Bus Rapid Transit Study

BRAC Implementation Committee Briefing
May 17, 2011

Presentation Overview

- Purpose of the Study
- What is BRT?
- Project Scope of Work
- Technical Analysis
- Results

EmX median busway (Eugene, OR)

Purpose of the Study

- Test the feasibility of a network system of BRT routes providing access to county activity centers within the existing right of way

Las Vegas MAX (RTC of Southern NV)

Eugene EmX (LTD, Oregon)

What is Bus Rapid Transit (BRT)?

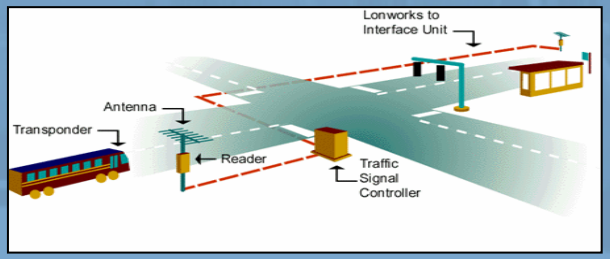
BRT is based on **rapid transit principles**. It combines the most attractive features of light rail with the lower costs of bus technology.

Instead of trains and tracks, **BRT** invests in improvements to roadways, rights-of-way, intersections, and traffic signals to speed up bus transit service.

Major BRT Elements in this Study

- ✓ Stylish Vehicles
- ✓ Attractive Stations
- ✓ Guideways and Rights of Way
- ✓ Faster Fare Collection
- ✓ Intelligent Transportation Systems
- ✓ Operations
- ✓ Land Use

Cleveland HealthLine (GCRTA)



Transit signal priority
(TCRP Synthesis 83)

Arterial Bus Lane
Albany NY 5 (CDTA, New York)

BRT Elements

Guideways and rights-of-way

- Separating BRT vehicles from other traffic increases speed and reliability.
- Several options
  - Exclusive bus ways
  - Bus only lanes
  - Mixed flow lanes with queue jumpers & TSP
- Assume guideways constructed within right-of-way, except at intersections

Rendering of Silver Line BRT in bus-only lane (Boston, MA)

Guided busway (Leeds, London)

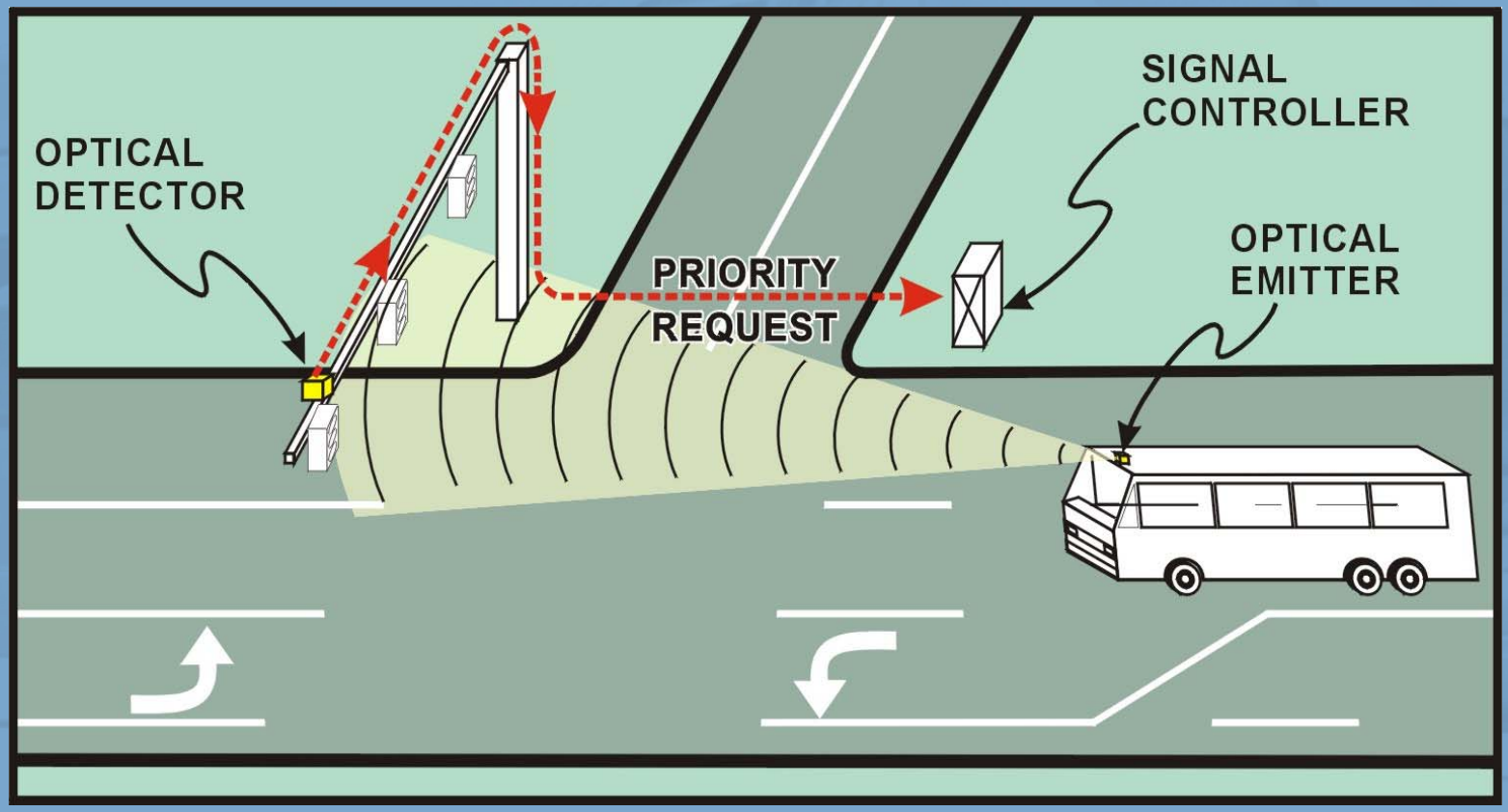
BRT Elements (continued)

Intelligent Transportation Systems

- Increase service reliability
  - Transit signal priority
    - Applied to roadway LOS C or D
    - Not signal pre-emption
  - Queue jumps
    - Applied at existing right-turn only lanes
    - Through- and right-turning traffic volumes would not hinder queue jump
- TSP preferable to queue jumps in study

BRT Elements (continued)

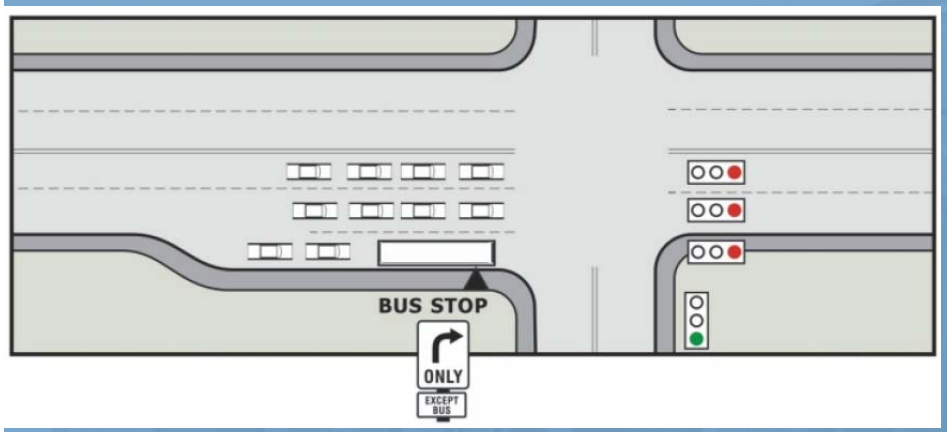
Intelligent Transportation Systems – transit signal priority

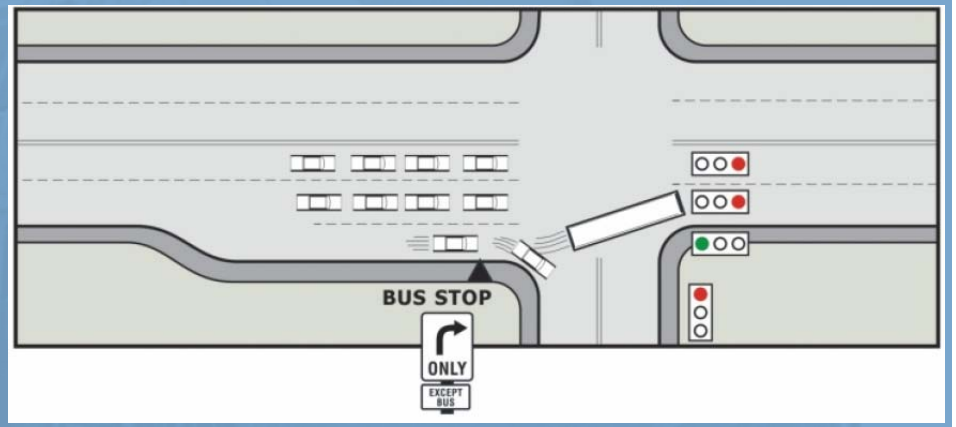


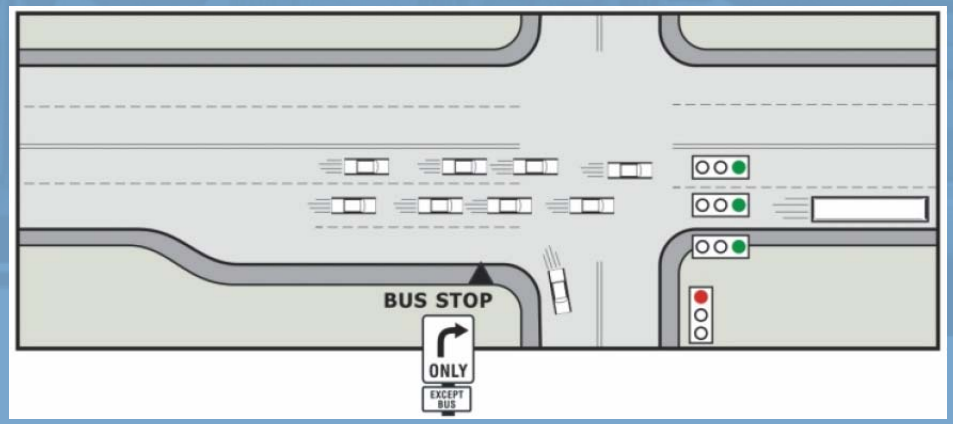
Bus detection concept (TCRP Synthesis 83)

BRT Elements (continued)

Intelligent Transportation Systems – queue jumps







Other Elements to Consider

Land Use

Cleveland, OH

- Coordinate transit-supportive land uses with BRT stations to create transit-friendly environments

Station Access

- Depending on station location, customers can walk, bike, take a shuttle bus, or drive/park-and-ride

Service Branding

Phoenix, AZ

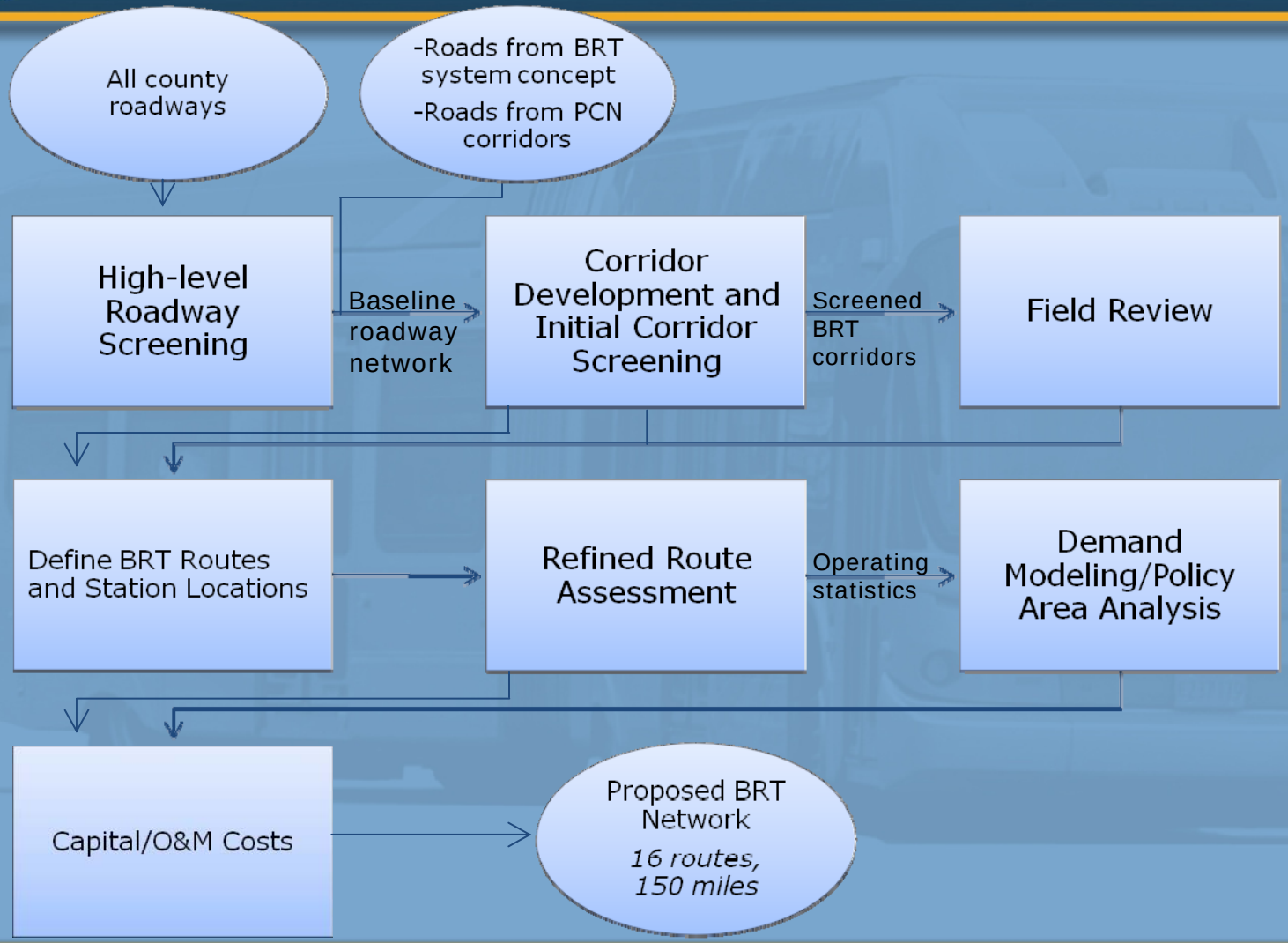
- Different than typical local bus service
- BRT is a new service with a new image

Project Scope Summary

- Screen all County roadways for potential BRT corridors
- Conduct planning-level corridor analyses to determine potential BRT treatments
- Determine travel demand and identify routes for network
- Determine capital and O&M costs for BRT network

Reversible median busway (Eugene, OR)

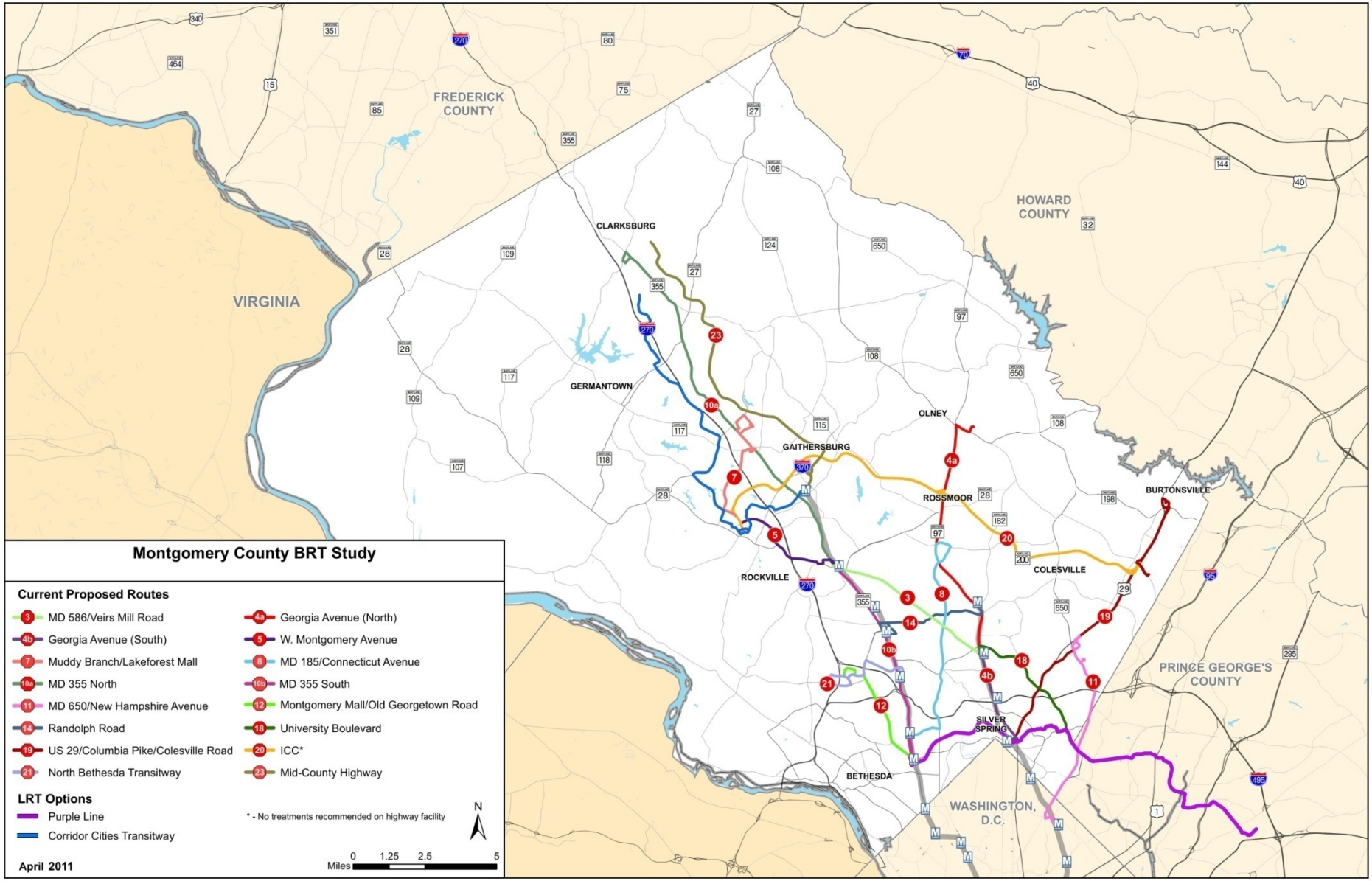
Study Methodology



Project Assumptions

- Operate in existing rights-of-way
- High-capacity articulated BRT vehicles
- Dedicated lanes where possible
- Traffic signal improvements where possible
- Queue jump lanes in areas where TSP is not feasible
- Off-board fare collection
- Real-time passenger information at major stations
- Stations approximately every 1/2-mile to mile, terminating at major activity centers or at other premium transit stations
- Minimum density thresholds assumed for BRT system

The Proposed Network
16 Corridors, 150 Miles



The Proposed Network

Route	From	To	Route Length (miles)	Number of Stations
MD 586/Veirs Mill Road	Rockville Metrorail Station	Wheaton Metrorail Station	6.7	11
Georgia Avenue North	Montgomery General Hospital	Wheaton Metrorail Station	9.8	12
Georgia Avenue South	Wheaton Metrorail Station	Silver Spring Transit Center	3.9	6
Rockville Metrorail-Life Sciences Center	Life Sciences Center	Rockville Metrorail Station	5.3	7
MD 124/Muddy Branch Road	Lakeforest Mall	Life Sciences Center	7.2	10
MD 185/Connecticut Avenue	Georgia Avenue and Bel Pre Road	Medical Center Metrorail Station	9.5	10
MD 355 North	MD 355 and Stringtown Road	Rockville Metrorail Station	14.6	16
MD 355 South	Rockville Metrorail Station	Bethesda Metrorail Station	8.8	13
MD 650/New Hampshire Avenue	White Oak Transit Center	Fort Totten Metrorail Station	8.8	9
Montgomery Mall/ Old Georgetown Road	Montgomery Mall Transit Center	Bethesda Metrorail Station	6.9	9
Randolph Road	White Flint Metrorail Station	Glenmont Metrorail Station	5.5	7
MD 193/University Boulevard	Wheaton Metrorail Station	Takoma/Langley Park Transit Center	6.4	9
US 29/Columbia Pike/Colesville Road	Burtonsville Park-and-Ride Lot	Silver Spring Transit Center	13.5	11
ICC	Life Sciences Center	Briggs Chaney Park-and-Ride lot	22.9	3
North Bethesda Transitway	Montgomery Mall Transit Center	Grosvenor Metrorail Station	5.1	7
Midcounty Highway	Snowden Farm Parkway and Stringtown Road	Shady Grove Metrorail Station	13.4	10
Total			**148.3**	**150**

Basis for Forecasting Ridership

- 2040 horizon year
  - "No-build" conditions
    - Projects in the MWCOG constrained long-range plan
    - Purple Line and Corridor Cities Transitway in operation as light rail
    - Round 8.0 land-use forecast (MNCPPC – MWCOG)
  - Use MDAA II model (Phase 2 model)
    - Rider survey-based model
    - Specific application for transit
    - FTA Accepted for Purple Line and CCT
- 2020 model run
  - Tested land-use implications against 2040 conditions
- Assumes baseline auto/transit costs for travel

Summary of Preliminary Findings

All results compared to 2040 No-build

- 85,000+ increase in daily transit trips
- 210,000 to 270,000 daily BRT boardings
- Majority of corridors with over 1,000 daily boardings per mile
- Average of 32% improvement over modeled local bus speeds (increase of 4.2 mph over local bus)
- O&M costs for Ride On and Metrobus decrease by 14% and 3%, respectively
- BRT network reduces Ride On and Metrobus boardings, permitting redeployment of resources

Ridership: Daily and By Route Mile – Preliminary Results

Route Name	Daily Boardings	Daily Boardings/ Route Mile	Required Peak Headway	% of 2040 Achieved w/ 2020 LU
MD 355 South	28,200 - 35,300	3,600 - 4,500	2.8 - 2.3	72%
Randolph Road	16,000 - 20,000	3,500 - 4,400	3.9 - 3.2	82%
MD 97/Georgia Avenue South	10,500 - 13,100	3,000 - 3,800	3.0 - 2.5	92%
MD 355 North	37,600 - 47,000	2,700 - 3,400	2.4 - 2.0	72%
North Bethesda Transitway	8,200 - 10,200	2,700 - 3,400	4.6 - 3.8	80%
MD 193/University Boulevard	14,600 - 18,300	2,300 - 2,900	2.9 - 2.5	84%
Rockville Metro-LSC	10,000 - 12,500	2,100 - 2,600	5.9 - 4.9	77%
MD 586/Veirs Mill Road	12,700 - 15,900	2,000 - 2,500	6.1 - 5.1	84%
Lakeforest Mall/Muddy Branch Road	9,400 - 11,700	1,600 - 2,000	6.5 - 5.4	73%
MD 187/Old Georgetown Road	7,700 - 9,600	1,500 - 1,900	7.0 - 5.8	95%
MD 97/Georgia Avenue North	14,700 - 18,400	1,500 - 1,900	3.1 - 2.6	88%
MD 650/New Hampshire Avenue	10,600 - 13,200	1,400 - 1,800	5.2 - 4.3	81%
US 29	14,700 - 18,400	1,200 - 1,500	3.1 - 2.6	92%
MD 185/Connecticut Avenue	6,600 - 8,300	800 - 1,000	5.7 - 4.7	94%
Mid-County	6,700 - 8,400	600 - 700	6.8 - 5.7	83%
ICC	4,900 - 6,100	200 - 300	8.1 - 6.8	44%
	213,100 - 266,400	*1,600 - 2,000*		80%

Operations Cost and Farebox Recovery – Preliminary Results

Route Name	Annual O&M Cost	Farebox Revenue	O&M Cost/ Boarding	Farebox Recovery Ratio
Randolph Road	$5,480,000 - $6,576,000	$4,759,894 - $4,569,499	$0.92 - $1.11	87% - 69%
MD 586/Veirs Mill Road	$4,855,000 - $5,826,000	$3,779,355 - $3,628,181	$1.03 - $1.23	78% - 62%
Rockville Metro-LSC	$4,580,000 - $5,496,000	$2,972,133 - $2,853,247	$1.23 - $1.48	65% - 52%
North Bethesda Transitway	$3,827,000 - $4,592,400	$2,433,826 - $2,336,473	$1.26 - $1.51	64% - 51%
MD 193/University Boulevard	$7,574,000 - $9,088,800	$4,358,906 - $4,184,549	$1.39 - $1.67	58% - 46%
MD 187/Old Georgetown Road	$4,064,000 - $4,876,800	$2,294,123 - $2,202,358	$1.42 - $1.70	56% - 45%
MD 355 South	$16,152,000 - $19,382,400	$8,404,554 - $8,068,371	$1.54 - $1.84	52% - 42%
MD 97/Georgia Avenue South	$6,497,000 - $7,796,400	$3,133,053 - $3,007,731	$1.66 - $1.99	48% - 39%
Lakeforest Mall/Muddy Branch F	$5,845,000 - $7,014,000	$2,799,293 - $2,687,321	$1.67 - $2.00	48% - 38%
MD 355 North	$26,657,000 - $31,988,400	$11,199,794 - $10,751,802	$1.90 - $2.28	42% - 34%
MD 97/Georgia Avenue North	$11,747,000 - $14,096,400	$4,391,566 - $4,215,904	$2.14 - $2.57	37% - 30%
MD 650/New Hampshire Avenu	$8,495,000 - $10,194,000	$3,155,462 - $3,029,244	$2.15 - $2.58	37% - 30%
MD 185/Connecticut Avenue	$6,836,000 - $8,203,200	$1,974,190 - $1,895,223	$2.77 - $3.32	29% - 23%
US 29	$15,735,000 - $18,882,000	$4,385,845 - $4,210,411	$2.87 - $3.44	28% - 22%
Mid-County	$7,922,000 - $9,506,400	$2,010,904 - $1,930,468	$3.15 - $3.78	25% - 20%
ICC	$8,230,000 - $9,876,000	$1,447,565 - $1,389,662	$4.55 - $5.46	18% - 14%
Total	*$144,496,000 - $173,395,200*	*$63,500,000 - $60,960,000*		44% - 35%

Other Findings – Preliminary

- BRT system requires additional bus maintenance facilities and the modification of existing facilities to service articulated vehicles
- Requires approximately 430 buses to accommodate passenger demand
- Will require redeployment of Ride On and Metrobus fleets

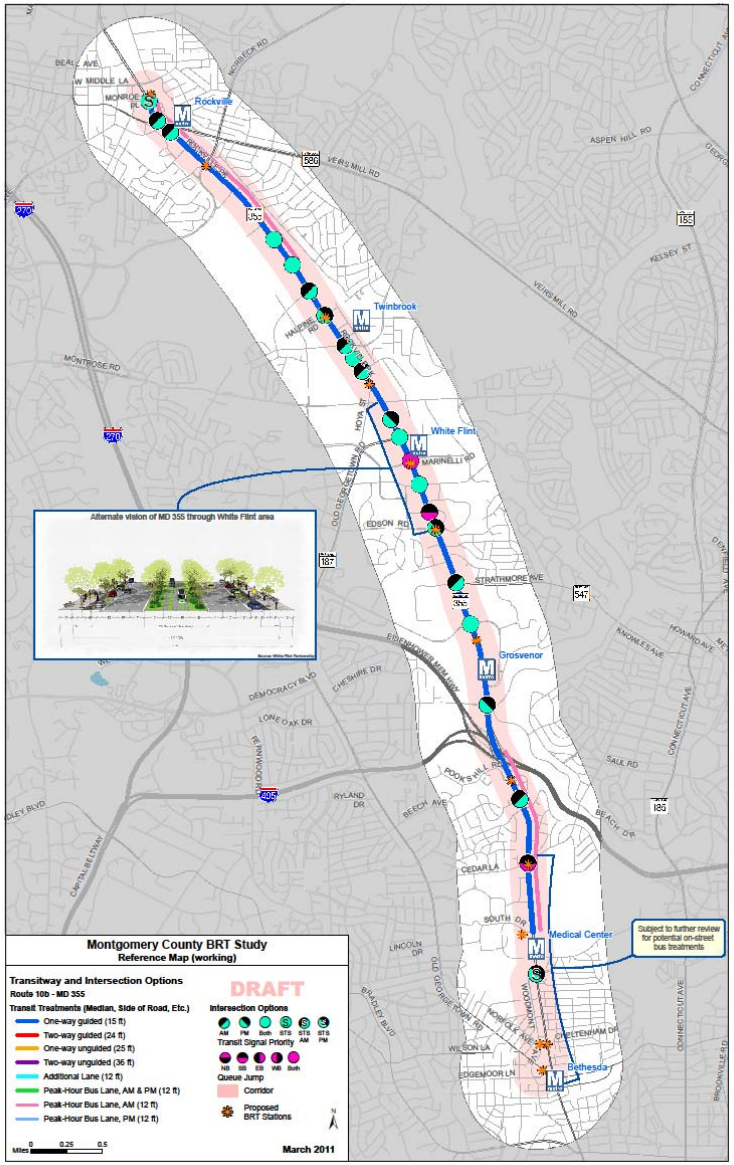
Capital Costs – Preliminary

Busway and Exclusive Lane Treatments *- includes 105 route miles of treatments*	
Intersection Treatments *- includes 175 intersections with TSP, 26 intersections with queue jumps, and 255 intersection widening treatments*	
Stations and Concrete Pads *- includes ticket vending, passenger information, and other station amenities (bike parking, etc.) at 150 locations; concrete pads for curb-lane stations only*	
430 Articulated Buses	
Maintenance Facilities *- based on average cost per articulated bus*	
Add-ins *-25% of costs of lane treatments, intersection treatments, stations, and maintenance facility. Include PE, final design, construction management, insurance, and startup costs*	
40 % contingency for BRT treatments, stations, and maintenance facilities	
Estimated System Cost*	**$2.5 billion**

*** Excludes costs such as right-of-way, utility relocation, and stormwater management**

Questions and Answers

Route 10b: MD 355 South


Rockville
Twinbrook
White Flint
Grosvenor
Medical Center
Bethesda
Alternate vision of MD 355 through White Flint area
Montgomery County BRT Study
Reference Map (working)
Transitway and Intersection Options
Route 10b - MD 355
Transit Treatments (Median, Side of Road, Etc.)
One-way guided (15 ft)
Two-way guided (24 ft)
One-way unguided (25 ft)
Two-way unguided (36 ft)
Additional Lane (12 ft)
Peak-Hour Bus Lane, AM & PM (12 ft)
Peak-Hour Bus Lane, AM (12 ft)
Peak-Hour Bus Lane, PM (12 ft)
DRAFT
Intersection Options
Transit Signal Priority
Queue Jump
Corridor
Proposed BRT Stations
Subject to further review for potential on-street bus treatments
March 2011