



# Bus Rapid Transit

## MD 355 BUS RAPID TRANSIT CORRIDOR PLANNING STUDY



# Introduction

The Maryland Department of Transportation (MDOT), in partnership with the Montgomery County Department of Transportation (MCDOT), is conducting the MD 355 Bus Rapid Transit Corridor Planning Study (Study) to evaluate preliminary concepts for providing enhanced transit service along MD 355 from Clarksburg to Bethesda (approximately 22 miles). The purpose of the Study is to conduct an assessment of a range of Bus Rapid Transit (BRT) concepts and develop recommendations that will:

- Improve quality of transit service
- Improve mobility opportunities and choices
- Develop transit services that enhance the quality of life
- Develop transit services that support master planned development
- Support sustainable and cost effective transportation solutions

The recommendations of the Study would be used in the future for environmental analysis and documentation as required by either the National Environmental Policy Act (NEPA) or the Maryland Environmental Policy Act (MEPA). The current phase of the study is funded by MDOT.

This project is part of a larger countywide effort (Countywide Transit Corridors Functional Master Plan) to establish a BRT network on major transportation corridors within Montgomery County. Currently, three of the corridors – MD 355, MD 586, and US 29 – in addition to the Corridor Cities Transitway, are being studied.

## What is Bus Rapid Transit?

BRT stands for Bus Rapid Transit, a modern, flexible, lower cost, premium form of transportation that combines features of both a bus system and a light rail system. BRT features may include:

- Frequent, all-day service
- Dedicated, BRT-only Lanes
- Fare payment before boarding
- Easy, level boarding
- Stations
- Transit signal priority and improvements at intersections

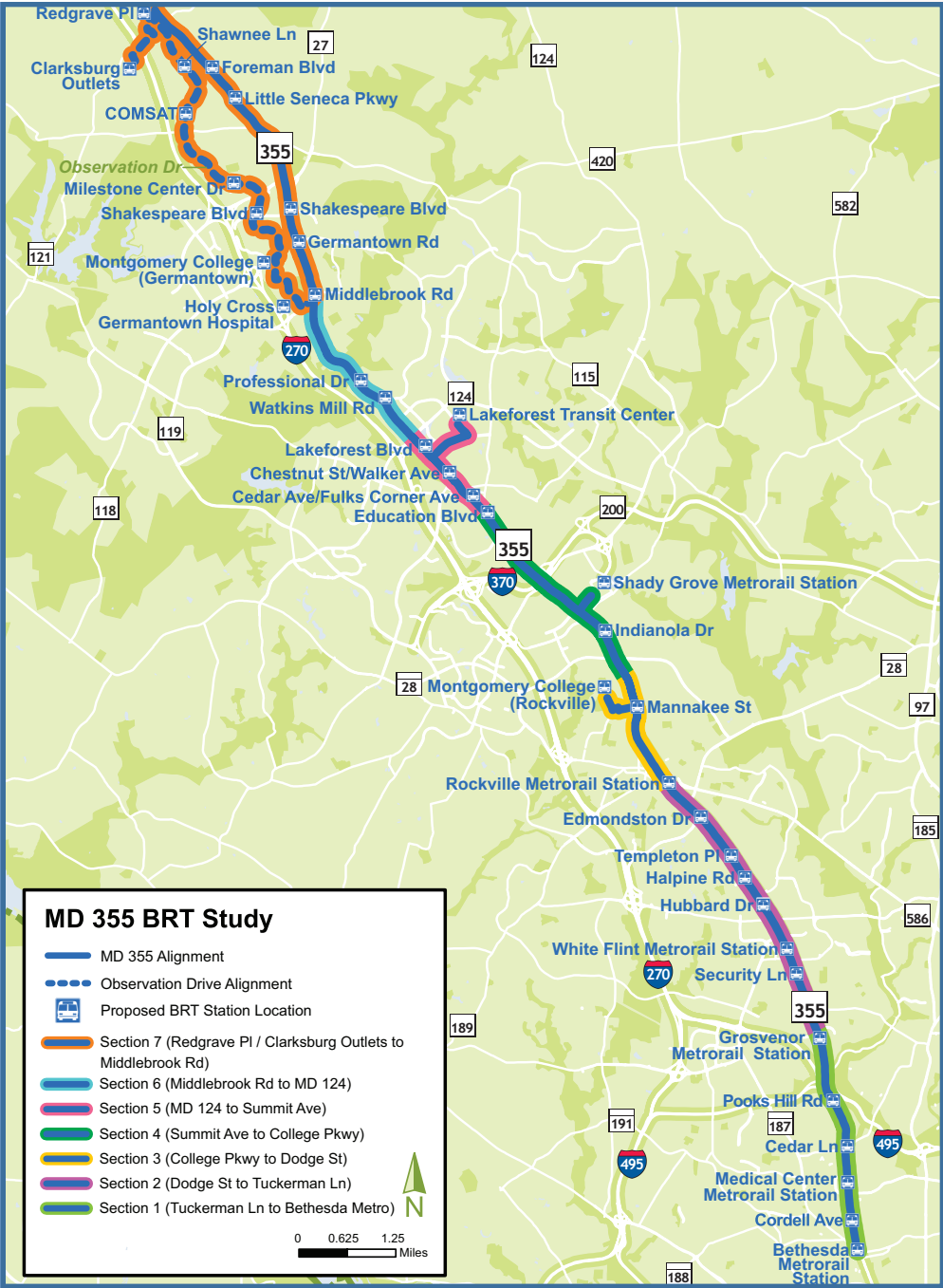
## BRT Alternative Components

The MD 355 project team developed conceptual BRT Alternatives for the corridor. The Alternatives are composed of three components:

- Running Way – A designated facility such as striped/ signed lane or exclusive busway in which the vehicle would travel between stations
- Station Location – Specific locations where passengers can access BRT and the service can support the local land uses (residential, commercial, etc.)
- Service Plan – The way in which BRT operates including service frequency, hours of service, routing and connecting services

# Corridor Sections

Given the varying existing conditions along MD 355 from a rural setting in Clarksburg to an urban setting in Bethesda, the corridor was divided into seven different sections. Each section has its own characteristics, opportunities, challenges and constraints.



Section	Section Limits	Section Length
Section 7 – Clarksburg / Germantown	Redgrave Place / Clarksburg Outlets to Middlebrook Road	~4.7 miles
Section 6 – Germantown / Montgomery Village	Middlebrook Road to MD 124	~3.2 miles
Section 5 – Gaithersburg	MD 124 to Summit Avenue	~1.4 miles
Section 4 – Shady Grove / Rockville	Summit Avenue to College Parkway	~3.2 miles
Section 3 – Rockville Town Center	College Parkway to Dodge Street	~1.8 miles
Section 2 – Rockville / White Flint	Dodge Street to Tuckerman Lane	~4.1 miles
Section 1 – Bethesda	Tuckerman Lane to Bethesda Metro	~3.2 miles





# Conceptual Alternatives

## Running Way

Transit service can be provided via a variety of running way options, such as dedicated median lanes; dedicated curb lanes; or running in mixed traffic. Dedicated lanes can be achieved either by widening the roadway or by repurposing existing travel lanes. The running ways can be mixed and matched along different sections of the corridor to best fit within the surrounding area. This mix and match approach recognizes that one single running way option may not be the best solution for the entire corridor.

Alternatives Automatically Moving Forward to Next Phase

**Alternative 1 No-Build:** No improvements to infrastructure or bus service along the MD 355 Study Corridor beyond those improvements already planned and programmed in the Constrained Long-Range Plan.

**Alternative 2 Transportation System Management (TSM):** Enhanced bus service operating in mixed traffic in existing lanes with minor infrastructure improvements. The infrastructure improvements would consist of queue jumps and Transit Signal Priority (TSP) at select intersections.

Alternative 1 and Alternative 2 automatically will move forward to the next phase of the study. The following BRT Alternatives are being evaluated to identify refinements and determine which of these four BRT Alternatives should be carried forward to the next phase.

BRT ROUTE	NORTHERN LIMIT	SOUTHERN LIMIT
Orange	Redgrave Place or Clarksburg Outlets	Rockville Metrorail Station
Blue	Lakeforest Transit Center	Rockville Metrorail Station
Purple	Montgomery College Rockville	Grosvenor or Bethesda Metrorail Station

### BRT Alternatives

**Alternative 3A:** New BRT service from Clarksburg Outlets to the Grosvenor Metrorail Station. The service would be on dedicated median lanes from Middlebrook Road to the Grosvenor Metrorail Station along MD 355 and in mixed traffic from the Clarksburg Outlets to Middlebrook Road along Observation Drive.

**Alternative 3B:** New BRT service from Redgrave Place in Clarksburg to the Bethesda Metrorail Station. The service would be mostly on dedicated median lanes from Redgrave Place to the Bethesda Metrorail Station along MD 355.

**Alternative 4A:** New BRT service from Redgrave Place in Clarksburg to the Grosvenor Metrorail Station. The service would be mostly on dedicated curb lanes from Redgrave Place to the Grosvenor Metrorail Station along MD 355.

**Alternative 4B:** New BRT service from Redgrave Place in Clarksburg to the Bethesda Metrorail Station. The service would be mostly on dedicated curb lanes from Redgrave Place to the Bethesda Metrorail Station along MD 355.

For more information on the proposed running ways for the BRT Alternatives, see pages 9 and 10.

## Station Locations and Service Plan

In addition to the running way, the two other elements of what defines the Alternatives are the station locations and BRT service plan.

The study tested a preliminary service plan with three routes as described in the table below and shown on the map on page 5. These routes will be modified as the study progresses. The proposed station locations also can be found on page 5.

## Steps to Recommending an Alternative

The Corridor Planning Study utilizes a three-step process to recommend an Alternative at the conclusion of this study.

### Step 1: Identify Constraints

The first step consisted of data collection of existing transit operations, highway data (such as traffic volumes and crash statistics), environmental information, and aerial mapping. This information was presented to the Corridor Advisory Committees (CAC) and with their input constraints were identified along the corridor.

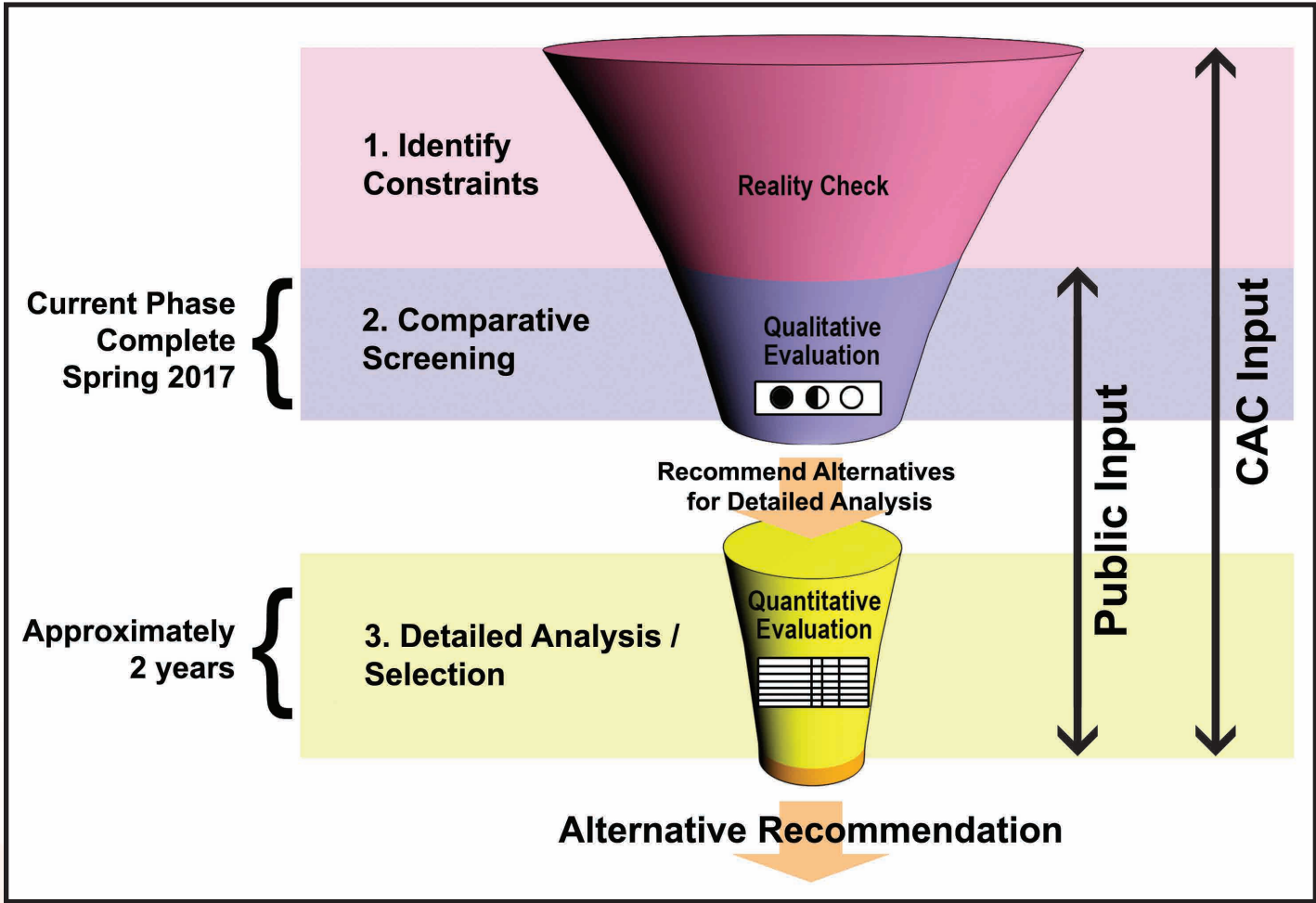
### Step 2: Comparative Screening (We are here)

With the information developed under Step 1, a set of Conceptual Alternatives was developed for testing purposes.

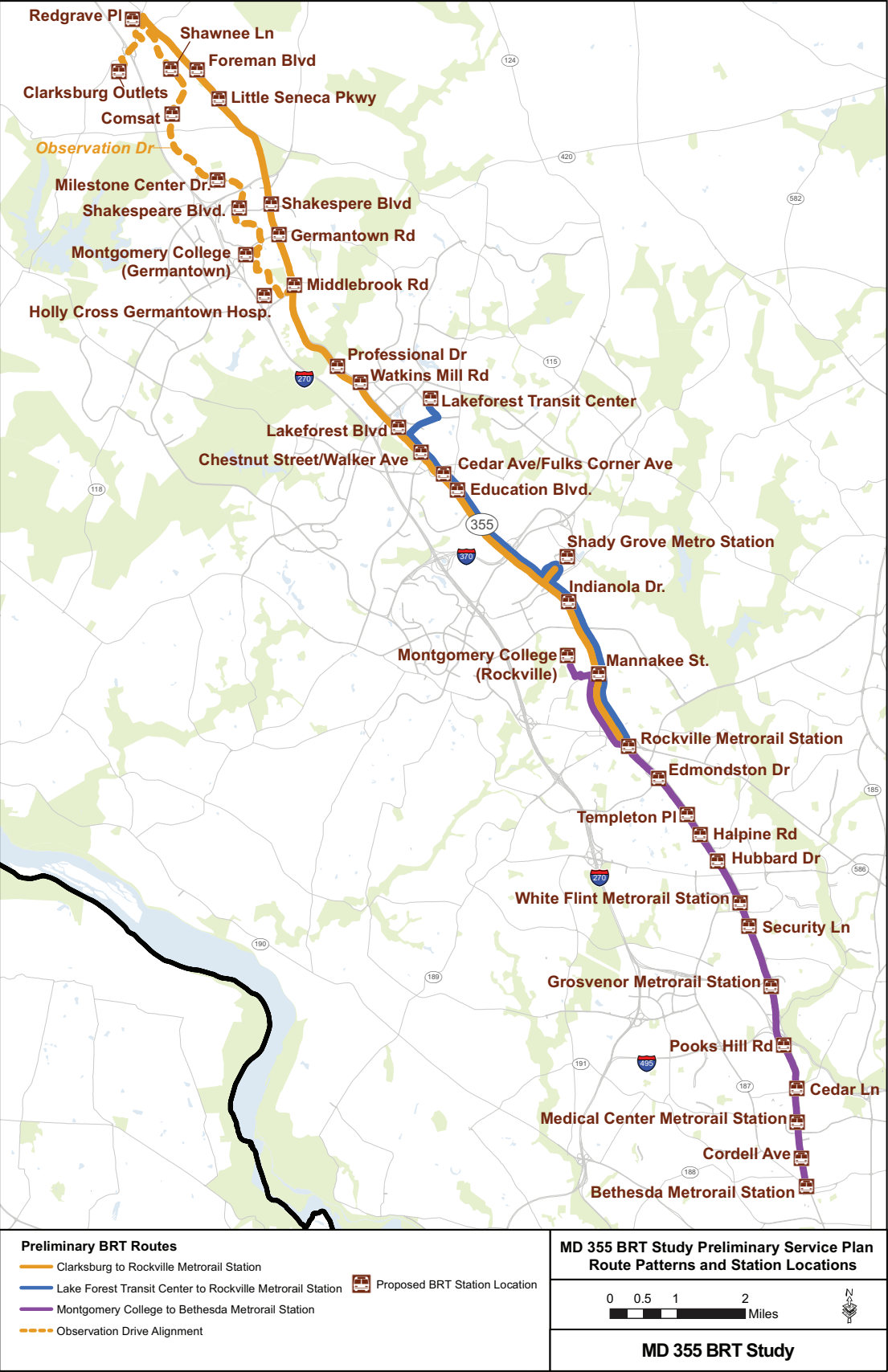
These Alternatives were tested to answer questions about the project limits, alignment, running way operations, and impacts. A set of screening criteria was identified to qualitatively evaluate the BRT Alternatives and to refine the Alternatives that will be investigated in Step 3. The refined BRT Alternatives may include a combination of elements found in one or more of the Alternatives under consideration.

### Step 3: Detailed Analysis

A narrower set of Alternatives will be investigated in further detail in the next phase of the project. These Alternatives will be evaluated using a set of selection criteria, and ultimately an Alternative will be recommended for future implementation.



Preliminary Service Plan Route Patterns and Station Locations



Screening Criteria Results

The BRT Alternatives have been evaluated to screen out elements that show the least benefit, and to develop a narrow set of Alternatives that will be analyzed in further detail in the next phase of the project. The evaluation of the BRT Alternatives was made using a set of defined screening criteria outlined in the table below.

Screening Criteria	Alt 3A	Alt 3B	Alt 4A	Alt 4B
Increase in total daily transit ridership	Medium	Higher	Lower	Higher
Increase in total bus ridership	Medium	Higher	Lower	Higher
Total daily BRT ridership	Medium	Higher	Lower	Higher
Boardings by station - North Section (Section 7)	Higher	Medium	Medium	Lower
Boardings by station - Central Section (Section 6 through Section 2)	Lower	Higher	Lower	Higher
Boarding by station - South Section (Section 1)	Same for Alternative 3B and Alternative 4B			
Increase in jobs within 45 minutes along the corridor	Medium	Higher	Lower	Lower
Increase in jobs within 60 minutes along the corridor	Medium	Higher	Lower	Medium
Increase in households within 45 and 60 minutes of activity centers	Lower	Higher	Lower	Higher
Property impacts *	Medium	Higher	Medium	Lower
Total operating costs *	Higher	Medium	Lower	Medium
Construction costs *	Medium	Higher	Medium	Lower

\* For screening criteria related to impacts and costs, if an Alternative has lower Impacts and Costs it performed better and therefore is presented in Green. If an Alternative has higher impacts and costs it performed worse and therefore is presented in Red.

The screening criteria presented above are for the entire length of the project. Additional screening criteria related to travel times, person throughput, impacts and costs will be presented for each section of the BRT Alternatives at the Open House and will be available on the project website [www.montgomerycountymd.gov/brt](http://www.montgomerycountymd.gov/brt) after the Open House.



# Conceptual Alternatives Preliminary Analysis - Takeaways

The results of the screening criteria have yielded important information about the Alternatives.

## Comparison of the two northern alignment Alternatives in Section 7 - MD 355 (Alt 3B, 4A, 4B) and Observation Drive (Alt 3A)

- Over 50% higher ridership identified along Observation Drive compared to MD 355.
- It takes twice as long (or more) for the BRT to travel along Observation Drive compared to MD 355.
- Observation Drive has higher ridership despite longer BRT travel times due to higher number of large trip generators.
- Observation Drive has operational costs that are over 40% higher than the other Alternatives due to higher ridership and longer travel times, resulting in more buses and service.
- The mixed traffic running way along Observation Drive results in lower property impacts and lower construction costs than Alternatives along MD 355.

## Comparison of the two southern limits in Section 1 - Grosvenor Metrorail Station (Alt 3A and 4A) and Bethesda Metrorail Station (Alt 3B and 4B)

- Approximately 15% of ridership is generated at stations south of Grosvenor Metrorail Station.
- Extending service to Bethesda Metrorail Station:
  - » Increases the ridership on the central section (Middlebrook Road to Grosvenor Metrorail Station – Sections 2-6) by more than 10%.
  - » Increases accessibility to households from activity centers by approximately 40 to 75%.
  - » Provides improved transit access to key activity centers including Medical Center and downtown Bethesda without having to transfer to Metrorail.
- Terminating service at Grosvenor Metrorail Station would result in lower property impacts, operational costs and construction costs.

## Differences in ridership for new BRT service between the Alternatives

- Providing service along Observation Drive increases ridership due to higher number of large trip generators.
- Extending service to Bethesda increases ridership by expanding the BRT market and providing improved transit access to additional activity centers without having to transfer to Metrorail.
- In general, the median running way sections have up to 20% shorter travel times generating higher ridership within those sections.

## Effects of lane repurposing in Sections 1 and 3 (Alt 3B and 4B)

- Person throughput measures how many people move through a certain location.
  - » Transit person throughput is how many people move through that certain location using transit.
  - » Auto person throughput is how many people move through a certain location in auto.
- Transit person throughput increases between 80% and 130% within the different sections with repurposed lanes compared to the No-Build.
- Total person throughput decreases by up to 15% in sections where lane repurposing is being proposed due to a decrease in auto throughput outweighing increase in transit throughput.
- The running ways where lane repurposing is being proposed results in lower impacts and lower construction costs.

## Operational characteristics for the bi-directional running way (Alt 3A and 4A) Section 3

- BRT travel times are up to 25% longer in Alternatives with bi-directional operations (Alternative 3A and 4A).
- BRT ridership is up to 25% lower in Alternatives with bi-directional operations (Alternatives 3A and 4A).
- Average delay per BRT trip, with bi-directional operations, ranges from a low of 1 minute 30 seconds to more than 3 minutes.
- Wider footprint of the bi-directional running way results in construction costs more than 13% higher compared to lane repurposing option.

## Median vs Curb Running Way Comparison

- In general, the median running way sections have up to 20% shorter travel times generating higher ridership within those sections.
- Median running way has a wider footprint and results in more than 25% higher property impacts and 60% higher construction costs compared to the curb running way.

## BRT service features that are affecting operational costs

- Orange BRT Route (Clarksburg to Rockville) is more than double the cost to operate than the other BRT Routes in the service plan.
- Higher ridership would require more frequent service and result in slower travel times and more buses in service, resulting in higher operational costs.

## BRT service features that are affecting property impacts and construction costs

- Median running way has a wider footprint and results in over 25% higher property impacts and 60% higher construction costs compared to the curb running way.
- Mixed traffic running way along Observation Drive reduces property impacts and construction costs on Alternative 3A.
- Extending service to Bethesda Metrorail Station results in higher property impacts and construction costs due to stations.

# Public Outreach

## Corridor Advisory Committees (CAC)

Two CACs were created for the Study. The CACs are comprised of residents, business owners and other interested stakeholders. The CACs meet regularly with the project team to review information, ask questions and provide feedback. The CACs serve as one part of the overall public outreach process.

Study team representatives are available to meet with community groups, civic associations and other organizations. To request a meeting, please send an email to [md355brt@mta.maryland.gov](mailto:md355brt@mta.maryland.gov).

To find copies of the CAC materials visit: [montgomerycountymd.gov/brt](http://montgomerycountymd.gov/brt). Look for the section on MD 355.

## Your Opinion Matters

This Open House offers members of the public the opportunity to comment on the BRT Alternatives presented. Your opinions will assist in refining the Alternatives that will be analyzed in further detail in the next phase of the project.

We will review and consider project concerns and preferences expressed at the Open House. Your comments and suggestions are very important to us.

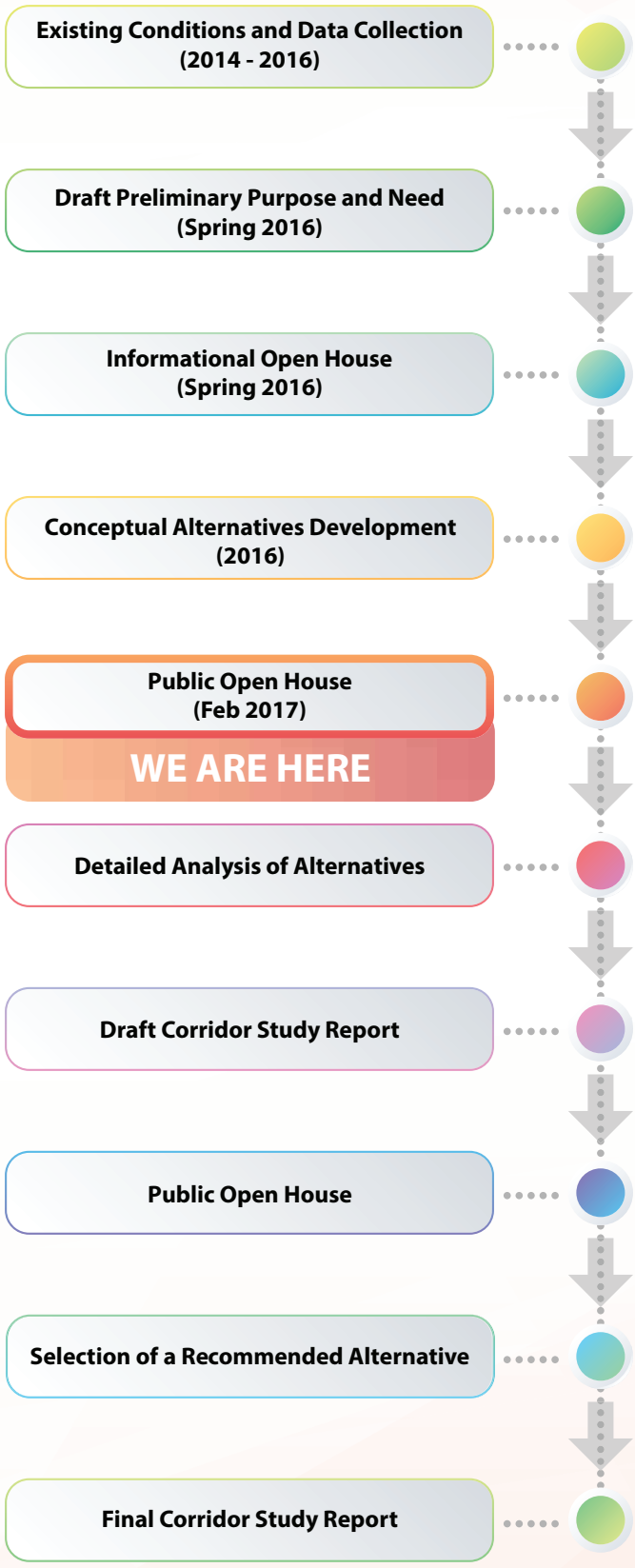
## Contact Us

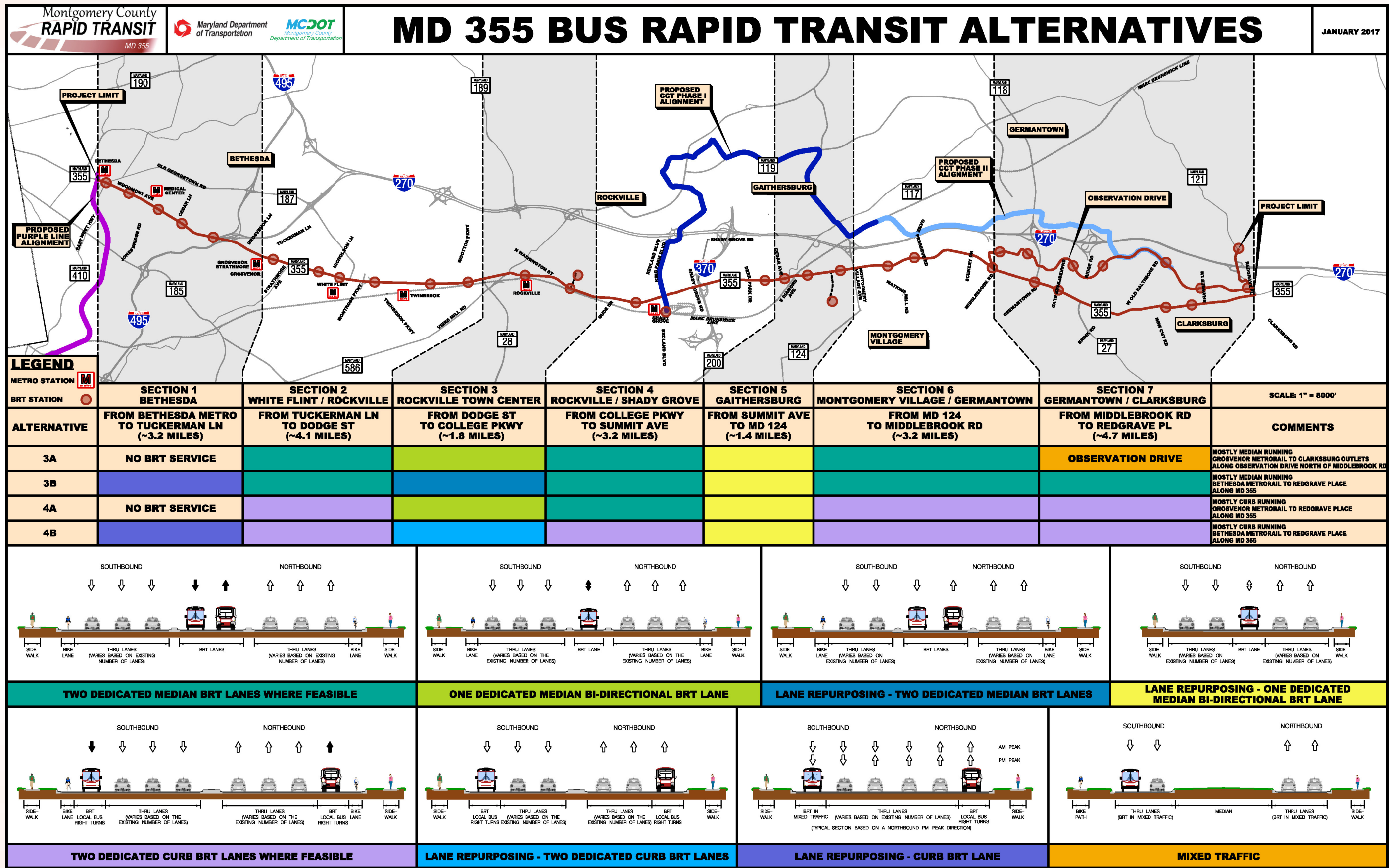
Project information can be found at: [montgomerycountymd.gov/brt](http://montgomerycountymd.gov/brt).

We encourage you to submit questions or comments to [md355brt@mta.maryland.gov](mailto:md355brt@mta.maryland.gov) or by mail to:

**Maryland Transit Administration**  
6 St. Paul Street, Suite 902  
Baltimore, MD 21202

# Study Timeline







**Maryland Department of Transportation**  
6 St. Paul Street, Suite 902  
Baltimore, MD 21202

[montgomerycountymd.gov/brt](http://montgomerycountymd.gov/brt)

Winter 2017