Bus Priority Treatment Guidelines

Briefing for Regional Bus Subcommittee

April 26, 2011


National Capital Region Transportation Planning Board

VHB Vanasse Hangen Brustlin, Inc.

Today's Briefing

- Study Background
- Study Objectives / Scope of Work
- Guidelines Objective
- Guidelines Summary
- Lessons Learned
- Next Steps
- Discussion

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Study Background

- TPB member agencies needed implementation guidance for priority bus
  - WMATA PCN network
  - TIGER Grant
  - Other BRT – Rapid Bus – Bus Priority projects

- "Development of Implementation Guidelines for Priority Bus Transit on Arterials in the Washington Region"

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Study Objectives

- Develop a set of bus priority implementation guidelines as a common reference for the region
- Collect and disseminate information on feasible bus priority strategies
  – Document regional and national bus priority strategies
- Foster coordination between transit operators and roadway owners / traffic agencies
  – Review draft guidelines with jurisdictional transit and traffic agency staff to get information and input

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Scope of Work / Tasks

1. Establish Technical Advisory Committee
2. Document bus priority strategies in the Washington region and other areas throughout the US
3. Develop Draft Implementation Guidelines
4. Meet with Transit and Traffic Agency Staff
5. Prepare Final Report

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Guidelines Objective

- Provide information about bus priority treatments that can be applied to improve bus operations
  - Intersection of transit system and road network agencies

Information conveyed in:

- Descriptions
- Drawings
- Examples

Target audiences:

1. Traffic engineers
2. Public officials
3. Public

- Question and answer (Q&A) format used throughout the guidelines

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Guidebook Summary / Organization

- Priority Bus Treatments Overview
- Street Segments
  - Running Way
  - Bus Stops
- Intersections
  - Transit Signal Priority (TSP)
  - Queue Jumps and Crosswalks
- Sidewalks
  - Sidewalk Design and Bus Shelters
- Local Examples of Priority Bus Treatments

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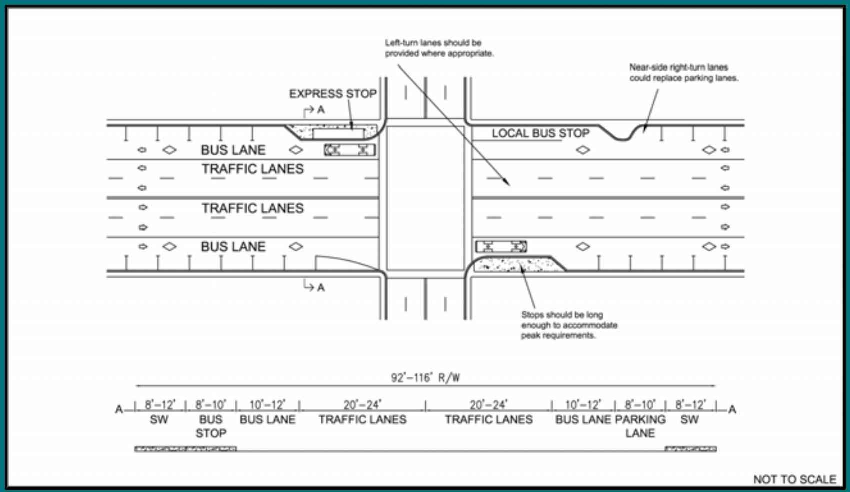
Street Segments: Running Way

- On Street Exclusive Bus Lane
  - Lane Location
  - Lane Operations
  - Lane Vehicle Restrictions
  - Lane Dimensions & Markings
- Mixed Traffic Bus Lane


Image source: GCRTA



Street Segments: Bus Stops

- Stop Location
  - Near-side
  - Mid-block
  - Far-side
- Bus Bays
- Bus Bulbs

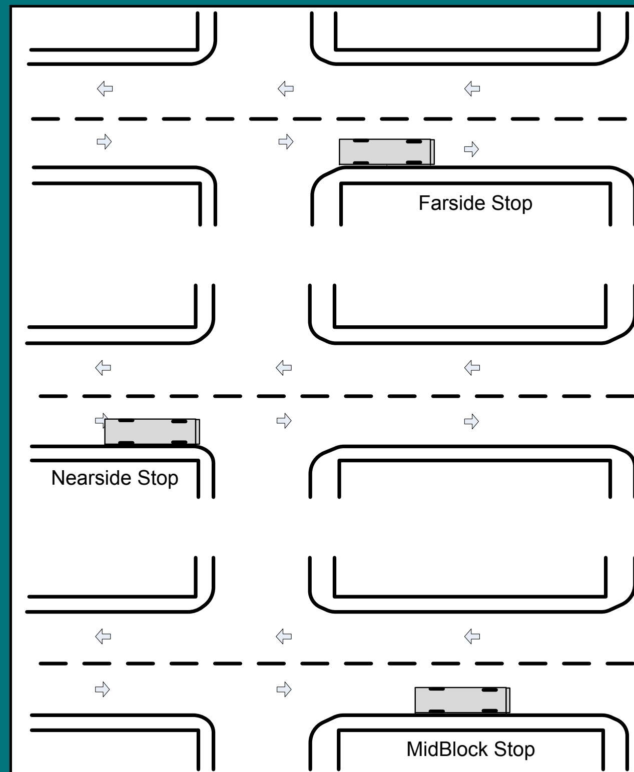


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Image sources (clockwise from L):
TCRP #19 (1996)
fairfaxcounty.gov
streetsblog.org

Sidewalks and Shelters

- Sidewalks
  - Width
  - Length
  - Height
- Shelters

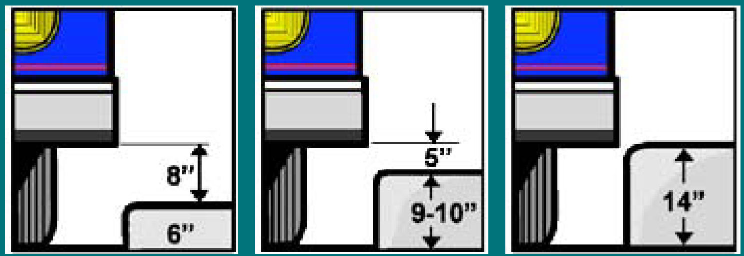
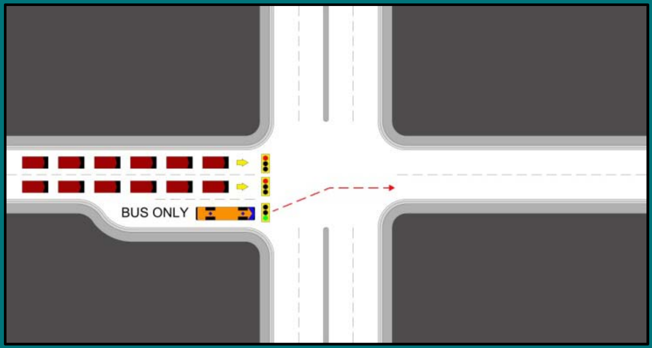
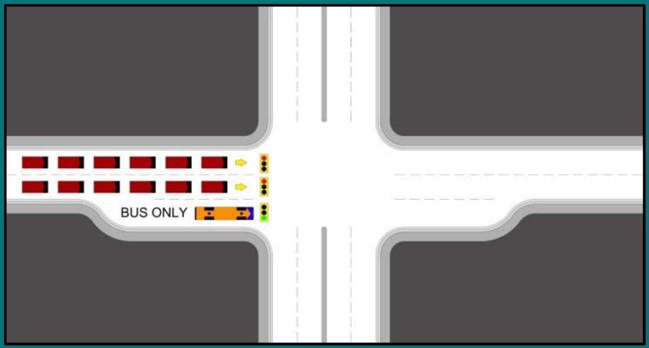


Image sources (clockwise from bottom L): Seattle DOT, NRBTI (group of four), NRBTI (2009)

Intersections: Queue Jumps and Crosswalks

- Queue jumps integrated with bus stop placement and TSP
- Typically at intersections with LOS D or worse
- Minimum of a striped crosswalk for every intersection with a bus stop
- Bus bulbs can reduce crossing distance / time
  - Include cut-throughs for cyclists





Source: NRBTI

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Intersections: TSP (1)

- TSP modifies signal timing to give an advantage to transit vehicles
  - Green extension or advance green
  - Conditional or unconditional
  - Active or passive
- TSP can improve the person throughput of an intersection
  - Bus passengers vs. car passengers
  - Person throughput included in HCM 2010
- Minimum green phase retained for adequate pedestrian crossing time

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Intersections: TSP (2)

- TSP should be considered in corridors that have bus delays resulting from heavy congestion
  - LOS D/E, V/C between 0.8 and 1.0
- TSP can be applied for both exclusive and mixed-traffic bus lanes
  - Integrate with queue jumps for mixed-traffic
- Signal priority ≠ signal preemption
  - Preemption typically for emergency vehicles (first responders), some LRT applications

Comparison of TSP Technologies

Lane Detection

Exclusive Lane	Mixed Traffic
• Induction loop detector • Video detector • GPS/AVL • Optical emitter • Radar detector • RF tag	• RF tag • Optical emitter • GPS/AVL • Infrared

TSP Communication

Technology	Advantages	Disadvantages
Inductive Loops	• Devices placed in guideway rather than vehicle	• Only appropriate for exclusive busways • Devices damaged in road construction
Low Frequency RF (100-150 KHz)	• Transmitters inexpensive and are easily removed or replaced	• Message transmitted may be hindered by accumulated dirt or snow on tag
900-1000 MHz RF	• Transmitters inexpensive and are easily removed or replaced • Can transmit much information	• Message transmitted may be hindered by accumulated dirt or snow on tag
Spread Spectrum Radio	• Can transmit much information	• Not as accurate in locating buses as other radio frequency technologies • Can be affected by weather • May be more expensive
Infrared	• Well proven in Europe	• Limited ability to provide precise vehicle information • Limited amount can be transmitted from vehicle • Requires line of sight
Video		• Requires line of sight
Optical	• Cost savings if already in place for emergency vehicle preemption	• Limited ability to provide precise vehicle information and transmit from vehicle • Requires line of sight
GPS/AVL Vehicle Tracking		• Buildings may block signal • May not provide precise location information for signal priority treatment

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Sources (clockwise from L): ITS America (2004), TCRP #90 (2003), PVTA

Lessons Learned

- Signal preemption vs. signal priority
- TSP consideration in congested (but not severely congested) corridors
- Combination of priority bus treatments often most effective
- Priority bus treatments favorable for "complete streets"
- Education, education, education
- ITS aspect of priority bus treatments crucial to success (TSP, AVL, etc.)

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Next Steps

- TPB Technical Committee – 06 May
  - Guidelines document print run in May
  - Possible TPB Presentation

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