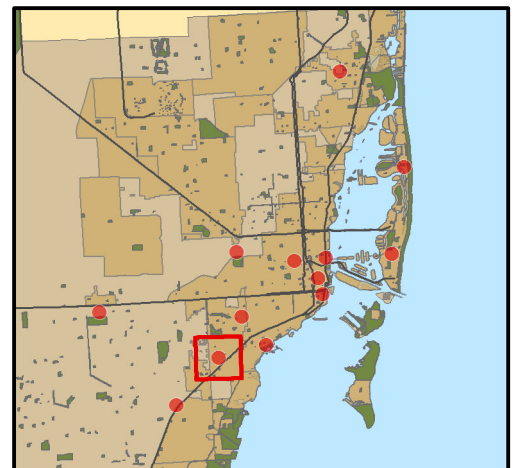
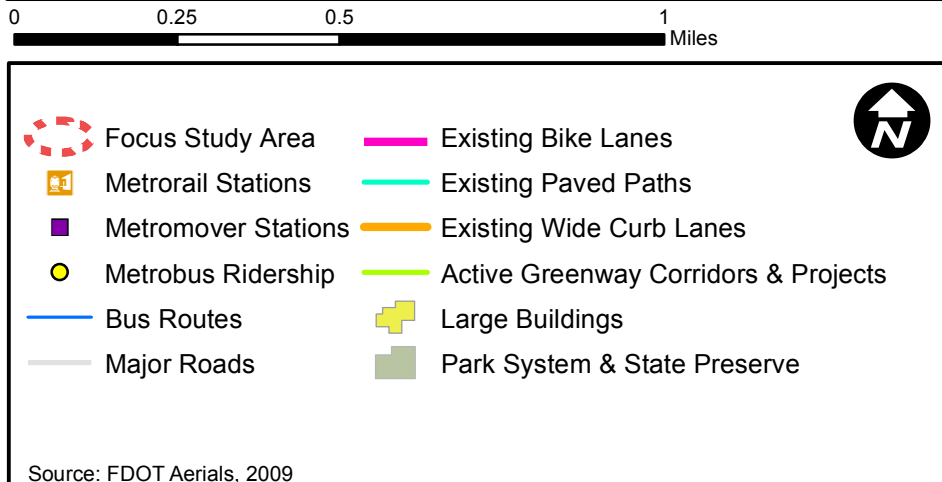
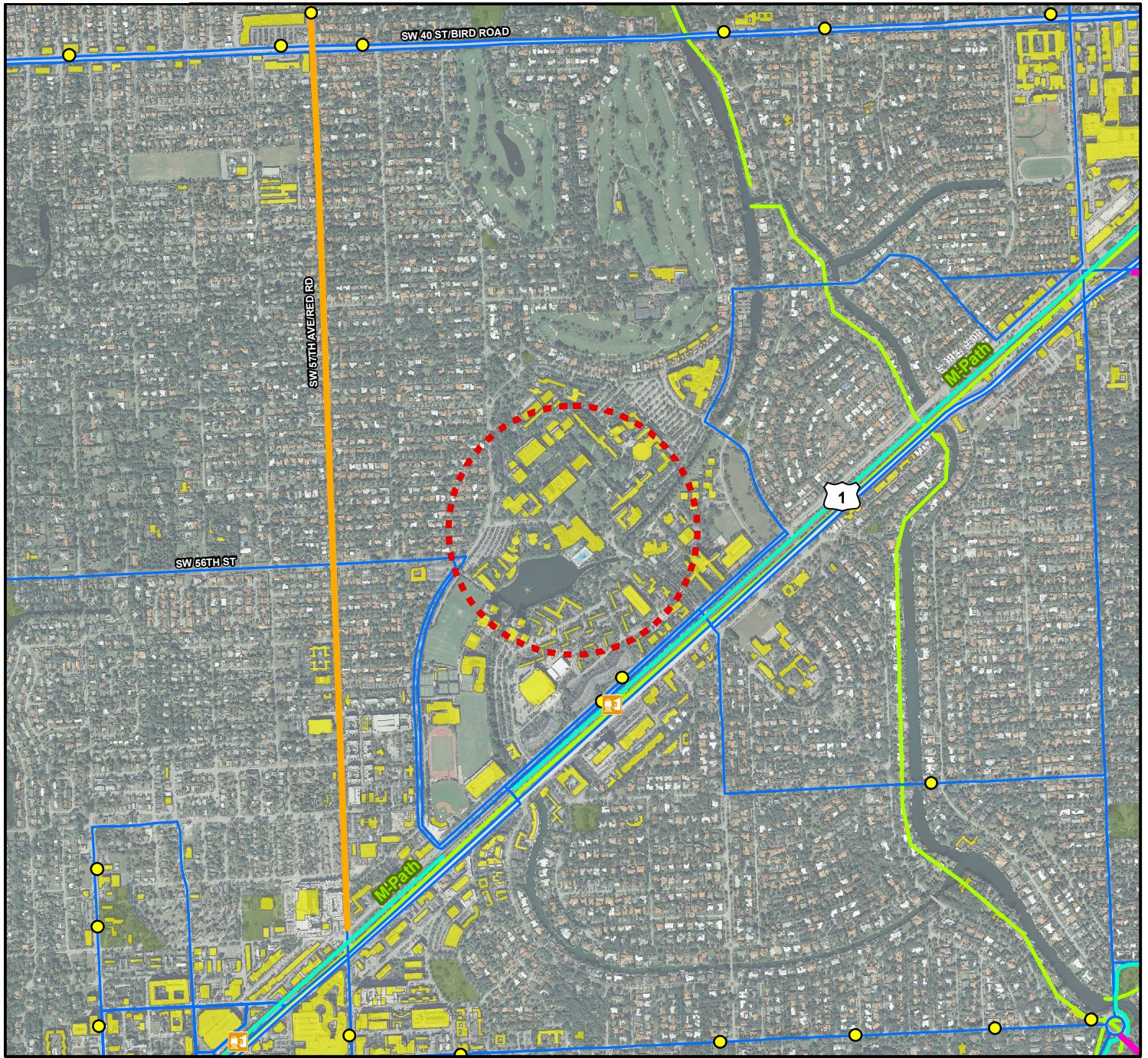




Figure 9. Coconut Grove

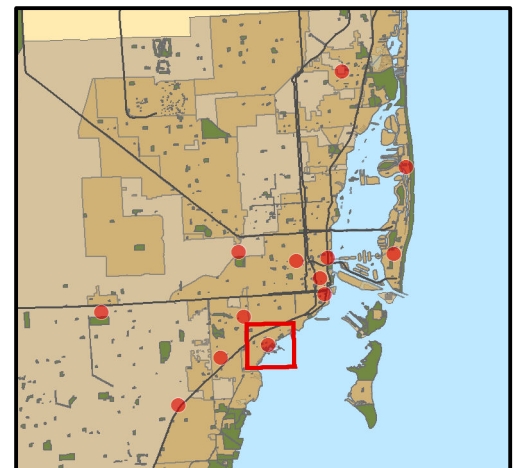
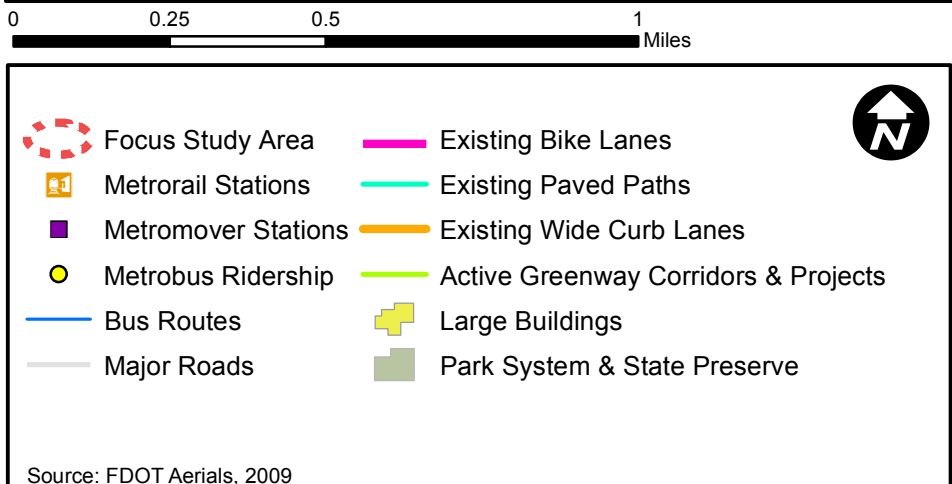
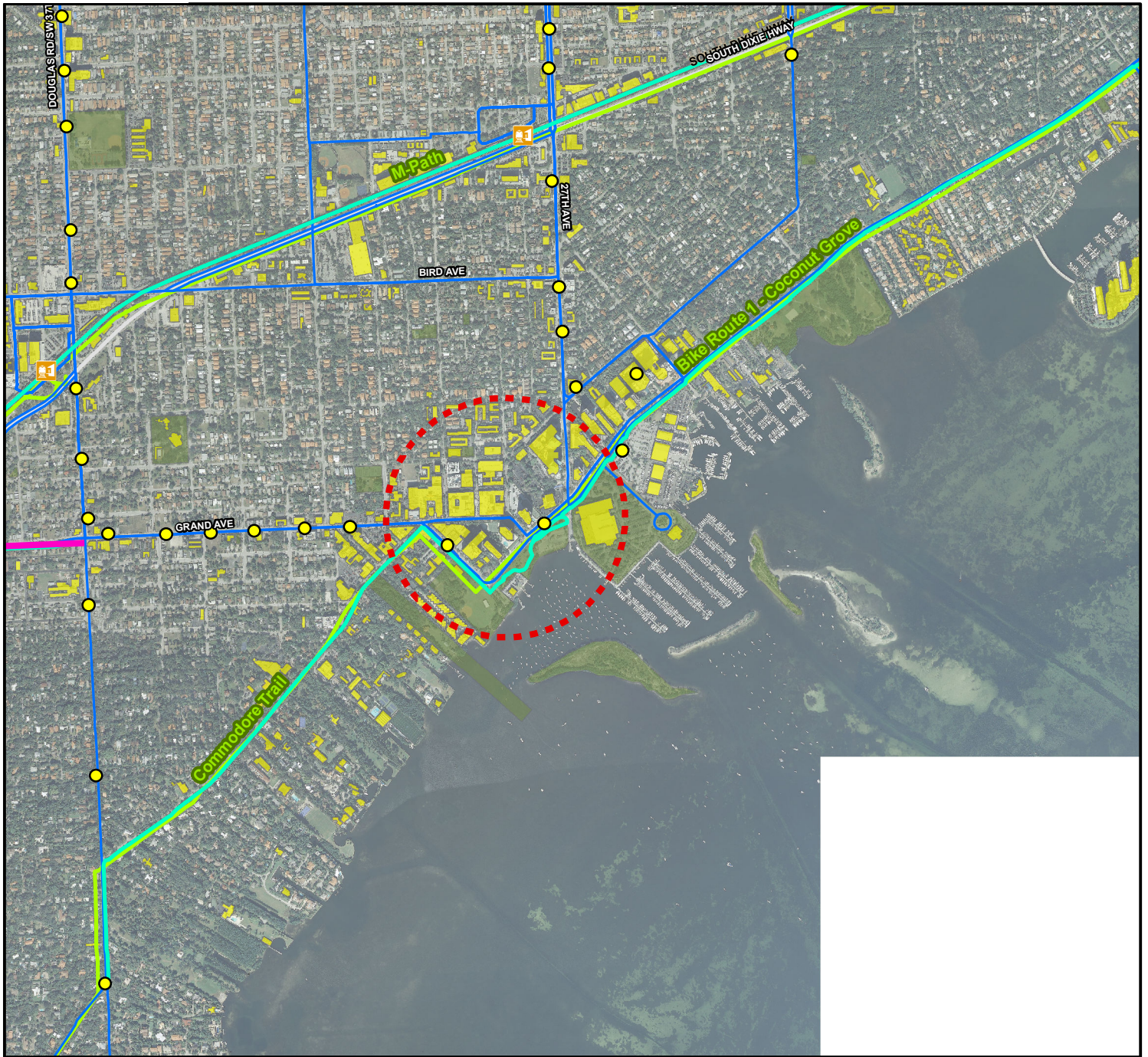




Figure 10. Coral Gables

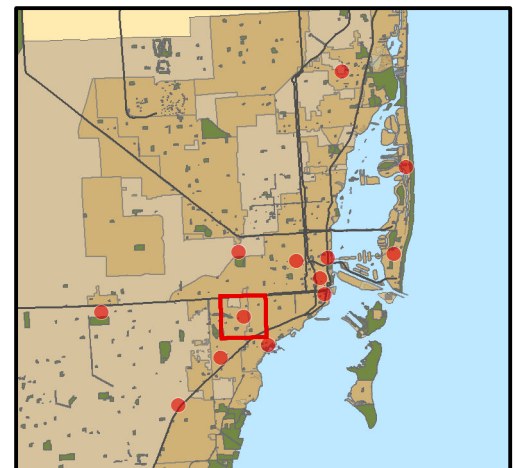
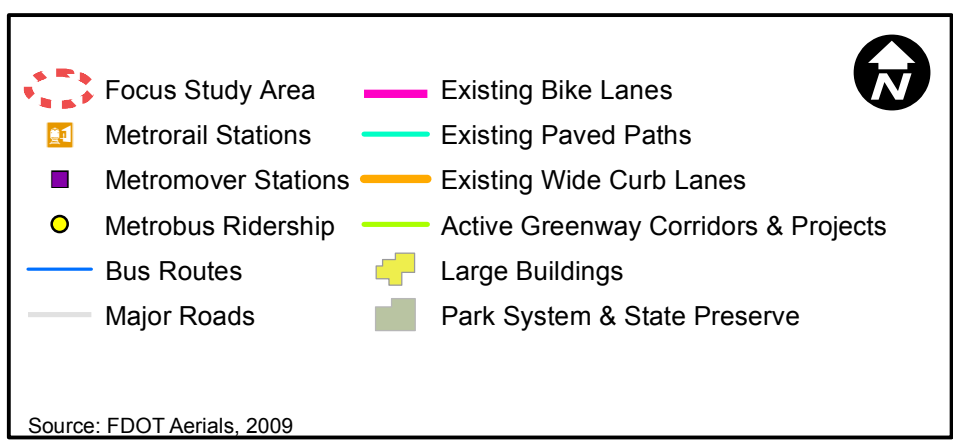
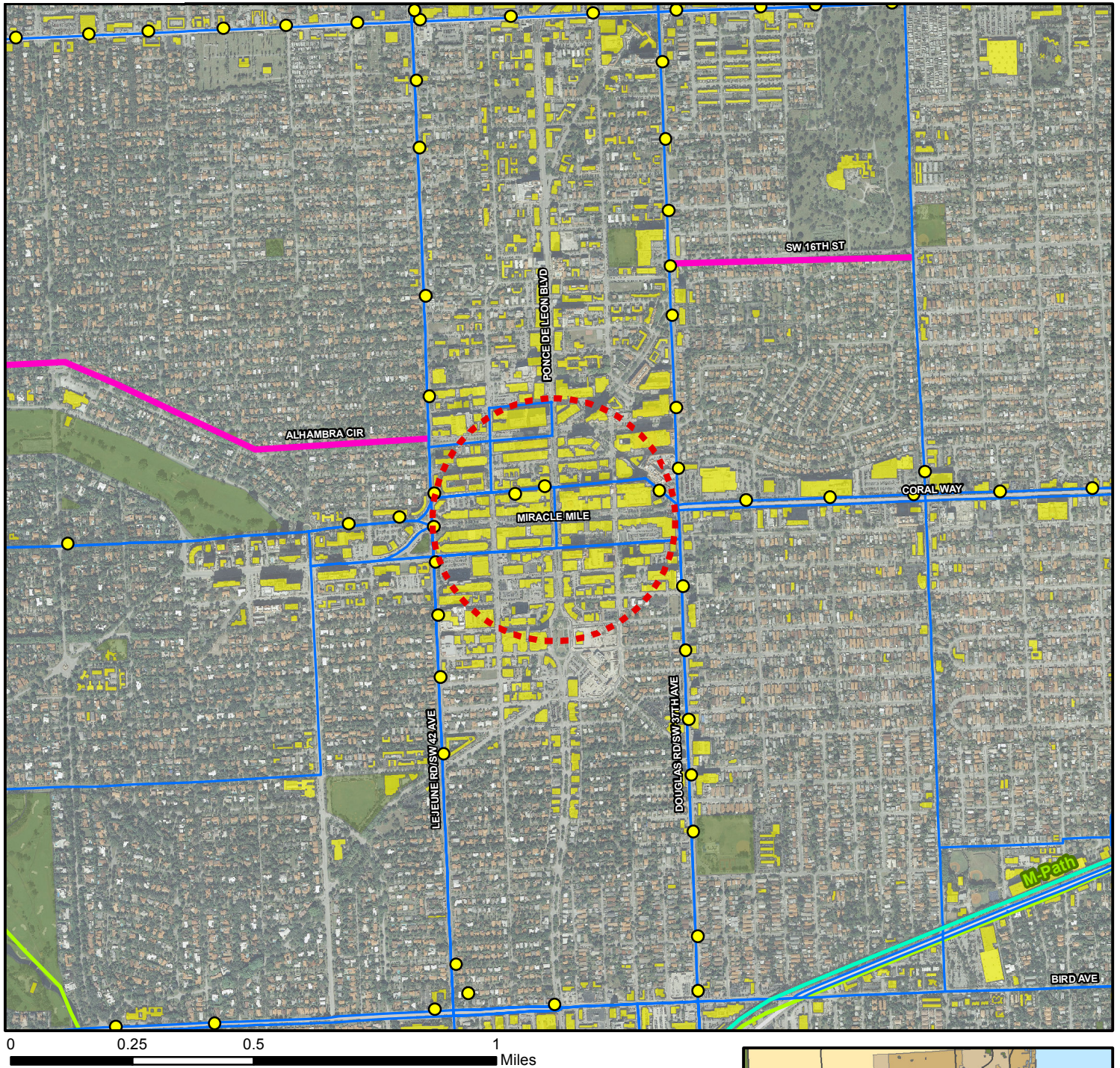




Figure 11. FIU - Modesto A. Maidique (Main) Campus

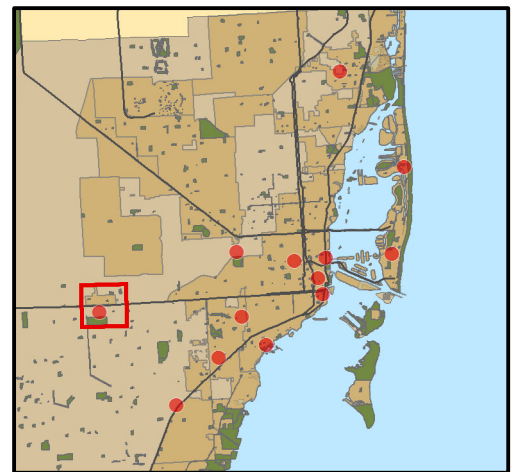
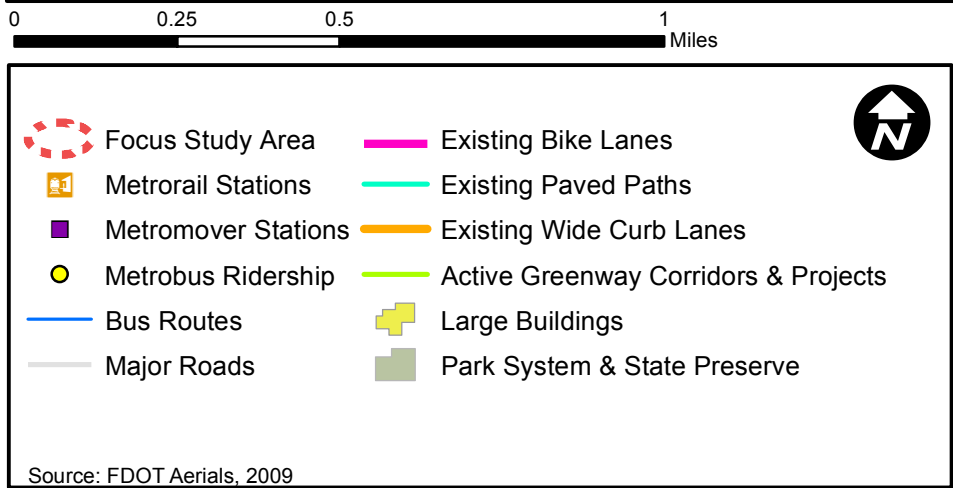
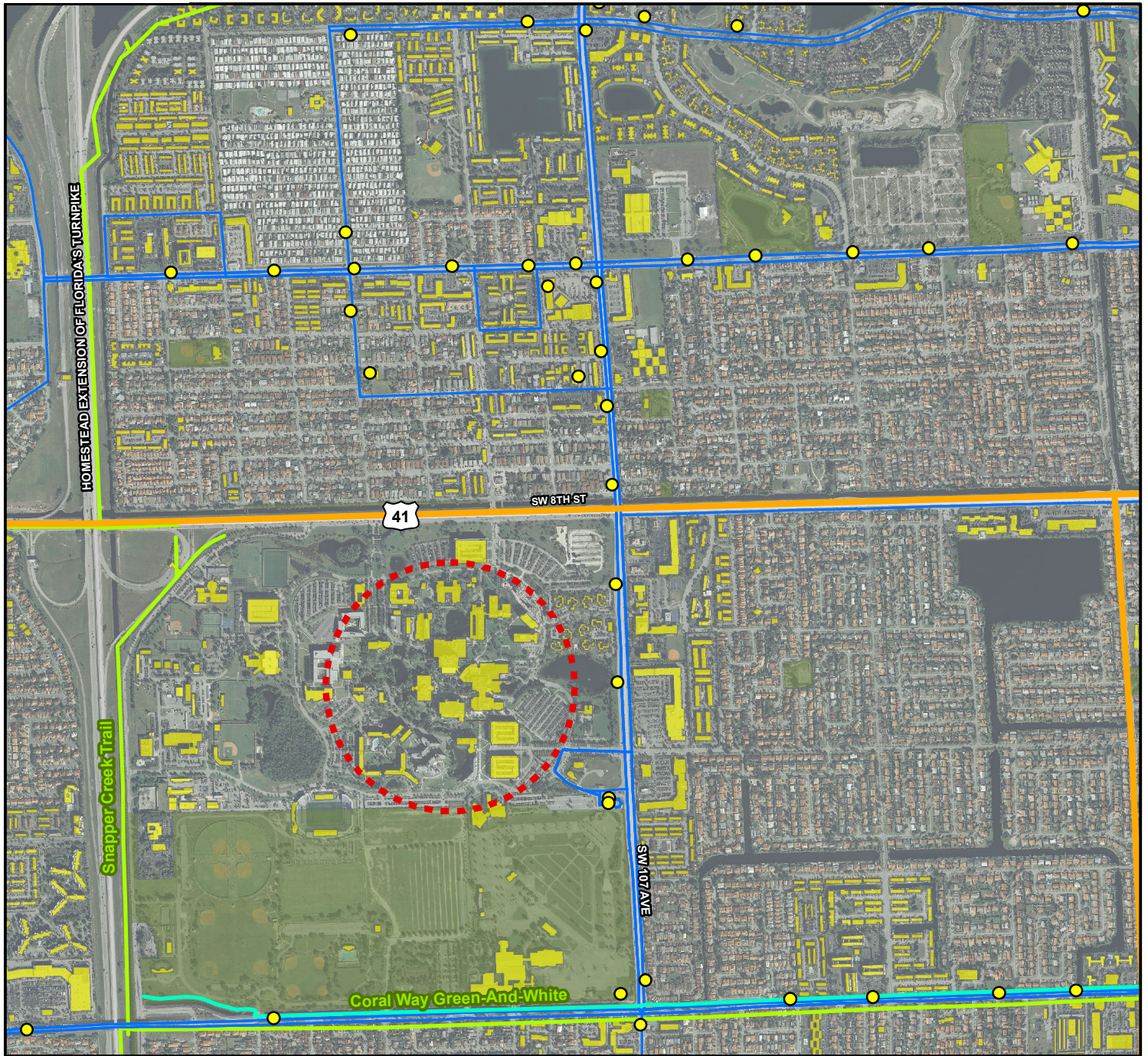




Figure 12. Brickell

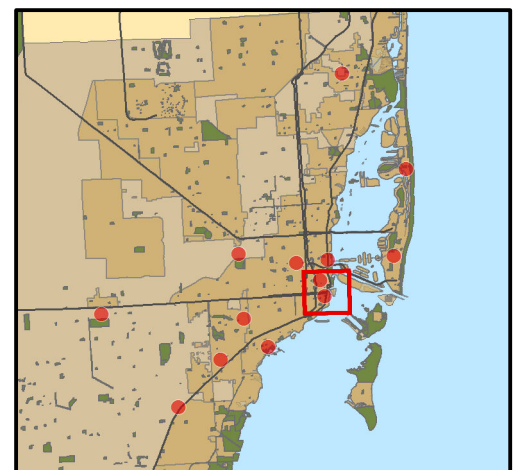
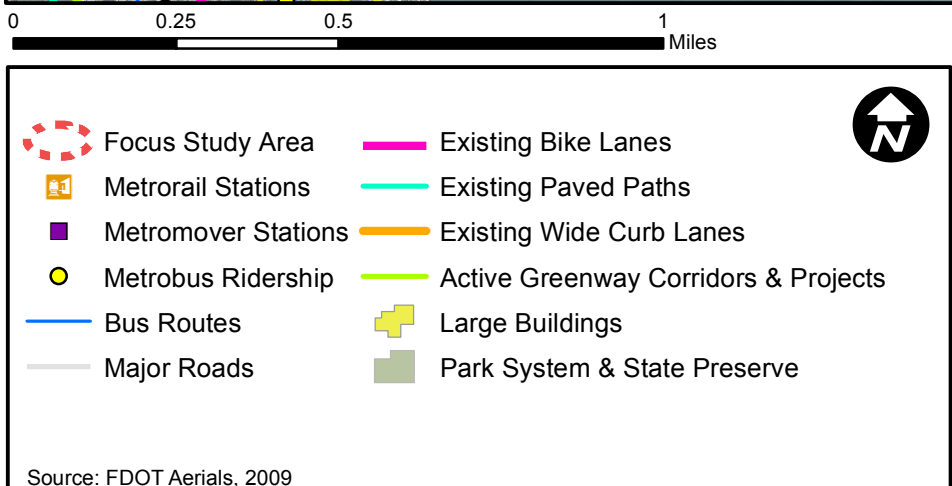
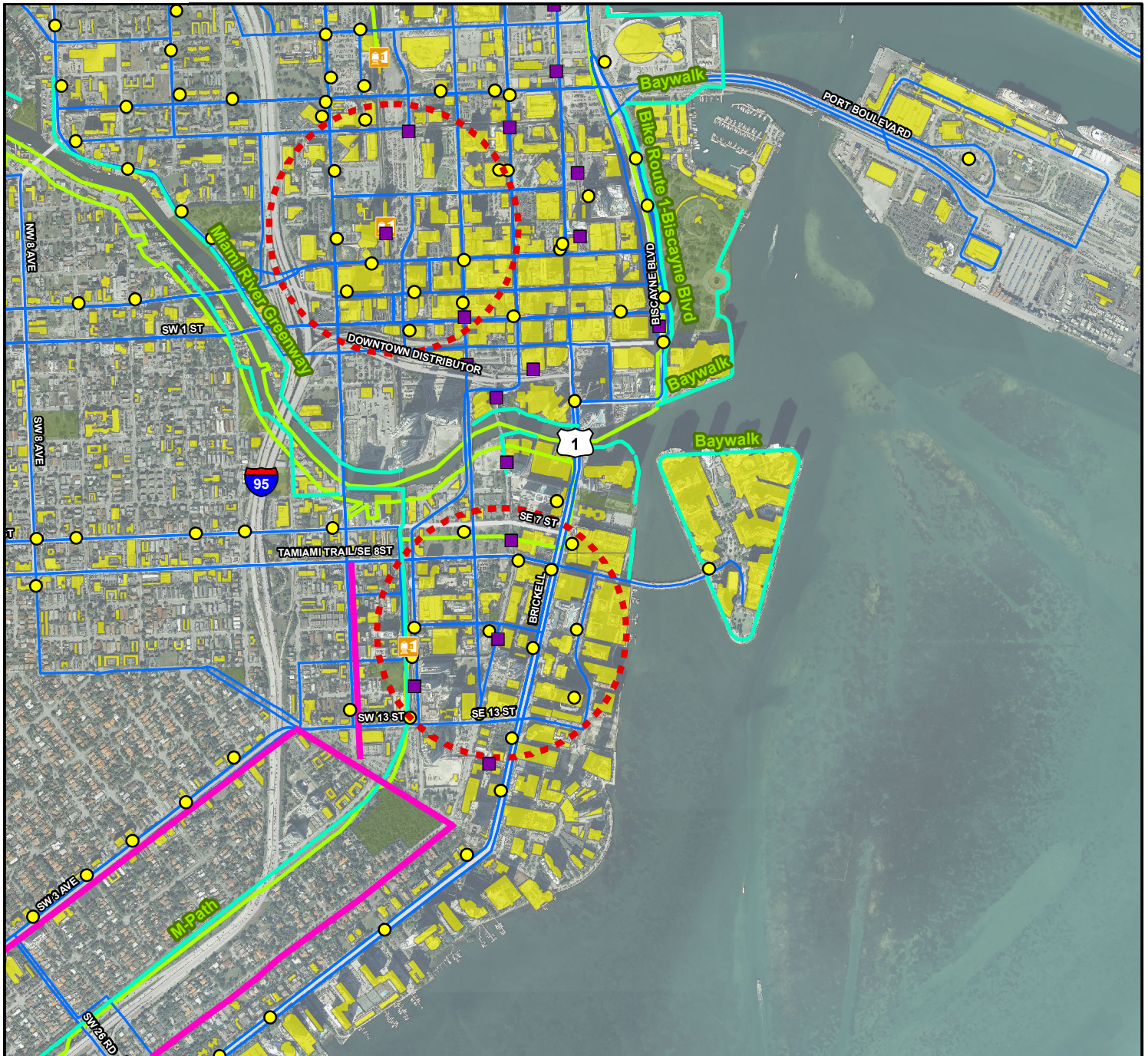




Figure 13. Downtown

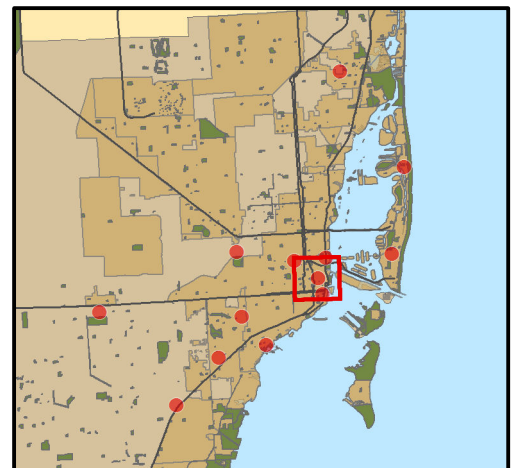
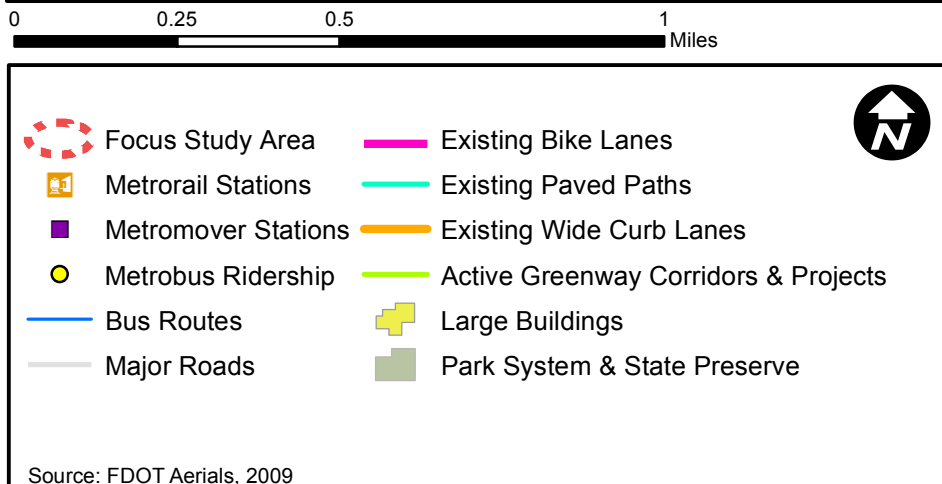
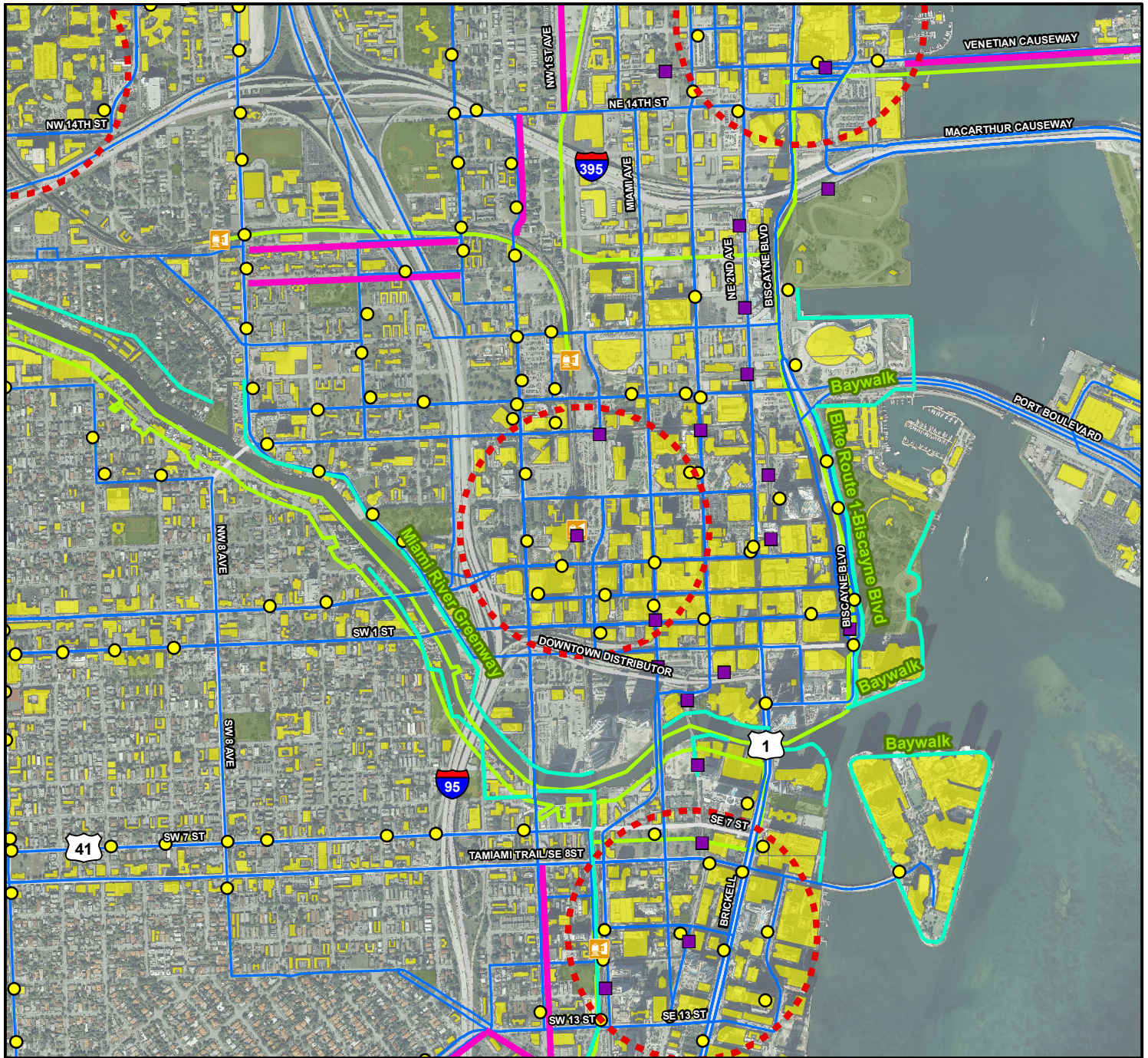




Figure 14. Omni

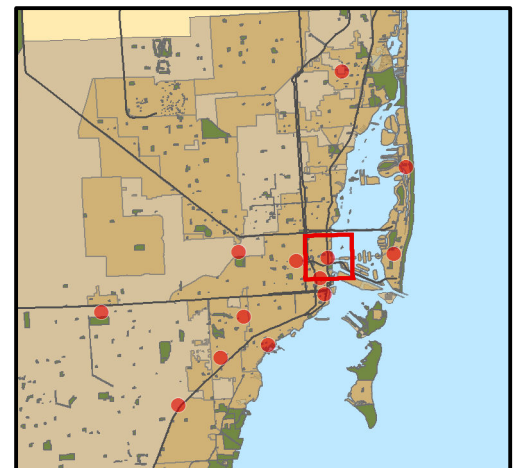
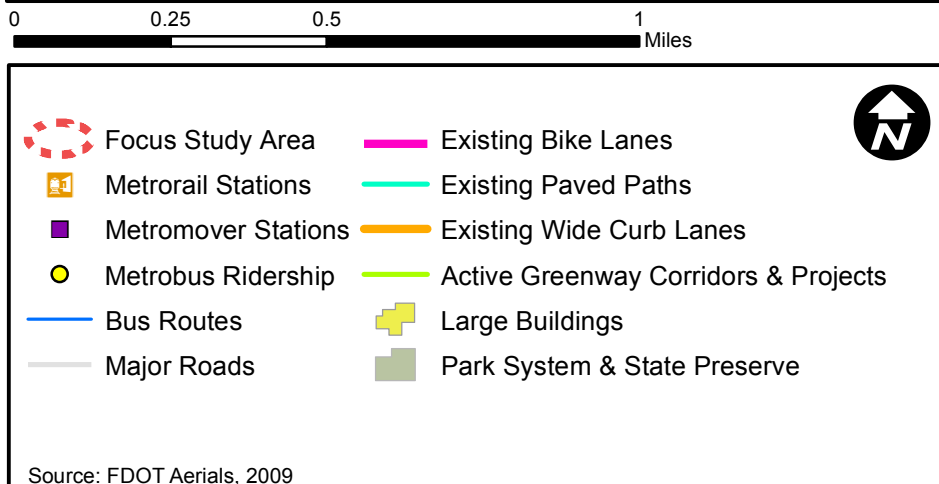
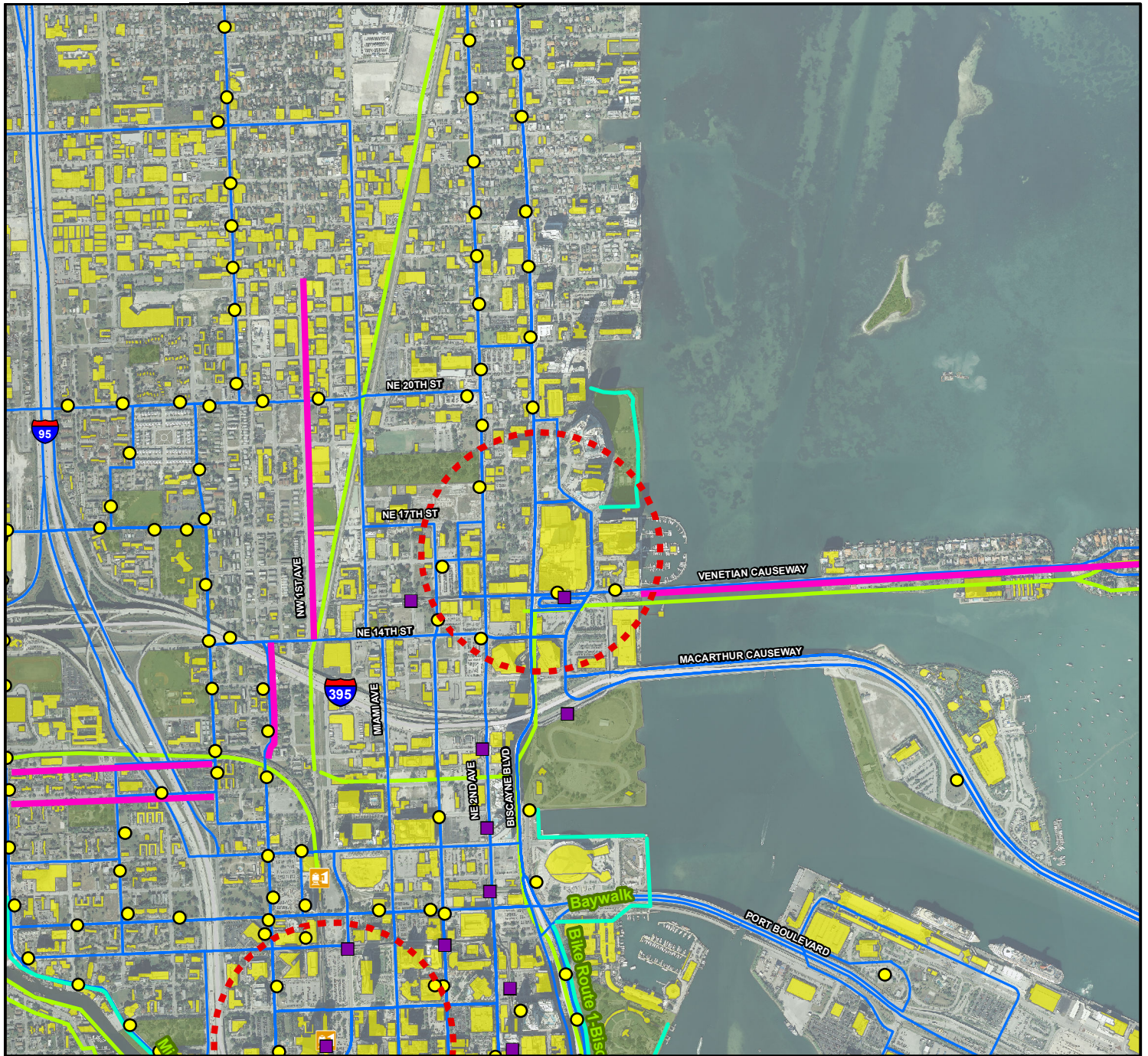
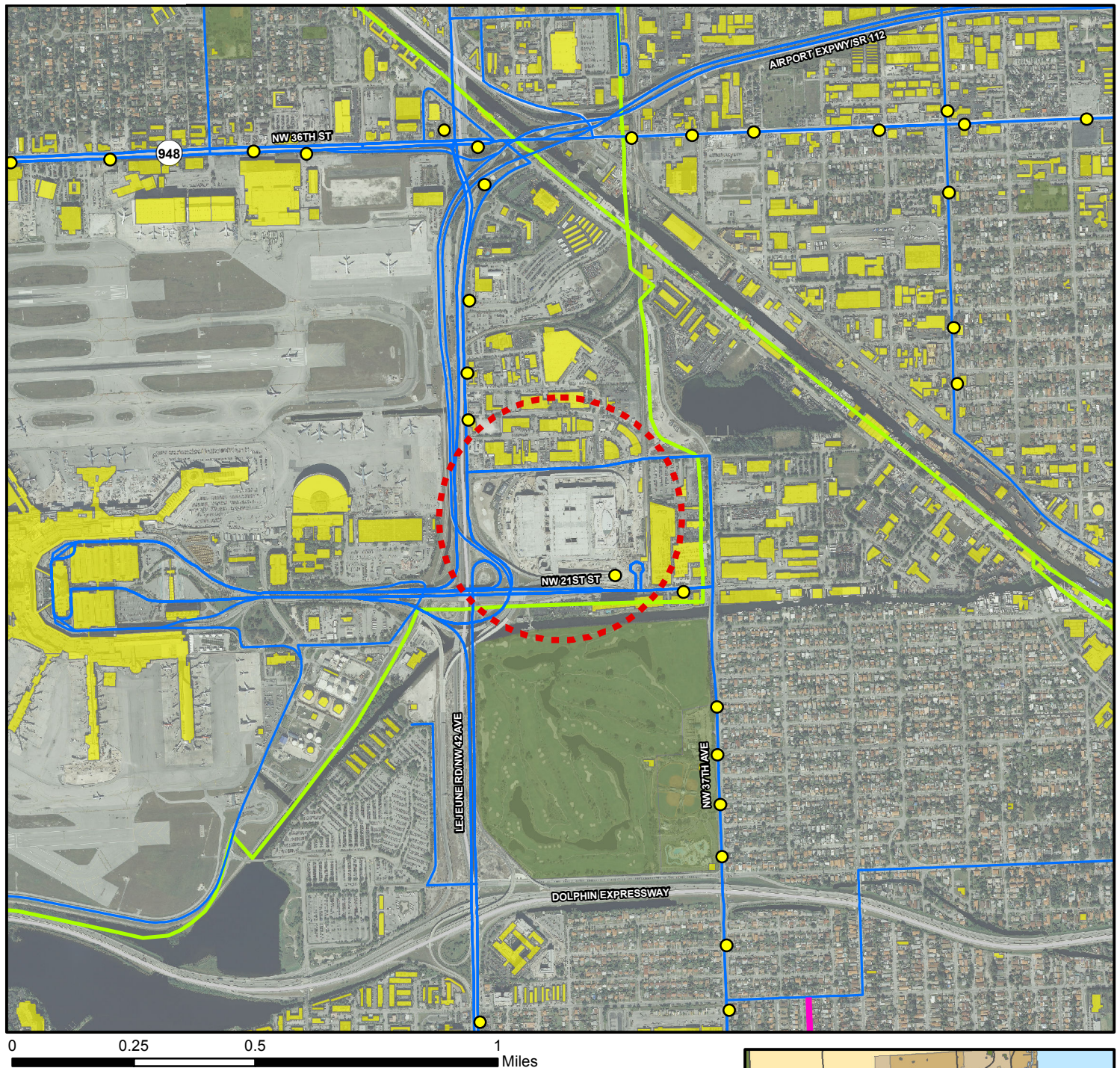








Figure 16. Miami Intermodal Center



- |  |                     |   |                                      |
|--|---------------------|---|--------------------------------------|
|  | Focus Study Area    |  | Existing Bike Lanes                  |
|  | Metrorail Stations  |  | Existing Paved Paths                 |
|  | Metromover Stations |  | Existing Wide Curb Lanes             |
|  | Metrobus Ridership  |  | Active Greenway Corridors & Projects |
|  | Bus Routes          |  | Large Buildings                      |
|  | Major Roads         |  | Park System & State Preserve         |

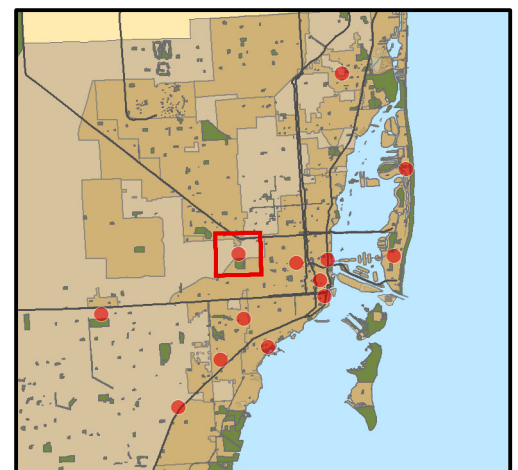




Figure 17. NE 163rd St. Mall Transit Center

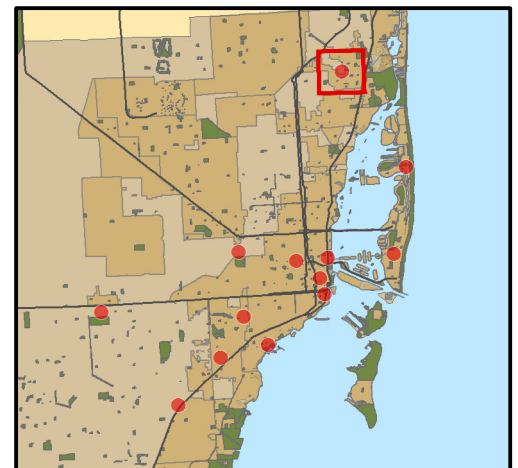
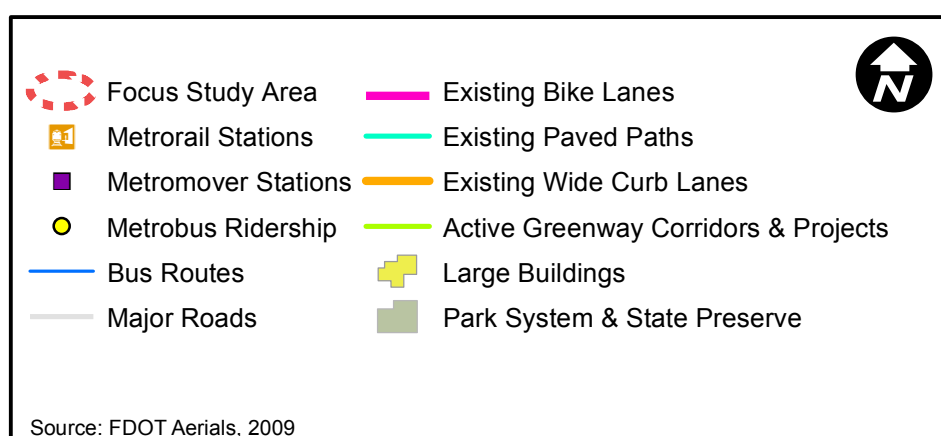
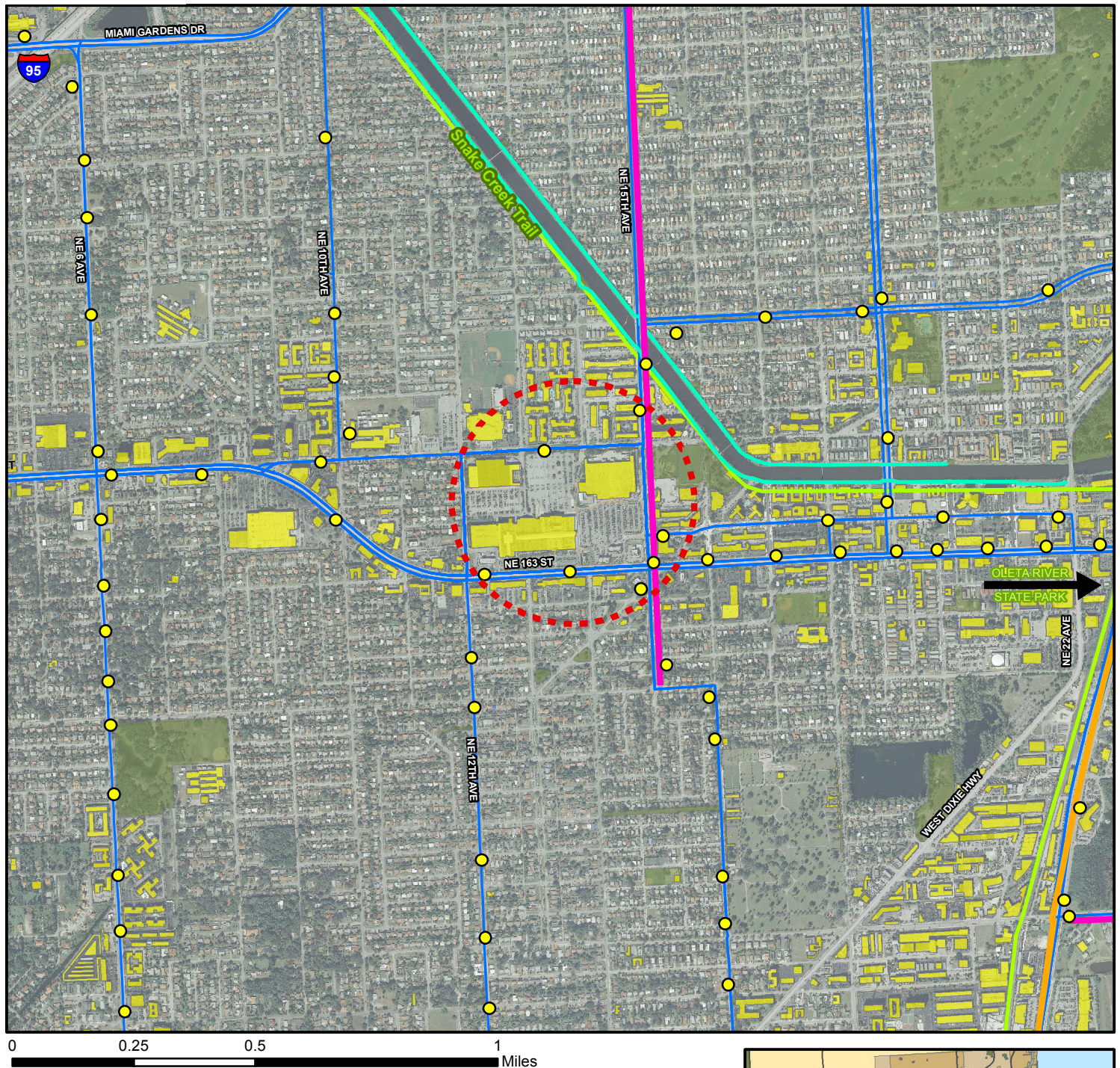




Figure 18. South Beach

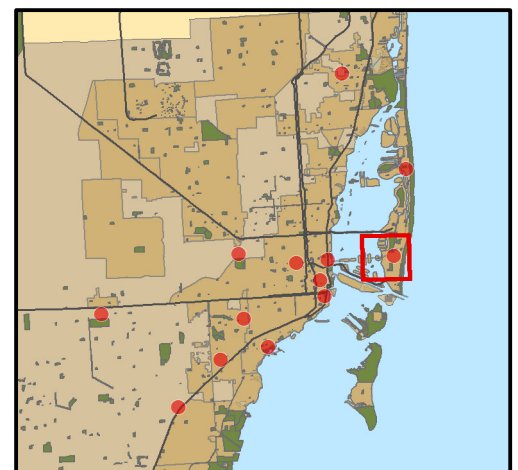
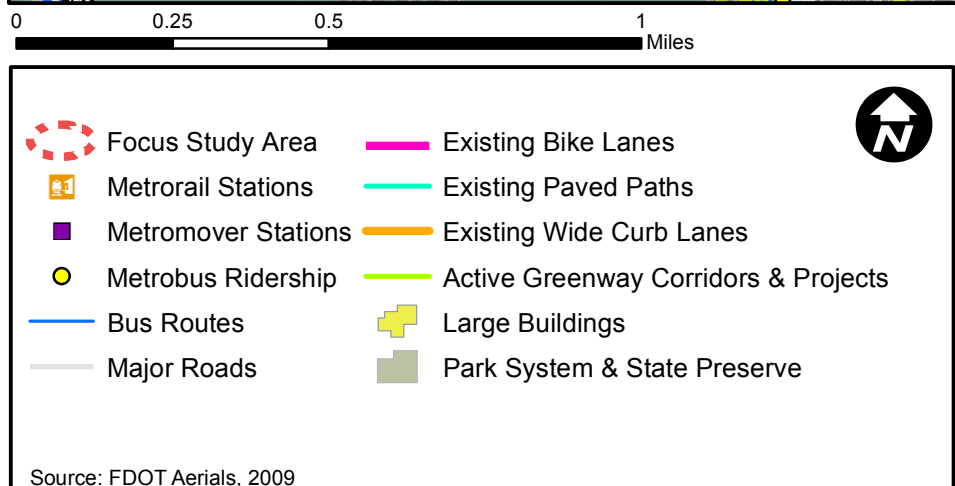
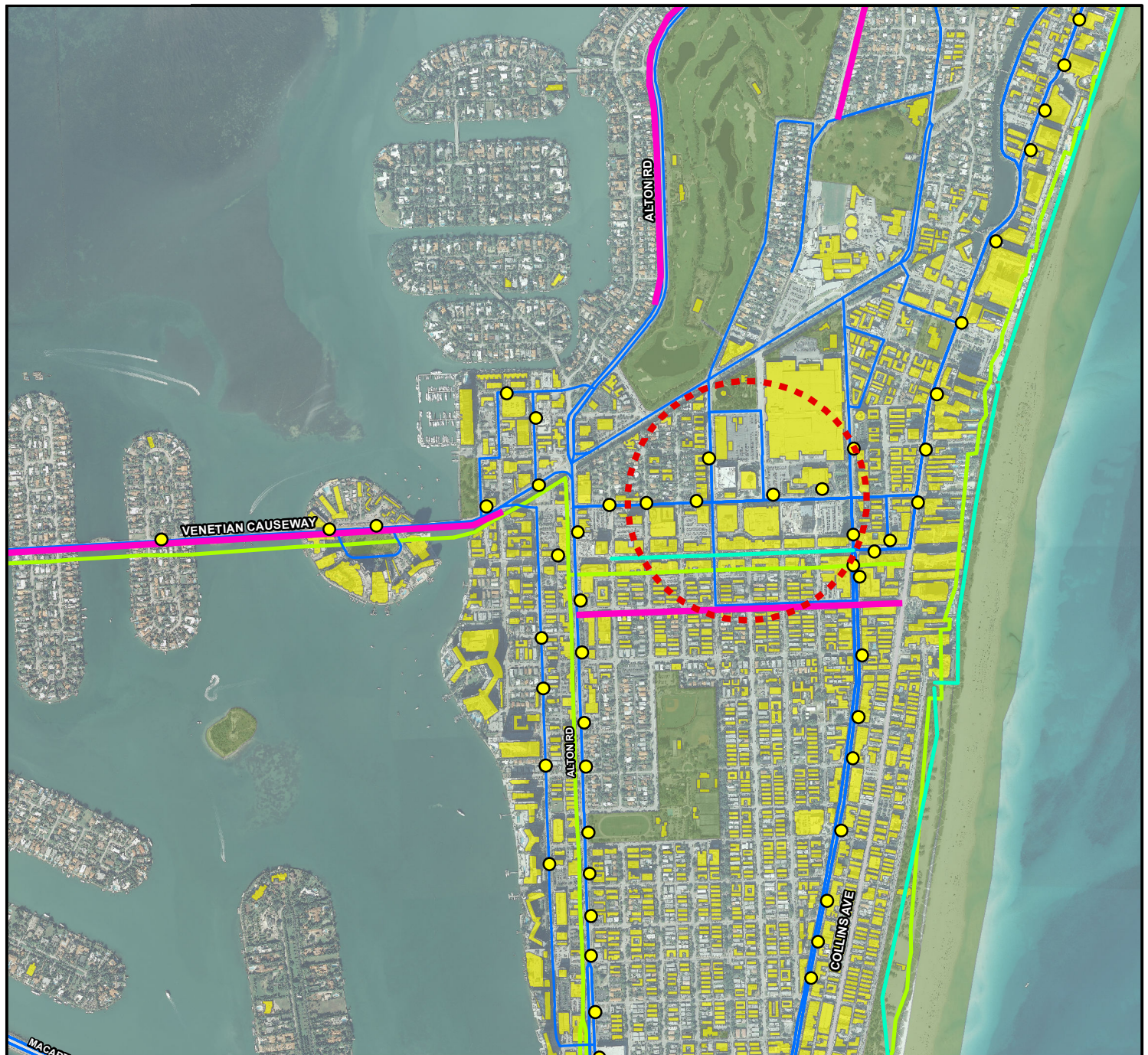
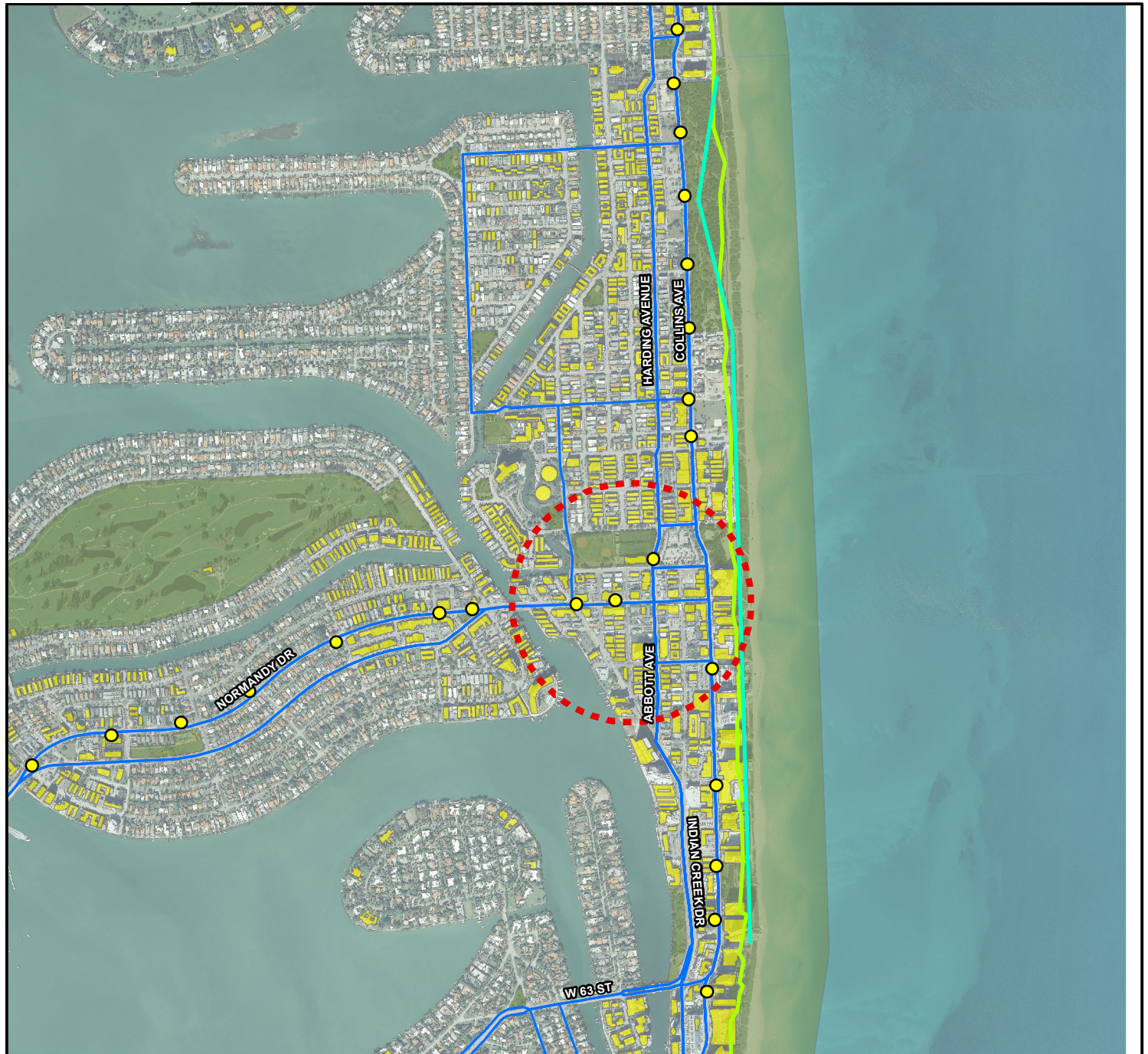


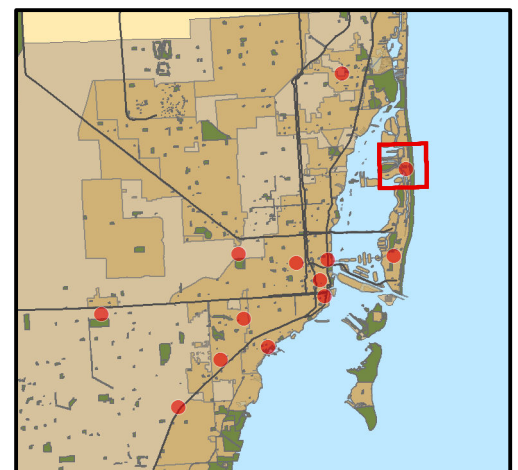


Figure 19. North Beach



0 0.25 0.5 1  
Miles

- |  |                     |   |                                      |
|--|---------------------|---|--------------------------------------|
|  | Focus Study Area    |  | Existing Bike Lanes                  |
|  | Metrorail Stations  |  | Existing Paved Paths                 |
|  | Metromover Stations |  | Existing Wide Curb Lanes             |
|  | Metrobus Ridership  |  | Active Greenway Corridors & Projects |
|  | Bus Routes          |  | Large Buildings                      |
|  | Major Roads         |  | Park System & State Preserve         |







## SUMMARY AND RECOMMENDATIONS

Recommendations are made in this study based on the agency coordination, literature review, and data collection and analysis tasks. The recommendations include potential markets and general locations for automated bicycle rental systems and bicycle parking transit centers. In addition, recommendations are made on a uniform countywide standard for bicycle parking. Table 10 presents a summary of the general recommendations for automated bicycle rental systems and bicycle parking transit centers.

**Table 10: Proposed Facility Types**

Focus Study Area	Automated Bicycle Rental System Demand	Bicycle Parking Transit Center Type <sup>(A)</sup>
Dadeland	Low	Type III
University of Miami	High	Type II
Coconut Grove	High	Type II
Coral Gables	High	Type II
FIU Main Campus	Medium	Type II
Brickell	High	Type III
Downtown	High	Type III
Omni / Wynwood / Design	Medium <sup>(B)</sup>	Type I
Hospital / Civic Center	High	Type II
Miami Intermodal Center	Low	Type II
NE 163 <sup>rd</sup> Street Transit Center	Low	Type I
South Beach	Existing	Type III
North Beach	Planned Expansion	Type II

**Notes:**

- (A)
  - Type III = Bike Station (secure, staffed, racks and lockers)
  - Type II = Bike Depot (secure, racks and lockers)
  - Type I = Bike Corral (collection of racks, typically in street right-of-way)
- (B)
  - Although the Omni area is rated medium, there is a strong potential for an automated rental station at the Omni Metromover Station / Bus Terminal to serve as a connection to the Deco Bike system (Venetian Causeway) and to any future Downtown / Brickell system (Biscayne Boulevard).





## Potential Market for an Automated Bicycle Rental System

The potential market for an automated bicycle rental system is difficult to quantify. No literature was found that describes a quantifiable methodology to determine future demand. There is a need to establish a methodology that would determine future demand in terms of number of rental kiosks / docking stations and number of bicycles in the system. Since the systems are typically proprietary, it is possible that companies do not typically divulge information regarding market studies.

A qualitative methodology was established based on local data reviewed for this study and general observations of existing bicycle parking and bicycle travel activity in each of the eleven focus study areas. The qualitative methodology took into account several factors that are observed to impact ridership for automated bicycle rental systems.

- **Density** – Presence of a single large activity center spread over at least one mile or two activity centers in close proximity with the potential for trip interaction.
- **Visitors** – Presence of a strong tourist attraction in the focus area (hotel rooms used as a proxy).
- **Trip Characteristics** – Presence of a strong potential for internal nested trips.

Based on these three qualitative criteria, the following focus areas within Miami-Dade County were determined to have a high demand for an automated bicycle rental system.

- Downtown Miami
- Brickell
- Hospital / Civic Center
- University of Miami
- Coconut Grove
- Coral Gables



*Automated Bicycle Rental System  
– Docking Station with Bikes*





### Locations for Bicycle Parking Transit Centers

Accommodations for bicycles at transit facilities can range anywhere from a simple bicycle rack to a staffed bicycle commuter station with secure indoor bicycle parking. The potential market for bicycle parking transit centers was estimated for each focus area in the previous section of this report. This demand estimation was used as a guide to assist the recommendations of bicycle parking transit center type, although additional factors were considered as well, such as predominant land use and the general level of service of bicycle facilities in the surrounding area. The bicycle parking transit centers are divided into three categories as described below – **Bike Stations** (highest intensity), **Bike Depots** (medium intensity), and **Bike Corrals** (lesser intensity).



*High Capacity Bicycle Parking Facility, although without Shelter*



# Automated BICYCLE

## Rental System and Parking Plan Study



### Bike Stations

- Basic amenities include secure bicycle parking and storage, staffing, light maintenance available, and the provision of bicycle racks and lockers. Additional amenities may include showers, changing rooms, retail sales of parts and clothing, retail sales of food and drink, bicycle rentals, maps, and transit information kiosks.
- Examples of Bike Stations include Seattle Bikestation, Chicago McDonald's Cycle Center, Toronto Union Station Bicycle Station, and Tempe Bicycle Cellar (see Background Research section for more information).
- Recommended for the following Miami-Dade Focus Areas:
  - Downtown Miami
  - Brickell
  - Dadeland



*Images of Bike Stations*



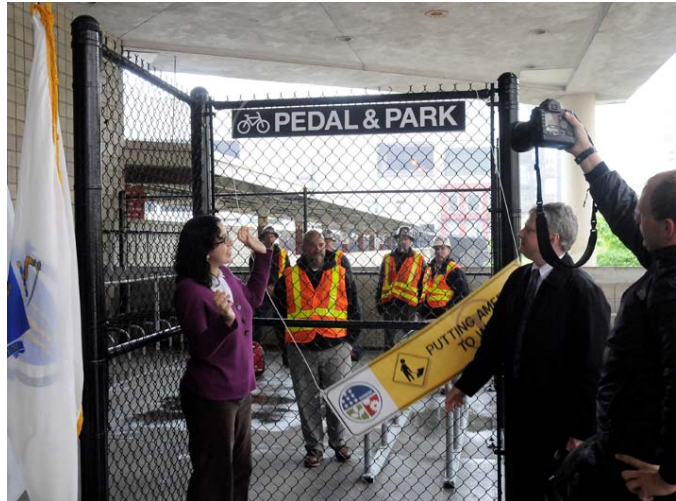
# Automated BICYCLE

## Rental System and Parking Plan Study



### Bike Depots

- Basic amenities include secure bicycle parking through the provision of bicycle racks and lockers, but without staffing, changing rooms, and maintenance/retail available. Access may be provided through an electronic card. Typically located within an enclosed space such as fence and may include security camera monitoring. Sometimes called bike cages.
- Examples of Bike Depots include Boston “Pedal & Park” at T Stations and Portland “Bike and Ride” at Tri-Met Stations. Bike depots are often located inside transit stations or inside parking garages.
- Recommended for the following Miami-Dade Focus Areas:
  - Metrorail Stations and Tri-Rail Stations
  - FIU Main Campus
  - University of Miami
  - Coconut Grove
  - Coral Gables
  - Hospital / Civic Center
  - Miami Intermodal Center



*Images of Bike Depots*



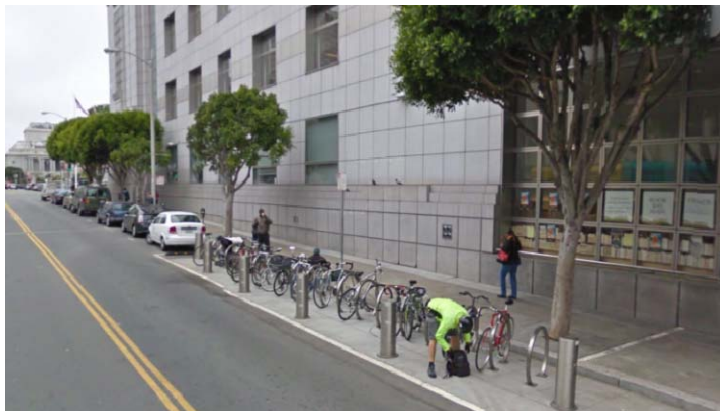
# Automated BICYCLE

## Rental System and Parking Plan Study



### Bike Corrals

- Basic amenities include a collection of bicycle racks typically located within a street right-of-way or near the entrance to a building. May include a shelter to provide some protection from the elements, but not typically fully enclosed. Sometimes called bike oases.
- Examples of Bike Corrals include San Francisco and Portland.
- Recommended for the following Miami-Dade Focus Areas:
  - NE 163<sup>rd</sup> Street Transit Center
  - Omni Transit Center
  - Omni / Wynwood / Design District
  - Supporting bike corrals should be scattered geographically as needed in Bike Station areas such as Downtown and Brickell due to the size of these areas



*Images of Bike Corrals*





### Uniform Countywide Standard for Bicycle Parking

The information gathered from the review of bicycle parking standards of other jurisdictions, and review of the Miami-Dade County Bicycle Parking Ordinance was utilized to develop recommendations to update the County's existing bicycle parking standards. A summary of key recommended revisions is presented below.

- Correlate bicycle parking spaces to the number of automobile parking spaces required or land use intensity measures such as number of residential units.
- Develop land use specific bicycle parking requirement criteria. In contrast to the existing Miami-Dade County standard, bicycle parking should be correlated to the type of land use. Several codes of ordinances reviewed in this study specify bicycle parking based on land use type. This approach accommodates varying degree of bicycle parking needs associated with different land uses of similar magnitude.
- In locations where bicycle parking is provided with bicycle parking racks in the public right-of-way or where required private bicycle parking is provided with racks on private property, the racks and their associated bicycle parking spaces should adhere to the following standards.
  - The bicycle parking rack shall permit the support of the bicycle with at least two (2) points of contact.
  - The bicycle parking rack shall permit the locking of the bicycle frame and at least one (1) wheel with a standard size U-lock.
  - Each properly installed bicycle parking rack shall be designed to allow the parking of two (2) bicycles, facing in opposite directions, parallel to the rack.
  - The bicycle parking spaces shall be at least two (2) feet wide and six (6) feet long.
  - The bicycle parking spaces shall have an access aisle of at least four (4) feet in width.
  - The bicycle parking spaces shall have an overhead clearance of at least eight (8) feet.
  - The bicycle parking rack should be located within fifty (50) feet of a building's main entrance.
  - The bicycle parking rack shall be securely anchored with theft-resistant hardware.





Miami-Dade County staff are in the process of recommending changes to the existing bicycle parking criteria in the code of ordinances. Additional proposed recommendations to the bicycle parking ordinance developed by the study team during the course of this study are presented below as applied to the proposed changes recommended by County staff. The proposed recommendations developed during the course of this study as applied to the current Chapter 33, Article VII, Section 33-122.3 of the Miami-Dade County Code of Ordinances are provided in Appendix C.

- Please note that words underlined and/or >>double arrowed<< are additions.
- Words ~~stricken~~ and/or [[double bracketed]] are deletions.
- Words **highlighted in green** are the proposed recommendations developed by the study team during the course of this study.

Miami-Dade County staff should consider developing a form-based code for bicycle parking due to the detailed nature of the proper geometric design requirements for bicycle parking described on the previous page. The study team for this study developed a handy Bicycle Parking Guide to illustrate the preferred bicycle rack designs, rack element requirements, examples of unacceptable designs, and the geometric requirements/dimensions for bicycle parking rack placement. The Bicycle Parking Guide should serve as a model for form-based code and potentially as a model for a County guide that would supplement the Code of Ordinances for items that are difficult to enforce or would involve the judgment of a reviewer/inspector. The Bicycle Parking Guide developed in this study is found in Appendix D.

## Chapter 33 Zoning

### Article VII. Off-Street Parking

**Section 1.** Section 33-122.3 of the Code of Miami-Dade County, Florida is hereby amended to read as follows:

**Sec. 33-122.3. Requirement of bicycle ~~[[racks or other means of storage]]~~ >>parking facilities for properties/buildings <<.**



>>Bicycle parking facilities<< ~~[[Racks or other means of storage that can secure at least four (4) bicycles]]~~ shall be required ~~[[for all park, shopping center, office and restaurant uses with parking lots,]]~~ as follows:

(a) Quantity of bicycle parking spaces required:

<del>[[Total Parking Spaces in Lot</del>	<del>Required Number of Bicycle Parking Spaces:</del>
<del>25 to 50</del>	<del>4</del>
<del>51 to 100</del>	<del>8</del>
<del>101 to 500</del>	<del>12</del>
<del>501 to 1000</del>	<del>16</del>
<del>over 1000</del>	<del>four (4) additional spaces for each 500 parking spaces over 1000.]]</del>

>>(1) Retail, office, and restaurant uses with parking lots:

<u>&gt;&gt;Size of Buildings (Gross Square Feet of Floor Area)</u>	<u>Minimum Required Number of Class 2 Parking Spaces(*)</u>
<u>Up to 4,999</u>	<u>4 (Four)</u>
<u>5,000 to 9,999</u>	<u>6 (Six)</u>
<u>10,000 to 20,000</u>	<u>8 (Eight)</u>
<u>20,001 to 50,000</u>	<u>12 (Ten)</u>
<u>50,0001 to 100,000</u>	<u>16 (Sixteen)</u>
<u>100,001 to 300,000</u>	<u>20 (Twenty)</u>
<u>More than 300,000</u>	<u>24 (Twenty-four)</u>

~~[[ (b) Other uses. All other uses, other than airport or seaport terminals, single family, duplex or townhouse which are exempt, shall provide racks or other means of storage as provided hereinonly where their total parking lot has one hundred one (101) or more spaces.]]~~

>>(2) Industrial and institutional uses except for schools and colleges:





<u>Total Automobile Spaces in Parking Lot</u>	<u>Required Number of Bicycle Parking Spaces:</u>
<u>1 to 9</u>	<u>2</u>
<u>10 to 50</u>	<u>4</u>
<u>51 to 100</u>	<u>8</u>
<u>101 to 500</u>	<u>12</u>
<u>501 to 1000</u>	<u>16</u>
<u>over 1000</u>	<u>four (4) additional spaces for each 500 parking spaces over 1000.</u>

### (3) Multifamily residential uses and hotels/motels:

	<u>Required Number of Bicycle Parking Spaces:</u>
<u>&gt;&gt;Multifamily Residential&lt;&lt;</u> <u>Projects up to 20 dwelling units</u>	<u>1 for every 2 dwelling units</u>
<u>Projects over 20 but less than 51 dwelling units</u>	<u>12 plus 1 for every 5 &gt;&gt;4&lt;&lt;</u> <u>dwelling units over 20</u>
<u>Projects over 50 dwelling units</u>	<u>20 plus 1 for every 10 &gt;&gt;8&lt;&lt;</u> <u>dwelling units over 50</u>
<u>Hotels/Motels</u>	<u>1 per 20 rentable rooms</u>

### (4) Schools and Colleges:

	<u>Required Number of Bicycle Parking Spaces:</u>
<u>Grades 2 through 8</u>	<u>2 per classroom</u>
<u>Grades 8 to 12</u>	<u>4 per classroom</u>
<u>Colleges</u>	<u>1.5 per 10,000 sq. ft. of net building area</u>

### (5) >>Free-standing commercial <<garage parking facilities >>that are not elements of projects that fall under (1) – (4)<<:

- (a) Every garage shall supply a minimum of six bicycle parking spaces regardless of the number of automobile spaces available.
- (b) Garages which offer between 120 and 500 automobile spaces shall provide one bicycle



parking space for every 20 automobiles spaces.

- (c) Garages which offer more than 500 automobile spaces shall provide 25 bicycle parking spaces plus one additional space for every 40 automobile spaces over 500 spaces, up to a maximum of 50 bicycle parking spaces.
- (d) Garages with ancillary uses such as retail and offices shall provide the additional bicycle parking required for those uses in this Section.
- (e) At minimum, all of the required bicycle parking spaces shall be of Class 2 type as provided in Section 33-122.3(b) of this Code.

(b) Type of parking spaces and facilities, requirements.

- (1) Bicycle parking spaces shall be provided in the form of >>stationary<< bicycle racks >>affixed to a solid surface<< (also known as Class 2 bicycle parking spaces) which support the bicycle upright by its frame in two places >>with at least two points of contact<<, enabling the frame and one of the wheels to be secured >>with a standard size U-lock<<. When feasible, the bicycle rack area shall be covered. >>The bicycle rack area shall have a minimum of eight (8) feet of overhead clearance.<<

- >>(2) The approved Class 2 bicycle parking rack design shall be of the following rack styles or their functional equivalents: the “Inverted-U” rack, the “Post-and-Ring” rack, and the “Swerve” rack. The “Inverted-U” rack and the “Swerve” rack shall be a minimum of 30 inches long with a height of approximately 30-36 inches. The “Post-and-Ring” rack shall be a minimum of 18 inches in diameter and the bottom of the ring shall be a minimum of 12 inches above the ground.<<

- >>(3) Each Class 2 bicycle parking rack shall be designed to park two bicycles, facing in opposite directions, parallel to the rack. Each bicycle parking rack shall





count as two (2) bicycle parking spaces when installed properly. Each bicycle parking space shall be a minimum of two (2) feet wide and six (6) feet long. Racks in a parallel series need to be at least 4 feet apart to provide adequate access to each bicycle. If adjacent racks are spaced less than 4 feet apart, they shall be counted as one (1) bicycle parking space, not two.<<

>>(4) Each Class 2 bicycle parking space shall be designed with an access aisle of at least 48 inches in clear width as measured from tire-to-tire or from tire-to-wall as applicable.<<

(2)>>(5)<< The bicycle spaces/racks must resist removal, resist rust, corrosion and vandalism, and must be properly maintained.

(3)>>(6)<< The owner may install Class 1 parking spaces consisting of facilities which protect the entire bicycle, its components and accessories against theft, vandalism and weather >> located in a lighted area. The Class 1 bicycle parking space shall be able to store the bicycle in a fully enclosed lockable space accessible only to the owner/operator of the bicycle, or in the case of an attendant parking with check-in system, accessible only to the attendant(s), or in a secure, locked room or office inside a building<< (i.e. storage rooms, lockers or cages).

(c) Location ~~[[and design]]~~ of bicycle parking spaces requirements.

(1) The bicycle parking spaces shall be located near >>within 50 feet of<< the >>main<< entrance to the building >>or located as close or closer than the nearest motor vehicle parking space<<.

(2) At buildings and shopping centers that have multiple parking lots, the bicycle parking spaces should be installed near the entrances to the buildings served by the lots.



- (3) The bicycle parking spaces should be in a highly visible, well lighted location that provides enough clear space to facilitate easy use and does not impede pedestrian traffic or handicap accessibility >>and is protected from the weather to the extent practically possible by being located under roof overhangs and canopies<<.
- (4) The >>bicycle<< parking spaces >>required in this Section<< may not be [[placed]]>>located<< in the [[County maintained]]>>public<< right-of-way.
- [[~~(5)~~] The design of the bicycle rack should permit the locking of the frame and at least one (1) wheel with a standard size "U" lock and accommodate the typical range of bicycle sizes.
- ~~(6) The bicycle rack must resist removal, resist rust, corrosion and vandalism, and must be properly maintained.]]~~
- [[~~(d)~~] Other forms of storage. At the owner's option, bicycle parking may also be installed in the form of storage rooms, lockers or cages.]]
- [[~~(e)~~] >>(d)<< Signage and markings. All bicycle parking spaces shall be posted with a permanent and properly maintained above-ground sign which shall conform to the figure entitled "Secured Bicycle Parking" hereby incorporated in this section. The bottom of the sign must be at least five (5) feet above grade when >>if<< attached >>flush<< to a building, which may not be installed in the County maintained right-of-way. >>The bottom of the sign must be at least eight (8) feet above grade for a detached sign. No private bicycle parking sign required by this section may be placed in the public right-of-way.<< No permit shall be required for such signs.
- [[~~(f)~~] Application to existing uses. All property owners of existing establishments that are required by this section to provide bicycle parking spaces shall comply within one (1) year from the effective date of the ordinance from which this section derives and shall be responsible to maintain such facilities. Existing multi-family uses are exempt from this subsection.]]



# Automated BICYCLE

## Rental System and Parking Plan Study



>>(f)(c) The location, signage and markings of bicycle parking facilities shall be in accordance with Section 33-122.3 of this Code.<<

**Section 2.** Section 9-76 of the Code of Miami-Dade County, Florida is hereby created to read as follows:

>>**Sec. 9-76. Requirement of bicycle facilities for properties/buildings owned or operated by the County.**

Notwithstanding any thing in the code to the contrary, County-owned or operated buildings, shall provide bicycle parking spaces for its employees for any new building, addition or enlargement of an existing building as provided herein:

(a) Quantity of bicycle parking spaces, showers and lockers required in County buildings by building type.

(1) County buildings primarily used for offices, general business services or cultural purposes shall provide bicycle parking spaces as provided in the schedule herein.

<u>&gt;&gt;Size of Buildings (Gross Square Feet of Floor Area)</u>	<u>Minimum Required Number of Class 2 Parking Spaces (*)</u>
<u>Up to 4,999</u>	<u>4 (Four)</u>
<u>5,000 to 9,999</u>	<u>6 (Six)</u>
<u>10,000 to 20,000</u>	<u>8 (Eight)</u>
<u>20,001 to 50,000</u>	<u>12 (Twelve)</u>
<u>50,001 to 100,000</u>	<u>16 (Sixteen)</u>
<u>100,001 to 300,000</u>	<u>20 (Twenty)</u>
<u>More than 300,000</u>	<u>24 (Twenty-four)</u>



>>County buildings primarily used for offices, general business services or cultural purposes shall provide shower and locker facilities as provided in the schedule herein.<<

>>Size of Buildings (Gross Square Feet of Floor Area)	Minimum Required Number of Showers	Minimum Required Number of Clothes Lockers
10,001 to 20,000	1 (One)	2 (Two)
20,001 to 50,000	2 (Two)	4 (Four)
More than 50,000	4 (Four)	8 (Eight)

(a) Bicycle parking spaces shall be provided in the form of a mix of Class 1 (protecting the entire bicycle, i.e. storage rooms, lockers or cages, and intended for employees) and Class 2 (bicycle racks that support the bicycle upright by its frame in two places, enabling the frame and one of the wheels to be secured). When feasible, the bicycle rack area shall be covered.

(2) Free-standing garage parking facilities:

The following criteria shall apply to new County garage parking facilities not built in connection with a building listed in Section 9-76(a)(1) above:

- (a) Every garage shall supply a minimum of six bicycle parking spaces regardless of the number of automobile spaces available.
- (b) Garages which offer between 120 and 500 automobile spaces shall provide one bicycle parking space for every 20 automobiles spaces.
- (c) Garages which offer more than 500 automobile spaces shall provide 25 bicycle parking spaces plus one additional space for every 40 automobile spaces over 500 spaces, up to a maximum of 50 bicycle parking spaces.





(d) At minimum, all of the required bicycle parking spaces shall be of Class 2 type as provided in Section 33-122.3(c) of this Code.

(3) Multi-modal transportation facilities, transit stations and terminals >>(including park-and-ride lots and other transit hubs)<<.

Bicycle parking spaces and related facilities shall be provided at all >>of the<< County's multi-modal transportation facilities, transit stations and terminals >>including park-and-ride lots and other transit hubs<< as provided in the schedule herein.

<u>Total Number of Automobile Parking Spaces in Lot and/or Garage at the &gt;&gt;Multi-modal&lt;&lt; Transportation Facility, Station or Terminal</u>	<u>Minimum Required Number of Class 2 Parking Spaces (*)</u>
<u>0 to 100</u>	<u>8 (Eight) &gt;&gt;16 (Sixteen)&lt;&lt;</u>
<u>101 to 500</u>	<u>16 (Sixteen) &gt;&gt;32 (Thirty-two)&lt;&lt;</u>
<u>501 to 1000</u>	<u>20 (Twenty) &gt;&gt;40 (Forty)&lt;&lt;</u>
<u>More than 1000</u>	<u>24 (Twenty-four) &gt;&gt;48 (Forty-eight)&lt;&lt;</u>
<u>* as defined in Section 33-122.3(c) of this Code.</u>	

(a) Bicycle parking spaces shall be provided in the form of a mix of Class 1 (protecting the entire bicycle, i.e. storage rooms, lockers or cages, and intended for employees) and Class 2 (bicycle racks that support the bicycle upright by its frame in two places, enabling the frame and one of the wheels to be secured). The bicycle rack area shall be covered.



>>(4)<< >>Airport and seaport terminals:<<

Bicycle parking spaces and related facilities shall be provided at all of the County's airport and seaport terminals as provided in the schedule herein.<<

Total Number of Automobile Parking Spaces in Lot and/or Garage at the Airport/Seaport Terminal	Minimum Required Number of Class 2 Parking Spaces (*)
0 to 100	8 (Eight)
101 to 500	16 (Sixteen)
501 to 1000	20 (Twenty)
More than 1000	24 (Twenty-four)
* as defined in Section 33-122.3(c) of this Code.	

(a) Bicycle parking spaces shall be provided in the form of a mix of Class 1 (protecting the entire bicycle, i.e. storage rooms, lockers or cages, and intended for employees) and Class 2 (bicycle racks that support the bicycle upright by its frame in two places, enabling the frame and one of the wheels to be secured). The bicycle rack area shall be covered.

(H4H)>>5<< The location, signage and markings of bicycle parking facilities shall be in accordance with Section 33-122.3 of this Code.<<





*Example of an Inverted-U Rack*



*Example of a Post-and-Ring Rack*



*Example of a Swerve Rack*



### Novelty Bicycle Racks

It is recommended that the local agencies reviewing bicycle parking include the potential to approve novelty bicycle racks, as long as the novelty bicycle rack meets the basic functional intent of the bicycle parking ordinance (providing at least two points of contact with the frame of the bicycle and supporting the ability to lock both the frame and one wheel). Novelty bicycle racks can include street art, which should be encouraged under certain circumstances where the bicycle rack may actually be used to promote community cohesiveness or to promote bicycling in general.



*Examples of Novelty Bicycle Racks*





## Bicycle Parking Signage

The Manual on Uniform Traffic Control Devices (MUTCD) provides a standard sign design (D4-3) for bicycle parking. This sign should be utilized to provide wayfinding to bicycle parking facilities from nearby public streets, transit stations, bicycle lanes, and shared-use paths. Use of the D4-3 sign should be required within commercial and office parking lots also; use of this sign can be recommended during plans review phase. The intent of the bicycle parking signage is to make bicycle parking easily identifiable by the public. Having provided bicycle parking, it makes sense to inform people that it is there. Bicycle parking can also be identified through pavement markings and building signs.



*2009 MUTCD Bicycle Parking Sign D4-3*



*Bicycle Parking Sign at a Transit Station*



*Bicycle Parking Pavement Marking at an On-Street Bike Corral*



### Flawed Bike Rack Designs and Common Installation Mistakes

A sound bicycle parking policy can be weakened by flawed bike rack designs or common installation mistakes that limit the effectiveness of bicycle parking. Designers, reviewers, installation crews, and construction observation personnel should be trained to identify and avoid flawed bike rack designs and common installation mistakes. While locating bicycle racks and lockers on a site or within public right-of-way, specific attention should be given to the design and location of the bicycle facilities from the user's point of view.

Some examples of flawed bike rack designs are provided below. Typically these bike racks are unacceptable due to one or more reasons including not supporting the bicycle with at least two points of contact, not allowing the locking of the frame and at least one wheel with a standard size U-lock, not providing enough space for bicycles, only supporting the front wheel of a bicycle, and encouraging bicyclists to park perpendicular to the rack instead of parallel. These rack designs should be avoided.



*Flawed Bicycle Rack Designs*





Merely locating a bicycle parking facility within fifty (50) feet of a building entrance or transit station entrance does not guarantee effective utilization. For example in the first image below (upper left), the serpentine (or wave) bicycle rack is located very close to the building and also to a raised section of concrete, rendering much of the rack unusable. In the second image below (upper right), there is only one point of contact between the bicycle and the rack and the rack does not support 180 degrees of the wheel arc; therefore, the rack results in unstable parking conditions with the potential of a bent wheel if the bicycle topples over.



*Common Installation Mistakes*

Such common installation mistakes should be carefully avoided to efficiently utilize and provide for bicycle parking facilities.



*Flawed Bicycle Parking Design Can Lead to Property Damage, Theft, or Injury*



### Avoiding Improvised Bicycle Parking

There are many reasons for improvised bicycle parking in urban environments including when no bicycle parking is provided, when bicycle parking is provided but at inconvenient locations, or when poorly designed bicycle parking is rejected. Improvised bicycle parking can have unintended negative side effects such as blocking pedestrian ways, increasing risk of theft, and creating unwanted street clutter. Improvised bicycle parking can be largely avoided by providing secure, well-designed bicycle parking in locations that make sense and provide accessibility to buildings, transit stations, and other destinations. One way to reduce improvised bicycle parking is to place properly-designed bicycle racks in locations where improvised bicycle parking is commonly observed.



*Three Bicycles Parked at a Bus Stop Pole*



*Bicyclists Rejecting Perpendicular Parking*



*Bicycle Locked to a Utility Pole*



*Flawed Rack Design Leading to Improvised Parking*





### Bicycle Parking Architecture

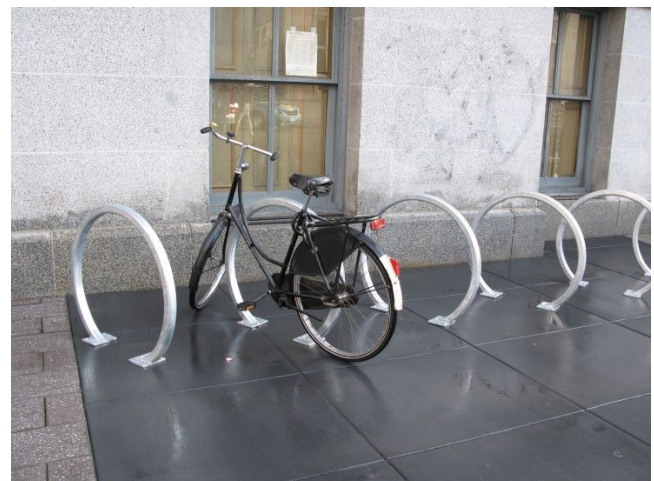
Bicycle parking should be considered an important element in urban streetscaping and building design. Not only should bicycle parking be functionally well-designed, it should also encourage and promote bicycle riding by exhibiting a handsome architecture. Modern urban architecture is often incorporated into bicycle parking design. The design can also be selected to be consistent with community themes. Examples of bicycle parking building design, bike depot design, and individual bicycle rack design (a simple variation on the basic functionalities of an Inverted-U rack) are provided below.



### *The Modern Architecture of Bikestations*



*Penny Farthings' Bike Depot Pod*



*O-Ring Design with a Galvanized Finish*



## CLOSING

It has been well-documented in prior Miami-Dade MPO studies that improving the connectivity between residential areas, bicycle facilities, transit stations, and places of business is one of the most cost-efficient and environmentally-friendly ways of addressing transportation mobility deficiencies. This study presents a plan for moving toward a fully integrated bicycle transportation system where Miami-Dade County residents and visitors alike have access to bicycles in key focus areas and access to secure bicycle parking with the infrastructure necessary for the convenient use of bicycles for functional transportation.



*Bicycles are Used for Functional Transportation*

### Harness the Power of Multimodalism

Alternative travel modes have the potential for an extraordinary cumulative impact if the power of multimodalism can be truly harnessed. Like the automobile in the early part of the 20th century,



*Secure Bicycle Lockers at a Train Station*

significant modal shift to bicycles will only occur with the development of the systems necessary for convenient use, such as secure parking, changing rooms/showers, maintenance facilities, bicycle retail shops, easy accessibility to destinations, and traveler information. This infrastructure is key to developing better and more effective solutions for bicycle transportation. Even public art and urban architecture may play a role in enhancing the visibility and desirability of bicycle parking centers.





### Work With Local Partners for Implementation

Miami-Dade County is envied for its tropical weather, lush foliage, and natural water features. Not only does Miami-Dade County's environment lead many to choose bicycling as a popular recreation activity, it also encourages bicycling as a viable mode of transportation. Unfortunately, barriers still exist to expanded use of the bicycle for transportation including lack of bicycle parking; perceived safety hazards and security risks; and lack of supporting services such as showers, lockers, and basic maintenance facilities. Bicycle parking transit centers, and the supporting services they can provide, will help break down these barriers. **Stakeholders must unite behind common goals and emphasize the role of a coordinated regional effort to prioritize, develop, and market an integrated network of regional bicycle parking facilities and automated bicycle rental systems.** In addition to providing access to bicycle mobility for short trips, an automated bicycle rental system could be promoted as a tourist amenity because bicycling is a great way to see Miami and its environs. Implementation partners for bicycle parking centers and automated bicycle rental systems include but are not limited to the following.

- Municipalities and local governments
- Transit operators
- Parks departments
- Downtown Development Authority (DDA)
- Community Redevelopment Agencies (CRAs)
- Parking authorities
- Developers
- Bike shops
- Advocacy groups



*Access to Bicycles is Key to Improving Mode Share*

Working together, local partners can promote an era of more innovative facilities for bicycle transportation and help everyone understand that it is cool, easy, and convenient to use a bicycle if the right infrastructure is in place.



# Appendix A

## Demand Methodology Estimate

### Tool



# Appendix

## King Street Station Bike Station Revised Demand Estimates

### User Group #1: Bike Commuters That Work in the Bikestation Magnet Zone

#### Key Inputs

Total number of jobs in magnet zone: 7,709

Bicycle mode share to magnet zone area per census 0.90%

Total number of jobs in magnet zone	7709
Bike mode share -- worst-case scenario	0.45%
<b>Bike mode share -- base estimate</b>	<b>0.90%</b>
Bike mode share -- best-case scenario	1.80%
Bike commuters to magnet zone -- worst-case scenario	34.7
<b>Bike commuters to magnet zone -- base estimate</b>	<b>69.4</b>
Bike commuters to magnet zone -- best-case scenario	138.8
Percent of bike commuters who will park at Bikestation -- worst-case scenario	10%
<b>Percent of bike commuters who will park at Bikestation - base estimate</b>	<b>20%</b>
Percent of bike commuters who will park at Bikestation -- best-case scenario:	50%
Number of current bike commuters who park at Bikestation -- worst-case scenario	3.5
<b>Number of current bike commuters who park at Bikestation -- base estimate</b>	<b>13.9</b>
Number of current bike commuters who park at Bikestation -- best-case scenario	69.4
Total # bicycle commuters who will park at Bikestation -- worst-case scenario	3.5
<b>Total # bicycle commuters who will park at Bikestation -- base estimate</b>	<b>13.9</b>
Total # bicycle commuters who will park at Bikestation -- best-case scenario	69.4

## User Group #2: (Transit) Bike-and-Ride

### Key Inputs

Total daily short-haul (local) transit boardings in magnet zone 8,675

Total daily long-haul (express) boardings in magnet zone 0

Total relevant short-haul boardings in Magnet Zone (default is 50% of total boardings)	4337.5
Total relevant long-haul boardings in Magnet Zone (default is 50% of total boardings)	0
Percent of short-haul boardings accessed by bike -- worst-case scenario	0.50%
<b>Percent of short-haul boardings accessed by bike -- base estimate</b>	<b>1.40%</b>
Percent of short-haul boardings accessed by bike -- best-case scenario	2.80%
Percent of long-haul boardings accessed by bike -- worst-case scenario	0.75%
<b>Percent of long-haul boardings accessed by bike -- base estimate</b>	<b>2.10%</b>
Percent of long-haul boardings accessed by bike -- best-case scenario	4.20%
Number of short- and long-haul boardings accessed by bike -- worst-case scenario	21.7
<b>Number of short- and long-haul boardings accessed by bike -- base estimate</b>	<b>60.7</b>
Number of short- and long-haul boardings accessed by bike -- best-case scenario	121.5
Percent of bike-and-riders who park at Bikestation -- worst-case scenario	33%
<b>Percent of bike-and-riders who park at Bikestation -- base estimate</b>	<b>50%</b>
Percent of bike-and-riders who park at Bikestation -- best-case scenario	75%
Number of bike-and-riders who park at Bikestation -- worst-case scenario	7.2
<b>Number of bike-and-riders who park at Bikestation -- base estimate</b>	<b>30.4</b>
Number of bike-and-riders who park at Bikestation -- best-case scenario	91.1
Percent of induced bike-and-ride users -- worst-case scenario	6%
<b>Percent of induced bike-and-ride users -- base estimate</b>	<b>12%</b>
Percent of induced bike-and-ride users -- best-case scenario	25%
Number of induced bike-and-ride users -- worst-case scenario	0.4
<b>Number of induced bike-and-ride users -- base estimate</b>	<b>3.6</b>
Number of induced bike-and-ride users -- best-case scenario	22.8
Total number of bike-and riders who will park at Bikestation -- worst-case scenario	7.6
<b>Total number of bike-and-riders who will park at Bikestation -- base estimate</b>	<b>34.0</b>
Total number of bike-and-riders who will park at Bikestation -- best-case scenario	113.9



## User Group #3: (Transit) Ride-and-Bike

### Key Inputs

Total daily short-haul transit alightings in magnet zone	<u>8,504</u>
Total daily long-haul transit alightings in magnet zone	<u>1,300</u>

Total relevant short-haul alightings in Magnet Zone (default is 50% of total alightings)	4252
Total relevant long-haul alightings in Magnet Zone (all alightings in AM peak)	1,300
Percent of short-haul alightings with bicycle -- worst-case scenario	0.5%
<b>Percent of short-haul alightings with bicycle -- base estimate</b>	<b>1.0%</b>
Percent of short-haul alightings with bicycle -- best-case scenario	2.0%
Percent of long-haul alightings with bike -- worst-case scenario	0.8%
<b>Percent of long-haul alightings with bike -- base estimate</b>	<b>1.5%</b>
Percent of long-haul alightings with bike -- best-case scenario	3.0%
Number of alightings short- and long-haul alightings with bike -- worst-case scenario	31.0
<b>Number of short- and long-haul alightings with bike -- base estimate</b>	<b>62.0</b>
Number of short- and long-haul alightings with bike -- best-case scenario	124.0
Percent of ride-and-bikers who park at Bikestation -- worst-case scenario	8%
<b>Percent of ride-and-bikers who park at Bikestation -- base estimate</b>	<b>16%</b>
Percent of ride-and-bikers who park at Bikestation -- best-case scenario	24%
Number of ride-and-bikers who park at Bikestation -- worst-case scenario	2.5
<b>Number of ride-and-bikers who park at Bikestation -- base estimate</b>	<b>5.0</b>
Number of ride-and-bikers who park at Bikestation -- best-case scenario	7.4
Percent of induced ride-and-bike users -- worst-case scenario	6%
<b>Percent of induced ride-and-bike users -- base estimate</b>	<b>12%</b>
Percent of induced ride-and-bike users -- best-case scenario	25%
Number of induced ride-and-bike users -- worst-case scenario	0.1
<b>Number of induced ride-and-bike users -- base estimate</b>	<b>0.6</b>
Number of induced ride-and-bike users -- best-case scenario	1.9
Total number of ride-and-bikers who will park at Bikestation -- worst-case scenario	2.6
<b>Total number of ride-and-bikers who will park at Bikestation -- base estimate</b>	<b>5.6</b>
Total number of ride-and-bikers who will park at Bikestation -- best-case scenario	9.3

## Total Estimated Bikestation Users

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<u><b>User Group</b></u>	<u><b>Worst-case scenario</b></u>	<u><b>Base Estimate</b></u>	<u><b>Best-case Scenario</b></u>
Bike Commuters That Work in Magnet zone	3	14	69
Bike-and-Ride	8	34	114
Ride-and-Bike	3	6	9
<b>TOTAL</b>	<b>14</b>	<b>53</b>	<b>193</b>





# Appendix B

## Design and Graphic Standards

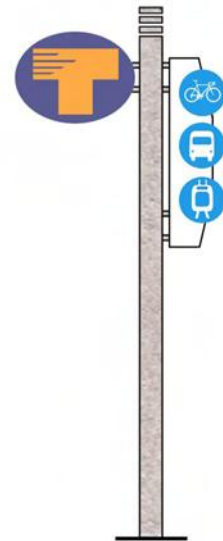
## V. DESIGN & GRAPHIC STANDARDS

### Design Standards

In this section we will present design standards for the three types of bike and transit facilities recommended for sites in the Central Puget Sound region. The three facility types are modular, adaptable to various sites, and easy to develop from one Phase to the next as demand grows. Details such as layout may vary from site to site, while technical specifications and materials remain constant.

These three types are defined as Type I Basic; Type II Bike Depot; and Type III Bikestation. Application of the level of service evaluation methods outlined earlier in this report will define the appropriate type of facility for the particular site under consideration.

Following the location guidelines and architectural design standards are pages devoted to graphic identity standards. These graphic elements relate the bike and transit facilities to Sound Transit's established graphic identity, maintaining a consistent image throughout the region.



Included with this document are detailed construction plans and drawings for the type I and II facilities. These can be found in the pocket on the inside cover of this binder.

### ***Location Guidelines***

The proper location of a Bikestation on any given site is essential to preserving the safety of both the bicyclists using the facility and their fellow transit users who are on foot. The following guidelines define primary considerations for selecting the location of bike parking on a given site.

- The bike parking facility should be located to allow for safe bicycle access to the facility across the site. Where such access uses roadways that are shared with motor vehicles, the bicycle way should be indicated through striping or signage.
- The bike parking facility should be located as close as is practical to the transit boarding platform. If the bike parking facility is focused more on serving surrounding workplaces, then the facility should be located as close as is practical to the primary entrances of the buildings housing this employment.
- Placement of the bike parking facility should avoid creating a “desire line” that would result in cyclists riding through an area intended strictly for pedestrians in order to access the bicycle parking.



## ***Architectural Standards***

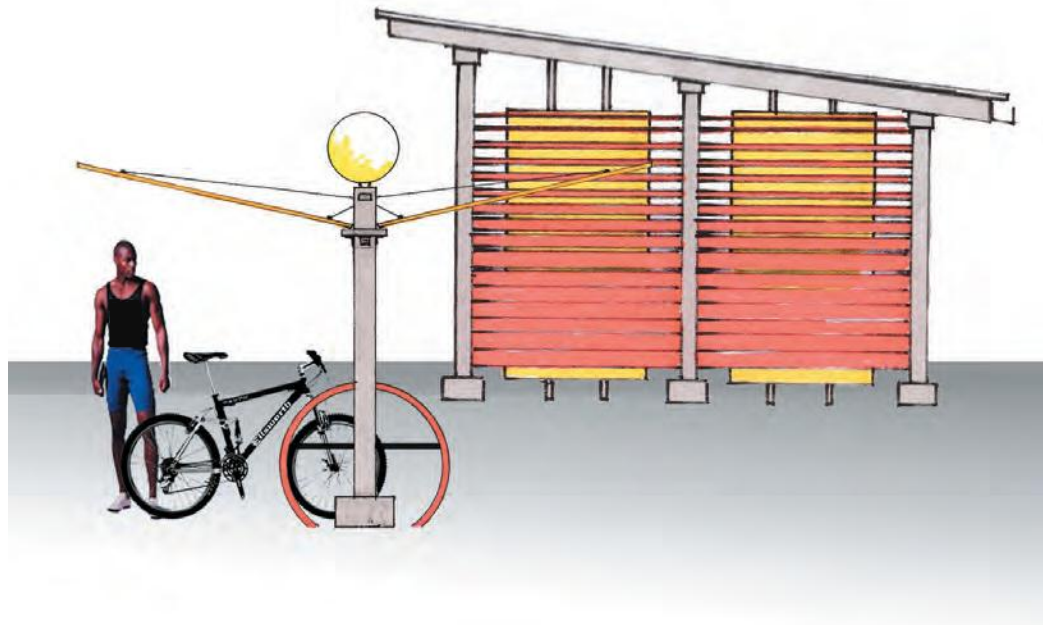
### **Materials and Construction**

The Bikestation material and construction standards proposed here are cost-effective, as well as ecologically and socially friendly by design. Through the use of simple materials such as concrete, metal and color, the structures will be kept inexpensive to construct, easy to maintain and inexpensive to operate.

Taking full advantage of government programs that encourage the use of recycled and sustainable materials can help save construction cost in addition to realizing the life cycle cost savings associated with these types of materials.



Custom building parts made from recycled bicycle components from sources such as Seattle's Resource Revival will make good use of resources and add to the ambiance of the Bikestations. In addition, great energy, color, light, and activity are achieved in the design with racks, signage, banners, and awnings.



*Naturally, security is a key to the success of a Bikestation. All of these facilities are designed and detailed to be secure and exceptionally durable public amenities.*

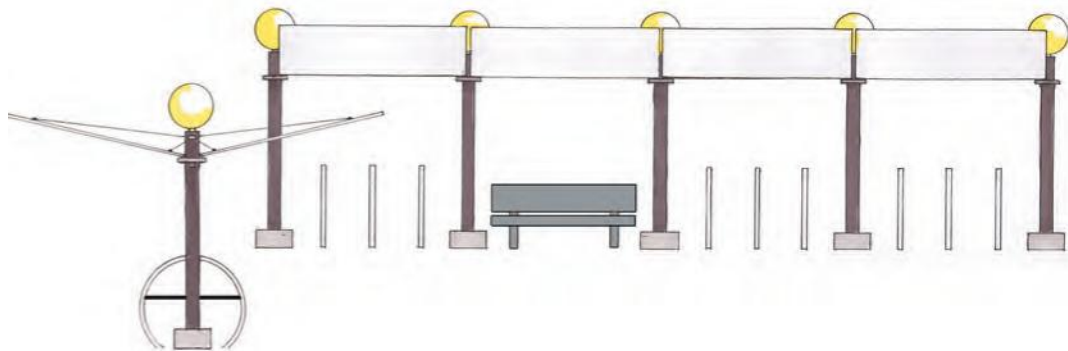
## Color



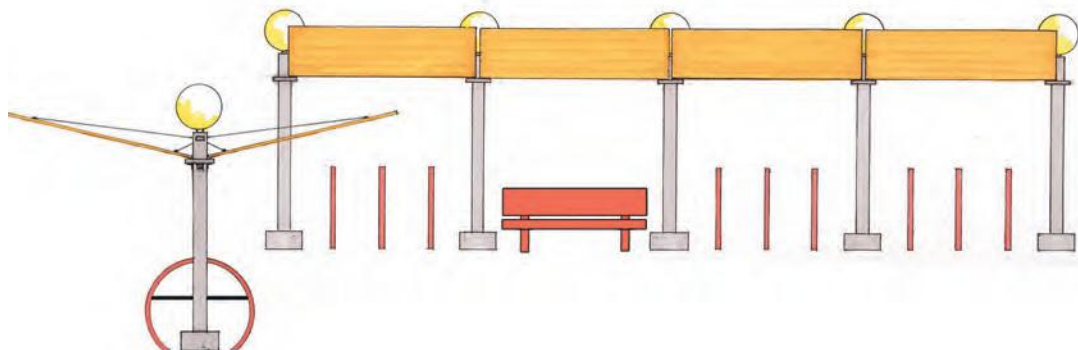
Some Bikestations will be directly adjacent to or even part of regional transit facilities, while others may be freestanding and more independent. Some will be in newly developed park-and-ride lots flanked by modern office buildings, while others may be required to fit neatly into residential or historic neighborhoods.

In anticipation of these varied relationships to neighborhood and context, two baseline color schemes and variations to those schemes are recommended here.

The Traditional color scheme is intended to harmonize with older neighborhoods while retaining a clear Bikestation identity. Primary colors in the scheme are silver, black, and perhaps a bit of red, with a glowing white light on the posts.



The Space Age scheme ties in more directly with Sound Transit and existing Bikestation Coalition colors, featuring a bright red taken from Sound Transit's signs, blue and orange from current Bikestation Coalition graphics, and modern bright metal structure.



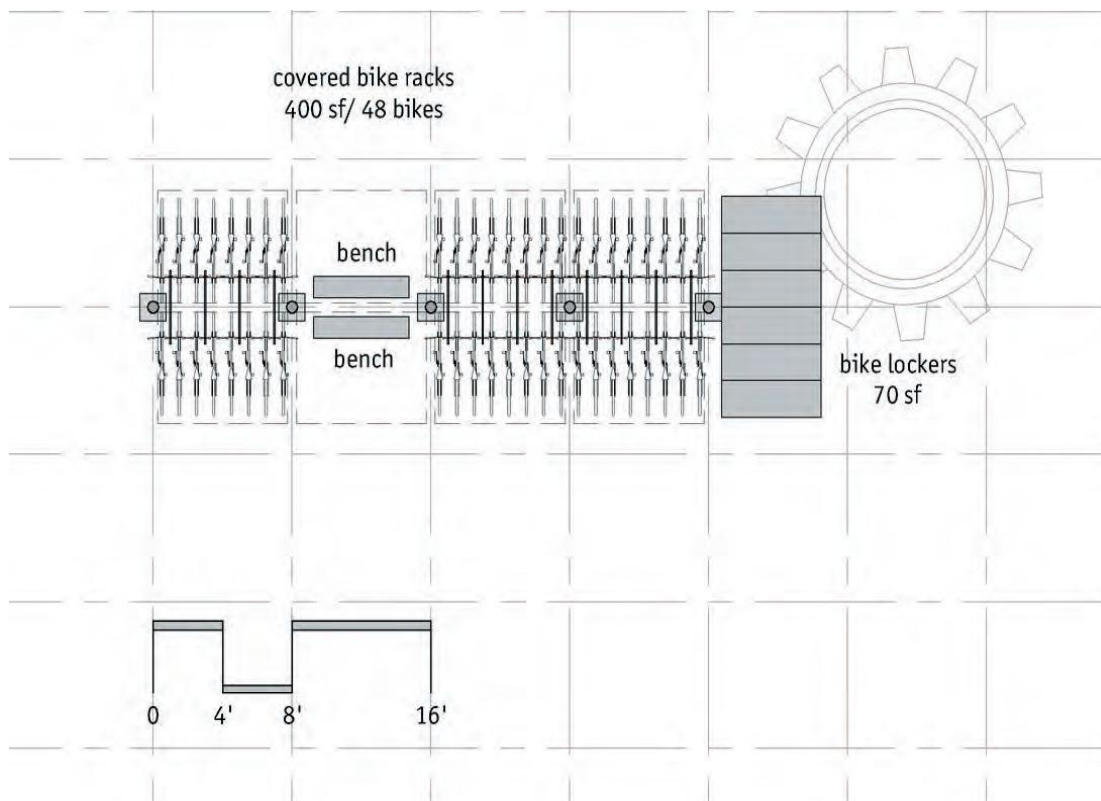


## **Facility Types**

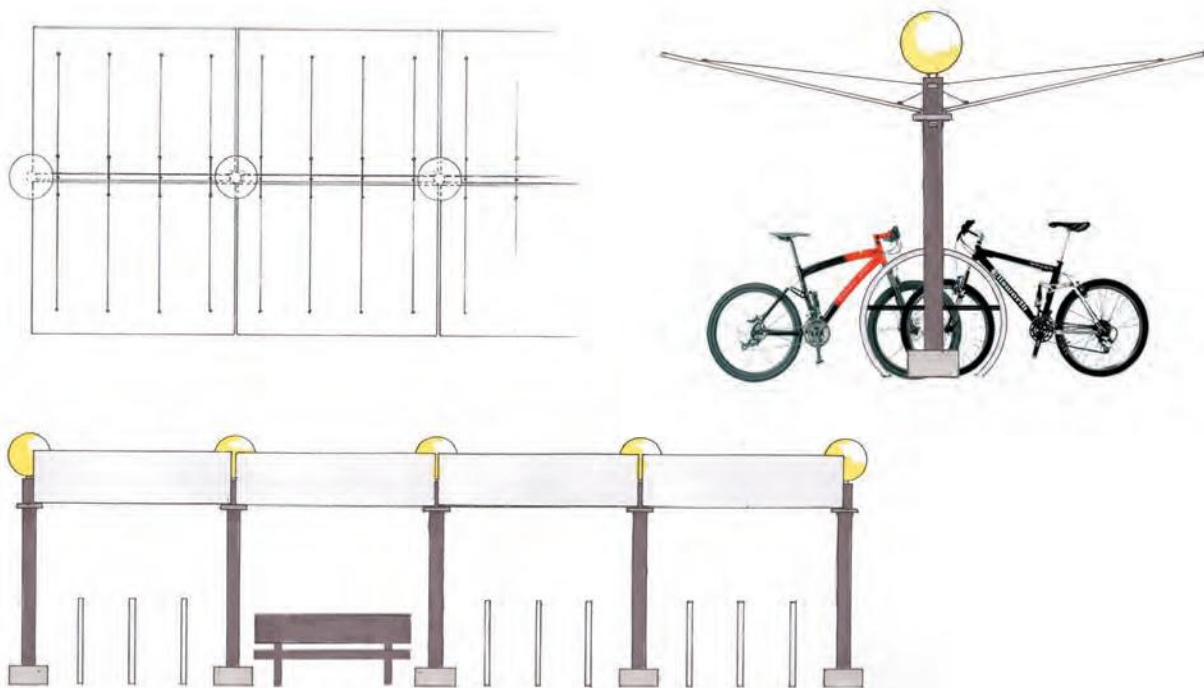
### ***Type I Basic***

Type I is a modular system combining lighting and structured covered bicycle parking. Each eight foot length of Type I parking will safely house up to 16 bicycles. It is easy to provide lockers at a Type I facility. Lockers can be under cover or placed at the end of a row of covered parking, as budgets and site factors dictate.

Type I facilities will fit into any context. They are presented as simple machines, and with color can blend or stand out as appropriate. Signage and details will relate the facilities to Sound Transit, but at the same time are intended to work with any transit agency's facilities.

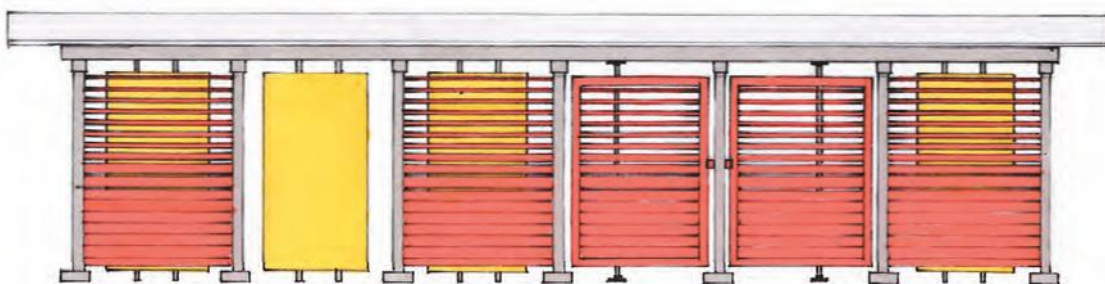


*This Type I facility is the simplest in its class, providing covered bicycle parking and lockers with good lighting for safety. Another possible Type I would be an unattended bike cage, with or without passcard access.*



*Basic racks and covers come in eight foot modules for easy adaptability to various sites and levels of demand. One or two sections can be built at first, then sections can be added as demand grows. Sections can cover racks, lockers, coffee carts, seating, and other amenities as needed, and will blend neatly into any context. Benches in one section provide convenient, out-of-the-weather changing space for riders.*

A higher-service variation on Type I Basic is a bike cage which provides far more protection than covered parking alone can, but which still has no attendant. The cage can be fitted with a gate and electronic passcard access to provide higher security unsupervised parking. With the addition of a coffee cart or other daytime activity, the cage can become a Type II facility.



*The unattended cage is another Type I facility, but a far more substantial one. The cage can easily grow into a Type II or even a full Bikestation, with the addition of selective access, attendants, and the other physical components of a Bikestation.*

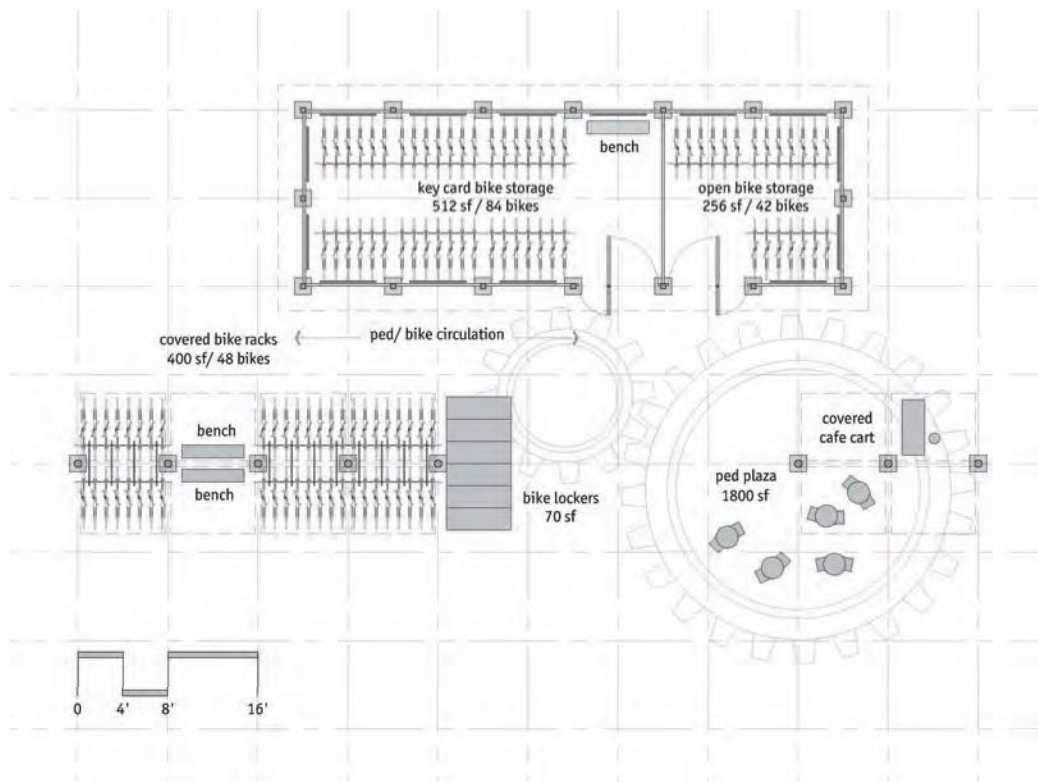


## Type II Bike Depot

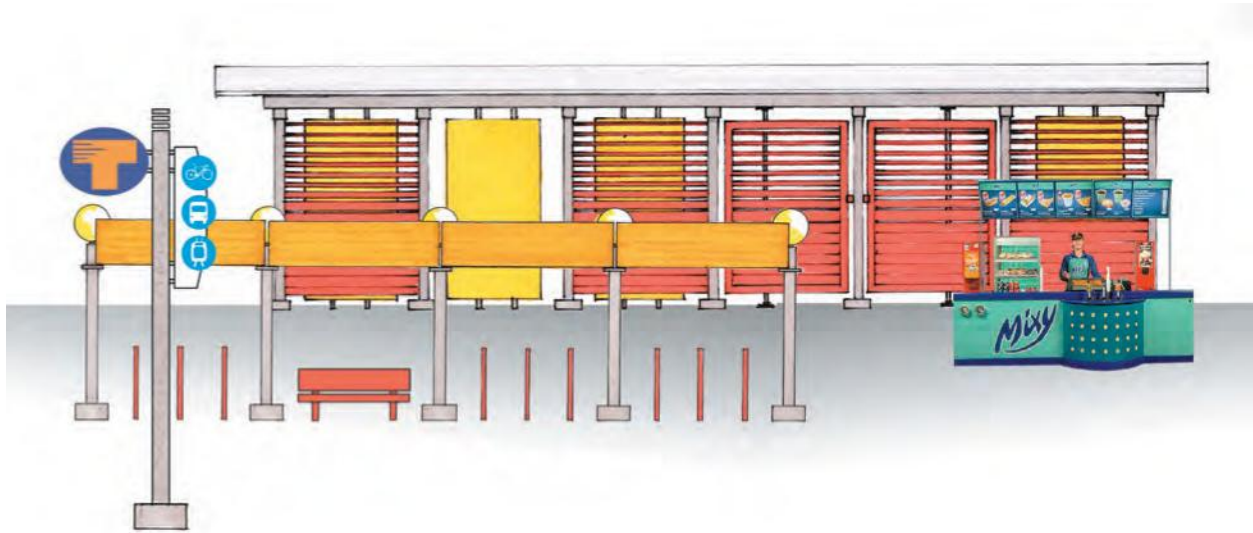
The primary difference between Type I and Type II facilities is the presence of people during the day. Type II facilities can grow from Type I or be built as Type II from the start.

Type II facilities feature:

- Adjacent retail or institutional activity to provide supervision of the parking area
- Covered parking, at racks and in a cage
- Bike Lockers
- Available information on regional and local bicycling resources (story panels)
- Possible vending machine sales of commonly needed supplies
- Air hose
- Drinking water



*This Bike Depot provides covered parking, lockers, and a storage cage in addition to social space and snacks. Lower- cost Type II facilities may provide either covered parking or the cage; what makes them Type II is the presence of a coffee cart or other daytime use at the facility. This is an example of how bicycle facilities can grow with demand. The Type I parking could be built first, then extended to house the coffee cart, then later, when the site gets busier, the cage can be built, making it a full Type II facility.*



*A fully built out Type II featuring covered parking, lockers, benches for sitting/changing shoes, a cage, and retail in the vicinity.*

There is flexibility in the definition of a Type II facility. The crucial element is the security provided by the presence of people all day, whether they are there selling coffee, dry cleaning service, or day care.

A simple Type II facility could be achieved with covered parking alone, as long as a retail presence is adjacent. A more secure, protected Type II facility would include a bike cage. This is a steel structure with either open storage or passcard access.



## ***Type III Bikestation***

The Bikestation offers the highest level of service and support for bicyclists proposed. Bikestations are typically located at key access points on transit corridors.



Services and amenities you will find at a Bikestation include:

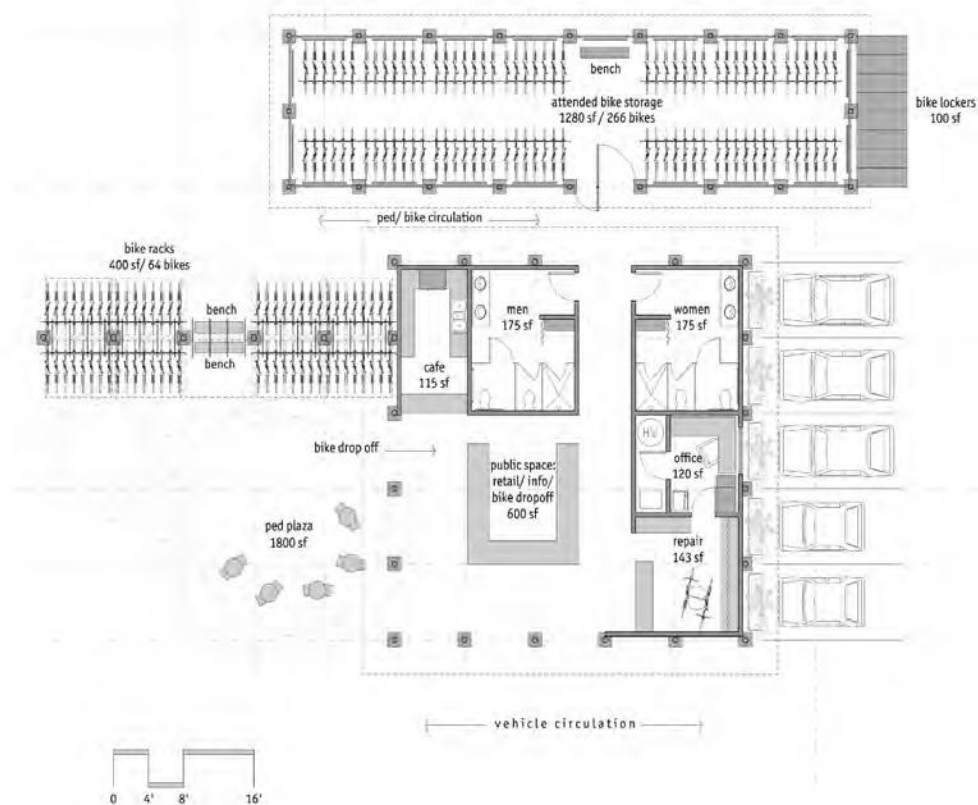
- Staffed free bicycle parking
- Changing rooms and benches
- Bicycle repairs
- Sales of bicycle commute accessories
- Coffee and Snacks
- Amtrak Bike Boxing (where applicable)
- Transit Information

Optional elements:

- Flexcar Pickup
- Bike Rentals
- Rental of alternative fuel “station cars” and other vehicles
- Showers and clothing lockers
- Organization offices or meeting rooms
- Storage for bicycles recovered from transit lost and found (bike and ride) programs



*A full service Bikestation has racks, a cage accessed only by the attendant, lockers, social space, bike rentals, community information and, if it is a Clean Mobility Center, Flexcars and more.*

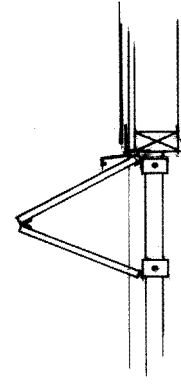


*This fully built-out Bikestation has space for Flex Cars, a full bike shop and cafe, dining space on the plaza, bike rack parking for 64 bikes and a cage that can hold up to 300 bicycles. This facility is conceived as a community gathering place, a focus for the cycling and non-cycling community alike.*

Bikestation layouts have the following features:

- Bicycle parking is shown in an unheated space, while areas where people gather would be heated.
- Initial sizing of the bike parking area should be modest but easily expandable. Such an undersizing approach can minimize the chance for negative public relations associated with low utilization during the start-up period.
- The layout allows flexibility for the addition and removal of amenities that are more experimental, such as showers.
- The layout takes into account the unique space and circulation requirements of services that involve short periods of intense activity at peak times. These include attendant bicycle parking and bicycle rental.
- Cafe service at a Bikestation is located to minimize internal circulation conflicts.





*A detail of the awning/entry assembly*



*A fully built-out Bikestation features full services, signage that relates it to Sound Transit and the Bikestation Coalition, a variety of types of bike parking and an attendant on site every day.*

## Graphic Standards

The intent of the signage and environmental graphics proposed for the Bikestations is to allow the stations to stand out as clearly identifiable facilities, with an image and iconography that is unique, while visually and functionally linking the Bikestations to regional and local transit agencies.

Two types of graphics will be addressed: marketing materials and signage.

### **Marketing Materials**

Marketing materials are limited at this point to logos and basic graphic elements for brochures, bulletin boards, publications and story panels. The logos coordinate with those of the Bikestation Coalition, and are consistent with logos for Bikestations all over the United States.



*These logos will help people recognize that their local Bikestation is part of a national system of visionary bicycle/transit facilities. They will help identify participating transit agencies as advocates of cyclists and clean mobility in addition to the buses and trains we usually associate with Sound Transit.*



## Signage

Bikestation signage is simple. We propose a three-part system of building signs, story panels, and transit signs.

The **building signs** are the only ones that break from Sound Transit standards. For a cost-effective, fun method of identifying the Bikestations, we propose lighted letters placed on the tops of the buildings, along the edges of the roofs.

**Story panels** (see right) offer the most flexibility and room for expression. These panels are part architecture, part marketing, and part public relations.

They should be placed in locations around the Bikestations where they can provide shade, information, and/or protection from the wind or cars. The content will vary. Some could be used as kiosks; others will have prepared images and information on them.

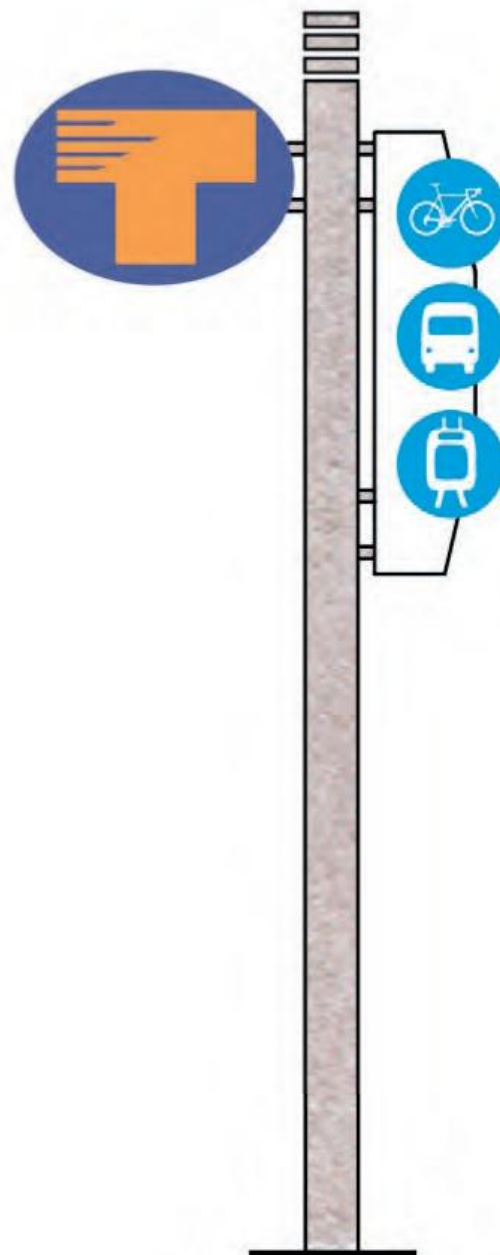
For example, for King Street Station in Seattle, we proposed using story panels to describe the long civic history that cycling and transit share in the Puget Sound region. *As an alternative, other panels can present general transit information for Bikestation patrons.*





**Transit signs** match Sound Transit standards to the letter.

We propose a bike sign in the language of Sound Transit's Bus and Light Rail signs, which can be used wherever needed in transit facilities and Bikestations.







# Appendix C

## Proposed Bicycle Parking Revisions to the Miami-Dade County Code of Ordinances



## Chapter 33 Zoning

### Article VII. Off-Street Parking

#### Sec. 33-122.3 Requirement of bicycle racks or other means of storage at certain parking lots

Sec. 33-122.3. Requirement of bicycle racks or other means of bicycle storage.

Racks or other means of storage that can secure at least ~~four (4)~~ two (2) bicycles shall be required for all government facilities, park, shopping center, office and restaurant uses with parking lots, as follows:

(a) Quantity of bicycle parking spaces required:

For all land uses except the ones listed under (b), the following bicycle parking requirements shall apply:

Total Parking Spaces in Lot	Required Number of Bicycle Parking Spaces
<u>1 to 25</u>	<u>2</u>
<del>25</del> <u>26</u> to 50	4
51 to 100	8
101 to 500	12
501 to 1000	16
over 1000	four (4) additional spaces for each 500 parking spaces over 1000

(b) For the uses listed under this subsection the following bicycle parking requirements shall apply:

- Elementary schools, Middle schools, Senior high schools, vocational or trade schools, colleges, public, private or parochial – 50 percent of the required number of motor vehicle parking
- Dormitories, fraternities and sororities – 50 percent of the required number of motor vehicle parking
- Public or private transportation facilities – 20 percent of the required number of motor vehicle parking
- Sports and Recreation Facilities (parks, playgrounds, racquetball, tennis and similar court facilities) – 20 percent of the required number of motor vehicle parking



# Automated BICYCLE

## Rental System and Parking Plan Study



~~(b)~~ (c) Other uses. All other uses, other than airport or seaport terminals, single family, duplex or townhouse which are exempt, shall provide racks or other means of storage as provided herein only where their total parking lot has one hundred one (101) or more spaces.

~~(e)~~ (d) Location and design of bicycle parking spaces.

(1) The bicycle parking spaces shall be located ~~near~~ within 50 feet of the main entrances to the building or located as close or closer than the nearest motor vehicle parking space.

(2) At buildings and shopping centers that have multiple parking lots, the bicycle parking spaces should be installed near the entrances to the buildings served by the lots.

(3) The bicycle parking spaces should be in a highly visible, well lighted location that provides enough clear space to facilitate easy use and does not impede pedestrian traffic or handicap accessibility and is protected from the weather to the extent practically possible by being located under roof overhangs and canopies.

~~(4) The parking spaces may not be placed in the County maintained right-of-way. No private bicycle parking required by this section may be placed in the public right-of-way.~~

(5) Bicycle parking installations should permit the support of the bicycle with at least two points of contact and ~~The~~ the design of the bicycle rack should permit the locking of the frame and at least one (1) wheel with a standard size "U" lock and accommodate the typical range of bicycle sizes.

(6) The bicycle rack must resist removal, must be solidly constructed to resist rust, corrosion and vandalism, and must be properly maintained.

~~(d)~~ (e) Other acceptable forms of bicycle storage. At the owner's option, bicycle parking may also be installed in the form of storage rooms, lockers or cages.

~~(e)~~ (f) Signage and markings. All bicycle parking spaces shall be posted with a permanent and properly maintained above-ground sign which shall conform to the figure entitled "Secured Bicycle Parking" hereby incorporated into this section. The bottom of the sign must be at least five (5) feet above grade ~~if when~~ attached flush to a building ~~which may not be installed in the County~~

# Automated BICYCLE

## Rental System and Parking Plan Study



maintained right-of-way. The bottom of the sign must be at least eight (8) feet above grade for a detached sign. No private bicycle parking sign required by this section may be placed in the public right-of-way. No permit shall be required for such signs.

(g) Bicycle parking facilities. Off-street bicycle parking facilities in multi-family and non-residential zoning districts shall include a bicycle parking area in a convenient location to encourage the use of bicycles. Required bicycle parking facilities shall be designed, constructed and maintained in accordance with this ordinance and the Miami-Dade County Public Works Design Standards. Where not specified, both short term and long term parking facilities are permissible. Long term facilities are required at large employment centers and major transit hubs, as determined by the applicable development review board or commission.

(1) Short term parking. "Short term bicycle parking" shall mean a stationary parking device on a concrete surface, which adequately supports the bicycle with at least two points of contact and must hold at least 180 degrees of the wheel arc. The approved short term bicycle parking rack design shall be of the following rack styles or their functional equivalents: the "Inverted-U" rack, the "Post-and-Ring" rack, and the "Swerve" rack.

- a. The "Inverted-U" bicycle rack and the "Swerve" bicycle rack shall be designed to park two bicycles, facing in opposite directions, parallel to the rack. Each "Inverted-U" rack and "Swerve" rack shall count as two (2) bicycle parking spaces when installed properly. Each bicycle parking space shall be a minimum of two (2) feet wide and six (6) feet long. Racks in a parallel series need to be 4 feet apart to provide adequate access to each bicycle. If adjacent racks are spaced less than 4 feet apart, they shall be counted as one (1) bicycle parking space, not two. The "Inverted-U" rack and the "Swerve" rack shall be a minimum of 30 inches long. The height of the "Inverted-U" rack and the "Swerve" rack shall be approximately 30-36 inches.
- b. The "Post-and-Ring" bicycle rack shall be a minimum of 18 inches in diameter and the bottom of the ring shall be a minimum of 12 inches above the ground. Each "Post-and-Ring" rack shall count as two (2) bicycle parking spaces when installed properly. Each bicycle parking



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space shall be a minimum of two (2) feet wide and six (6) feet long. Racks in a parallel series need to be 4 feet apart to provide adequate access to each bicycle. If adjacent racks are spaced less than 4 feet apart, they shall be counted as one (1) bicycle parking space, not two.

- c. All short-term parking facilities shall have a minimum of eight feet of overhead clearance
- d. All short-term parking spaces shall be designed with an access aisle of at least 48 inches in clear width as measured from tire-to-tire or from wall-to-tire as applicable.

- (2) Long term bicycle parking. "Long term bicycle parking" shall mean a locker consisting of a fully enclosed lockable space accessible only to the owner/operator of the bicycle, attendant parking with a check-in system accessible only to the attendant(s), a secure, lighted, covered area, or a locked room or office inside a building. The bicycle lockers shall provide secure locking mechanisms that store bicycles with protection from the elements. Existing developments that do not have the necessary space on site to provide for secure bicycle lockers can accommodate long term bicycle parking by converting an existing easily accessible room as a bike room or locker room. Other long term bicycle parking facilities that meet the intent of this Code shall be reviewed and can be accepted by the applicable development review board or commission on a case-by-case basis.

~~(f)~~ (h) Application to existing uses. All property owners of existing establishments that are required by this section to provide bicycle parking spaces shall comply within one (1) year from the effective date of the ordinance from which this section derives and shall be responsible to maintain such facilities. Existing multi-family uses are exempt from this subsection.



# Appendix D

## Bicycle Parking Guide



# BICYCLE RACK DESIGNS

## PREFERRED DESIGNS



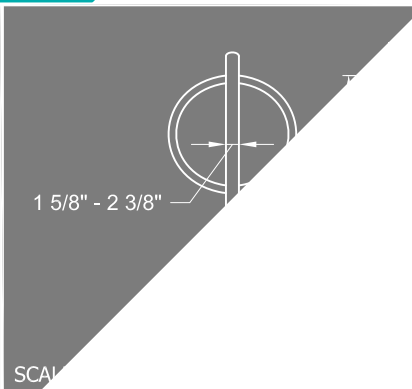
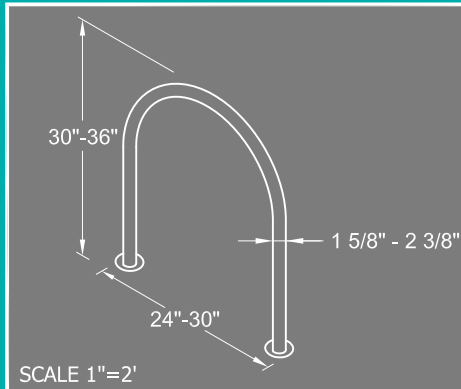
INVERTED - U



POST - AND - RING



SWERVE



## RACK ELEMENTS

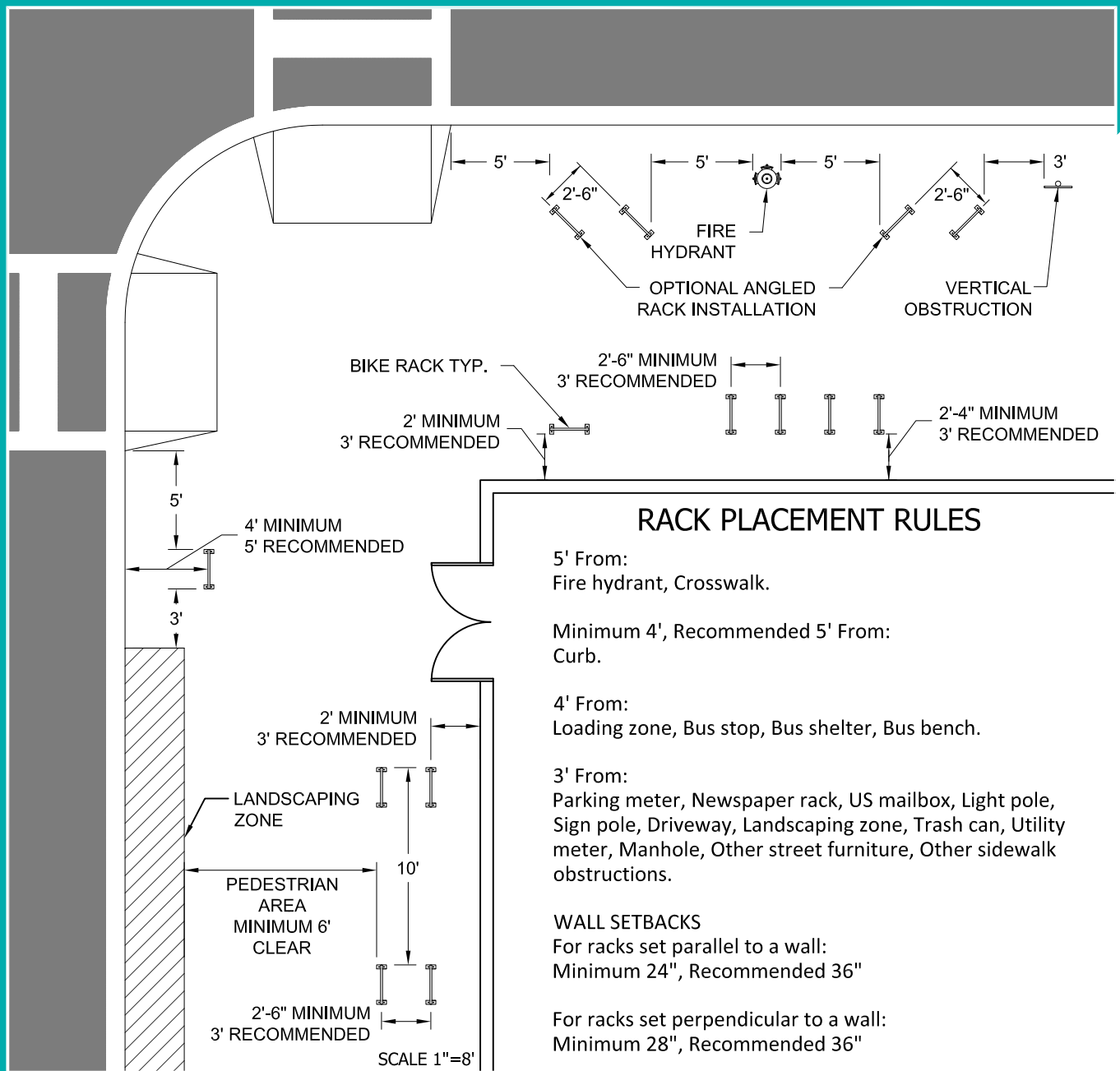
The bicycle parking rack must:

- Permit the support of the bicycle with at least two (2) points of contact with the frame.
- Permit the locking of the bicycle frame and at least one (1) wheel with a standard size U-lock.
- Allow the parking of two (2) bicycles, facing in opposite directions, parallel to the rack.
- Be securely anchored on a hard surface with theft-resistant hardware.
- Be located within fifty (50) feet of a building's main entrance (for on-site bicycle parking), or closer than the nearest motor vehicle parking space.
- Provide an overhead clearance space of at least eight (8) feet.
- Provide an access aisle of at least four (4) feet.

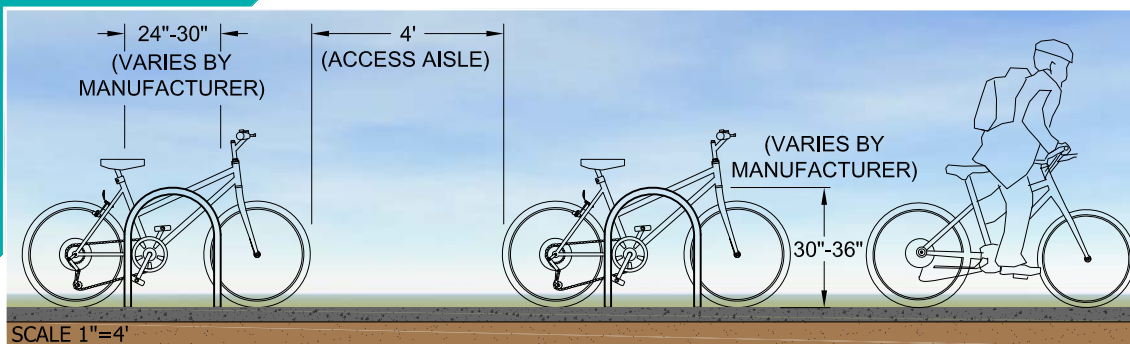
## UNACCEPTABLE DESIGNS



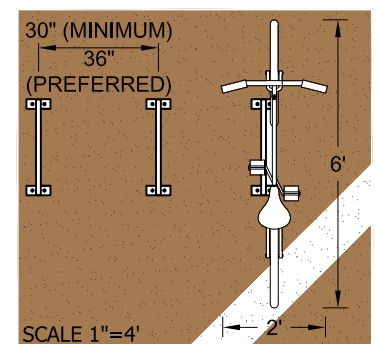
# BICYCLE PARKING RACK PLACEMENT



## SIDE VIEW



## SIDE BY SIDE RACKS





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