Item 6

Briefing on NCHRP 8-36 (104) — Integrating Performance Measures into a Performance-Based Planning and Programming (PBPP) Process

TPB Technical Committee

May 4, 2012

Eric Randall, DTP

NCHRP 8-36 Overview

National Cooperative Highway Research Program (NCHRP) study of the potential for performance based planning and programming (PBPP) of transportation projects.

- Consulting team of Cambridge Systematics, Inc.
- Three pilot sites/themes:
  - Kansas City – safety,
  - Pennsylvania – pavement and bridge preservation,
  - DC/Maryland – multimodal congestion hotspots.

Project Objectives

- Move from conceptual framework to realistic examples for PBPP.
- Examine how state DOTs can work with regional partners to use national performance measures within regional planning processes.
- Identify barriers and obstacles, and strategies for addressing them.

TPB/WMATA/Suburban Maryland pilot

Participants:

- MPO: TPB
- Transit Agency: WMATA
- State DOT: MDOT/SHA
- Local: Prince George's and Montgomery Counties, MNCPPC

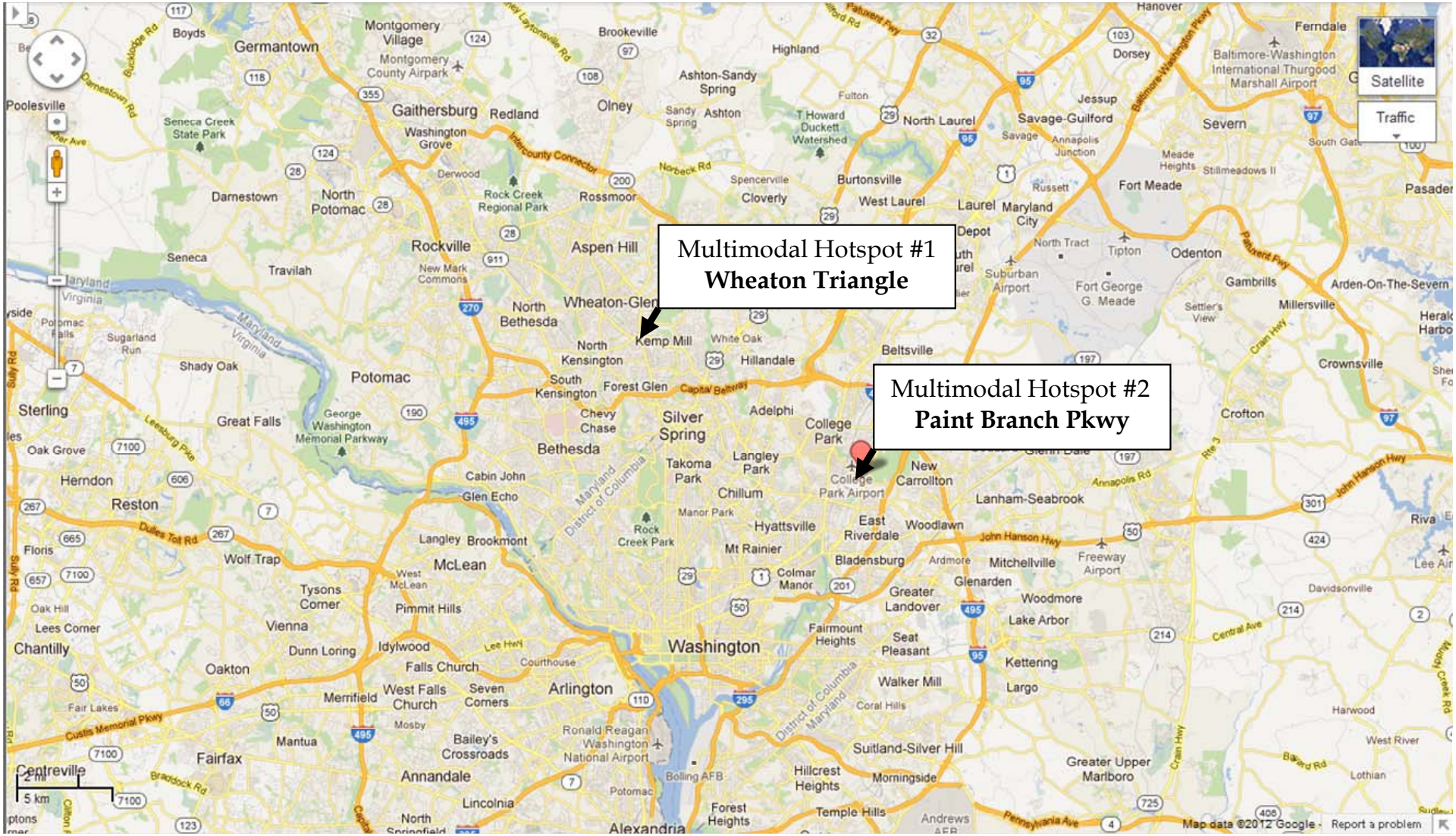
Objective

- Develop a **collaborative** methodology for identifying and prioritizing strategies to address **congestion** at two **multimodal** hotspots

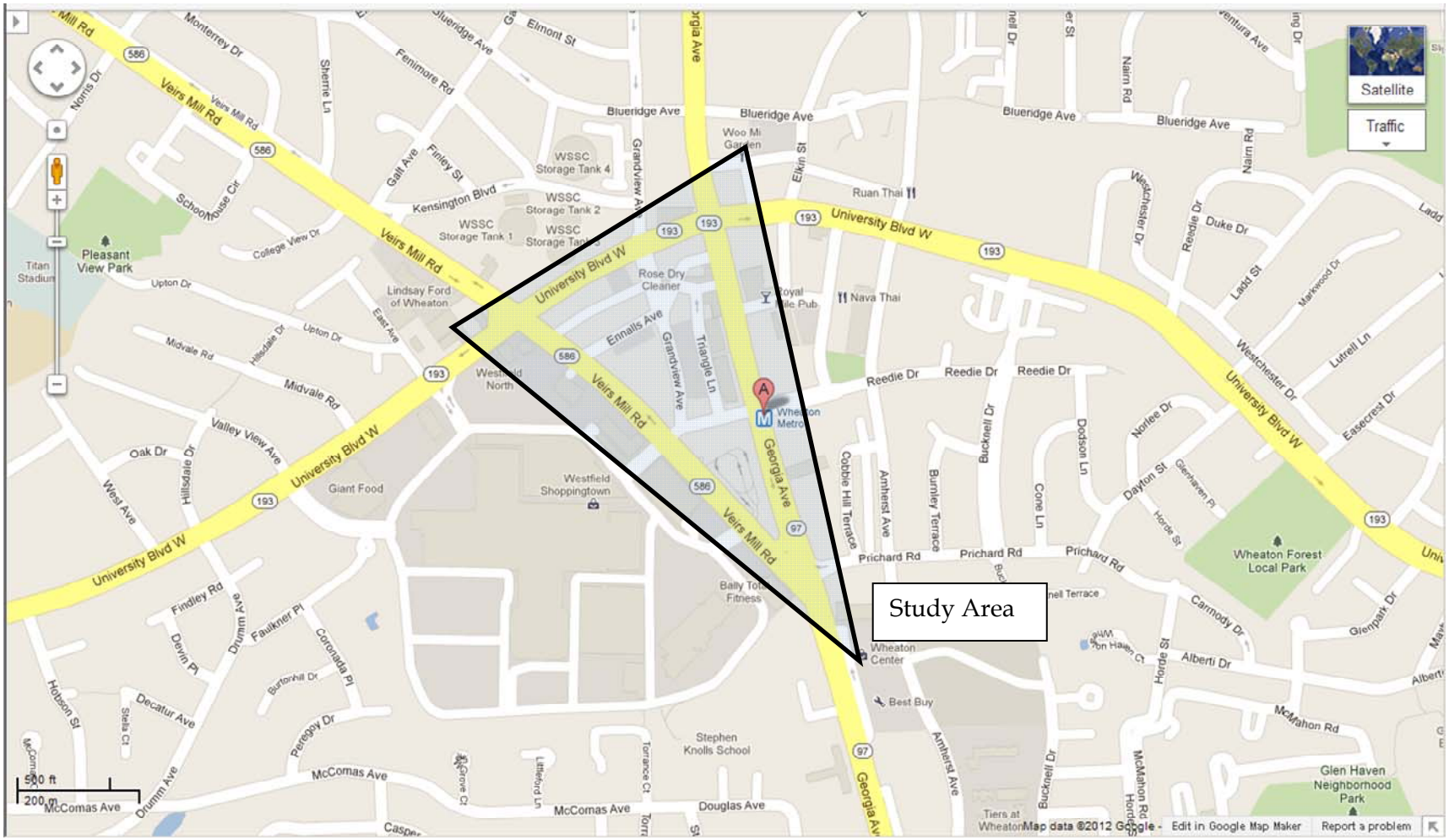
Pilot Activities

- Identify two multimodal congestion hotspots.
  - Made use of ongoing UPWP Multimodal Coordination / Bus Hot Spots study to select locations
- Compile and assess data in these locations to investigate options for analysis.
  - Transit operations, traffic counts and analysis, INRIX data
- Agency interviews regarding current practices and opportunities for improvement.
- Develop a prioritization framework.
- Review options for communicating results.

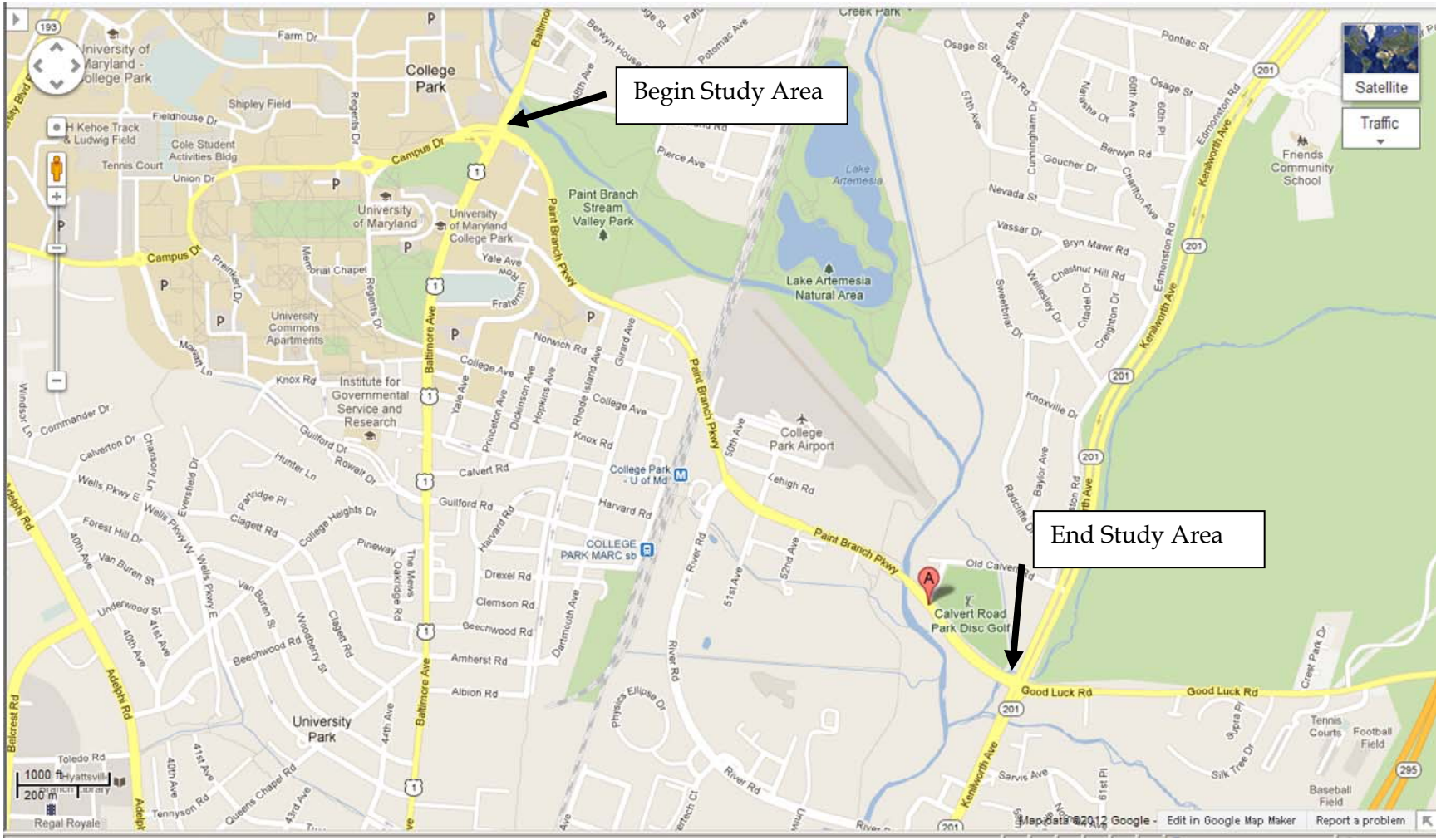
Pilot Study - Multimodal Hotspots



Wheaton Triangle (Montgomery County)



Paint Branch Pkwy (Prince George's County



Paint Branch Parkway Data Sample

Counts, Critical Lane Volume (CLV), Volume/Capacity Ratio (V/C), Level of Service (LOS)

DCI Daniel Consultants Inc

Maryland State Highway Administration

Turning Movement Summary and Level of Service

Request No.: 1020024

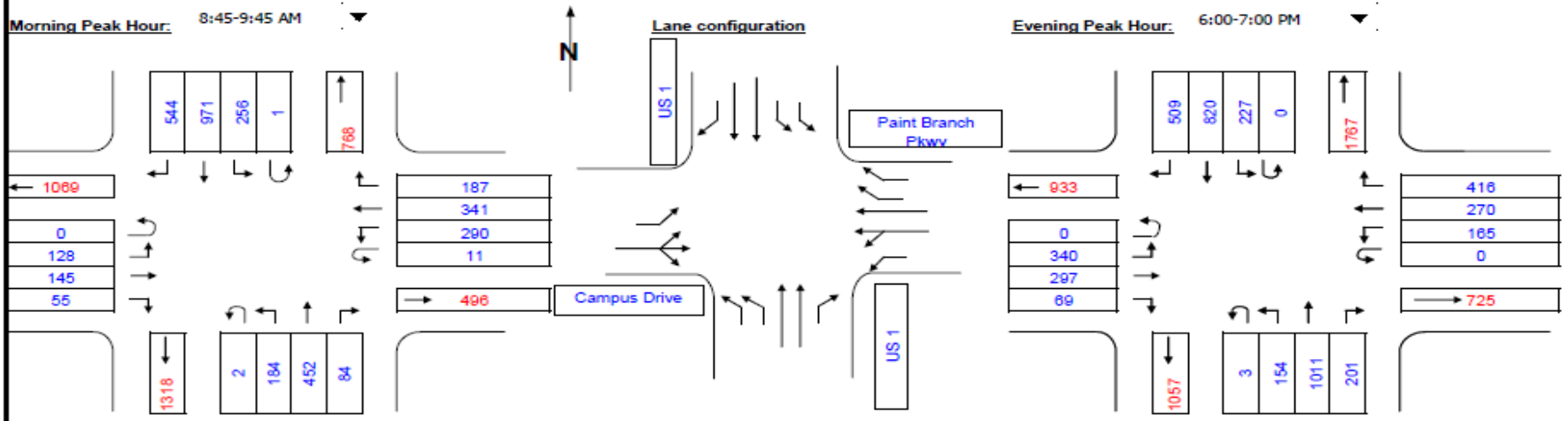
Count Date: 10/25/2011 | Conditions: Existing | Location: US 1 at Campus Dr./Paint Branch Pkwy

Design Year: 2011 | Computed by: DCI | Date: 10/28/2011

Morning Peak Hour: 8:45-9:45 AM

Evening Peak Hour: 6:00-7:00 PM

Lane configuration



Number of Lanes	Lane Use Factor	Service Level	Critical Lane Vol	Opposing Volume (VPH)	PCE
1	= 1.00	A	<= 1000	<= 199	1.1
2	= 0.55	B	<= 1150	<= 599	2.0
3	= 0.40	C	<= 1300	<= 799	3.0
4	= 0.30	D	<= 1450	<= 999	4.0
Dbl-Lt	= 0.60	E	<= 1600	> 1000	5.0
		F	> 1600		

Phasing: 1 | 2 | 3 | 4 | 5

RTOR/Overlap: ☑ Northbound ☑ Southbound ☑ Eastbound ☑ Westbound

Split Phasing: ◉ East/West ○ North/South ○ None

Inx. Control: ◉ Signal ○ Stop

Phase	Movement	Volume 1	Lane Use Factor - 2	Lane volume 1 X 2	Opposing Movement	Critical ln. volume	*
	NB	452	0.55	249	154	403	
	SB	971	0.55	534	112	646	*
	EB	328	0.55	180	0	180	*
	WB	642	0.40	257	0	257	*

Remarks:

* Critical volume — Total: 1083

Level of service (V/C): 0.68 B

Phase	Movement	Volume 1	Lane Use Factor - 2	Lane volume 1 X 2	Opposing Movement	Critical ln. Volume	*
	NB	1011	0.55	556	136	692	*
	SB	820	0.55	451	94	545	
	EB	706	0.55	388	0	388	*
	WB	435	0.40	174	0	174	*

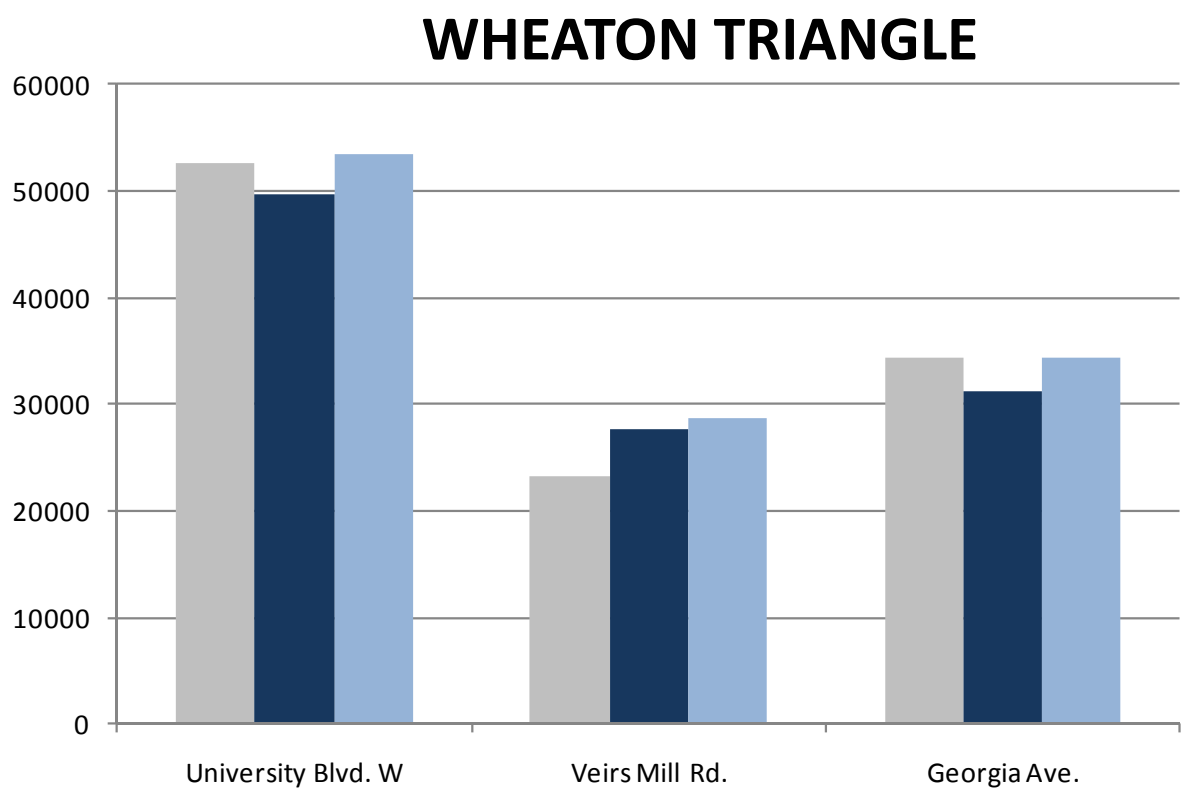
Remarks:

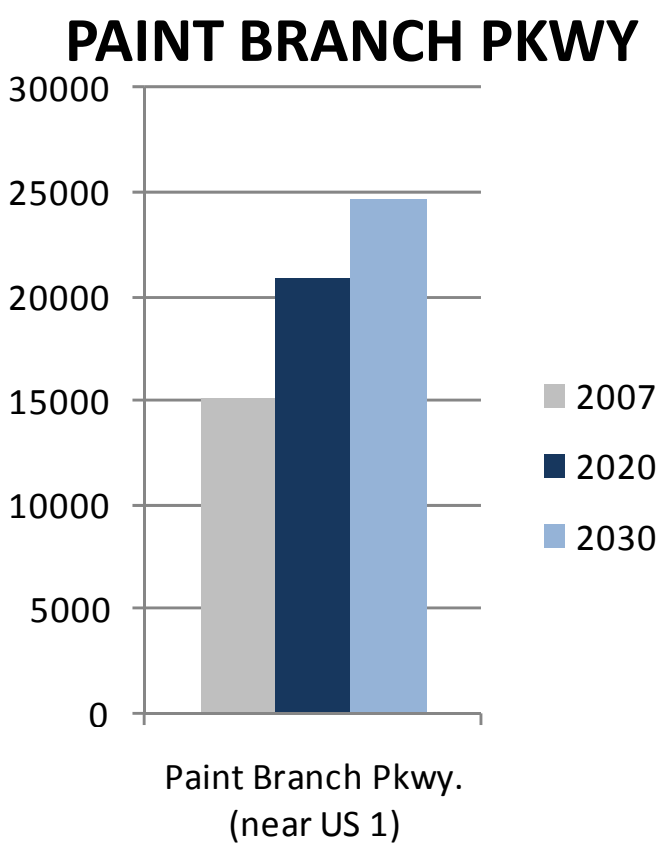
* Critical volume — Total: 1254

Level of service (V/C): 0.78 C

Hotspot Forecast Conditions

2011 CLRP SIMULATED RAW AWDT VOLUMES (2007 to 2040)



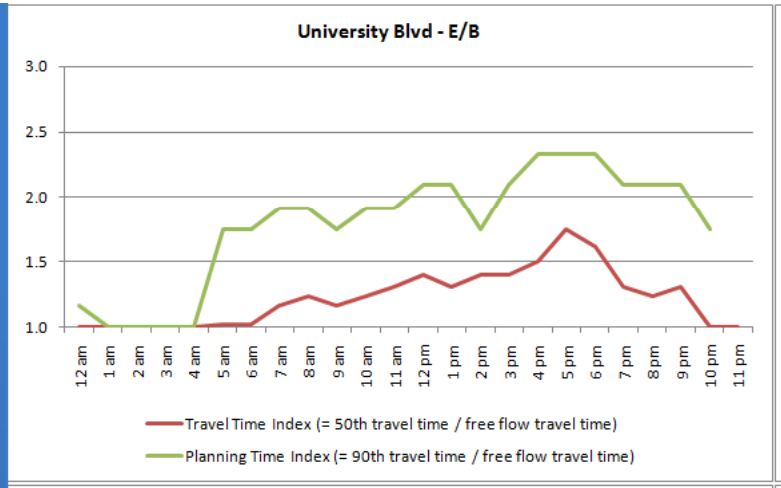


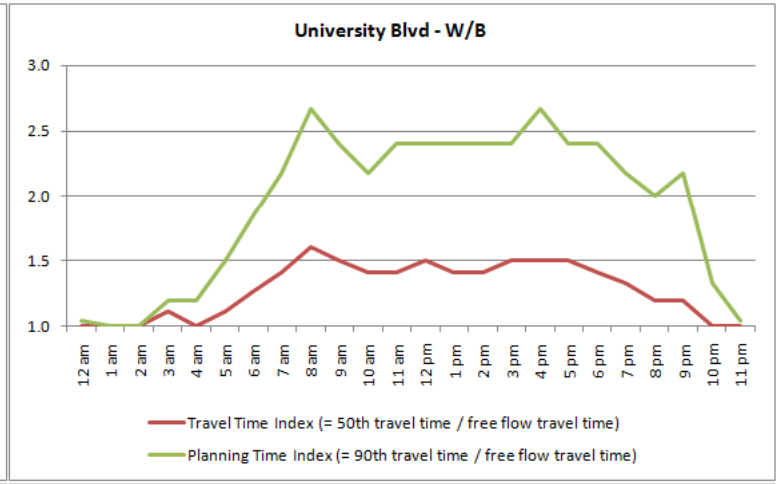
INRIX Data Analysis

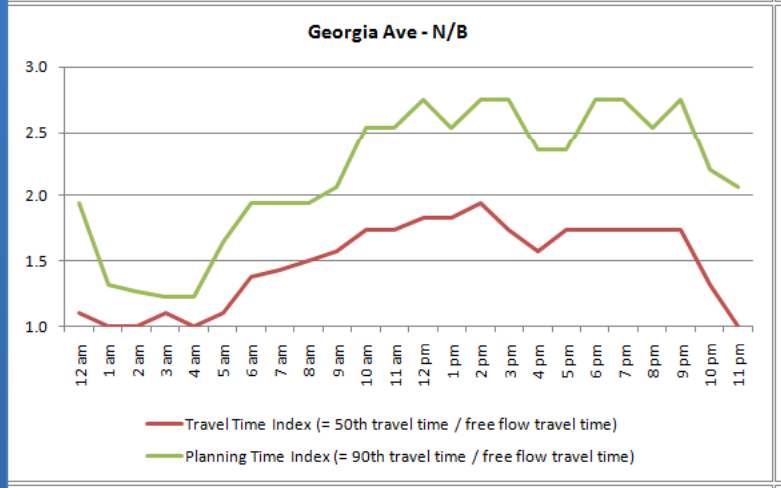
- INRIX data provide:
  - Speeds (including free flow speeds)
  - Travel time (*by 15-minute intervals for each day of the week).*
- The analysis used data from Tue/Wed/Thu in 2010.
- Performance measures
  - Travel Time Index (TTI)
    - A congestion indicator, calculated as TTI = 50th percentile travel time / free flow travel time.
  - Planning Time Index (PTI)
    - A reliability measure, calculated as PTI = 90th percentile travel time / free flow travel time.

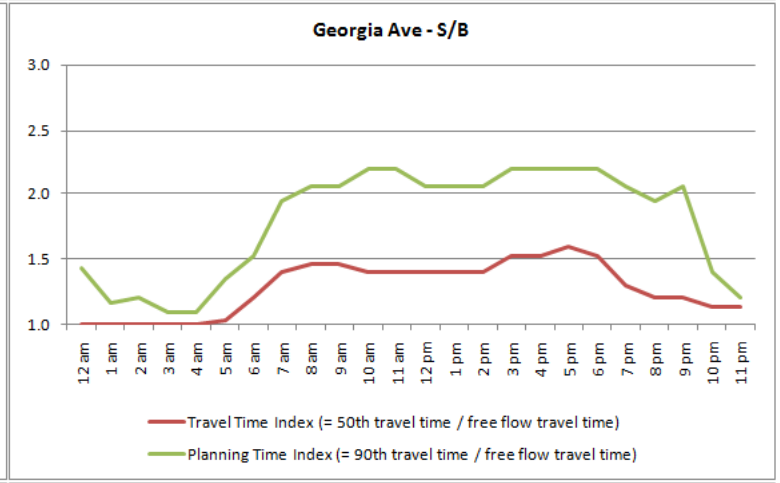
Wheaton Triangle:

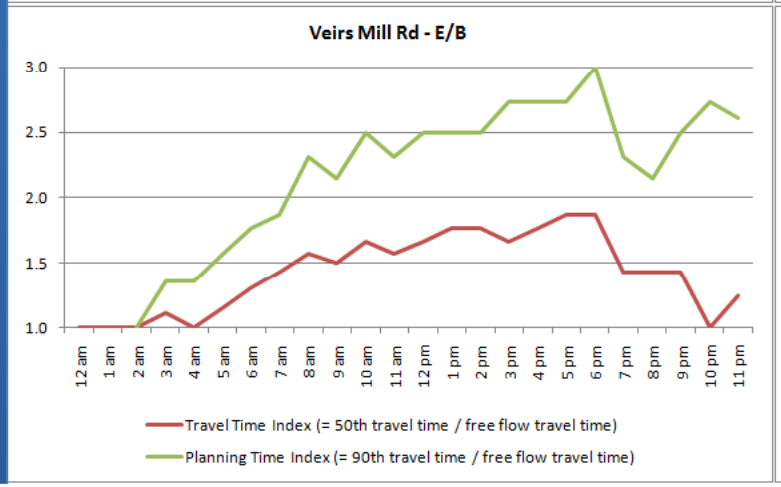
Travel Time Index & Planning Time Index

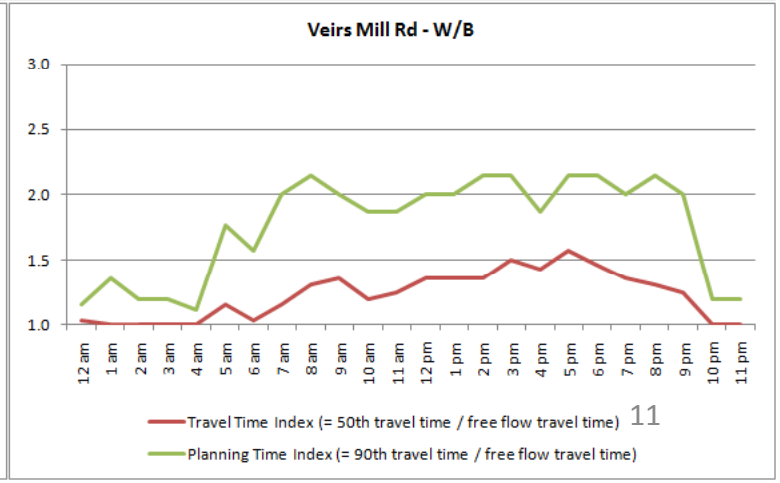




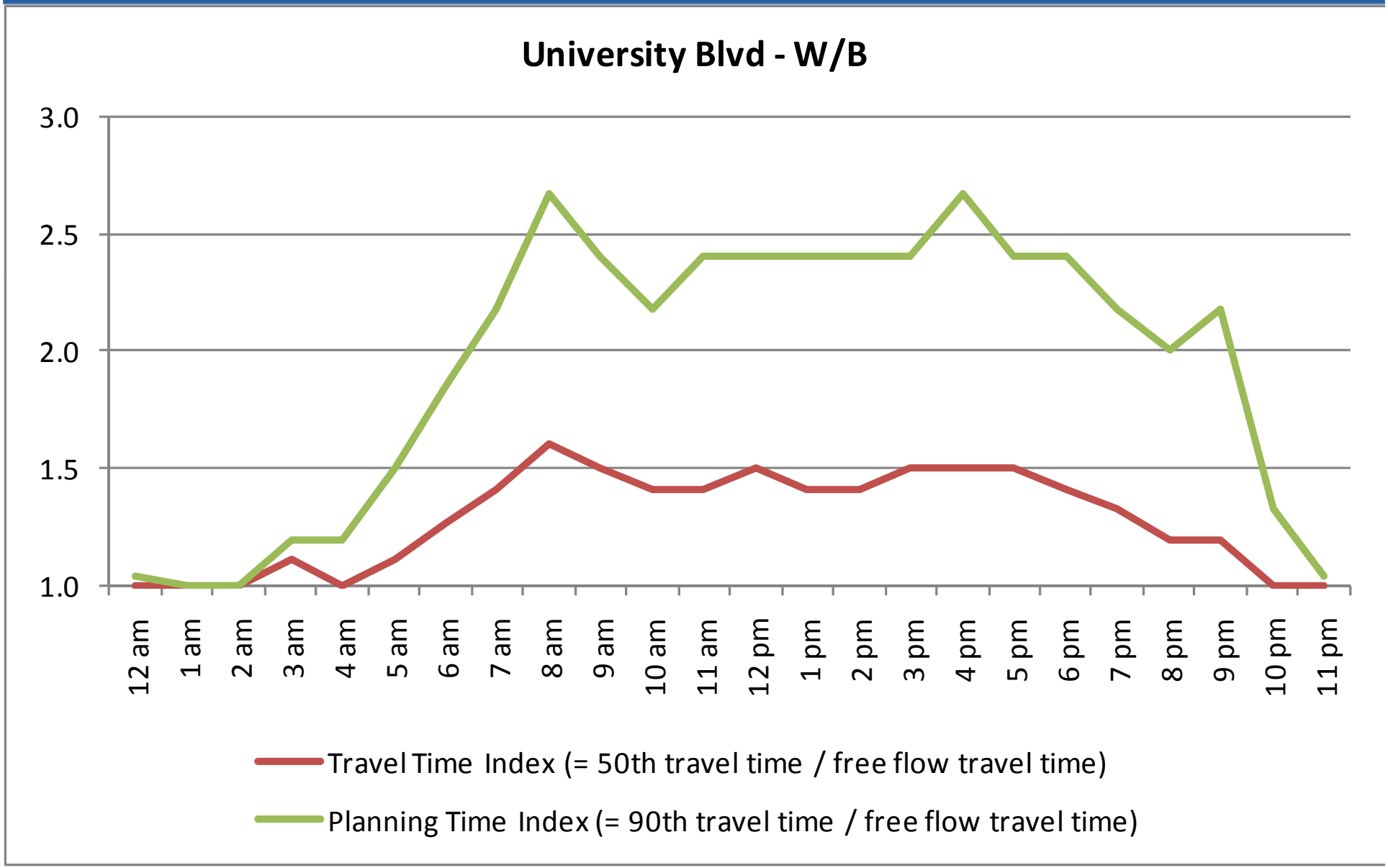






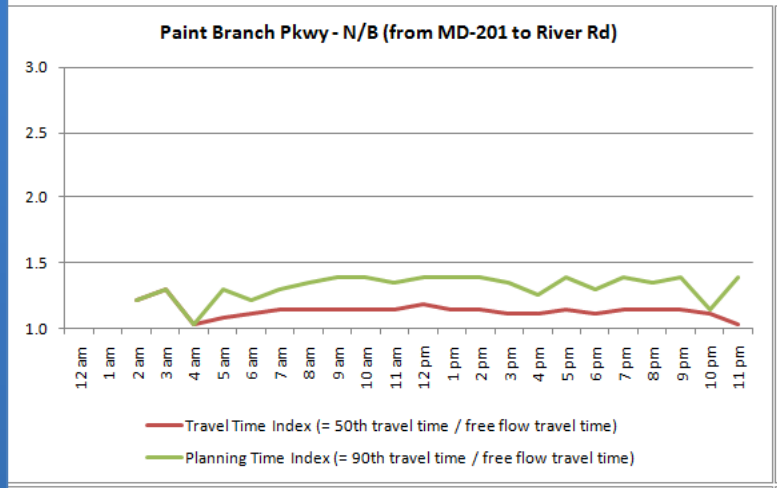


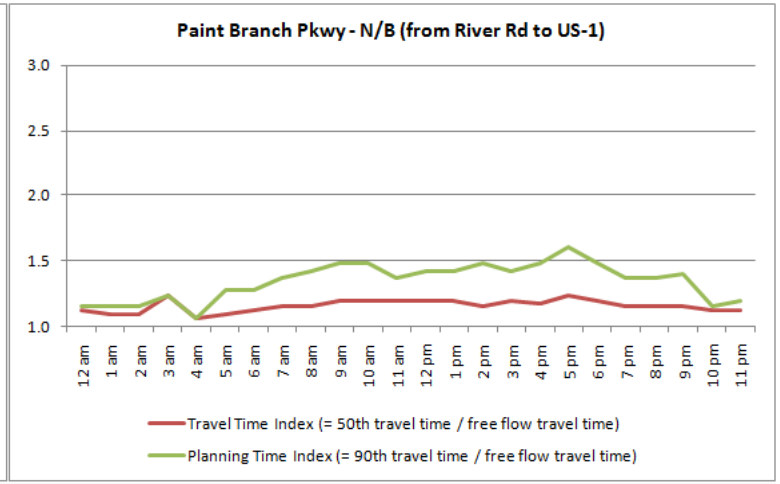
University Blvd (Westbound)

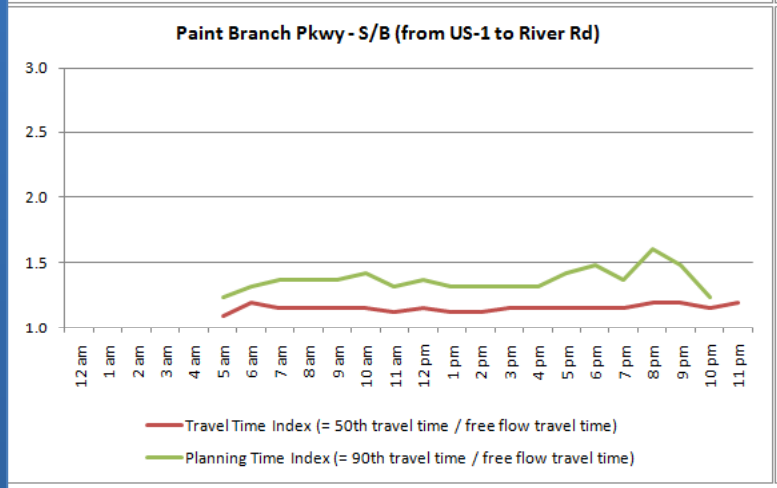


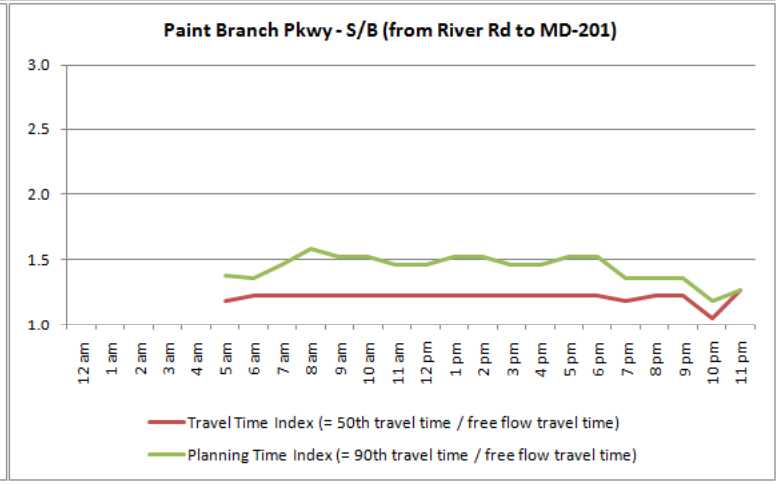
Paint Branch Pkwy:

Travel Time Index & Planning Time Index









Findings of INRIX Data Analysis

- Wheaton Triangle was more congested and less reliable than Paint Branch Parkway.
- Within the 24-hour travel time profile, the most congested and unreliable time periods can be clearly identified.
- INRIX data is complementary to volume counts data.
  - Provides 24/7 speed/travel time profile.
  - Can enhance Benefit/Cost Analysis (by monetizing travel time and reliability) and Before/After Analysis.
  - With appropriate volume data, can calculate:
    - Vehicle Delay
    - Vehicle Miles Traveled (VMT)
    - Vehicle Hours Traveled (VHT)
    - Person-Delay
    - Person Miles Traveled (PMT)
    - Person-Hours Traveled (PHT)

Transit Data Challenges and Next Steps

- Bus travel speed, travel time, and passenger counts data exists but is not consistently available or fully accurate.
  - Manual processing required to eliminate outliers and incomplete records.
- WMATA moving to a "datamart" that will consolidate archived Automated Vehicle Location (AVL), Automated Passenger Counting (APC), and other data in a searchable format.
  - Anticipate some automatic post-processing to remove outliers and correct incomplete records.
- Better utilization of historic AVL data to determine scheduling will result in more accurate schedules.
  - Ride On has been doing this for two years and reports more accuracy.
- Better utilization of AVL data for travel time and reliability issues can help inform where to invest in bus priority improvements.

Applying Performance Measures: Veirs Mill/Reedie Hotspot Analysis

For the purposes of this study and discussion, a conceptual analysis was completed as follows:

1. Use of the UPWP Multimodal Coordination / Bus Hot Spots Study
   - Wheaton Triangle includes a Bus Hotspot, identified by regional bus speed and volume data analysis.
   - Consulting team conducted a field survey and proposed several options.

2. Conducted a Benefit-Cost Analysis (BCA)
   - Based on USDOT TIGER Grant application BCA.
     – Potential model for national performance measures.
   - Used transit and highway data.
   - “Ballpark” costs and benefits.

Multimodal Coordination Bus Hot Spots Study Field Verification Summary - Maryland

Location #1: Wheaton Triangle

	Street(s)	Rankings			Potential for Improvements			
		Daily	AM	PM	Physical	Transit	Signal	Long-Term
	Georgia Ave.	2	4	4	x			**X**
	River Rd/Paint Branch D.	3	14			x		**X**
1	Veirs Mill Rd./Reedie Dr.	4	12	8	**X**		**X**	**X**
	Fenton St.	5	6	7	x			
	East-West Hwy.	6	7	5	**X**			
2	Piney Branch Rd.	7	10	10	**X**	**X**		
	Carroll Ave.	11		14	x			
	Hungerford Dr.	13						
3	Annapolis Rd.	15	9	15	**X**	**X**		
	Wayne Ave.		1	1				**X**

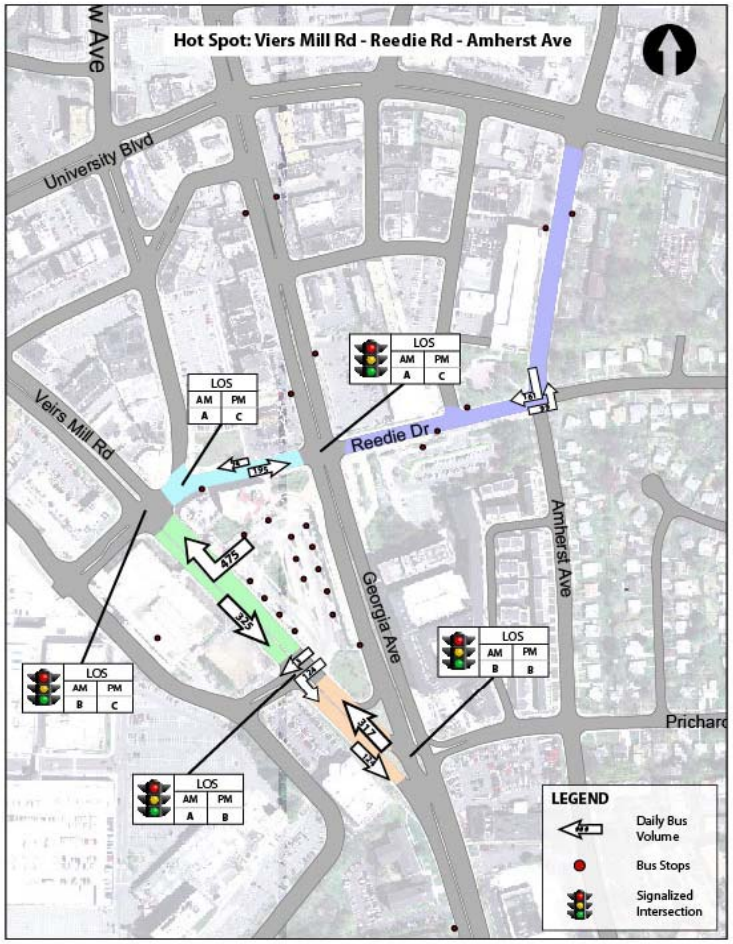
x = Some potential for improvements
X = Strong potential for improvements
= Recommended for concept design

Multimodal Coordination Bus Hot Spots Study MD #1 – Veirs Mill/Reedie

- Problems Observed
  - Focus on Reedie between Veirs Mill Rd. and Georgia Ave.
    - Multiple, non-signalized access points from north create weave conflicts
    - Triangle Lane crosswalk lacks pedestrian signal – random pedestrian crossings
    - Left turn from Reedie onto Veirs Mill has conflicts with pedestrian crossings
  - Secondary impacts on Veirs Mill Rd.
    - SB queues at Metrorail station bus loop intersection inhibit bus access

Multimodal Coordination Bus Hot Spots Study MD #1 – Veirs Mill/Reedie

- Potential physical improvements
  - Extension of left turn lane from Veirs Mill Rd. into Wheaton station bus loop
- Potential signal improvements
  - Assess signal timing along Veirs Mill Rd.
  - Consider protected left turn phasing at Veirs Mill/Reedie intersection
  - Install pedestrian signal at mid-block crosswalk on Reedie



Benefit Cost Analysis (BCA) – TIGER Model

TIGER Grant applications require a detailed BCA, with benefits & costs quantified across multiple Project Selection Criteria:

Primary Selection Criteria	Benefit-Cost Analysis Measures
State of Good Repair	• Reduced Operating & Maintenance Costs
Economic Competitiveness	• Travel and User cost savings (users) • Land Use productivity
Livability	• Accessibility • Congestion savings (non-users) • *Indirect benefits from changing travel patterns and mode choices* • Public Health benefits
Environmental Sustainability	• Emission reductions
Safety	• Accident reductions (from reduced VMT and improved Access)

BCA – *Veirs Mill/Reedie Location*

Inputs:

- Current travel volumes for both modes,
- Hypothetical capital cost of $500K (e.g., traffic signal optimization)
- Reduced WMATA operating costs (~ $55K annually)

Sensitivity Analysis

- ❖ 5% improvement in bus travel time
  -> increased transit ridership and pedestrian travel
- ❖ Scenario #1 = 2% more auto congestion
- ❖ Scenario #2 = 1% more auto congestion

- *Very sensitive to auto congestion impact.*
- *Also sensitive to competing safety impacts – auto accidents down, pedestrian accidents up.*

BCA – *Veirs Mill/Reedie Location*

Scenario #1 = 2% more auto congestion

Costs	**$519**
Capital	**$485**
Operating	**($878)**
Construction Impacts	**$0**
Accident	**$911**
Benefits	**($1,185)**
Net Travel Time Savings	**$17**
Net Travel Cost Savings	**$1,255**
Increased Access	**$634**
Congestion Reduction	**($3,863)**
Emissions Reduction	**$369**
Health Benefits	**$0**
Accident Reduction	**$402**
Net Present Value	**($1,704)**
Rate of Return	**#DIV/0!**
Benefit-Cost Ratio	**-2.285**

Scenario #2 = 1% more auto congestion

Costs	**$519**
Capital	**$485**
Operating	**($878)**
Construction Impacts	**$0**
Accident	**$911**
Benefits	**$746**
Net Travel Time Savings	**$17**
Net Travel Cost Savings	**$1,255**
Increased Access	**$634**
Congestion Reduction	**($1,932)**
Emissions Reduction	**$369**
Health Benefits	**$0**
Accident Reduction	**$402**
Net Present Value	**$228**
Rate of Return	**5.075%**
Benefit-Cost Ratio	**1.439**

20 years, 3% Discount Rate

BCA Conclusions

- All modes are interested in the same “real estate” – roadway, signal cycle time.
  - Requires multi-modal comparison of trade-offs.
  - Can be measured in:
    1. Simple modal terms: AADT, LOS, CLV, Bus Trips;
    2. Person throughput: Auto and Bus occupancy;
    3. Broader range of areas: User cost and time, Accessibility, Livability.

- Benefit-Cost Analysis is sensitive to projected assumptions.
  - Sensitivity analysis can provide some range of comfort to account for project uncertainties, but not an exact science.
  - Requires effort to collect data and analyze.

Overall NCHRP Pilot Study Findings (1)

Within the Washington Metropolitan Region:

- Significant work is being done already in performance measurement and analysis, however there are opportunities to improve.
  - New and better data as technology improves (e.g., INRIX, Transit AVL).
  - Improved use and input into the planning process.
- Separate modal planning reflects history and responsibilities of each agency:
  - There is an opportunity to move towards a multi-modal planning approach, with person-based, mode neutral measures.

Pilot Study Findings (2)

- Biggest challenge is moving from collaborative prioritization and selection of a preferred strategy to agency-specific implementation.
  - Involves an implementing agency programming, funding, and building the preferred strategy.
  - Preferred strategy must compete with other priorities and needs of the implementing agency.
  - Added complexity if multiple implementing agencies are involved.
  - Public involvement is a critical part of the decision-making process.

Pilot Study Recommendations (1)

- Improve presentation of performance measures to public and decision-makers.
  - Investigate communication techniques for presenting performance measurements and analysis.

- Maximize use of current information and “traditional” project justification reports.
  - Identify key pieces of information included.
  - Develop a template that reflects best practices.

Pilot Study Recommendations (2)

- Within each agency:
  - Identify steps for framing discussions around the total user experience perspective.
  - Maintain a list of priorities and potential strategies and look for opportunities to attach improvements to large mode-specific projects.
  - Create line item programs for addressing multi-modal issues.
    - Example: Maryland SHA's competitive Fund 87 Program for capacity improvements at failing intersections.
  - Improve inter-agency coordination
    - Performance data: share transit AVL and ridership data
    - Implementation: coordinate as in TIGER Grant project.

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Questions?