



MEMORANDUM

Date: September 17, 2013

To: David Anspacher, Planner Coordinator, M-NCPPC

Organization: M-NCPPC, Functional Planning and Policy Division

From: Robert Patten, Senior Planner; Bryan Barnett Woods, Planner; Daniel Biggs, Landscape Architecture Practice Leader; Jeff Ciabotti, Senior Planner;

Project: Bicycle and Pedestrian Technical Assistance for Bethesda Purple Line Station
Minor Master Plan Amendment

Re: Assessment of bicycle parking demand at Bethesda Station South

This document explains how bicycle parking demand projections were developed for Bethesda South Station, at the location of the planned South Entrance to the Red Line and the planned Purple Line station. These projections will help determine the amount and types of bicycle parking infrastructure required to meet potential demand. Future bike parking infrastructure at Bethesda Station South will serve three constituencies:

- 1) Transit users who will ride the Red Line
- 2) Transit users who will ride the Purple Line
- 3) Individuals who live and work near the train station in the Bethesda Central Business District (CBD), and would switch transportation modes to bicycling if a secure, convenient, and high quality bike parking service existed.

The 2030 projection for the Red Line is from the WMATA Bike Parking Forecasting Study – Station Level and estimates that 4,151 people will board the Red Line during the AM peak period. Furthermore, the Red Line projections also account for the additional entrance created by the new Bethesda South Station. Considering the likely origins and destinations of bicycle trips to the Red Line, and the new condition of both a North and South Station entrance, Toole Design Group (TDG) planning judgment estimates that Red Line access demand for bike parking be split 87.5% / 12.5% between the South and North Entrances, respectively.

The 2030 projection for the Purple Line is from the 2013 adjusted ridership summary, which is part of the Bethesda Station South Entrance Alternative Station Concept (7/23/13) Elevator Simulation Calculations report prepared by MTA, and estimates that 1,047 people will board the Purple Line during the AM peak period. Since the only entrance to the Bethesda Purple Line will be from the southern station, it is assumed that all Purple Line AM peak boardings will arrive by the southern entrance. These projections exclude individuals who transfer between the two lines, ensuring that the projections only include individuals that arrive at the station.

The third projection used is the AM peak hour incoming motor vehicle trips into Transportation Analysis Zone (TAZ) 637, which includes Bethesda Station South and is representative of the Bethesda CDB. This projection is derived from the Metropolitan Washington Council of Governments Cooperative Land Use Forecasts Round 8.0 for TAZ 637 and vehicular trip generation rates in the Planning Department’s LATR guidelines for Bethesda. It estimates 2,867 inbound AM peak hour trips in 2010 and 3,353 inbound AM peak hour trips in 2040.

Since predicting future bike parking needs at transit stations is not an exact science, a range of estimates are provided based upon how aggressive the County would like to generate bike-transit trips. There are four estimates measuring the potential bicycle parking demand for the Bethesda Station South in 2030:

- 1) no change in the current bike access rates (low estimate¹)
- 2) a conservative growth in bike access rates (medium estimate²)
- 3) growth based on WMATA 2030 system wide goal for bike access of 3.5%, which is also consistent with APBP guidelines (standard estimate³), and
- 4) a goal-based growth in bike access adjusted for the presence of a high quality trail access demand (high estimate⁴)

2030 Bethesda South Station Bike Parking Projections

	Projected Bicycle Parking Demand
Low Estimate	140
Medium Estimate	266
Standard Estimate	486
High Estimate	657

¹ Currently, there is a 2.3% bicycle access rate at the Bethesda Metro Station; from 2010 WMATA Metrorail Bicycle & Pedestrian Access Improvement Study.

² The medium estimate assumes that 5% of AM peak boardings will be individuals arriving to the station by bicycle.

³ The standard estimate assumes that 9.7% of AM peak boardings will be individuals arriving to the station by bicycle.

⁴ The high estimate assumes 12% of AM peak boardings will be individuals arriving to the station by bicycle.

The WMATA 2030 3.5% goal and the National APBP Guidelines

WMATA has set a goal of 3.5% bicycle access system-wide for 2030⁵. However, since each station has a proportionately different share of bicycle ridership, each station will need to achieve a unique rate of bicycle access to achieve the goal system-wide. Since Bethesda Station has a higher than average share of transit riders, its rate of bicycle access is also higher. To meet the system-wide 3.5% goal, 9.7% of Bethesda Red Line users will need to arrive by bicycle⁶. Other stations served by major trail systems comparable to the Capital Crescent Trail have even higher indexes. See table below.

<u>Station Name</u>	<u>Trail Names</u>	<u>Bike Parking Need Index</u>
College Park	Anacostia Tributaries Trail System	19.5%
East Falls Church	Custis / 4-Mile Run / W & O D Trail Systems	13.0%
Medical Center	Bethesda Trolley Trail and Rock Creek Trail	28.8%
West Hyattsville	Anacostia Tributaries Trail System	12.3%

Additionally, the national guidelines for a rail station in an urban high demand area, like Bethesda Station, recommend supplying bicycle parking infrastructure for nine percent of AM peak boardings⁷. The nine percent is composed of two percent parking for short-term bike parking and seven percent for long-term or commuter bike parking. Bethesda Station South will need 352 bike parking spaces to account for a 9.7% bicycle access for the Red Line. Finally, the twelve percent projection is a conservative estimate based on the chart above representing other stations served by trails systems in this region.

Bicycle Demand Projections Conclusion

To meet the low and medium projected demands, the Bethesda Station South will need to supply bicycle parking infrastructure for 140 and 266 bicycles, respectively. However, neither of these levels of infrastructure will meet WMATA's 3.5% bicycle access goal, nor adhere to national standards. In order to achieve WMATA's goal, as well as attain national standards, it is recommended that Bethesda South Station supply bicycle parking infrastructure for at least 9.7% of AM peak boardings for the Red and Purple Lines or at least 486 bicycle parking spaces to accommodate the projected 2030 daily use. Moreover, it is recommended that Bethesda South Station allocate space for 12.0% of AM peak boardings for the Red Line and Purple Line or 657 bicycle parking spaces to be able to fully accommodate any increase in bicycle parking demand resulting from improvements to the Capital Crescent Bike Trail.

⁵ WMATA Board of Directors, Resolution 2011-10

⁶ The methodology for projecting 2030 Bike Parking capacity needs are based on 2007 customer service survey data and 2010 bike parking census data to establish a bike parking share index (multiplier) for each of 86 Metrorail Stations. Bethesda's need is based upon a 9.7% bike arrival rate for projected 2030 AM peak boardings.

⁷ National Association of Pedestrian and Bicycle Professionals, Bicycle Parking Guidelines 2nd Edition 2010.

Space Requirements for Bicycle Parking Projections

In addition to projecting the bicycle access demand for Bethesda Station South, it is also necessary to account for the amount of space required to park and access those bicycles. To accurately determine the space requirements, the type of bicycle parking infrastructure must be identified. The WMATA Pedestrian and Bicycle CIP⁸ lists criteria and recommendations for the best mix of parking equipment types based on the type of Metrorail Station. There are four types of parking infrastructure recommended:

- 1) Covered/Unsecure U-Rack parking
- 2) Standard Bicycle Lockers
- 3) On Demand Lockers
- 4) Two-Tiered High Capacity Bike Parking

Covered/Unsecure U-rack parking is the common outdoor bike rack which resembles an inverted 'U' shape and is attached to the sidewalk. U-racks are self-serve units. Two bicycles can be secured to the rack at once and bicyclists can lock and un-lock their bicycles at any time. Although very convenient, this type of parking infrastructure is less secure than other available types.

Standard bicycle lockers are metal or hard-plastic lockers that can store one or two bicycles. Although standard bike lockers are also self-serve units, they are reserved specifically for one person who has the key to the locker and can use the locker at his or her convenience for a fixed amount of time. Standard bicycle lockers are more secure than other types of parking infrastructure, but they are the least convenient for the general public and require a significant amount of space.

Similar to standard lockers, on demand lockers are self-serve units that hold one or two bicycles and can be accessed at a cyclist's convenience. However, these lockers are available at a first come first serve basis and usually use a key-code to lock or unlock the locker. Additionally, on demand lockers can be programmed to meet the varied needs of cyclists and bike stations, such as reserving an on demand locker to be used as a standard for a set amount of time, or varying the price of using the locker to meet demand. On demand lockers are as secure as standard lockers and are more convenient for the general public, but these lockers still require a significant amount of space.

Two-tiered high capacity bicycle parking is a self-serve or valet service bicycle parking infrastructure that stacks an additional row of bicycles above the ground level and are common among bike stations. These racks can be used as reserved and secured spaces or as on demand bicycle parking in areas with high bicycle activity. The security of the two tiered rack depends on the location – a bike station, open access lot, or valet lot. However, the two-tiered rack requires much less space than the bicycle locker or the u-rack, which can make space available for additional bike facilities or other uses.

The following projections reflect two mixes of bike parking types. In the WMATA Pedestrian and Bicycle CIP, Bethesda is identified as a Regional Urban Center and the first set of projections are based on the WMATA recommended mix for train stations in regional urban centers and it includes:

- 1) 50% Covered/Unsecured U-Rack Parking
- 2) 5% Standard Bicycle Lockers

⁸ A memo for the Pedestrian and Bicycle CIP, "Criteria for determining the best mix of parking equipment types for Metrorail stations" Oct. 2011 identifies Bethesda Station as a Regional Urban Center.

- 3) 15% On Demand Lockers
- 4) 30% Two-Tiered High Capacity Parking

The second set of space requirements represents a mix of bike parking equipment that emphasizes high capacity bicycle parking; it eliminates all lockers, and halves the amount of u-rack parking. The second mix includes:

- 1) 25% Covered/Unsecured U-Rack Parking
- 2) 0% Standard Bicycle Lockers
- 3) 0% On Demand Lockers
- 4) 75% Two-Tiered High Capacity Parking

The space requirements are derived from the sizes of existing bike parking infrastructure used at other WMATA rail stations and include space to maneuver the bicycle into the parking space. The maneuvering space is determined by the width of the bicycle parking spot by the average length of bicycle (six feet). Additionally, these projections include a 10% contingency space.

Bethesda Station South Bike Parking Square Footage Projections

	Low Estimate	Medium Estimate	Standard Estimate	High Estimate
WMATA Recommendation Mix	2,866	5,461	9,979	13,501
High Capacity Parking Mix	1,848	3,522	6,435	8,705

Note: All numbers are in square feet.

Space Requirements Projections Conclusion

In order to achieve WMATA’s bicycle access goals, attain national standards, and maintain WMATA’s recommended parking mix it will be necessary to reserve at least 9,979 square feet of space solely for bicycle parking. Should Bethesda Station South adopt a higher-capacity mix for bicycle parking infrastructure, it can reduce the amount of required space by nearly 3,500 square feet to 6,435 square feet. Moreover, high capacity bike parking infrastructure can more readily be used for bicycle station parking, which can better accommodate a combination of self-serve and valet-service bike parking, or the space made available by higher capacity infrastructure can be used for additional bike facilities or other amenities at the train station.

Table X: Bicycle Parking Demand

			No change over 2013 bike access to transit rates. ¹⁰		Conservative Growth Estimate		Goal-Based Growth Estimate (WMATA) ⁴ , Consistent with National Guidelines (APBP) ⁵		Goal-Based Growth Estimate (Adjusted for High Quality Trail Access Demand Factor) ⁹	
			Low Estimate		Medium Estimate		Standard Estimate		High Estimate	
			2030 Demand Projection AM Peak (Transit Boardings/CBD arrivals)	Estimated Bethesda South Entrance Share of Red Line Bike Parking Demand	Percent of Bicycle to Station Trips	Count of Bike to Station Trips	Percent of Bicycle to Station Trips	Count of Bike to Station Trips	Percent of Bicycle to Station Trips	Count of Bike to Station Trips
Bethesda Station Red Line AM Peak Period Boardings ¹	4,151	87.5%	2.3%	83.5	5.0%	181.6	9.7%	352.3	12%	435.9
Bethesda Purple Line AM Peak Period Boardings (excludes transfers between Red Line and Purple Line) ²	1,047	NA	2.3%	24.1	5.0%	52.4	9.7%	101.6	12%	125.6
AM Peak Hour Incoming Motor Vehicle Trips (TAZ 637) ³	3,182	NA	1.0%	31.8	1.0%	31.8	1.0%	31.8	3.0%	95.5
Total Bike Parking Demand to be Supplied by an On-site Full-Service Bicycle Storage Facility at the new Bethesda South Station				139		266		486		657
AM Peak Bike Arrivals Needed to reach WMATA Red Line 2020 2.1% Target ⁷	229									
AM Peak Bike Arrivals Needed to reach WMATA Red Line 2030 3.5% Target ⁸	401									
¹ Bethesda Red Line 2030 AM Boardings Projection is from the 2011 WMATA Bike Parking Forecasting Study - Station level. Considering the likely origins and destinations of bicycle trips to the Red Line, and the new condition ² Bethesda Purple Line 2030 AM Boardings Projection is from the 2013 Adjusted Ridership Summary, part of the Bethesda Sta South Entrance Elevator Data Report (Does not include AM Peak Boardings to Purple Line generated ³ TAZ 367 2030 projection is based on the MWCOG Round 8.0 Total Motor Vehicle Trips (which uses a 2010 projection of 2,867 and a 2040 projection of 3,353). One percent of in bound AM Peak Hour motor vehicle trips to TAV ⁴ Percentage required (9.7%) for Bethesda Station to meet a system wide goal of 3.5% bicycle users ⁵ Standard % Estimate (Column H) is APBP's 7% for long term bike parking and 2% short term bike parking, for a rail transit station in an urban high demand setting; from Bicycle Parking Guidelines 2nd Edition ⁶ Incidental Bike Parking would include inverted-U racks placed on the street or in plaza areas at the entrance points to the Bethesda South Station, which may be used by those going to the building, to transit services or for ⁷ AM Peak bike Arrivals needed to Reach WMATA goals is from the 2011 WMATA Bike Parking Forecasting Study - Station level ⁸ Only the Standard and High estimates attain the WMATA Red Line 2030 3.5% target ⁹ WMATA's methodology for projecting 2030 Bike Parking capacity needs are based on 2007 customer service survey data and 2010 bike parking census data to establish a bike parking share index (multiplier) for each of 86 ¹⁰ Current bicycle access to the Bethesda Station is 2.3%; from 2010 WMATA Metrorail Bicycle & Pedestrian Access Improvements Study.										
	Station Name	Trail Names	Bike Parking Need Index							
	College Park	Anacostia Tributaries Trail	19.5%							
	East Falls Church	Custis / 4-Mile Run / W & O D	13.0%							
	Medical Center	Bethesda Trolley Trail and Rock	28.8%							
	West Hyattsville	Anacostia Tributaries Trail	12.3%							

Table X: Bicycle Parking Spatial Requirements (WMATA Parking Mix)

				No Growth Estimate		Medium Growth		Standard Growth ⁷		High Growth		
Total Bike Parking Demand to be Supplied by an On-site Full-Service Bicycle Storage Facility at the new Bethesda South Station				140		266		486		657		
WMATA Recommendation Mix¹												
		Bike Parking Infrastructure Attributes	Share of Bike Parking Mix	Area Required (Sq. Ft./Bike)⁶	No Increase in Capacity		Medium Capacity Increase		Standard Capacity Increase		High Capacity Increase	
Parking Type					Capacity	Area Required (Sq. Ft.)	Capacity	Area Required (Sq. Ft.)	Capacity	Area Required (Sq. Ft.)	Capacity	Area Required (Sq. Ft.)
Covered/Unsecured Inverted U-Rack ²		Self-Serve, unsecured, publicly accessible, moderate footprint	50%	20	70	1,395	133	2,659	243	4,858	329	6,572
Bicycle Locker ³		Self-Serve, secured, publicly inaccessible, large footprint	5%	29	7	204	13	389	24	711	33	962
On Demand Locker ³		Self-Serve, secured, publicly accessible, large footprint	15%	29	21	613	40	1,168	73	2,134	99	2,887
Two Tiered High Capacity Bike-n-Ride Parking ⁴		Self-Serve or valet, secured or unsecured, publicly accessible, small footprint	30%	9	42	393	80	749	146	1,368	197	1,851
Total Parking Capacity				140		266		486		657		
Area Needed for Bike Parking, including Maneuvering Space (Sq. Ft.)						2,606		4,965		9,072		
+ 10% Contingency Space						2,866		5,461		13,501		

¹ WMATA Recommendation is composed of 50% Covered Inverted U-Rack, 25-35% High Security Storage Area, 15-25% On-Demand Locker Capacity, and 0-5% Standard Lockers; from pedestrian and Bicycle CIP Criteria for determining the best mix of bike parking equipment types for Metrorail stations, 2011.

² Inverted U-Rack - 12 sq.ft. parking foot print and 8 sq. ft. of maneuvering space, at 36" rack spacing; derived from WMATA College Park Bike and Ride Facility

³ Double entry bike locker, containing two triangular interior spaces - 6.5ft x 3.166ft (20.58 sq.ft.) unit and 6ft x 3.166ft (19 sq. ft.) maneuvering space on either side of the locker; CycleSafe M02 Model

⁴ Two-tiered bike rack - 7.833ft X 5ft (39.166 sq. ft.) unit and 6ft x 10.5 ft (73.5 sq. ft.) maneuvering space; Dero, Dero Decker 1-Sided Model for 12 bicycles

⁵ High capacity bike parking mix doubles the space dedicated for two tiered bike parking

⁶ Area required includes footprint of parking infrastructure and six linear feet of maneuvering space

⁷ Standard growth estimate accounts for WMATA's 2030 3.5% bike accessibility goal, and is consistent with 2010 APBP bike parking guidelines

Table X: Bicycle Parking Spatial Requirements (High Capacity Parking Mix)

				No Growth Estimate		Medium Growth		Standard Growth ⁷		High Growth	
Total Bike Parking Demand to be Supplied by an On-site Full-Service Bicycle Storage Facility at the new Bethesda South Station				140		266		486		657	
High Capacity Bike Parking Mix⁵											
Parking Type	Bike Parking Infrastructure Attributes	Share of Bike Parking Mix	Area Required (Sq.Ft./Bike) ⁶	No Increase in Capacity		Medium Capacity Increase		Standard Capacity Increase		High Capacity Increase	
				Capacity	Area Required (Sq. Ft.)	Capacity	Area Required (Sq. Ft.)	Capacity	Area Required (Sq. Ft.)	Capacity	Area Required (Sq. Ft.)
Covered/Unsecured Inverted U-Rack ²	Self-Serve, unsecured, publicly accessible, moderate footprint	25%	20	35	698	66	1,329	121	2,429	164	3,286
Bicycle Locker ³	Self-Serve, secured, publicly inaccessible, large footprint	0%	29	-	-	-	-	-	-	-	-
On Demand Locker ³	Self-Serve, secured, publicly accessible, large footprint, programmable	0%	29	-	-	-	-	-	-	-	-
Two Tiered High Capacity Bike-n-Ride Parking ⁴	Self-Serve or valet, secured or unsecured, publicly accessible, small footprint	75%	9	105	983	199	1,872	364	3,421	493	4,628
Total Parking Capacity				140		266		486		657	
Area Needed for Bike Parking, including Maneuvering Space (Sq. Ft.)					1,680		3,201		5,850		7,914
+ 10% Contingency Space					1,848		3,522		6,435		8,705

¹ WMATA Recommendation is composed of 50% Covered Inverted U-Rack, 25-35% High Security Storage Area, 15-25% On-Demand Locker Capacity, and 0-5% Standard Lockers; from pedestrian and Bicycle CIP Criteria for determining the best mix of bike parking equipment types for Metrorail stations, 2011.

² Inverted U-Rack - 12 sq.ft. parking foot print and 8 sq. ft. of maneuvering space, at 36" rack spacing; derived from WMATA College Park Bike and Ride Facility

³ Double entry bike locker, containing two triangular interior spaces - 6.5ft x 3.166ft (20.58 sq.ft.) unit and 6ft x 3.166ft (19 sq. ft.) maneuvering space on either side of the locker; CycleSafe M02 Model

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