ConnectGreaterWashington – Land Use Alternatives

Summary of Scenario B

Introduction

In 2015, WMATA planners asked "what if the region's future growth was used to fulfill the expectations of regional plans such as *Region Forward* and *Place + Opportunity*? Would WMATA benefit? Would the region?"

We hypothesized that changes to local jurisdictions' and/or the region's approach to development, such as where to guide future jobs and population, and adding more transit-supportive policies, such as cordon charges, parking pricing, and improving walk and bike access, could allow the region to better use the transportation system we already have rather than require us to spend tens of billions on new transportation projects. We developed three different scenarios (A, B, and C) to vary future growth locations and transportation-supportive policies that could affect demand. No additional transportation capacity was added to the transportation system beyond the projects in the region's 2013 Constrained Long-Range Plan and Metro2025, such as the Purple Line, Potomac Yard Metro, and full eight-car trains on Metrorail. The remainder of this document talks only about *Scenario B*. Scenario A can be found online in a previous post and Scenario C will follow in a separate document.

Scenario B, entitled Cost-Effective Transit, had the goal of reducing the subsidy that the jurisdictions pay annually to support Metrorail operations by increasing ridership. For reference, Metrorail operations are paid by a combination of customer fares and parking and a subsidy from each jurisdiction. Essentially, we wanted to increase ridership such that fares and parking paid for a larger part (or all!) of the operating costs, which would eliminate the jurisdictions' subsidy. Note that fares themselves did not vary, so the only way to make this happen was to get more people to ride Metro.

Approach and Definitions of Scenarios B Prime, B1, and B2

To complete Scenario B, we focused on super-charging the main transit-friendly travel markets by increasing future residential growth around suburban stations and increasing future job growth in the core and other existing employment centers, as well as increasing the cost of driving in the main travel markets.

The below document highlights the inputs, results and key findings from Scenario B, which had a no-build scenario, as well as three iterations called Scenario *B Prime*, *B1*, and *B2*.

- *Scenario B Prime:* Used the region's adopted forecast and added transit-supportive policies to encourage transit ridership including: a cordon toll for vehicles entering the region's main employment center; increasing and equalizing regional parking prices; decreasing transit wait times; improving bike/pedestrian access; and increasing park and ride capacity at Metrorail stations on lines that are not crowded (e.g. Largo and New Carrollton).
- *Scenario B1:* Kept each jurisdiction's job and population growth totals as forecast in the adopted forecast, but shifted that growth to activity centers within each jurisdiction that have high-capacity, high-frequency transit. The focus here was to reinforce the traditionally strong transit markets and shift job growth (beyond 2020) to activity centers that are already significant job centers and shift residential growth (beyond 2020) to activity centers that are significant residential centers. It used the same transit-supportive policies as *B Prime*.
- *Scenario B2:* Kept the region's job and population growth totals as forecast in the adopted forecast, but shifted that growth across jurisdictional boundaries to activity centers that have high-capacity, high-frequency transit where transit is not already at capacity. Like *B1*, the focus was to reinforce strong transit markets, so jobs were added to existing employment centers (e.g. downtown DC) and residents were added to existing population centers around transit stations (e.g. suburban stations). It used the same transit-supportive policies as listed in *B Prime* and *B1*.

It's a lot to digest, so the below graphic attempts to show the differences in land use, while also highlighting the policies that were changed across all *B Scenarios*.

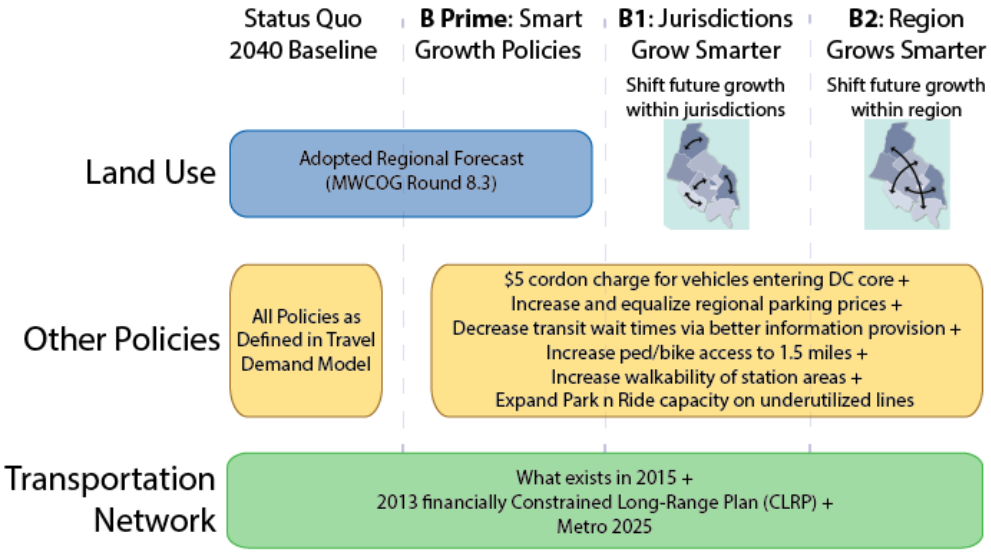

Figure 1: Approach for Building Scenario B to Make Transit More Efficient

Potential Benefits to the Region From Scenario B Results

The benefits of both supercharging existing transit markets AND making it less desirable to drive between them resulted in some pretty amazing results, especially in terms of ridership across all transit modes. Key results are listed below, but if you'd like to geek out, a more detailed description of *Scenario B* and its iterations is provided further on in the document along with the modeling results.

Summary of *Scenarios B Prime, B1, and B2*:

- **Making it less desirable to drive between existing travel markets, even without changing land use (*Scenario B Prime*), showed huge benefits.** Metrorail's operating subsidy was reduced by over 50 percent (to $166 million), transit ridership, Metrorail ridership, and daily transit mode share increased, and vehicle miles traveled (VMT) and congestion at peak times on key roadways decreased. The increase in ridership resulted in an increase in crowding on Metrorail, especially in the segments that are already crowded, such as the Rosslyn-Ballston corridor.
- **Growing smarter within each jurisdiction (*Scenario B1*) and making it less desirable to drive between existing travel markets improved many of the measures, but also added to transit crowding.** The increase in Metrorail ridership resulted in a further decrease in the operating subsidy (to $97 million). All transit modes had an increase in ridership, which resulted in an increase in transit mode share. Crowding on Metrorail (which in many places is already overcrowded today) and on buses did increase and in some locations, could not be supported by existing infrastructure. Most interesting, even though *Scenario B1* did not change the future growth in jurisdictions without high-capacity, high-frequency transit (e.g. the non-Compact jurisdictions such as Prince William County, Frederick County, etc. kept the job and population growth exactly as they have forecast) nor did it change the quantity of jobs and households within a Compact jurisdiction (just the location), ***long distance trips still remained BUT congestion on roadways declined***. That means that enough residents within the Compact jurisdictions and some of the long-distance commuters were incentivized to hop on transit for their commute. ***In essence, the cost of driving began to outweigh the time it takes to drive, which shifted people to transit.***
- **Growing smarter as a region (*Scenario B2*) and making it less desirable to drive between existing travel markets resulted in a massive Metrorail operating surplus, but at the expense of reasonable ridership and crowding conditions.** Metrorail ridership almost tripled, which created an operating surplus of $1.7 B annually. Overall transit ridership increased and the transit mode share increased to more than a third of all daily trips. ***Clearly this outcome is not feasible using our current transit infrastructure and carrying***

capacity, so significant expansion would be needed to make this possible, which would then change the operating costs of the service. From a transportation perspective, vehicle miles traveled decreased below 2010 levels, overall roadway congestion and travel times decreased dramatically across the region.

Other Major Takeaways:

- Disincentivizing driving on trips where transit is viable WORKS WONDERS in terms of ridership, congestion, and operating subsidy, even without changing future development decisions. A cordon charge and removing free parking/equalizing the price of parking resulted in a 30 percent increase in transit ridership over the 2040 projections. This is a huge piece of useful information if discussing land use and development growth becomes too intractable.
- An escalating Metrorail operating subsidy is not a foregone conclusion and the region's modus operandi. Starting to address the region's underlying incentives that encourage driving over transit, as well as shifting future job and population growth to activity centers can place the region on the right trajectory.
- Adding land use changes, especially by super-charging markets where transit already works well, just intensified the outcomes and results. Scenario B2's land use changes resulted in locating 30 percent of the region's jobs in DC (compared to 18 percent in the 2040 adopted forecast) and shifted 1 million households regionwide to be in activity centers with high-capacity, high-frequency transit. Making this trip more costly in a car meant that transit became a viable option and the *preferred* mobility choice.
- Growing smarter across the region and disincentivizing driving absolutely requires transit capacity improvements, especially in the region's core. Metrorail's capacity is constrained in key places, especially at the two Potomac River crossings. However, the increased ridership and revenues that come from the scenarios' policies could provide the funding needed to make expansion possible.

2040 Metrorail Peak Period Passenger Loads

Below are the forecasted 2040 Metrorail peak period passenger loads in the peak direction. *Red indicates segments with crowded conditions and dark and light green indicate those segments that are under capacity. As you can see, light green segments are spread across the system - that is, we have a lot of excess capacity on Metrorail even in the peak period and the peak direction. Scenario B* attempted get as many riders on the system to eliminate the operating subsidy, regardless of the crowded conditions on the system.

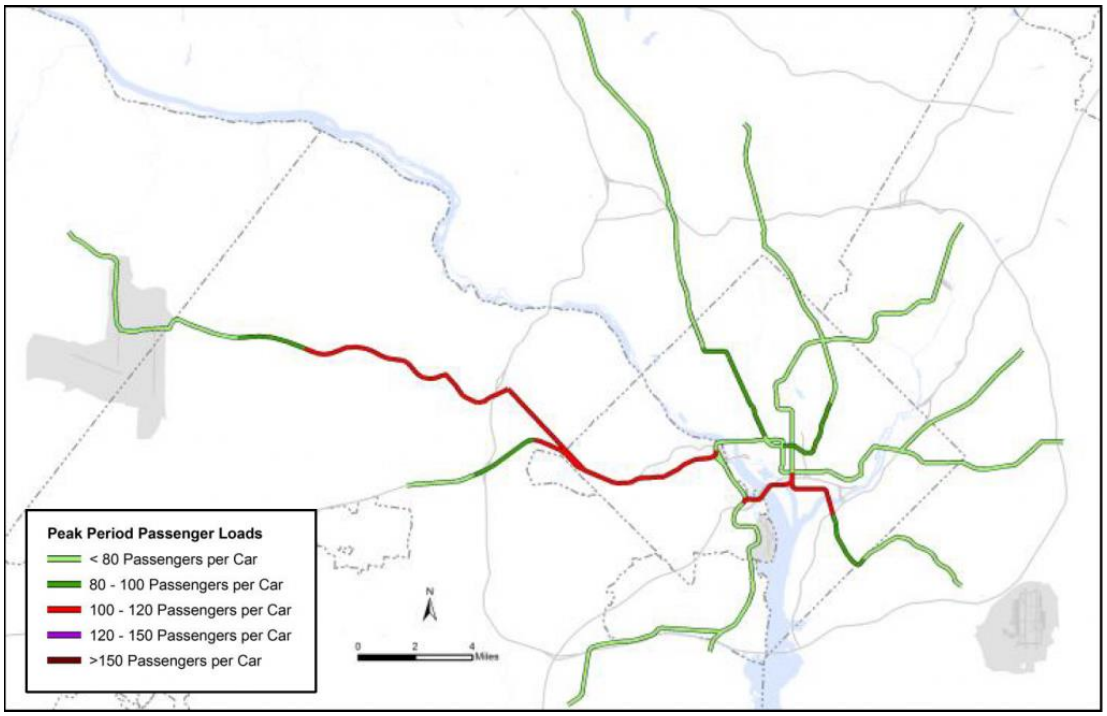

Figure 2: Forecasted 2040 Peak Period Passenger Loads

Land Use and Development Changes in Scenarios B1 and B2

Part Two of the series provided the basics of our approach to the land use forecast, but to summarize, we:

- Only analyzed changes to forecasted growth beyond 2020, which is beyond the typical development pipeline and does affect what is on the ground today;
- Placed jobs and/or population at the 86 activity centers that have or will have high-capacity transit by 2040; and
- Stayed true to the kinds of places that these activity centers are today: unique, interesting, and attractive places to live and work that should stay that way.

This was completely based on an average density calculated based on each place type identified in MWCOG's Place+Opportunity report (pdf), a document which each jurisdiction has already embraced. Across all iterations of *Scenario B*, we focused on increasing the quantity of jobs in current employment centers and increasing the quantity of households in residential areas, as long as those areas already had high-capacity, high-frequency transit. That means we super-charged the already existing and well served transit markets.

In total, for *Scenario B1*, we guided 500,000 households and 400,000 jobs that are forecast to appear between 2020-2040 to station areas. Again, these households and jobs stayed in the jurisdiction they were forecast in, but were just shifted from locations in those jurisdictions that did not have access to transit to activity centers with transit. In total, for *Scenario B2*, we guided over 1 million households and 1.6 million jobs that are forecast to appear between 2020-2040 to station areas. Below, from left to right, are images that show:

(1) The forecasted land use density for 2040 (note this is the same density for *B Prime* since land use did not change in this scenario);

(2) Change in total land use in *Scenario B1* that results from growing smarter within a jurisdiction; and

(3) Change in total land use in *Scenario B2* that results from growing smarter as a region.

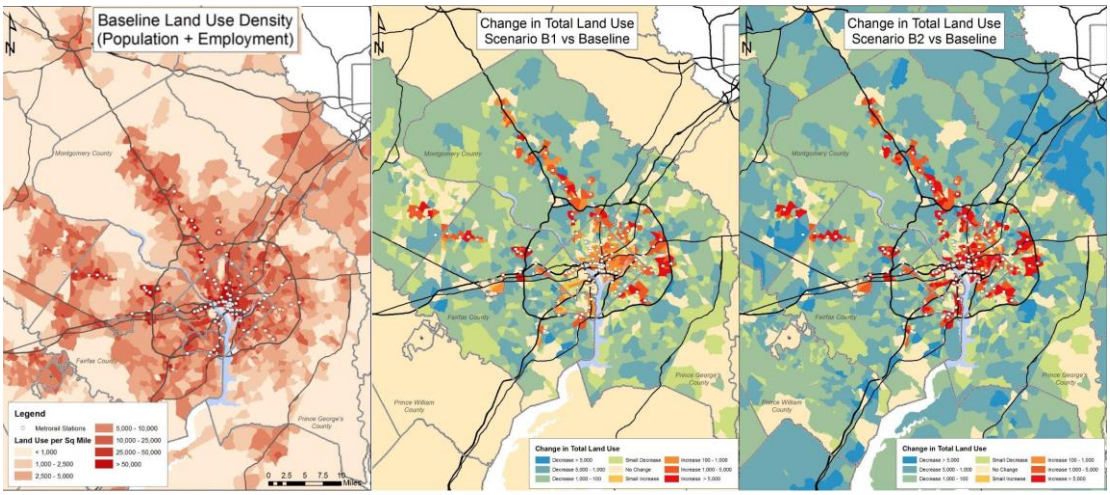

Figure 3: A Scenarios: Changes in Total Land Use between B Prime, B1, and B2

Demand Policies Modified in Travel Demand Model

To reduce the operating subsidy by increasing overall use of Metro, we modified the below transit-supportive policies in the travel demand model. You'll note that these policies in *Scenario B* are a mix of "carrots" to encourage transit ridership and "sticks" to discourage driving a car.

- Cordon Charge: A $5 cordon charge was added to all vehicles entering the region's employment core (shown in **Figure 4** below) as a mechanism to encourage transit use to the region's core. The cordon location was developed by defining the region's employment core as the area that encompasses the majoring of modeling zones with a job density greater than 200 jobs per acre. This includes most of downtown DC, the Waterfront and Capital Riverfront, Rosslyn, the Pentagon, and the Pentagon City area.

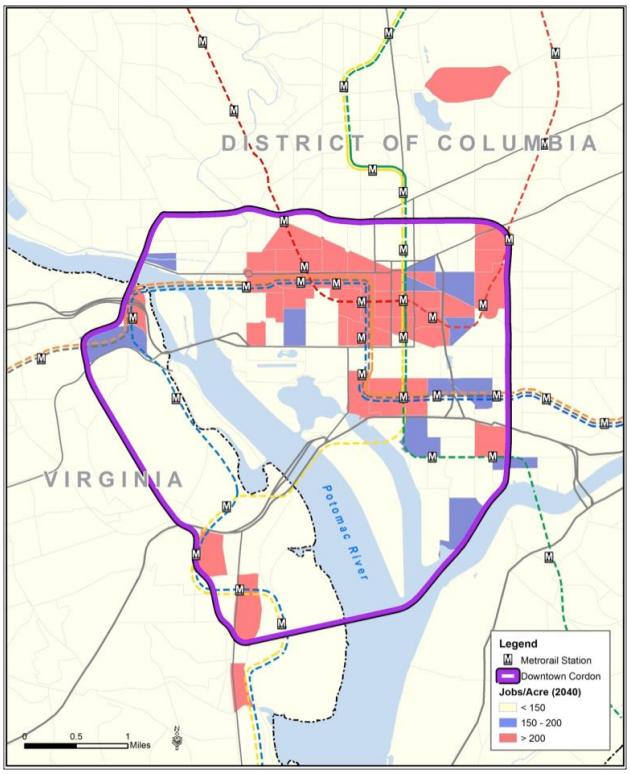

Figure 4 Location of Downtown Cordon around High-Density Employment

- Parking Pricing: Another element to make transit travel more effective was to target the free and/or cheap parking that exists around the region as well as the inequality of parking prices within model's analysis zones. The zonal parking costs were increased by 25 percent and minimum prices were applied to eliminate zones with free parking. The pricing was varied by trip purpose, with the parking minimums set higher for home-based work trips (e.g. typical commute trips) than other trip types.

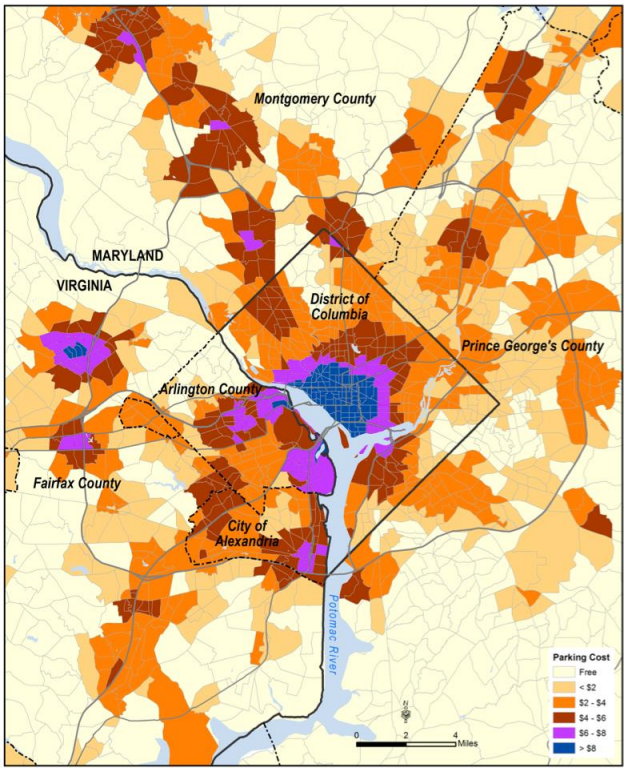

Figure 5 Baseline Parking Costs by Zone - Home-Based Work Trips

- Intelligent Transportation Systems: Transfers are generally perceived negatively by rider, so this policy assumed that various technological enhancements would occur to decrease the negative effect of wait and transfer time on passenger demand. The model simulated this policy by decreasing wait times and transfer times by 25 percent.
- Walkability and Bicycle Access: As we know, many Metrorail stations have poor pedestrian and bicycle access between the station and surrounding development. To increase ridership, we increased the variable that represents the walkable environment around stations by the same percentage as the changes to land use at that station plus another ten percent bump. We also increased bike and pedestrian access to occur within a 1.5 mile radius, up from the 1 mile radius in the standard model.
- Selective Expansion of Park and Ride Capacity: We expanded park and ride capacity at stations located on lines that were underutilized. Essentially that meant that longer-distance riders could find parking at stations on the Shady Grove, Glenmont, Greenbelt, Largo, and New Carrollton branches of the system, but not at Vienna and Wiehle Avenue.

Modeling Results

The key takeaways are above, but we've provided results of key measures from the 25+ measures of effectiveness that were analyzed.

Measure of Effectiveness	Compared to	2010	2040 Base Constrained*	2040 Base Unconstrained*	B Prime	B1	B2
Daily Vehicle Miles Traveled	2010	170,307,284	194,821,896	194,146,210	188,933,683	185,454,894	141,912,896
Change to Metrorail Operating Subsidy	2040 Constrained		$ 440,600,000	$ 345,696,953	$ 166,429,958	$ 97,161,345	$ (1,771,432,560)
Increase in Compact Property Tax Revenues	2040 Base (Same)				No Change	(222,333,426)	1,989,670,322
Number of Jobs Accessible within 45 minutes of Households	2040 Base (Same)		1,339,301	1,339,301	1,339,301	1,463,060	2,763,692
Highway Travel Times for 13 different O-D pairs	2010	552.12	642.26	619.42	534.66	492.49	355.21
Total Congested Person Miles Traveled Autos	2040 Base Constrained		30,028,837	30,715,845	26,188,127	23,944,935	26,581,169
Actual Daily Transit Mode Share	2040 Base Unconstrained	6.20%	6.9%	7.7%	8.8%	9.5%	34.4%
Daily Metrorail Ridership (Unlinked Boardings)	2040 Base Unconstrained		1,445,234	1,546,251	1,948,101	2,061,569	4,503,884
Daily Transit Ridership (Including Metrorail)	2040 Base Unconstrained		2,535,368	2,659,302	3,464,840	3,633,955	9,581,832
Person Hours Traveled on Congested Metrorail Vehicles >= 100 Passengers per Car during the Peak	2040 Base Unconstrained		1,398	41,629	73,849	75,285	383,497
Peak Metrorail Transfers at Seven Main Transfer Stations	2040 Base Unconstrained		234,665	268,178	346,727	357,907	585,236
Person Hours Traveled on Congested Buses >=45 Paasengers per Bus during the Peak	2040 Base Unconstrained		36,216	39,150	55,714	52,020	104,316

* Because the region has has only fully funded Metro's State of Good Repair needs, but not expansion needs associated with running the longest possible trains and station improvements, the region travel forecasting model constrains the capacity of Metrorail beyond 2020. This is calculated by running the model for 2020 to estimate Metrorail demand. For all future years, the model is run and all Metrorail demand in excess of the 2020 demand is reallocated to the highway network. As part of this study, WMATA also modeled the unconstrained demand - that is, what is the actual demand for Metrorail if expansion were funded by the region.

Lowest Performing Iteration Highest Performing Iteration

Figure 6: Scenario B Key Results

If you've made it this far, congratulations! What struck you as interesting? Any key conclusions that you noted? Any follow up questions on our analysis?