Route 1 Multimodal Alternatives Analysis

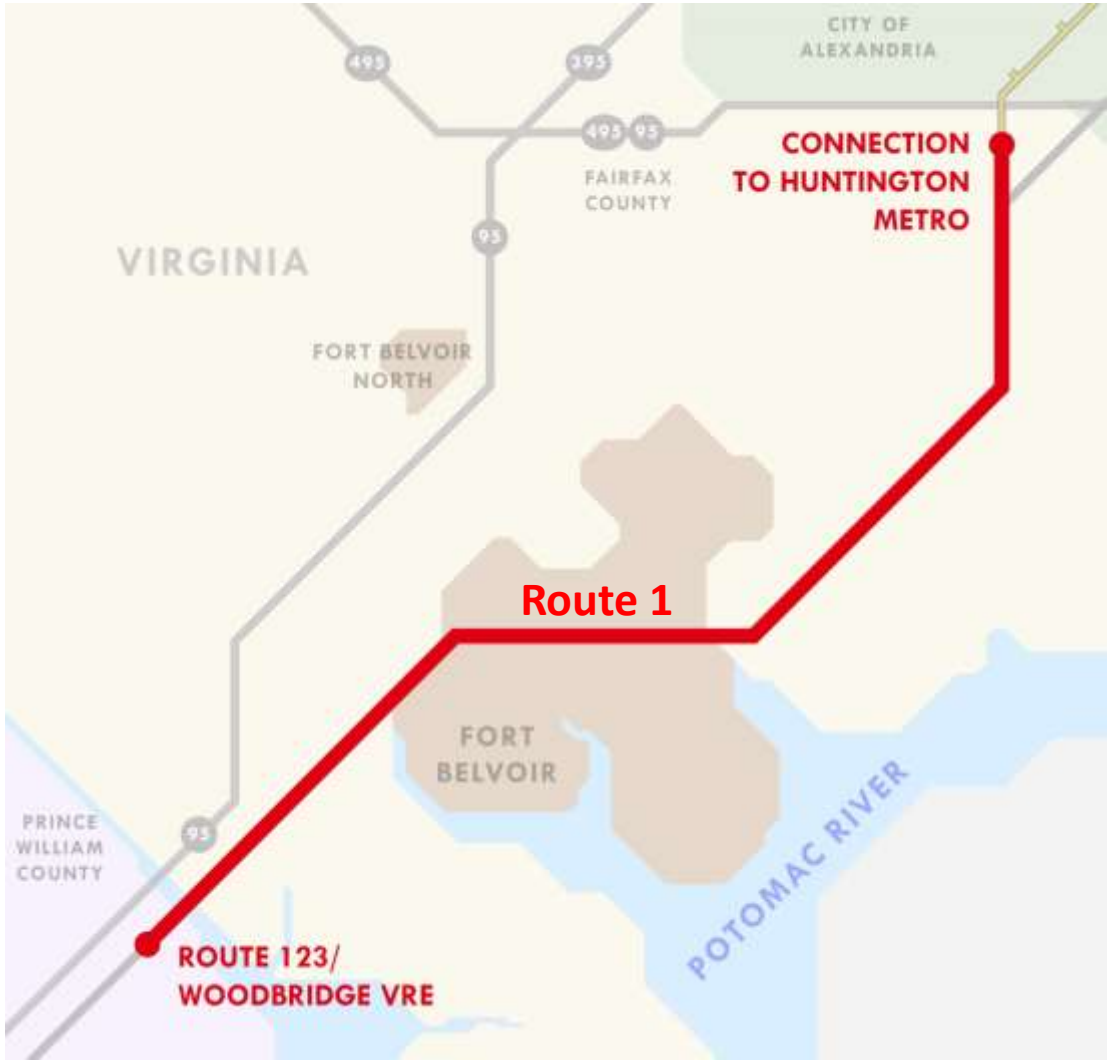
Technical Advisory Committee

March 6, 2014

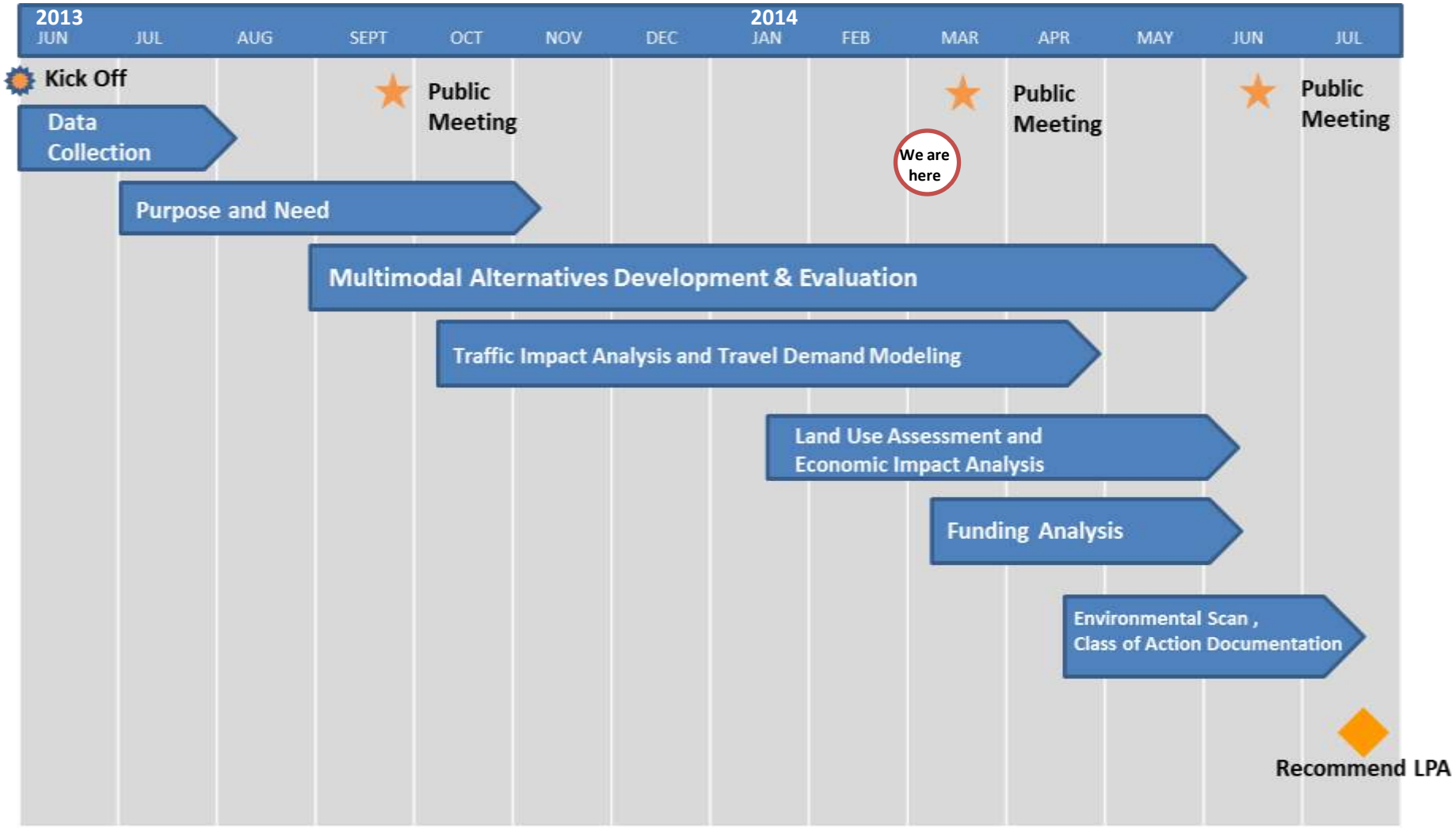
Agenda

1. Background and Process (10:00)
2. Travel Markets and Metrorail Core Capacity (10:05)
3. Proposed Alternatives for Further Evaluation (10:15)
4. Land Use Scenario Development (10:45)
5. Project Funding and Finance (10:55)
6. Q&A, Discussion (11:15)
7. Upcoming Meetings and Next Steps (11:35)

Project Corridor

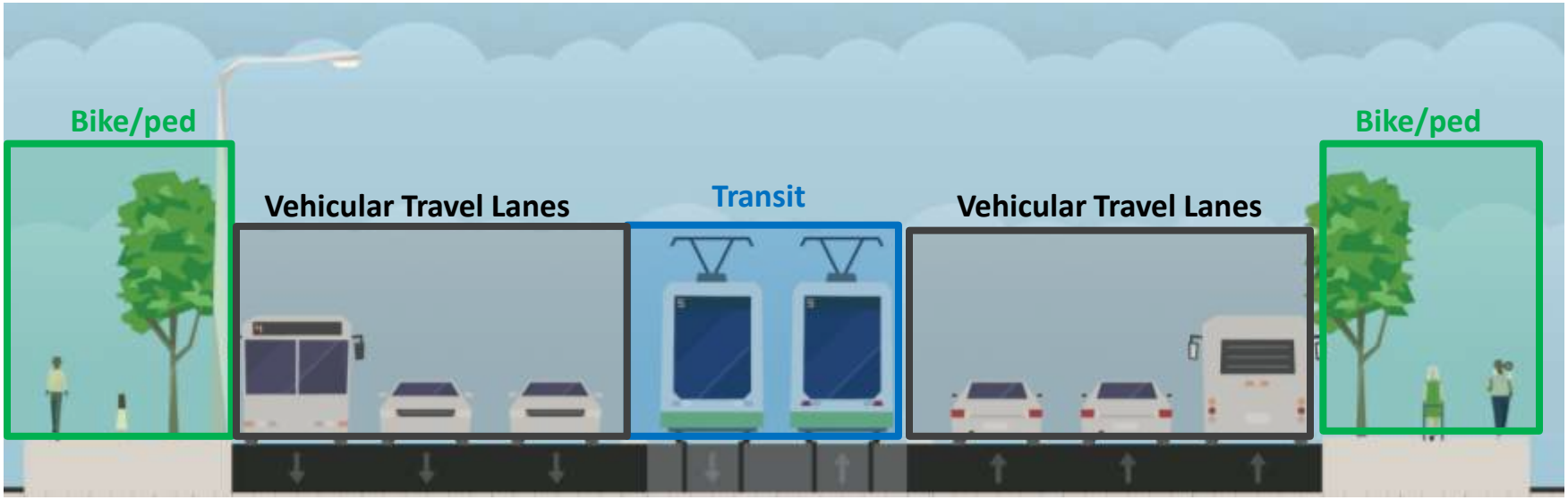


Project Schedule (June 2013 to July 2014)



Outcome of the Study

- A recommended multimodal alternative for implementation in the Route 1 corridor by the technical team
- The recommended alternative will have three elements:
  - **Transit**: Mode and alignment
  - **Vehicular**: Number of automobile travel lanes
  - **Bike/ Ped**: Facilities and location



1. Background and Process

Reminder: Highlights of Last Meeting

- Presented Purpose and Need
- Identified the transportation problems we want to solve
- Presented preliminary options for:
  - Transit modes
  - Vehicular Lanes
  - Bike/Ped facilities

What did we learn between the last meeting and now?

- Assessed the existing travel market
- Studied a range of transit, vehicular lane, and bike/ped options
- Defined the alternatives for evaluation
- Developed land use scenarios

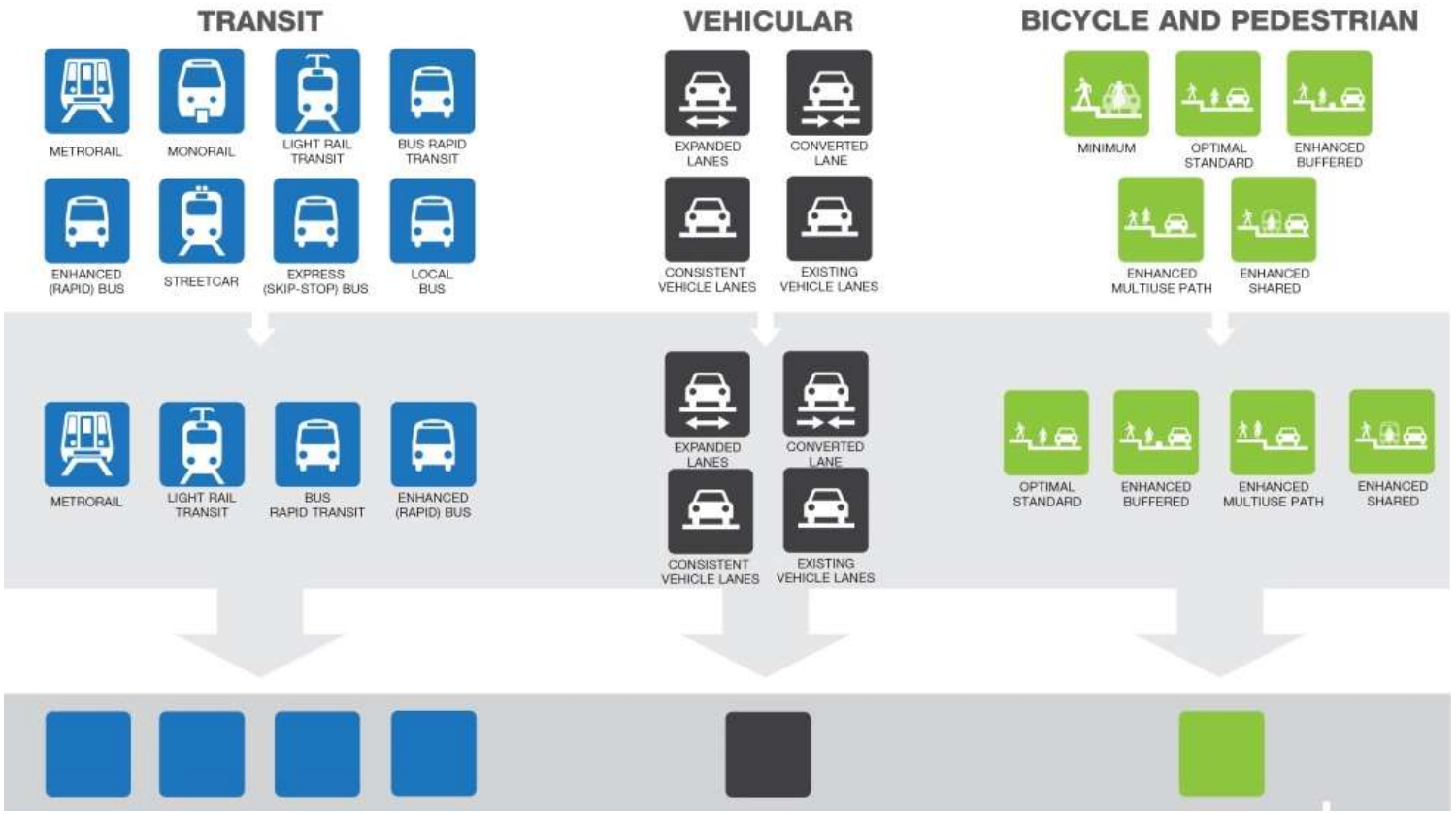
How do we Arrive at a Recommended Alternative?

Step 1: Identify the best transportation options

Range of Alternatives

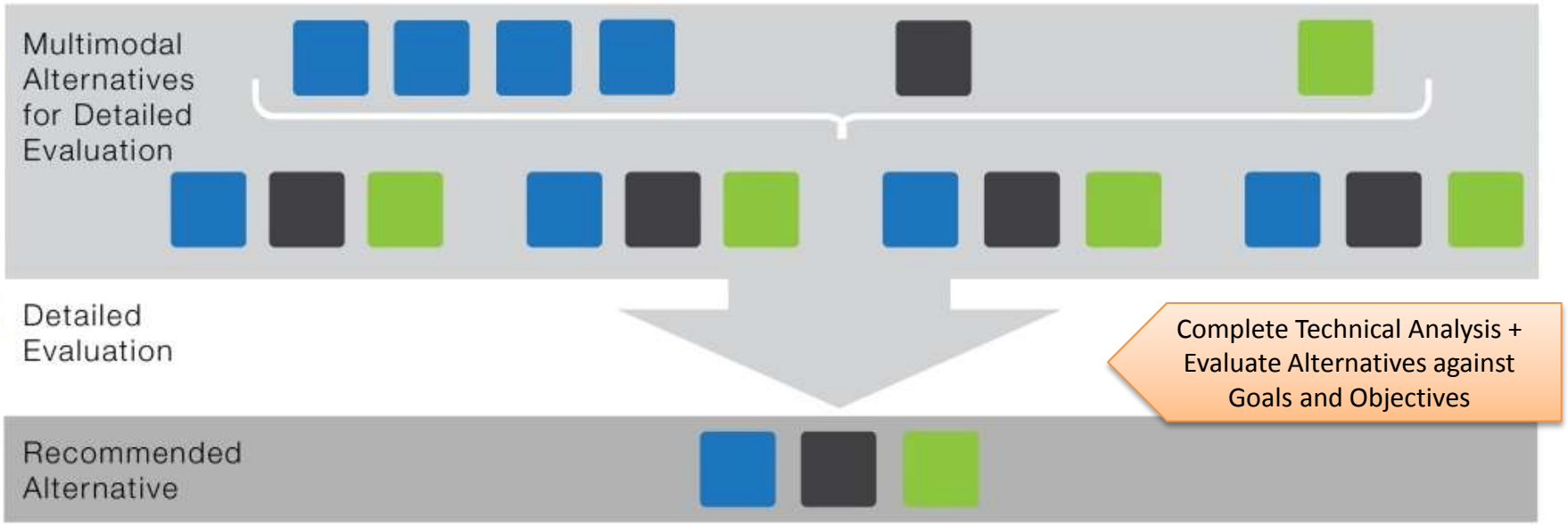
Initial Alternatives

Refined Alternatives



How do we Arrive at a Recommended Alternative?

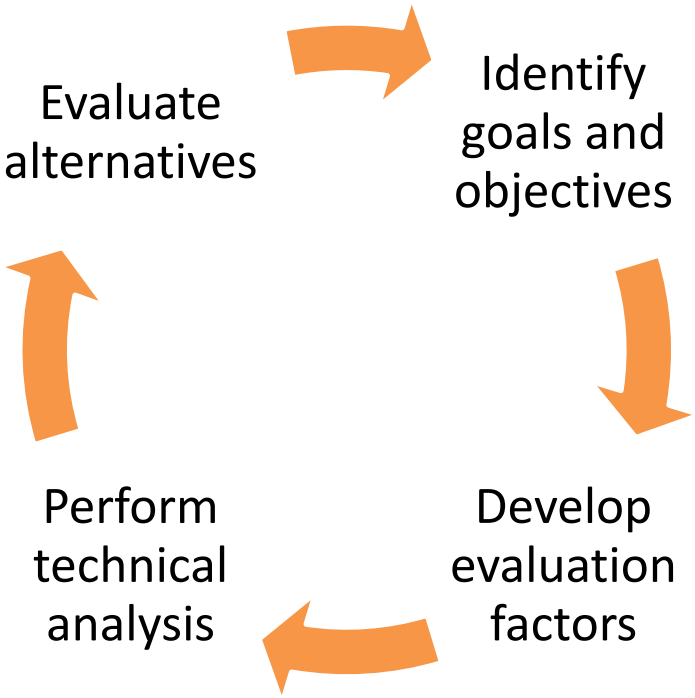
Step 2: Combine options into multimodal alternatives and evaluate



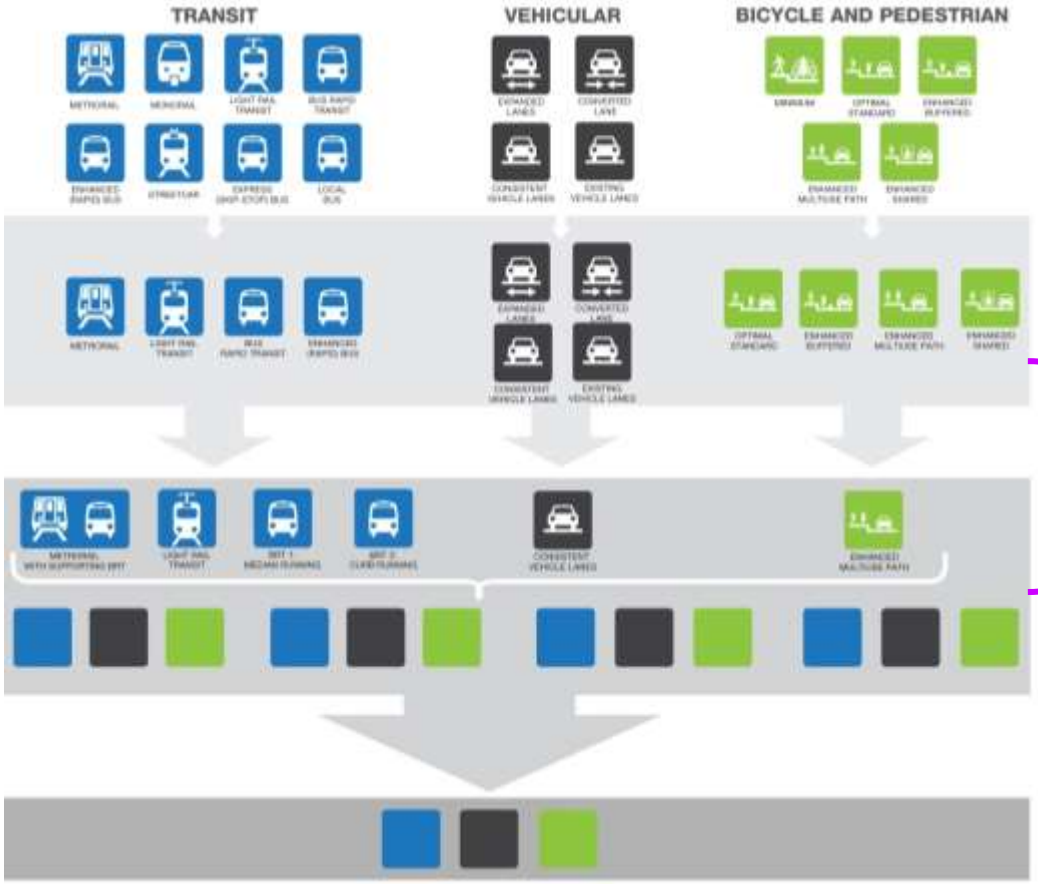
Arriving at Recommended Multimodal Alternative: How do we choose one?

Key Evaluation Factors:

- Transit system performance
- Bicycle and pedestrian network improvements
- Traffic operations
- Implementation/ ability to phase project
- Financial feasibility
- Capacity to meet current and future needs
- ROW and impacts on community resources



Multimodal Evaluation Process



Today's meeting answers

How do we get from Screen 1 to Screen 2?

Discuss the process for evaluating options under each category:

Transit, **Vehicular**, and **Bike/Ped**

At the end of the presentation, we will have confirmed:

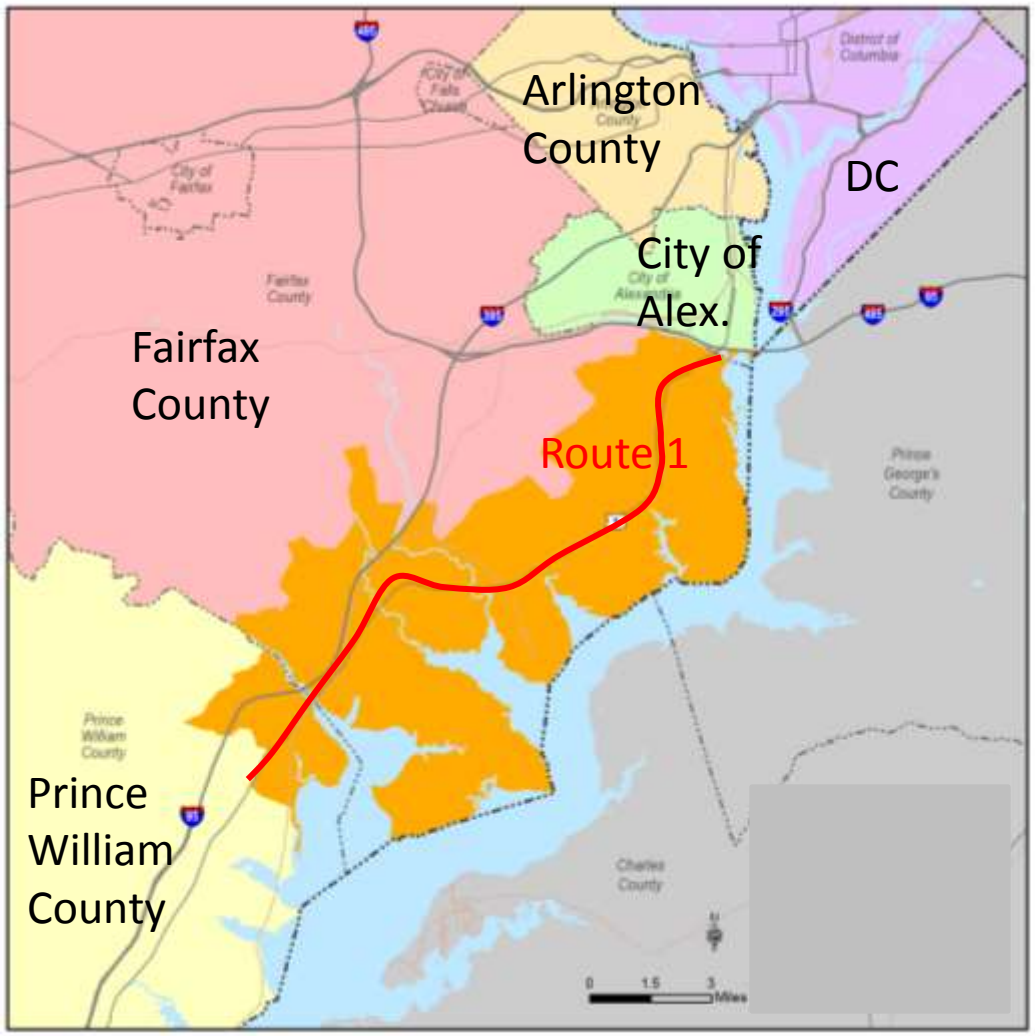
Which alternatives will be further evaluated?

(We'll have filled in the boxes!)

One of these options will ultimately be the recommended alternative.

2. Travel Markets and Metrorail Core Capacity

The Existing Transit Travel Market

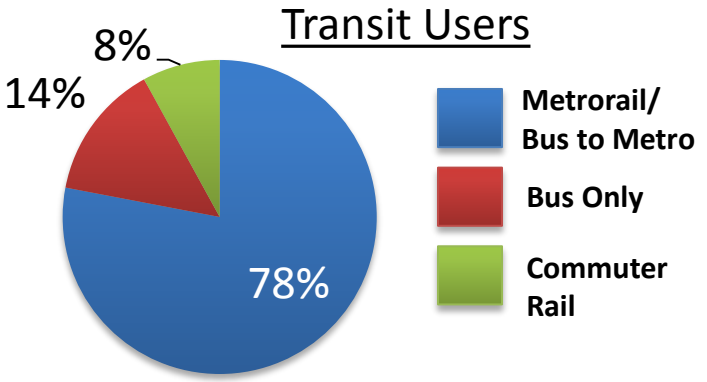


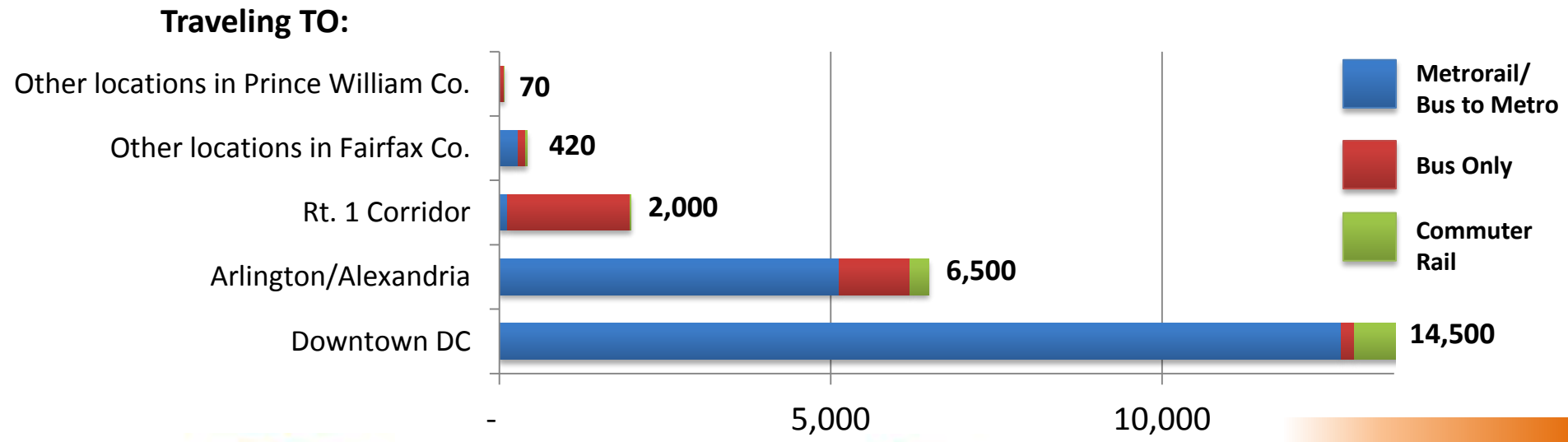
Considered regional travel to, from, and within Route 1 corridor:

- Where people live and work
- Major regional destinations

Existing Transit Travel Markets: Where do people who live in the corridor travel to?

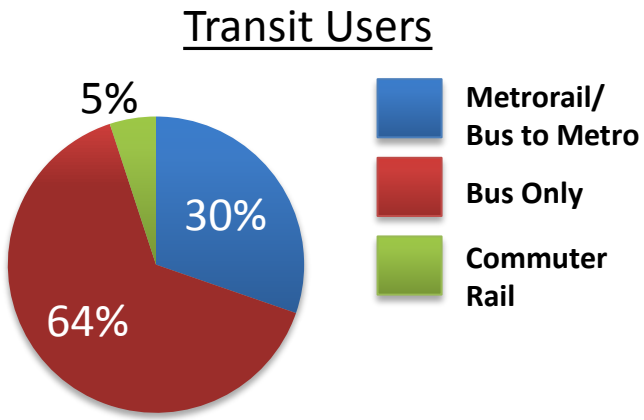
- 78% of corridor residents who use transit ride Metrorail
- The majority of corridor transit users (52%) are commuting to Downtown, using Metrorail
- 86% of corridor transit users are traveling to Arlington or Downtown



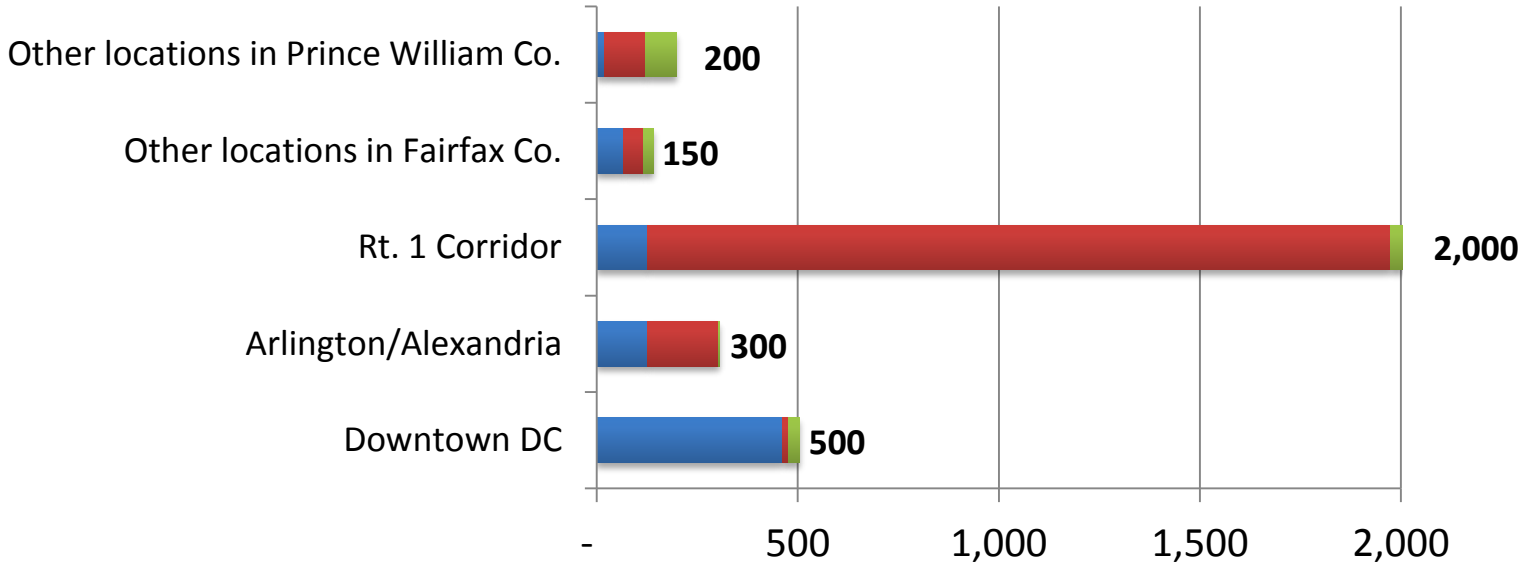


Existing Transit Travel Markets: Where do people who travel to the corridor come from?

- 64% of transit commuters to the corridor use the bus
- Most transit trips begin and end in the corridor



Traveling FROM:



Metrorail Core Capacity Constraints

WMATA cannot expand Metrorail at end of line stations without increasing rail and station capacity in the downtown core.

Supporting Metro and MWCOG Studies:

- **Momentum** (Metro, 2013)*: Includes Metro 2025, which is a set of initiatives to improve core capacity and maximize the existing system.*

- **2035 & 2040 Constrained Long Range Plan** (TPB, 2013): *Does not identify any improvements to increase core capacity*

- **Regional Transit System Plan** (Metro, 2014): *Identifies future priority projects and improvements to increase core capacity, including new rail lines in the DC and Arlington core and high-capacity high-frequency surface transit corridors*

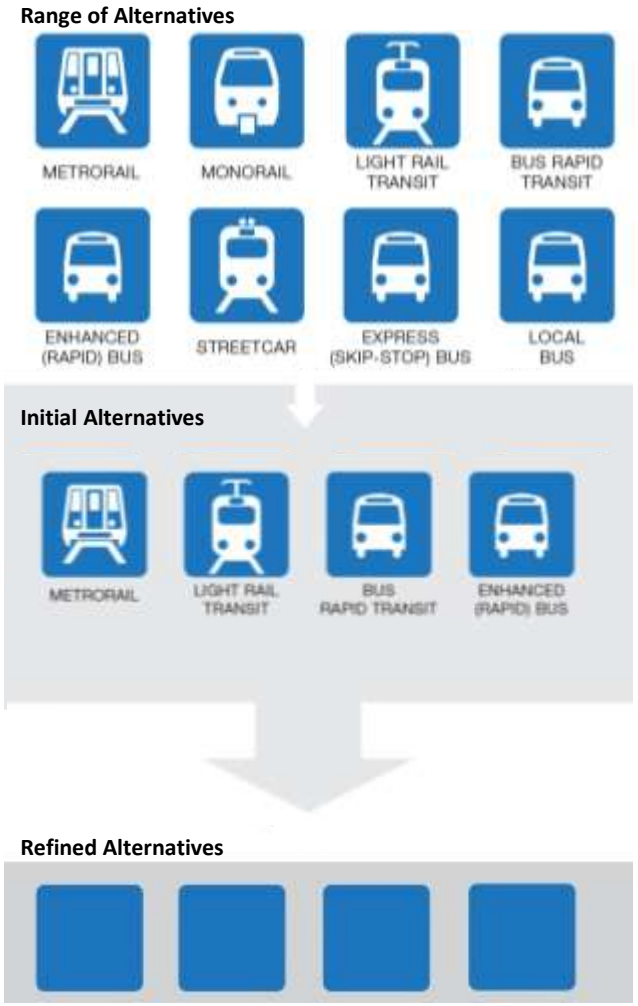
Route 1 ridership modeling does not assume core capacity constraints for Metrorail

3. Proposed Alternatives for Further Evaluation

Transit Evaluation: Overview

1. **Screened a wide range of transit alternatives** based on basic project requirements to arrive at four initial alternatives

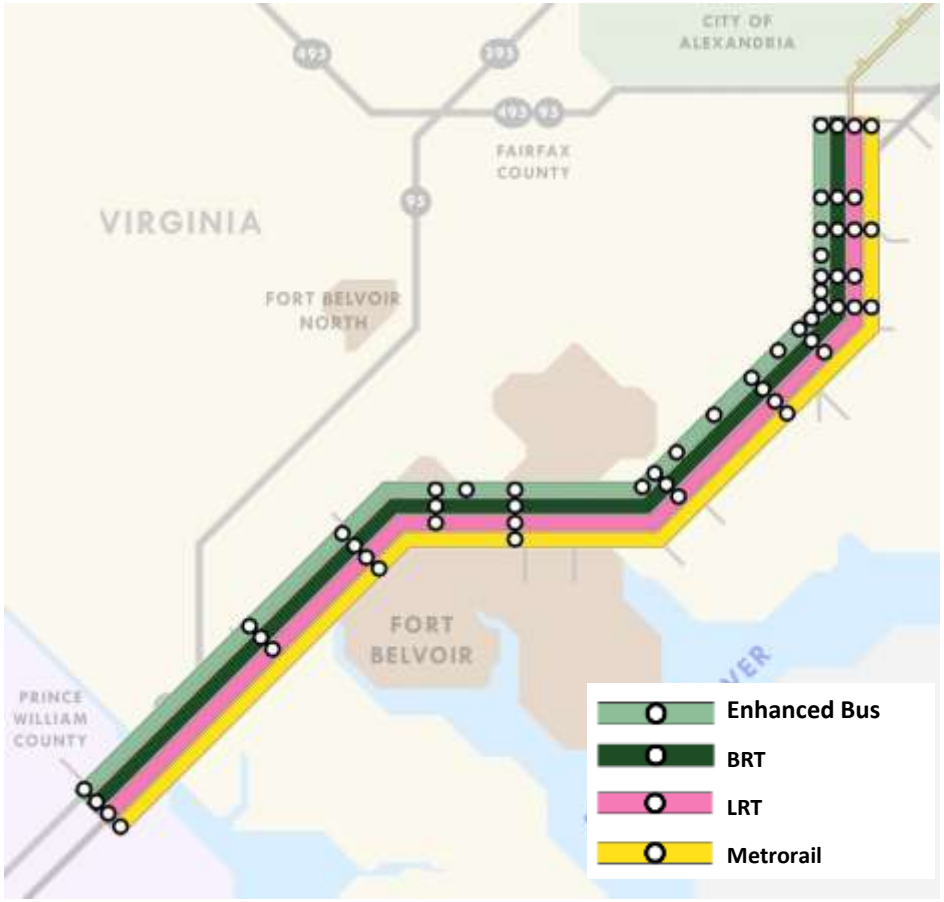
2. Analyzed **four transit alternatives** to identify the most promising modes (e.g. rail, bus) and routes for further evaluation



Initial Alternatives

Four Initial Transit Alternatives:

- Metrorail
- Light Rail Transit (LRT)
- Bus Rapid Transit (BRT)
- Enhanced Bus



Key Indicators: Initial Alternatives

	Enhanced Bus	Bus Rapid Transit	Light Rail Transit	Metrorail
Average Weekday Ridership (2035)	9,500	16,600	18,400	38,500
Conceptual Capital Cost	$180 M	$780 M	$1.20 B	$4.80 B
Annual O&M Cost	$14 M	$17 M	$24 M	$84 M
Cost Per Rider*	$10	$15	$21	$37
Supportive of population and employment levels (MWCOG 2035)	Most of north, and south terminus	Some areas at north, and south terminus	Some areas at north, and south terminus	None

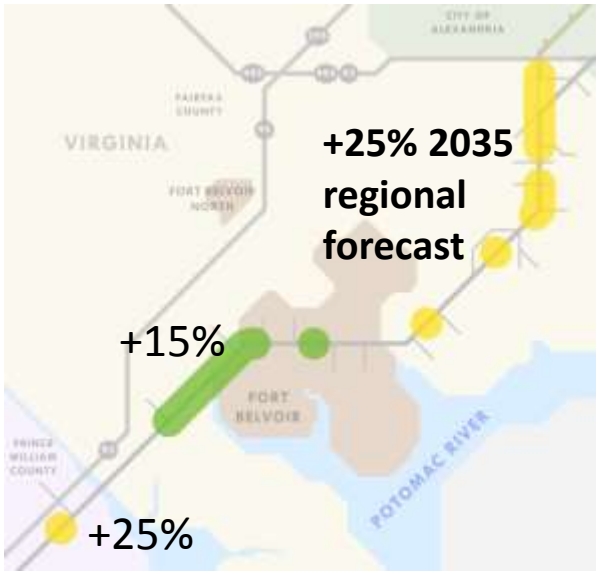
*Assumes Annualized Capital Cost + Operating Costs divided by total boardings (2035)
Note: FTA Cost Effectiveness measure averages current (2015) and horizon year (2035) costs and boardings

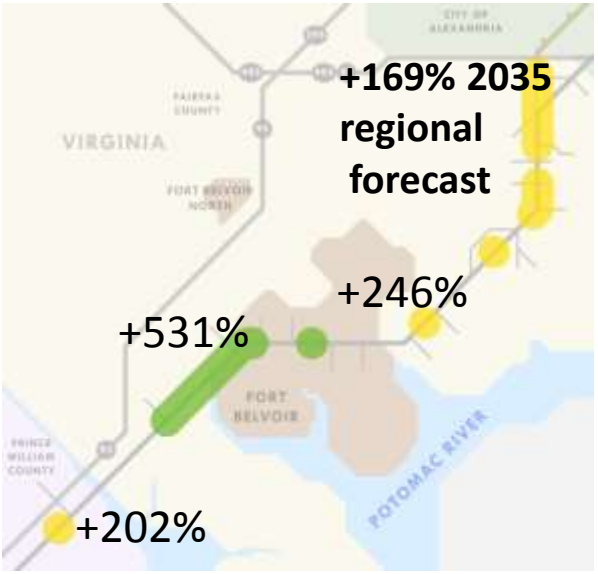
Land Use: Transit-Supportive Activity Densities

Scenario 1:
"Base Land Use Scenario" = 2035 MWCOG regional forecast

Scenario 2:
What is a reasonable growth expectation for a corridor that invests in high-quality transit (BRT or LRT)?

Scenario 3:
How much do population and employment need to increase to achieve density levels typically supportive of **Metrorail**?

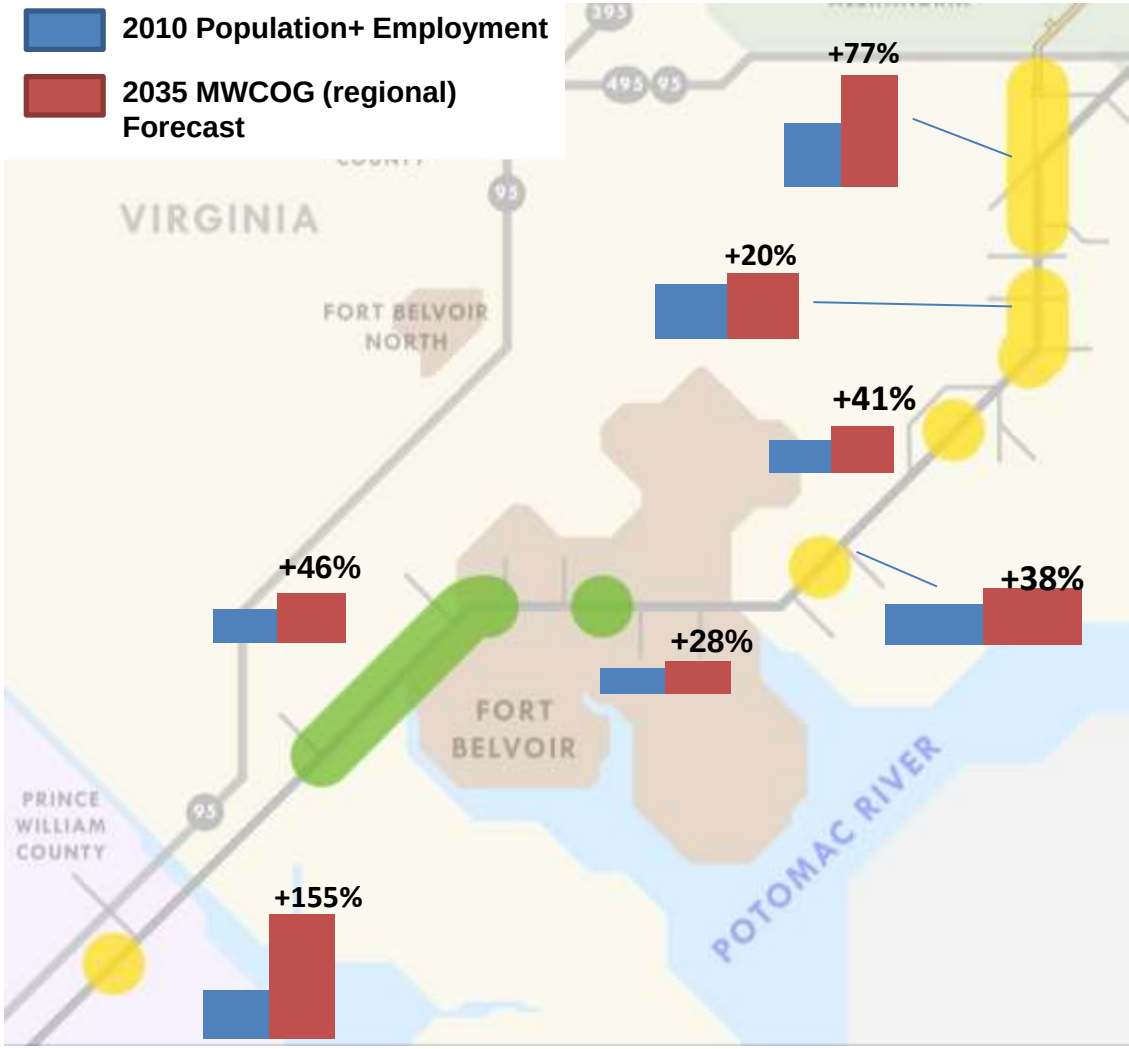




- Large Town/Suburban Center (Express Bus)
- Medium Town/Suburban Center (Fixed Route Bus)
- Rural or Village Center (Demand Response)

Scenario 1: 2035 MWCOG Population and Employment Forecast

- The 2035 regional forecast anticipates high growth that varies along the corridor
- Base scenario for potential FTA grant application
- Station areas (within ½-mile) in the north and at Woodbridge are supportive of express bus; areas near Fort Belvoir are less dense



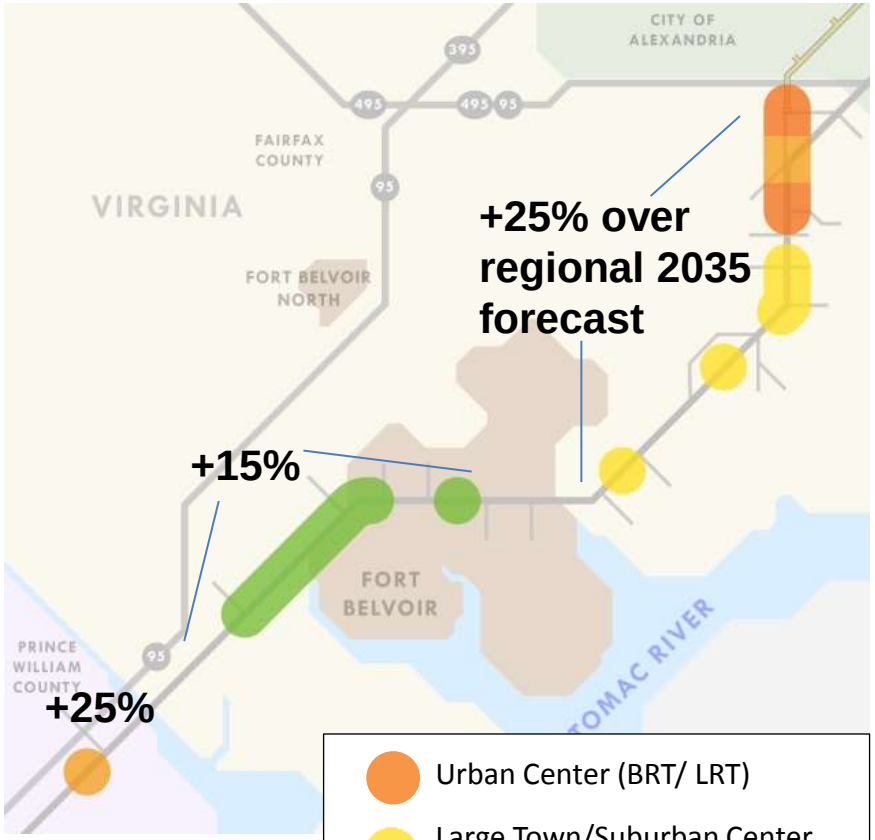
Scenario 2: Reasonable Response to High-Quality Transit Investment

What is a reasonable growth expectation for a corridor that invests in high-quality transit (BRT or LRT)?

- Given national experience, assumed a **25%** increase in activity levels due to **premium transit investment,** coupled with strong land use **planning** and **development incentives**

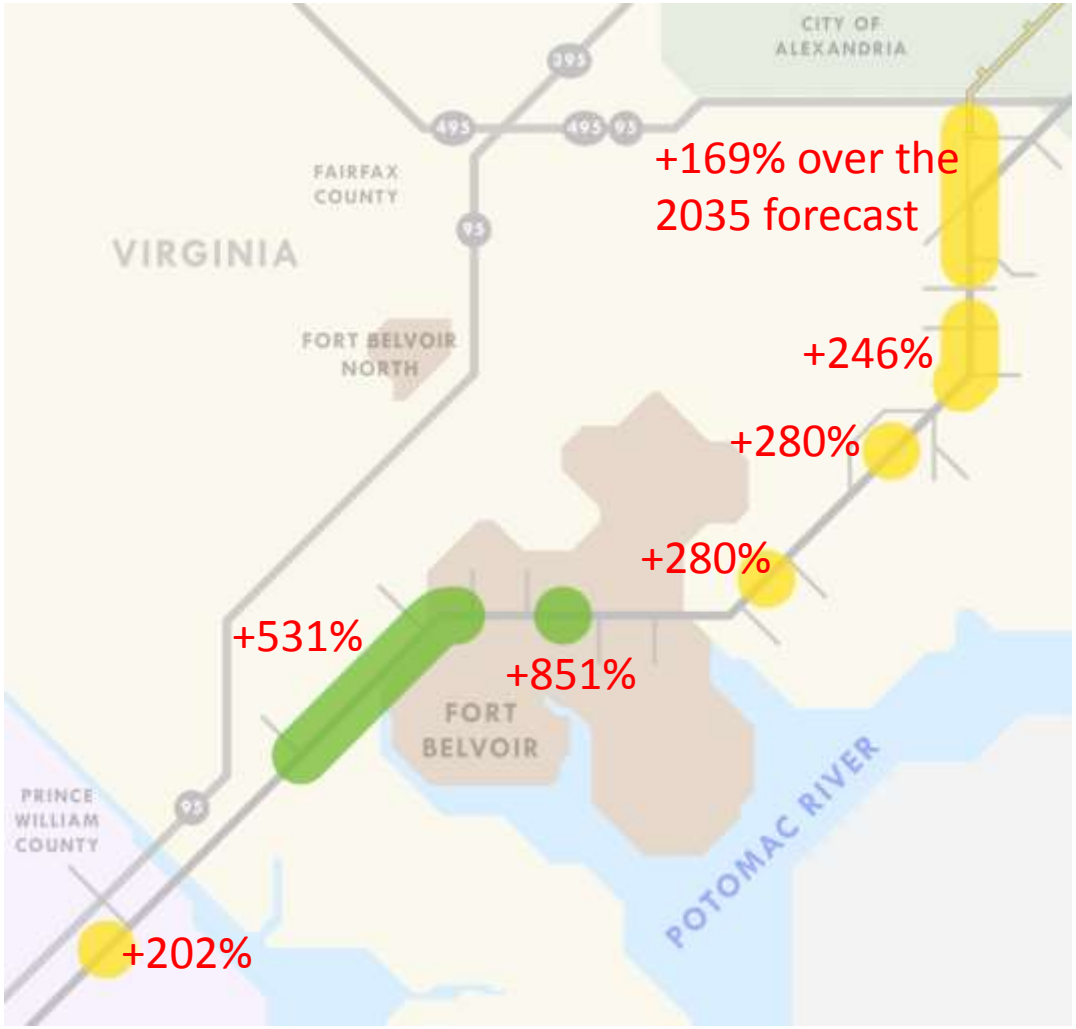
- Coordinated assumptions with Fairfax County and Prince William County planners:
  - **25% increase** in activity level densities in the north portion and at Woodbridge
  - **15% increase** for stations near Lorton

- Scenario 2 could support a future FTA New Starts or Small Starts application



Scenario 3: What would it take to support Metrorail?

Densities around stations would need to **increase dramatically** beyond the 2035 regional forecast to meet development levels typically associated with Metrorail as defined in the DRPT Multimodal Design Guidelines

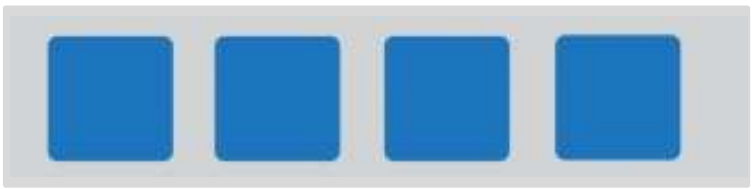


How do we refine the initial alternatives for further evaluation?

1. Perform quantitative and qualitative analyses for each of the four modes along the entire corridor:

- Developed **initial ridership forecasts**
- Developed high-level **capital** and **O&M Costs**
- Compared existing and mode-typical land use densities

2. Using **key indicators** (**cost, ridership, and land use**) and **qualitative criteria** (**project goals**), recommended **four refined alternatives** to be analyzed in further detail.



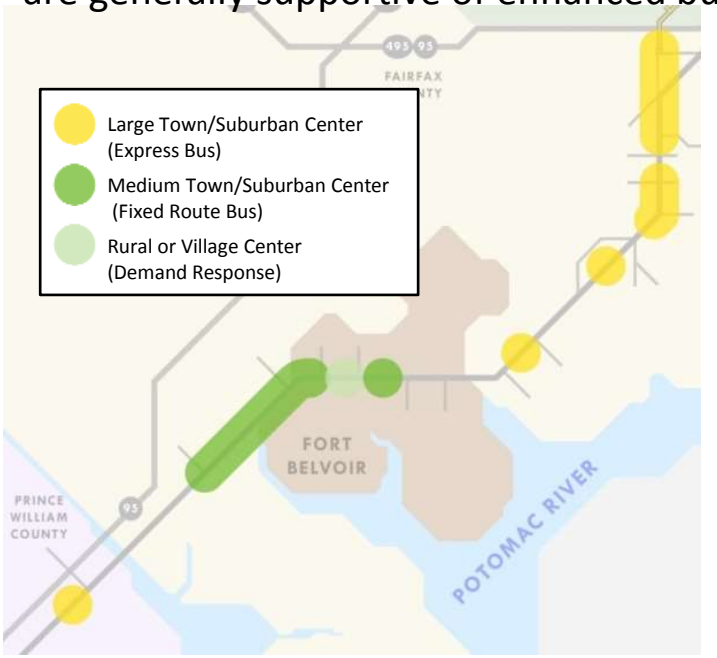
Initial Alternative: Enhanced Bus

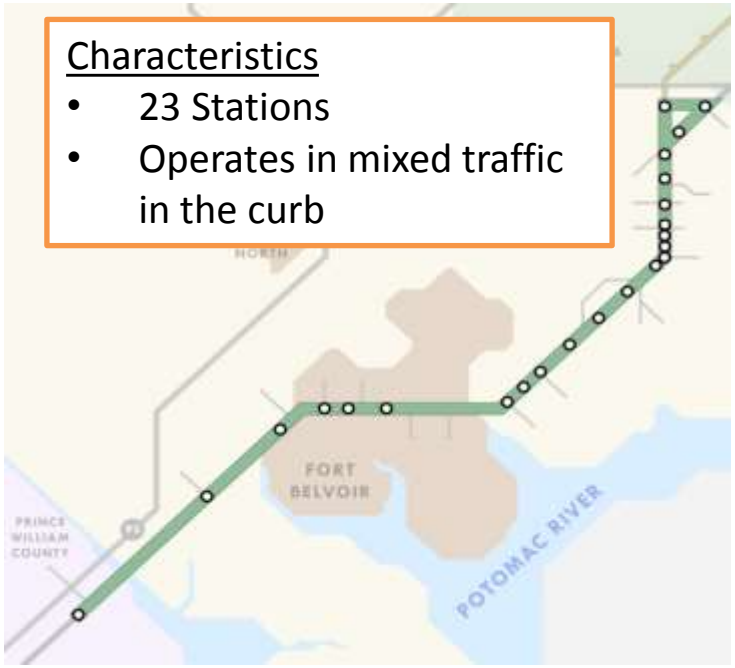
Key Transit Characteristics

- Weekday Ridership 9,500
- Capital Cost $180 M
- O&M Cost $14 M
- Cost per Rider $10

Land Use

Scenario 1: Areas within ½-mile of stations are generally supportive of enhanced bus





Conclusions:

- Enhanced bus is the least cost-intensive alternative but carries fewer riders
- REX buses currently provide enhanced bus service in north portion of corridor
- Land use supportive of enhanced bus (2035 MWCOG)
- Enhanced bus operating in mixed-traffic from Fort Belvoir to Woodbridge should be evaluated further

Initial Alternative: Bus Rapid Transit- Median

Key Transit Characteristics

- Weekday Ridership 16,600
- Capital Cost $780 M
- O&M Cost $17 M
- Cost per Rider $15

Land Use

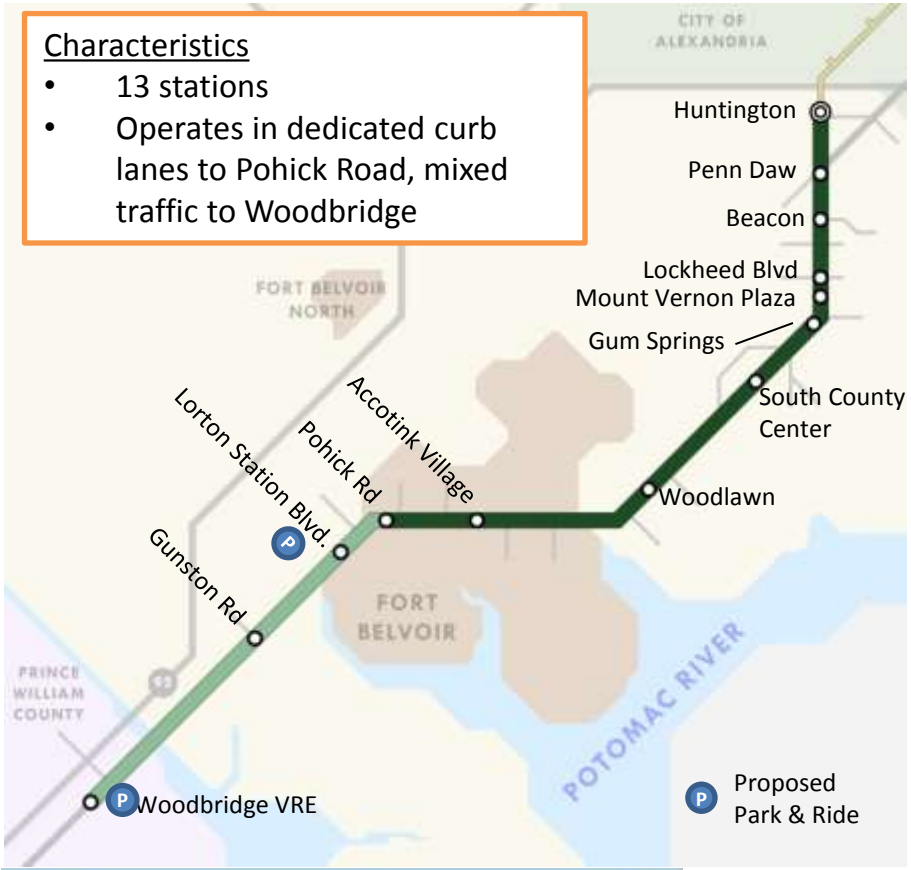
Scenario 2: Areas within ½-mile of stations in the north and southern terminus areas supportive of BRT

Conclusions:

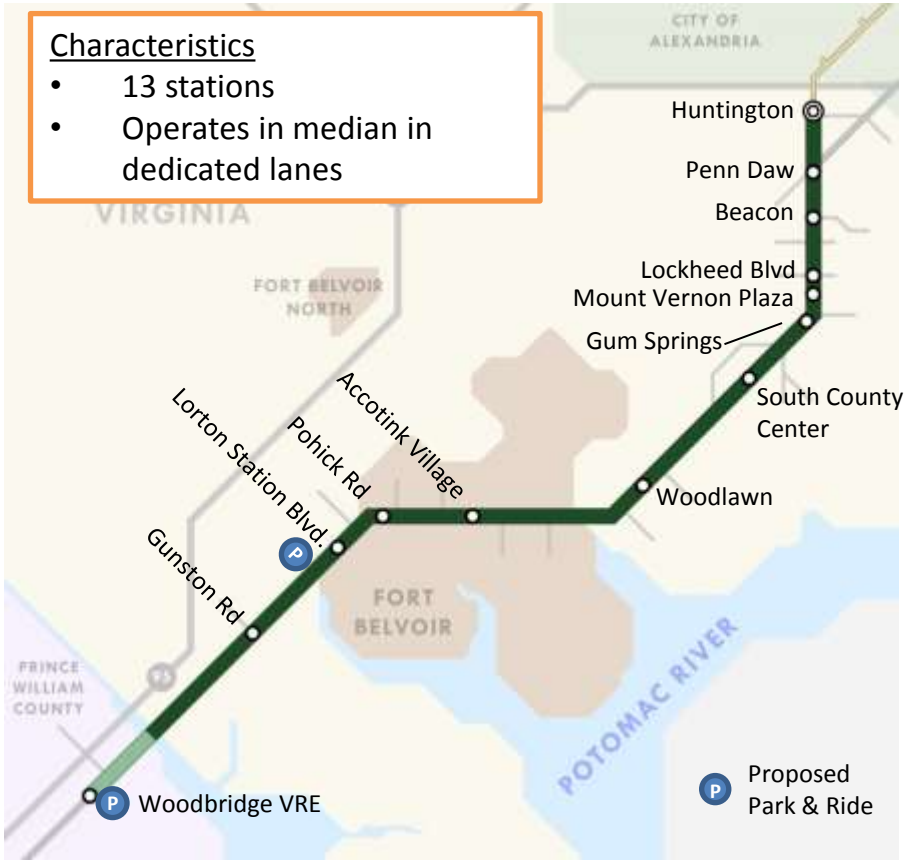
- BRT attracts significantly higher ridership than enhanced bus
- Projected (2035 MWCOG) land use would support a higher capacity transit mode in the north portion of corridor
- Enhanced land use (Scenario 2) would support a higher capacity transit mode along the full corridor
- Need to explore tradeoffs of curb versus median running

Proposed Refined Alternatives: Two Bus Rapid Transit Alternatives

BRT 1- Curb Running



BRT 2- Median Running



Initial Alternative: Light Rail Transit

Key Transit Characteristics

- Weekday Ridership 18,400
- Capital Cost $1.20 B
- O&M Cost $24 M
- Cost per Rider $21

Land Use

Scenario 2: Some areas within ½-mile of stations in the north could support LRT

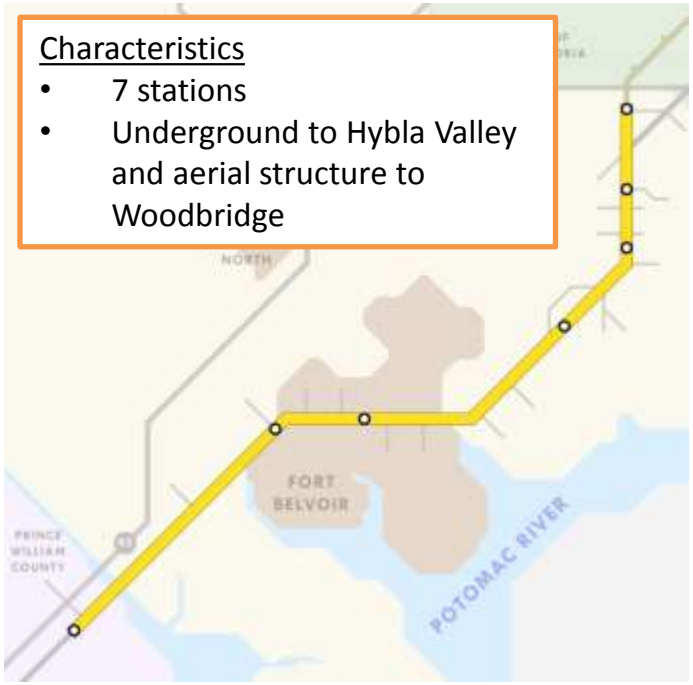
Conclusions:

- LRT attracts higher ridership than BRT, and is more cost effective than Metrorail
- Enhanced land use (Scenario 2) could support LRT in north portion of corridor
- Recommend advancing for further evaluation

Initial Alternatives: Metrorail

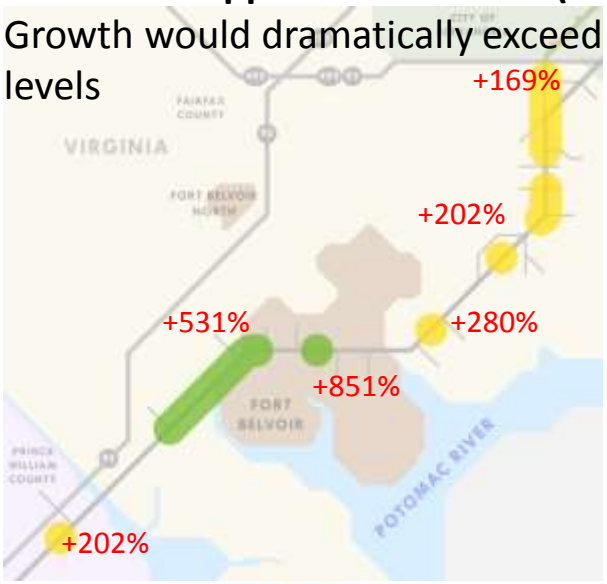
Key Transit Characteristics

- Weekday Ridership 38,500
- Capital Cost $4.80 B
- O&M Cost $84 M
- Cost per Rider $37



Land Use

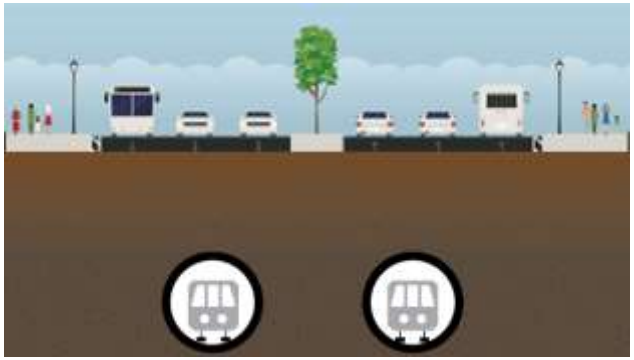
Metrorail Supportive Land Use (Scenario 3):
Growth would dramatically exceed planned levels



Conclusions:

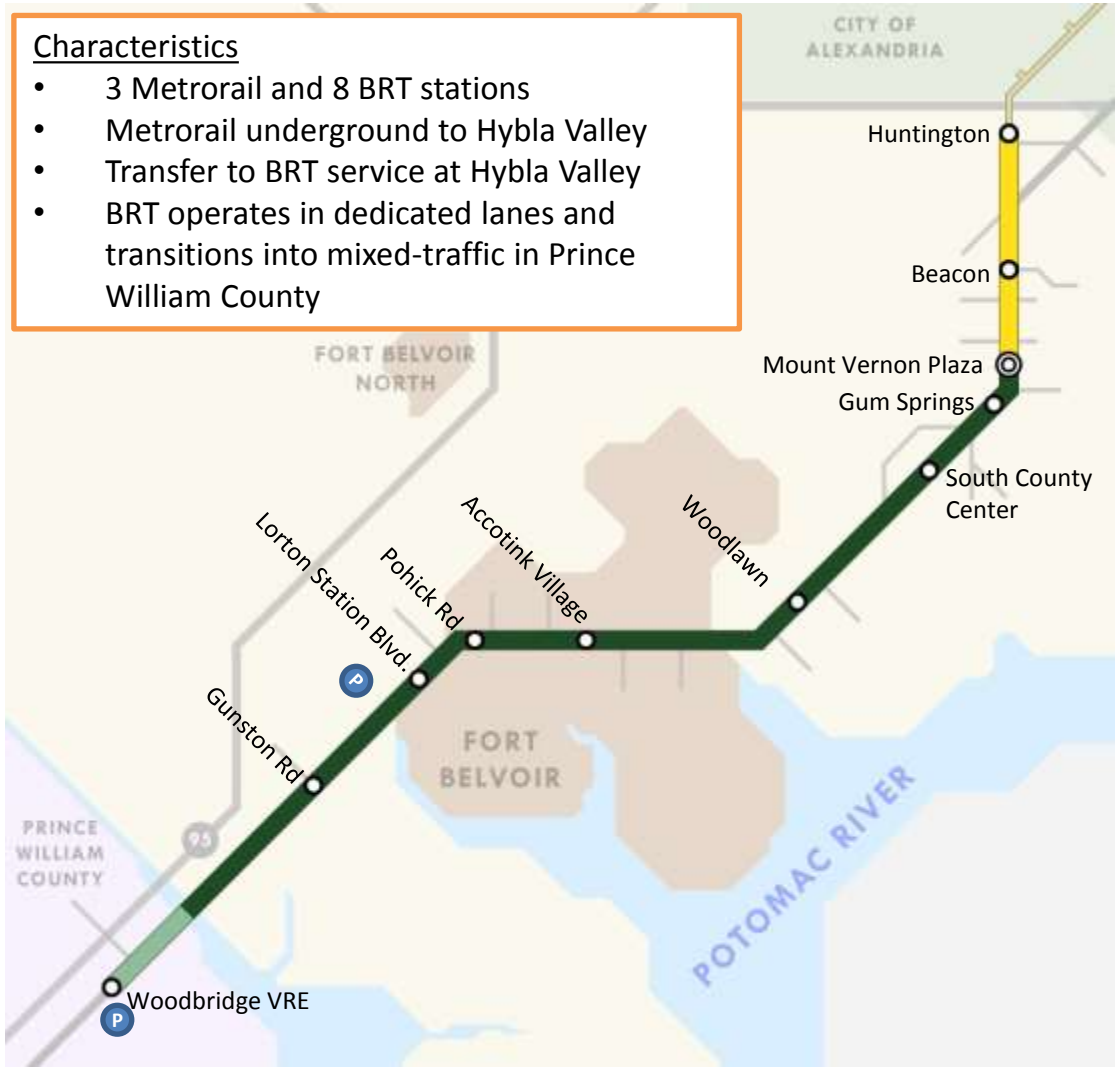
- Neither enhanced land use nor the Fairfax Comprehensive Plan support Metrorail activity density levels
- Not competitive for federal funding
- 15-mile Metrorail is not feasible, but a shorter segment at north end of corridor should be explored

Proposed Refined Alternative: Metrorail/BRT Hybrid



Characteristics

- 3 Metrorail and 8 BRT stations
- Metrorail underground to Hybla Valley
- Transfer to BRT service at Hybla Valley
- BRT operates in dedicated lanes and transitions into mixed-traffic in Prince William County



Summary:
Four Proposed Alternatives for Further Evaluation

Alternative 1: Bus Rapid Transit A

- Bus operates in curb, dedicated transit lanes from Huntington to Fort Belvoir
- South of Fort Belvoir to Woodbridge, bus operates in mixed traffic

Alternative 2: Bus Rapid Transit B

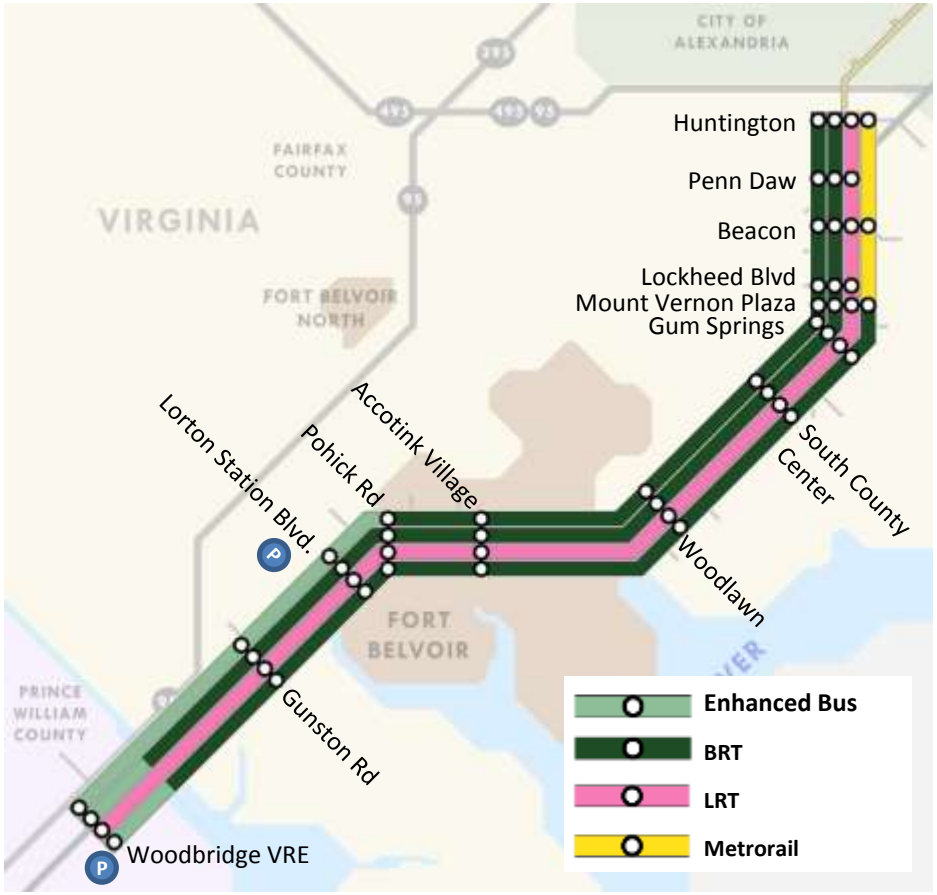
- Bus operates in the median in dedicated lanes for entire length of corridor and in mixed-traffic in Prince William County

Alternative 3: Light Rail Transit

- Light Rail vehicle operates in the median in dedicated lanes for entire length of corridor

Alternative 4: Metrorail- BRT Hybrid

- Yellow line extension to Hybla Valley with connecting BRT service to Woodbridge



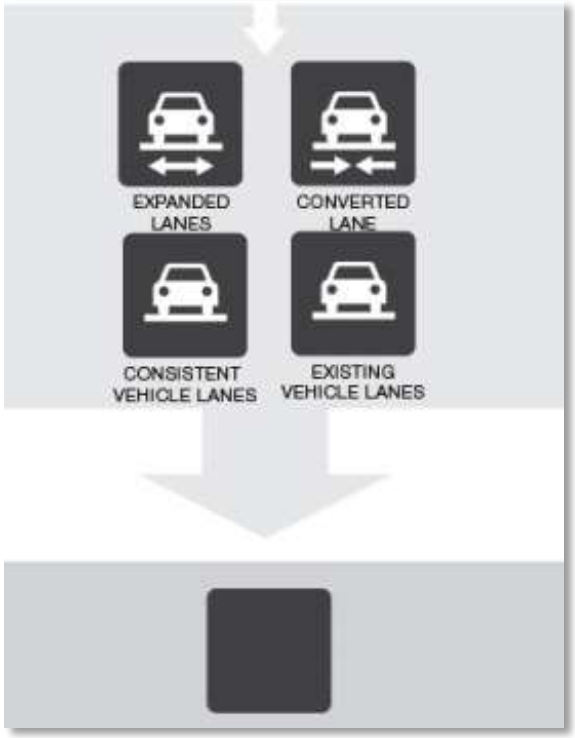
Key Indicators: Refined Transit Alternatives

	Bus Rapid Transit 1 - Curb	Bus Rapid Transit 2- Median	Light Rail Transit- Median	Metrorail/BRT- Median Hybrid
Average Weekday Ridership (2035)	15,200	16,600	18,400	26,500* (BRT- 10,600; Metro- 22,900)
Conceptual Capital Cost	$500 M	$780 M	$1.20 B	$1.57 B
Annual O&M Cost	$18 M	$17 M	$24 M	$31 M
Cost Per Rider**	$12	$15	$21	$18

* Corridor ridership, excluding transfers between Metrorail and BRT portions

**Assumes Annualized Capital Cost + Operating Costs divided by total boardings (2035)
Note: FTA Cost Effectiveness measure averages current (2015) and horizon year (2035) costs and boardings

Vehicular Travel Lanes Evaluation



Existing Lanes

Expanded Lanes:

Three or four lanes, depending on location along the corridor

Converted Lanes

Consistent Lanes

Vehicular Lanes Evaluation: Overview

1. **Confirm the recommendations from prior studies** (VDOT and Fairfax County):

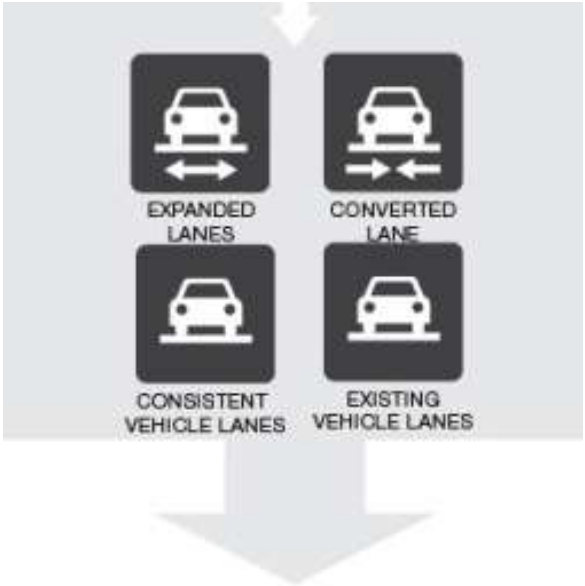
   Consistent, 6 vehicular lanes for the entire corridor

2. **Compare the Consistent 6-Lane Alternative to other options:**
   - Existing lanes
   - Expanded lanes
   - Converted lanes

3. **Confirm Findings with VDOT**

Recommendation:
Consistent, 3 travel lanes in each direction

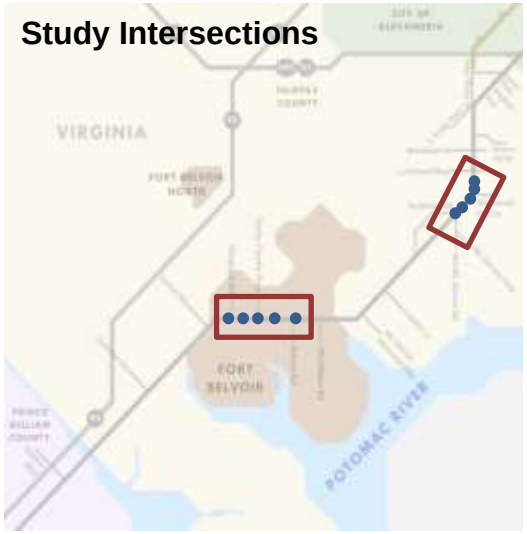
- **Used two key quantitative indicators:**
  - Intersection Level of Service (LOS)
  - Intersection Volume-to-Capacity (V/C)
- **Applied qualitative factors**
- **Recommendation:** 3 general purpose travel lanes in each direction



Consistent Lanes

How did we arrive at this recommendation?

Vehicular Lane Evaluation



Other, qualitative factors:

- Desire to maintain existing speeds (45 mph)
- Minimize lane transition that contribute to travel delays
- Pedestrian crossing distance/time

Alternative		Intersection Performance	Right of Way Impacts
Expanded		No intersections with LOS E or worse ↑	Significant ROW impacts ↓
Consistent		3 intersections with LOS E or worse ↑	Moderate ROW impacts ↓
Converted		10 intersections with LOS E or worse ↓	Few ROW impacts ↑

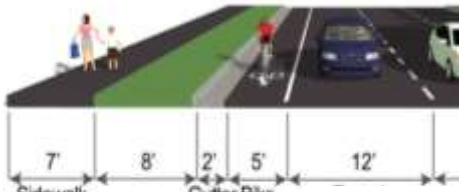
Legend

↑ Compares more favorably

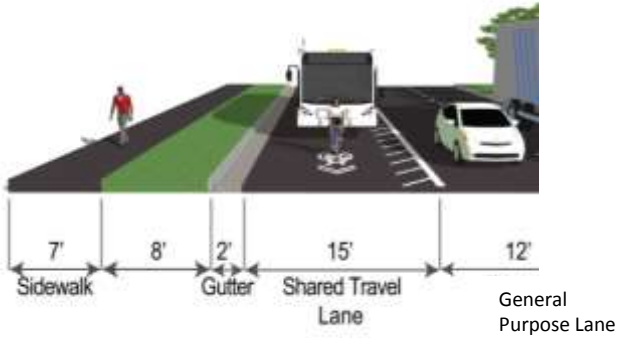
↓ Compares less favorably

Bicycle and Pedestrian Evaluation

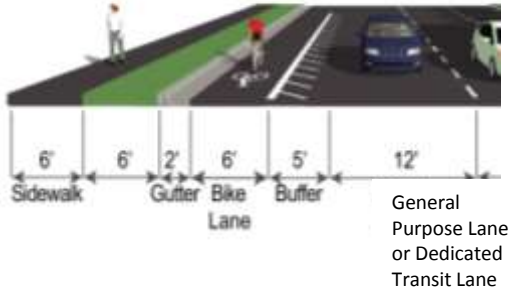
Sidewalk and in-street bike lane



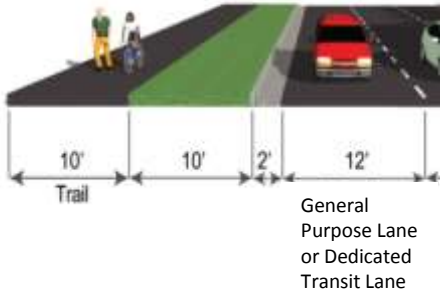
Shared bus/bike lane and sidewalk



Buffered bike lane and sidewalk



Multiuse path (bike and ped)



Bicycle and Pedestrian Evaluation

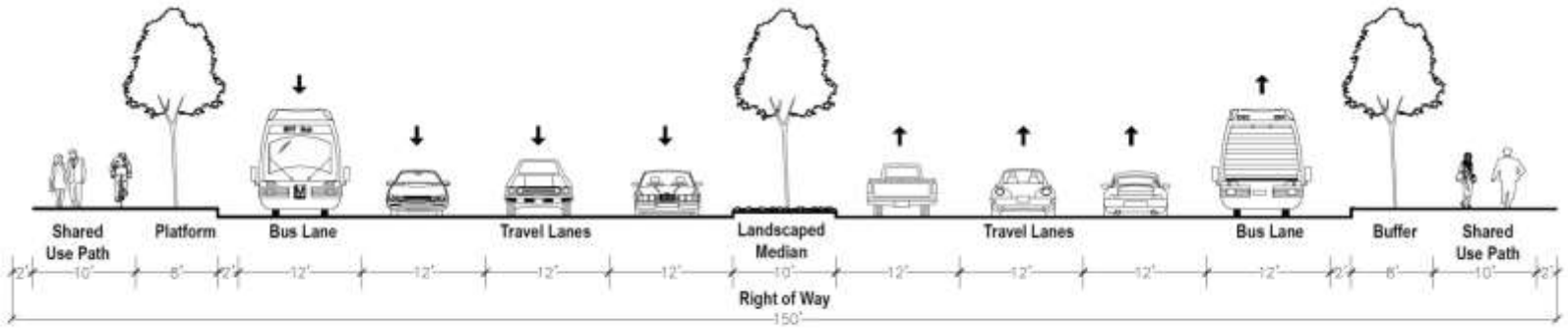
Factors	In-street bike lane and sidewalk	Shared bus/bike lane and sidewalk	Buffered bike lane and sidewalk	Multiuse path
Legend for ratings: ↑ Compares more favorably ↓ Compares less favorably				
Provides access along full corridor	Improves walk & bike access to destinations ↑	Improves walk & bike access to destinations ↑	Improves walk & bike access to destinations ↑	Improves walk & bike access to destinations ↑
Provides safety and comfort given high auto speeds and volumes	In-street bike lane not recommended for 45 mph+ ↓	Shared bike/travel lane not recommended for 45 mph+ ↓	Bike lane buffered from 45 mph traffic ↑	Bike lane buffered from 45 mph traffic with curb and landscape strip ↑
Requires additional right-of-way	Requires some new ROW ↓	Requires little new ROW ↑	Requires significant new ROW ↓	Requires some new ROW ↓

Summary: Refined Multimodal Alternatives

	BRT- Curb Running	BRT- Median Running	LRT	Metrorail-BRT (Hybrid)
Transit Elements	• Dedicated lanes north portion of corridor • Special treatments at key locations south portion of corridor	• Dedicated lanes for entire corridor • Median transitway • Mixed-traffic in Prince William County	• Dedicated lanes for entire corridor • Median transitway	• Metrorail extension for a short northern segment • BRT in dedicated lanes, mixed-traffic through Prince William County
Vehicular Lanes	• Consistent three lanes	• Consistent three lanes	• Consistent three lanes	• Consistent three lanes
Bike/Ped Elements	• Enhanced multi-use path	• Enhanced multi-use path	• Enhanced multi-use path	• Enhanced multi-use path

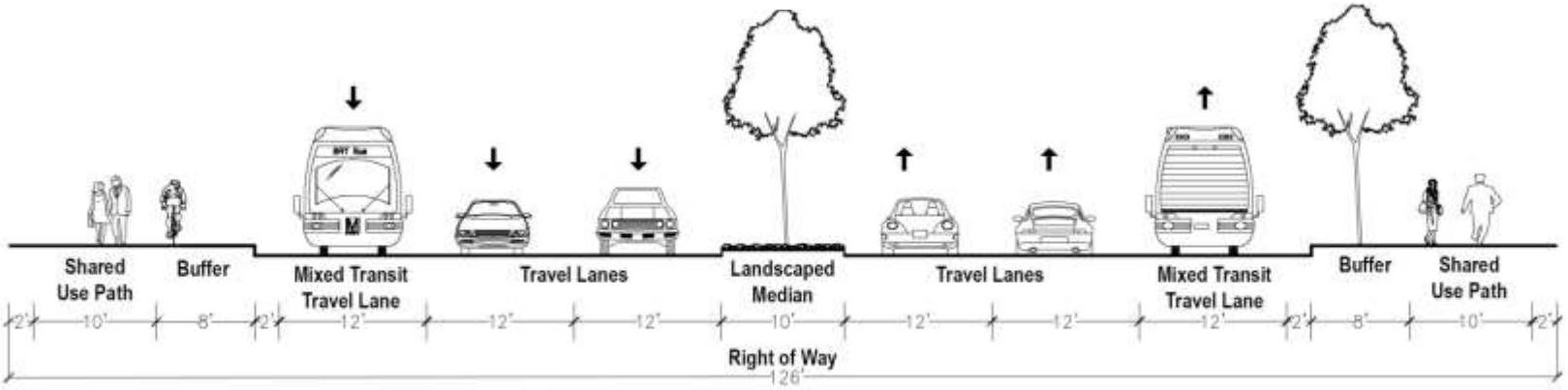
Alternative 1:
Bus Rapid Transit- Curb Running

BRT (Curb Running, North of Ft. Belvoir)



TYPICAL MID-BLOCK

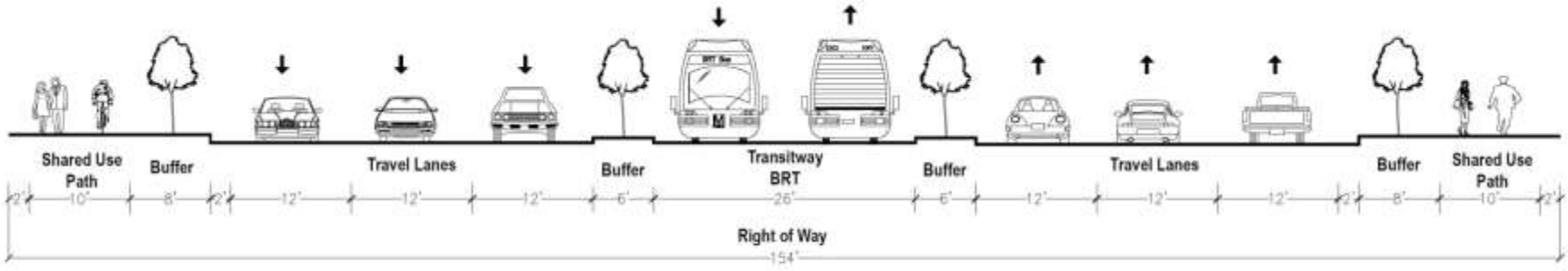
Enhanced Bus (Mixed-Traffic, South of Ft. Belvoir)



TYPICAL MID-BLOCK

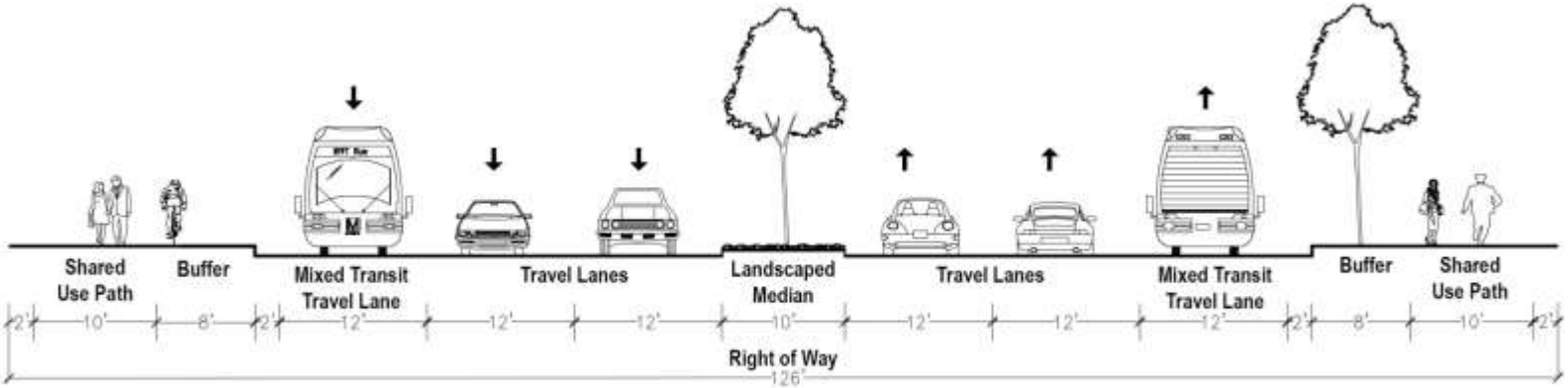
Alternative 2:
Bus Rapid Transit- Median

Median Running, Majority of corridor



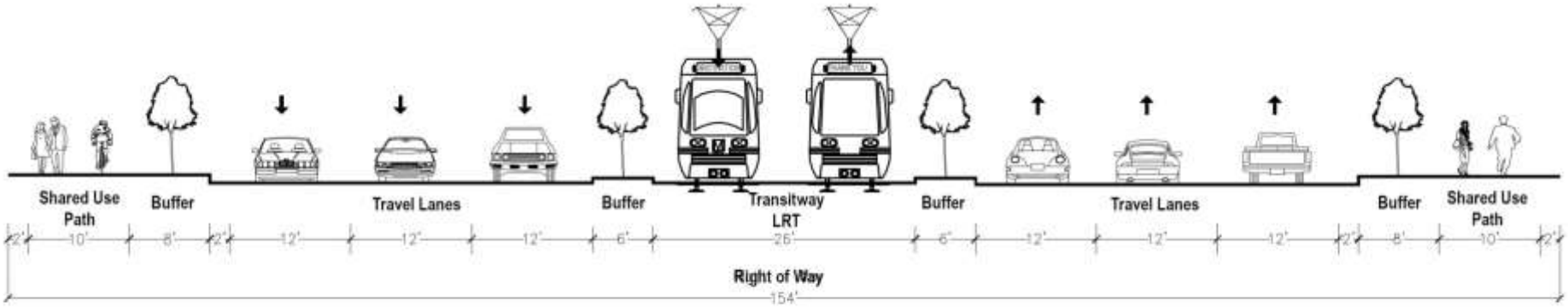
TYPICAL MID-BLOCK

Mixed-Traffic, Southern Terminus—Prince William County



TYPICAL MID-BLOCK

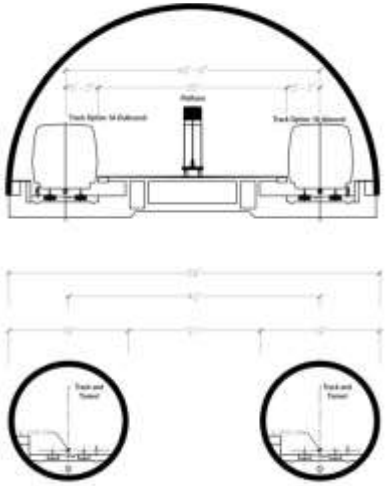
Alternative 3: Light Rail Transit - Median

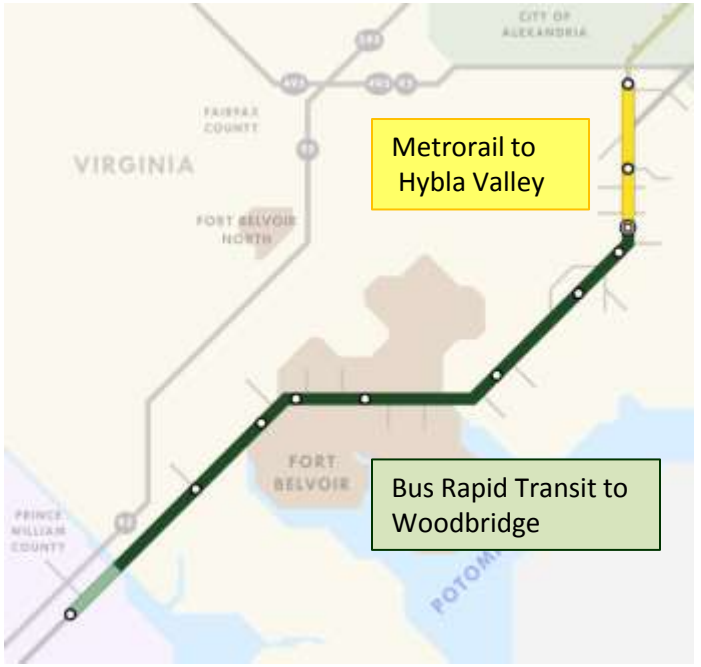


TYPICAL MID-BLOCK

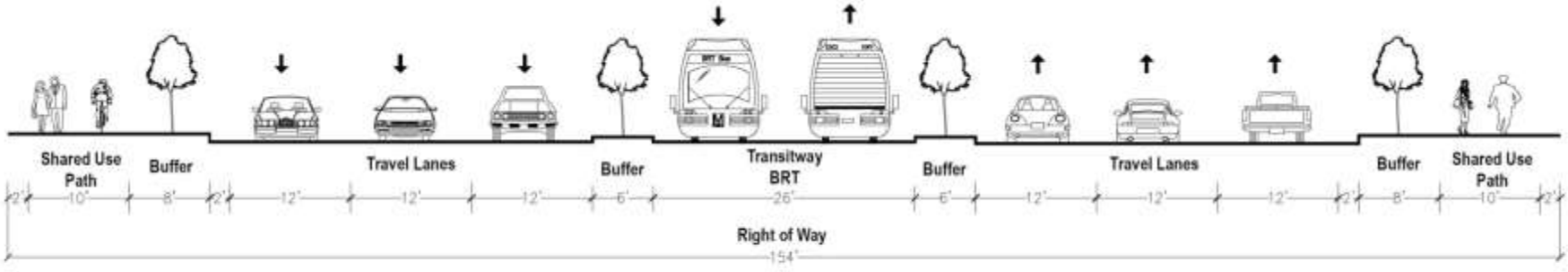
Alternative 4: Metrorail and BRT Hybrid

Metrorail, underground to Hybla Valley





BRT - Median Running South of Hybla Valley



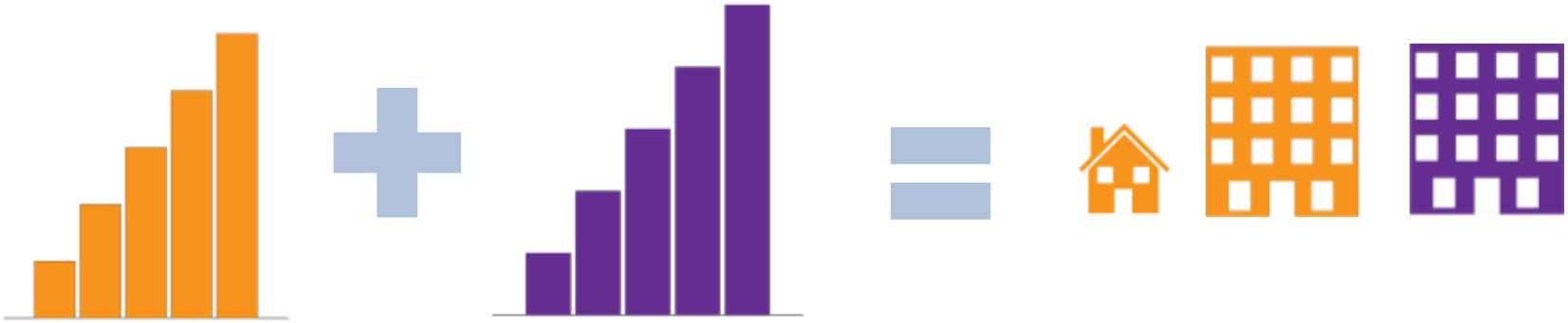
TYPICAL MID-BLOCK

Refined Definition: Service Characteristics

	BRT- Curb Running	BRT- Median Running	LRT	Metrorail/BRT Hybrid
Vehicle fleet type	Articulated buses	Articulated buses	Light rail vehicle (1-car consists)	Metrorail Train (8-car consists)
Vehicle capacity	90 passengers	90 passengers	160 passengers	960 passengers per train
Peak headways	6 min.	6 min.	6 min.	Metrorail- 6 min. BRT- 6 min.
Off-peak headways	12 min.	12 min.	12 min.	Metrorail- 12min. BRT- 12mn
Running way	Curb running	Median running	Median running	Metrorail- underground BRT- median running
Fare collection	Off-vehicle payment and validation; on-board random inspections	Off-vehicle payment and validation; on-board random inspections	Off-vehicle payment and validation; on-board random inspections	Metrorail- same as current system; BRT: Off-vehicle payment and validation; on-board random inspections
Number of Transit Stops	13	13	13	11
Boarding and Alighting	All doors	All doors	All doors	All doors
Local bus service	Operates along curb transit lanes, shares some stops with BRT	Operates along outside general purpose lanes	Operates along outside general purpose lanes	Operates along outside general purpose lanes
Park-and-Ride Facility	• Woodbridge • Lorton	• Woodbridge • Lorton	• Woodbridge • Lorton	• Woodbridge • Lorton

4. Land Use Scenarios

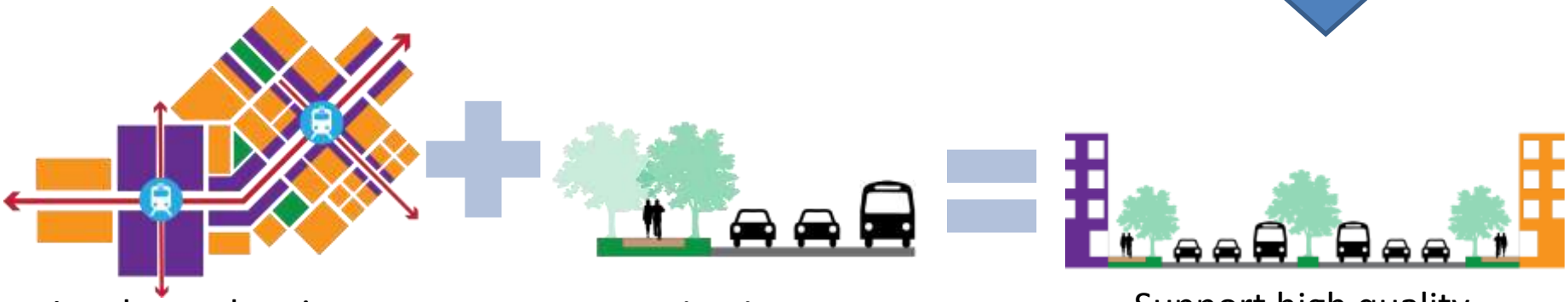
Transportation Investment helps to increase economic viability and vitality of the corridor



Population growth

Employment growth

Demand for new residential units and commercial space



Land use planning

Transportation investment

Support high quality community development

Example: Cleveland, OH (Bus Rapid Transit)

- Pedestrian-oriented, higher concentration development
- Larger tax base
- Increased travel demand

Example: Charlotte, NC (Light Rail)

- Pedestrian-oriented, higher concentration development
- Larger tax base
- Increased travel demand

Example: Arlington, VA (MetroRail)

- Pedestrian-oriented, higher concentration development
- Larger tax base
- Increased travel demand

Summary of Land Use Scenarios

- **Scenario One** (2035 COG projections)

  Compare transportation alternatives in light of projected growth levels

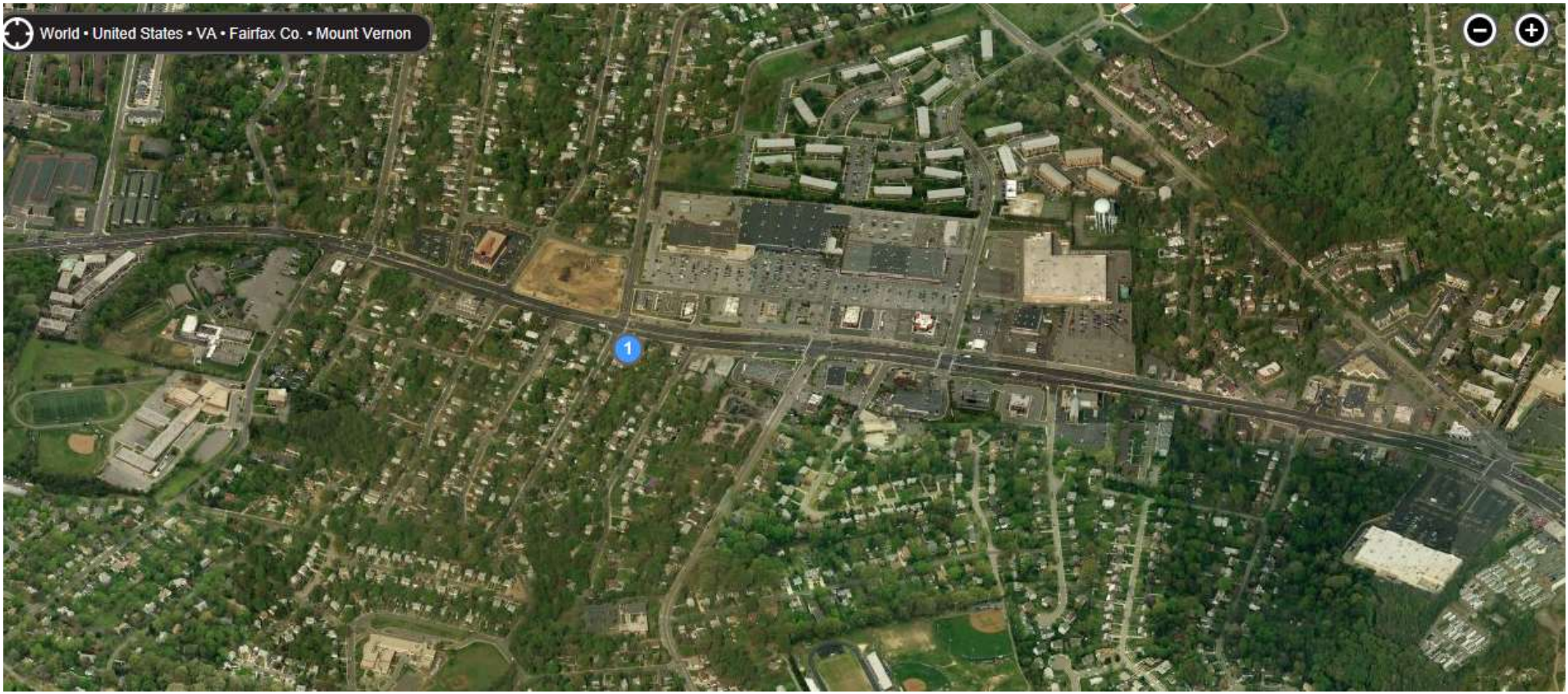
- **Scenario Two** (growth above 2035 projections)

  What is a reasonable growth expectation for a corridor that invests in high-quality transit (BRT or LRT)?

- **Scenario Three** (Metrorail supportive)

  How much do population and employment need to increase to achieve density levels typically supportive of Metrorail?

Beacon: Bird's Eye View Today



Beacon: Land Use Scenario One (2035 COG Projection)

BEACON STATION SCENARIO 1

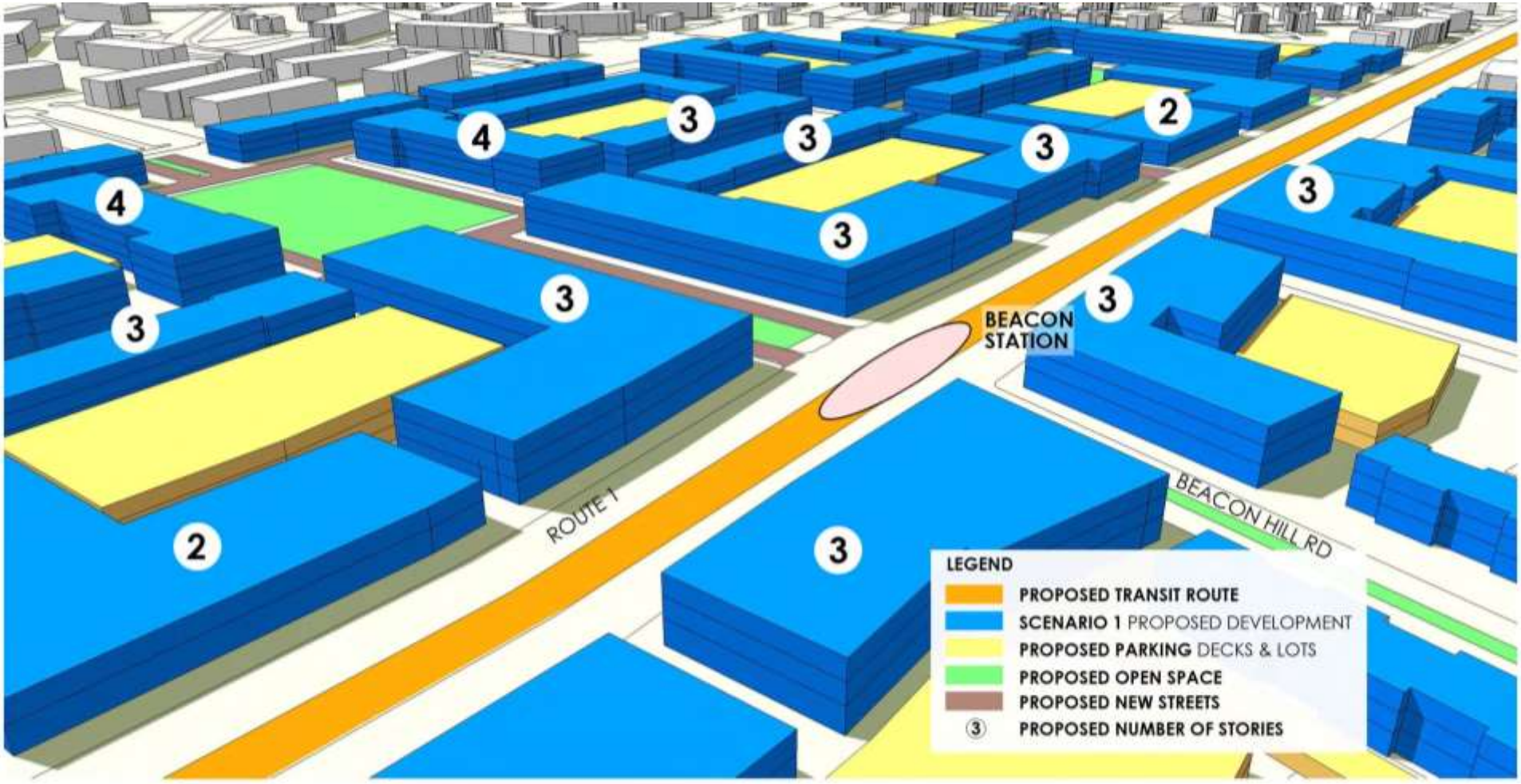
Beacon: Land Use Scenario Two (additional growth increment)

BEACON STATION SCENARIO 2

Beacon: County Comprehensive Plan

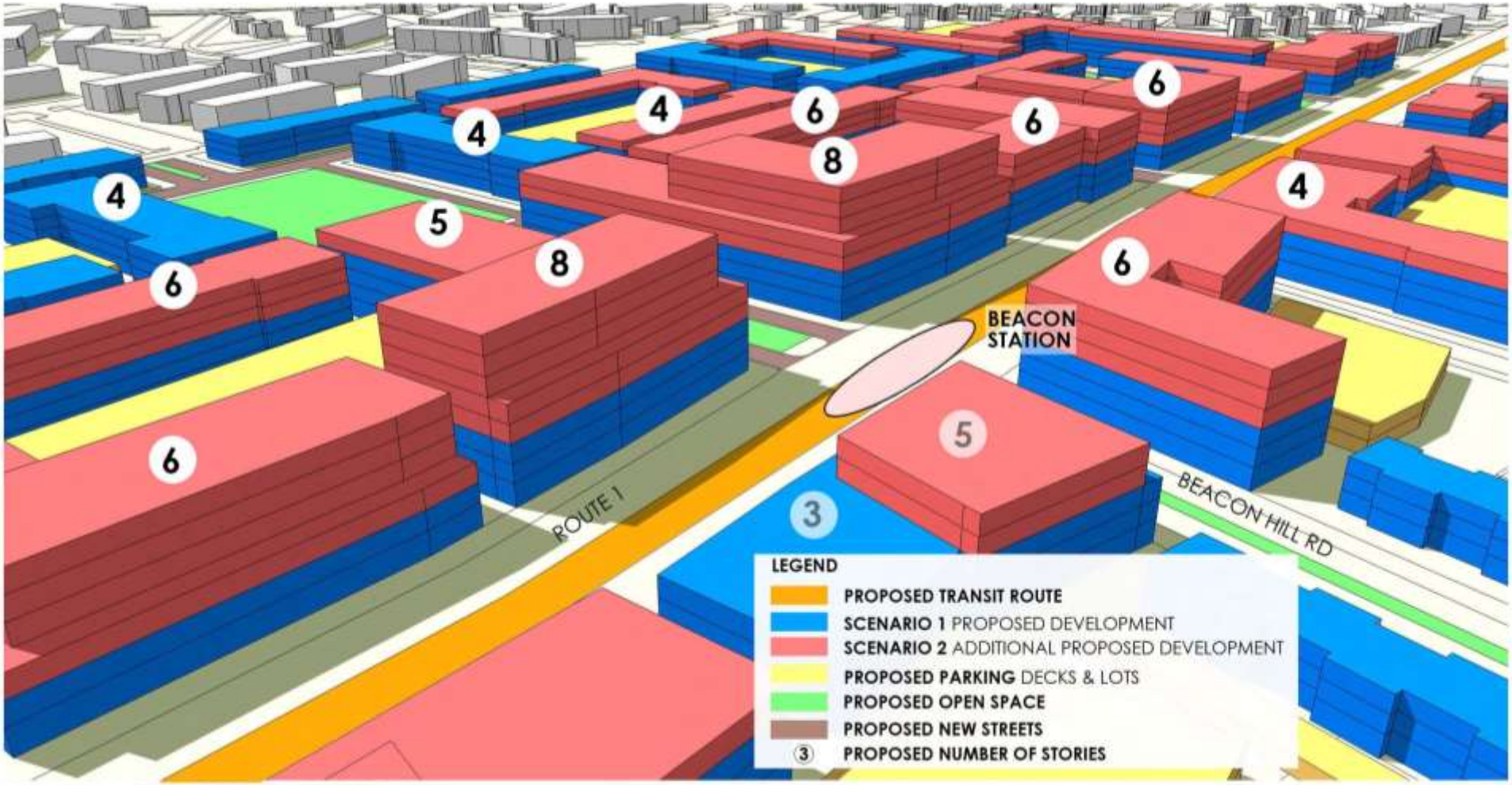
BEACON STATION SCENARIO COMPREHENSIVE PLAN

Beacon: Land Use Scenario One (2035 COG Projection)



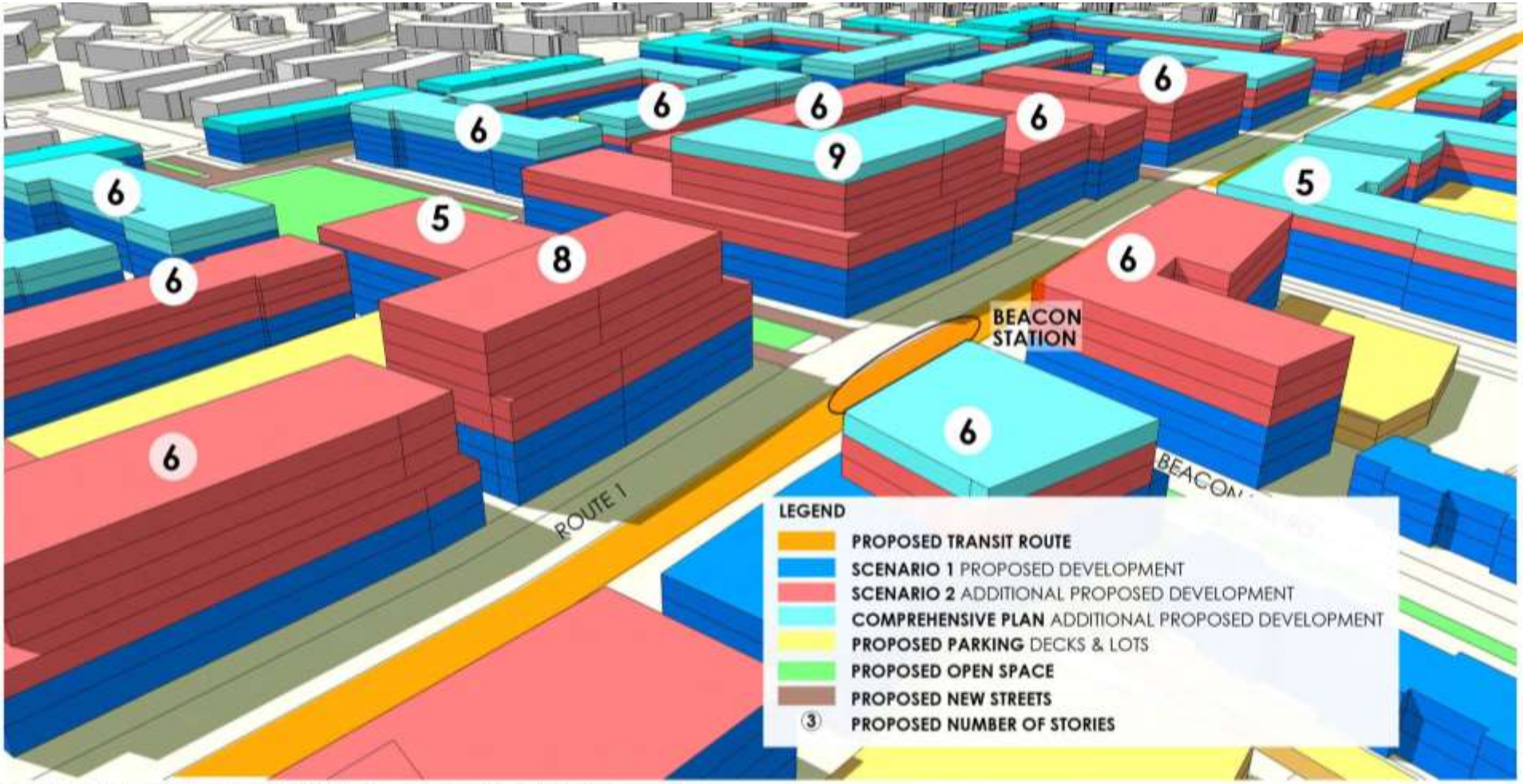
BEACON STATION SCENARIO 1

Beacon: Land Use Scenario Two (additional growth increment)



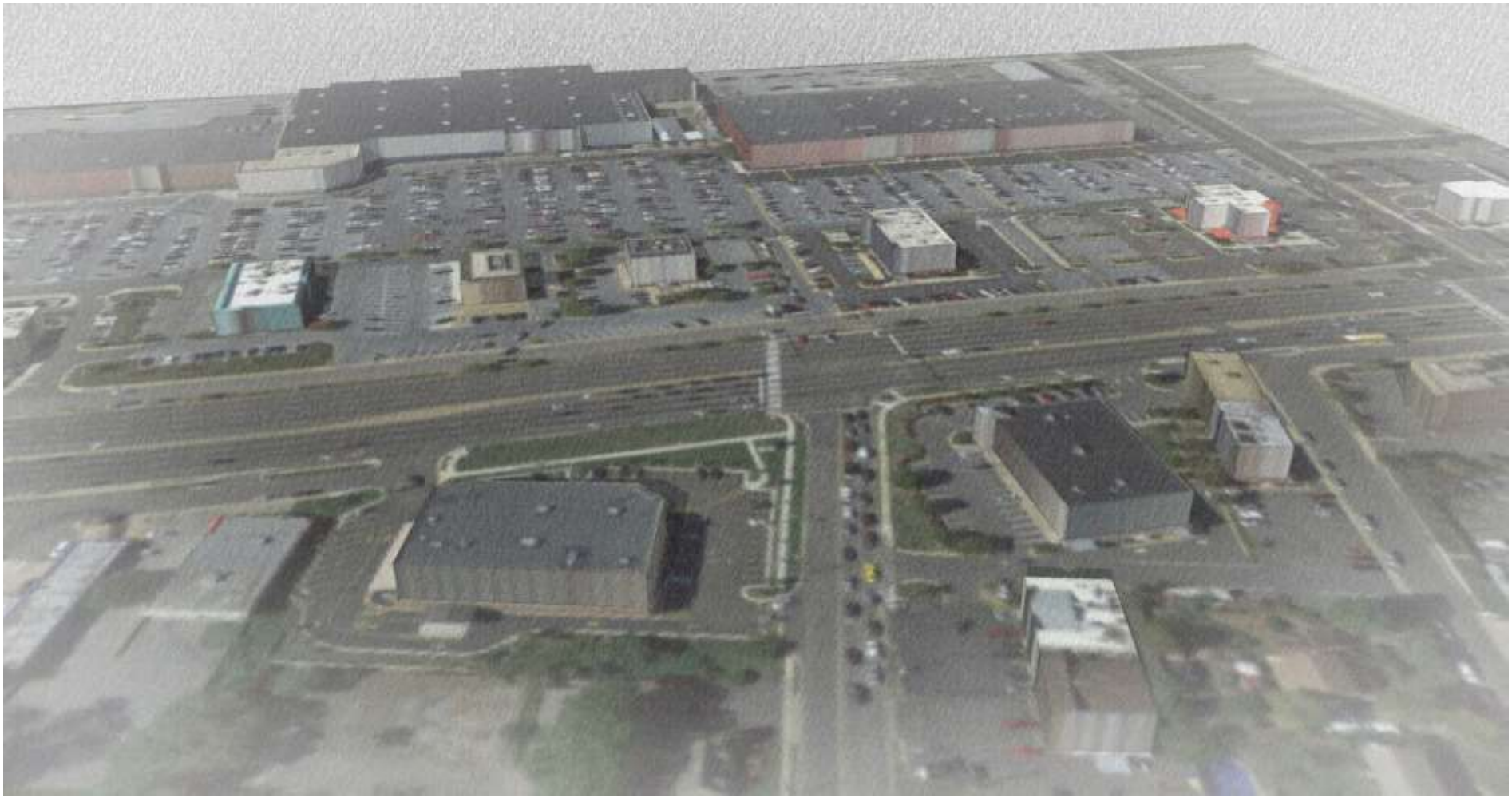
BEACON STATION SCENARIO 2

Beacon: County Comprehensive Plan



BEACON STATION SCENARIO COMPREHENSIVE PLAN

Beacon: Bird's Eye View Today



Beacon: Scenario Two Bird's Eye View

Scenario 2 Land Use Analysis Next Steps

- **Updated ridership forecast**
- **Economic assessment:** Consider the increase in economic value and tax base around transit stations for each land use scenario
- **Funding analysis:** Assess value capture potential to support transit investment

5. Evaluation of Alternatives

Evaluation Criteria: Project Goals and Objectives

Goals and Objectives	Multimodal Measures
GOAL 1: Expand attractive multimodal travel options to improve local and regional mobility	
Increase transit ridership	Transit ridership
Improve transit to reduce travel times	Transit travel time, Automobile travel time
Increase transportation system productivity	Total person throughput
Improve bicycle and pedestrian networks	Continuous sidewalk and bike pathway
Integrate with other transit service	Connections to existing and planned transit
GOAL 2: Improve safety; increase accessibility	
Provide accessible pathways	Continuous sidewalk and bike pathway
Reduce modal conflicts	Separate facilities for separate modes
Improve pedestrian crossings	Average pedestrian delay to cross, Adequate pedestrian refuges
Maintain traffic operations	Traffic LOS
GOAL 3: Increase economic viability and vitality of the corridor	
Support higher activity levels	Accommodate 2035 density (growth scenarios)
Investments are financially feasible to construct and operate	Project costs, cost effectiveness, Allows incremental implementation
High-capacity transit facilities at appropriate locations	Serves low-income residents, value added to adjacent properties
GOAL 4: Support community health and minimize impacts on community resources	
Minimize negative impacts to the natural environment	ROW impacts on environmental and historic resources
Contribute to improvements in regional air quality	Change in VMT
Increase opportunities for bicycling and walking	Continuous sidewalk and bike pathway

Evaluation Criteria: FTA New Starts/Small Starts

Project Justification Criteria
Economic Development: Transit supportive plans and policies; plans to preserve affordable housing
Mobility Improvements: Total project boardings; transit-dependent ridership is weighted 2x
Cost Effectiveness: Annualized cost per annual linked trip on the project
Land Use: Quantitative analysis of station area development, proportion of legally binding affordability
Environmental Benefits: Environmental benefits are monetized and compared to the annualized costs
Congestion Relief: Project sponsors will receive a medium rating until further guidance is released

Financial Commitment Criteria
Current Condition (capital and operating)
Commitment of Funds (capital and operating)
Reasonableness of Assumptions and Financial Capacity (capital and operating)

6. Project Funding and Finance

Project Funding and Finance: Lessons Learned

- Project funding should be considered along with development and evaluation of alternatives
- Consider capital and long-term operating expenses
- Project will likely be implemented with a mix of several sources
- Federal Transit Administration grants are becoming more competitive; greater focus on local funding commitment

Project Funding: Overview of Potential Sources

Funding Source	Type	Notes
Federal	FTA New Starts/Small Starts	Limited funding for highly competitive nation-wide program
	FHWA Surface Transportation Program, CMAQ	Formula grants applied according to state and metropolitan priorities
Regional	NVTA funding	Dedicated funding for northern Virginia priorities
State	VDOT highway	Grants applied to statewide priorities
	DRPT matching grants	Match on local investment for all capital projects
Local	County managed funds	General fund, bond allocations, etc.
	Value capture (TIF or SAD)	Corridor-specific tools

Local Project Funding Sources

Funding Type	Description	Notes
County Managed Funds	• Sales Tax • Property Tax • Other revenues	Application of existing local revenue sources to cover costs of transportation infrastructure and services
Value Capture	• Tax Increment Financing (TIF) • Special Assessment Districts (SAD)	Capture increased property value that accrues over time resulting from public investment
	• Joint Development	Coordinated development of commercial and residential buildings with public transportation facilities

Project Funding: Next Steps

- **Economic analysis** to inform the degree to which transportation investments can be supported by value created with corridor growth and development

- **Viability of project funding** informs evaluation of alternatives

- **Funding strategy** developed for recommended alternative

- **Funding sequence** or cash flow projection developed for specific recommended alternative

7. Upcoming Meetings and Next Steps

Calendar of Meetings

Meeting	Date
Technical Advisory Committee	March 6, 10:00 - 11:30am South County Government Center
Executive Steering Committee	March 13, 3:30 - 5:00 pm Mount Vernon Government Center
Community Involvement Committee	March 18, 4:00 – 5:30 pm Mount Vernon Government Center
Public Meeting #2	March 26, 6:00 – 8:00 pm South County Government Center

Next Steps

- Continue technical analysis of refined alternatives
- Evaluate land use scenarios
- Complete evaluation of multimodal alternatives
- Conduct scan of potential project impacts
- Develop project funding strategy
- Recommend a multimodal alternative