Use of Freeway Shoulders for Travel

Part-time Shoulder Use Guide

FHWA Guide

AASHTO SCOTE, Savannah GA

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DOTs Face Increasing Challenges

Use of Freeway Shoulders for Travel
PBPD is a decision making approach that helps agencies better manage transportation investments and serve system-level needs and performance priorities with limited resources.

Modifying the traditional “top down, standards first” approach to a “design up” approach
This does not mean one can compromise on certain standards or regulations!
Common Themes of PBPD:

• Project decisions are based on critical examination of geometric elements
  – Select/size elements that serve priority needs
  – Reduce or eliminate those that don’t
• Utilizes relevant, objective data to inform decisions – engineering judgement
• Choices made to serve project priorities while trying to make cost effective decisions
• Project savings Benefit System Needs
Example Operations Strategies and Solutions

- Work Zone Management
- Traffic Incident Management
- Service Patrols
- Special Event Management
- Road Weather Management
- Transit Management
- Freight Management
- Traffic Signal Coordination
- Traveler Information
- Ramp Management
- Managed Lanes
- **Part-Time Shoulder Use**
- Active Traffic Management
  - Dynamic Speed Limits
  - Dynamic Lane Assignment
  - Queue Warning
  - **Dynamic Part-Time Shoulder Use**
Part-Time Shoulder Use

- Use of the safety shoulder as a travel lane during congested conditions – **Not a permanent conversion of a shoulder**
- Add capacity only when needed
- Keep shoulder intact for most hours of the day
- Do what is physically and financially possible
  - Support decisions with analysis
What is Part-Time Shoulder Use?

• Various names
  – Hard shoulder running (European)
  – Shoulder running
  – Temporary shoulder use
  – Part-time shoulder use

• Same meaning: use of the left or right shoulders of an existing roadway for travel during certain hours of the day.
  – TSM&O strategy for addressing congestion and reliability issues
  – Preserves shoulder as shoulder during most hours of day
Types of Part-Time Shoulder Use

• Static shoulder use – open to passenger vehicles during predetermined hours of operation

• Dynamic shoulder use – open to passenger vehicles based on need and real-time conditions

• Bus-on-Shoulder (BOS) – open only to buses, usually at driver’s discretion

Shoulder use typically implemented on freeways; but can be applied to arterials
Where is Part-Time Shoulder Use?

- Now 16 states
- Many international applications as well
Bus On Shoulder (BOS) in Minneapolis-St. Paul
Left-Shoulder Bus on Shoulder (BOS) in Chicago
Bus on Shoulder (BOS) on US 9 Arterial in New Jersey
Static Shoulder Use – US 2 in Washington State
Static Shoulder Use – I-66 in Virginia (Made Dynamic in 2015)

Dynamic signs over shoulder; but fixed hours of operation
Dynamic Shoulder Use – I-66 in Virginia
Dynamic Shoulder Use – I-35W in Minneapolis

- Part of Managed Lane (HOT) operation
Purpose of Shoulder Guide

Why did we need a Guide?

• No national guidelines
  – Existing research scattered in many sources
• Growing interest - Division Offices getting requests for projects
• Regulatory uncertainty/complexity
  – Air and noise analysis
  – NEPA
  – Design exceptions
  – Signing and pavement marking (MUTCD)
• The Guidebook is not a standard/directive/policy/etc.
  – Collection of referenced standards and applied best practices
• Consistent with other FHWA initiatives
  – PBPD
  – TSM&O and Active Traffic Management
Chapter 1 – What is Part-time Shoulder Use?
• Also contains summary of entire guide

Chapter 2 – Planning, Decision Making, and Preliminary Engineering
• Planning considerations
• NEPA requirements
• Preliminary Engineering
• Relationship to Planning for Operations and PBPD
Guide Chapters - Analysis

Chapter 3 – Mobility Analysis
• How to do it (HCM/FREEVAL, Simulation)
• Observed and simulated shoulder use capacities

Chapter 4 – Safety Analysis
• Before/after studies
• How to do analysis
• What Highway Safety Manual says

Chapter 5 – Environmental Analysis
• Air quality
• Greenhouse gas emissions
• Noise

Chapter 6 – Costs and Benefits Analysis
• Life cycle costs
• Benefit-cost ratio
Chapter 7 – Design Considerations
- Geometry
- Pavement/Drainage
- Signing and pavement marking

Chapter 8 – Implementation Process
- Design exceptions
- MUTCD
- Stakeholder/public involvement

Chapter 9 – Day-to-Day Operations
- Maintenance
- Incident management
- Law enforcement
- Opening and closing the shoulder
Some Design and Operations Questions

Preliminary Engineering

• Is shoulder width adequate, or can it be widened?
• Are vertical clearances adequate?
• Is the shoulder pavement structural capacity adequate in terms of drainage and rideability?
• Is it feasible to provide supplemental emergency turn-out or refuge areas beyond the shoulder at reasonable intervals?
• Is a sufficiently long segment available, or is an acute bottleneck being relieved?

Operations Concepts

• Should the right or left shoulder be used?
• What vehicles will the shoulder be open to?
• If the shoulder is open to more than buses, should it be static (fixed hours of operation) use dynamic use?
• Will there be speed restrictions?
• Use in conjunction with other operational strategies?
Shoulder Use Capacity Findings

- Shoulder lane utilization and effective capacity is highly dependent on geometric/design features
- Effective capacities of 1200 – 1800 VPH
- Left vs. Right shoulder use is quite different
Before and after Implementation of Shoulder Use

Washington State
Narrowing shoulders and adding a lane reduces crashes if the volume is high enough.
Environmental Effects of Part-Time Shoulder Use

• Changes in traffic volumes or speeds may effect:
  – Air quality
  – Greenhouse gas emissions
  – Noise

• Likely minimal changes in roadway footprint with minimal effect:
  – Water quality
  – Plants and animals
  – Cultural resources

• Cannot generalize air and noise effects
  – Reduced congestion -> generally good for air quality/noise
  – Increased volume -> generally bad for air quality/noise
Turnoffs

- Have refuge for disabled vehicles approximately every half mile
- Construct turnoffs where other refuge spaces (ramps, gores, etc.) don’t exist
- If turnoffs cannot be constructed, part-time shoulder use still possible
- Not necessary for BOS, but still helpful
Signs and Pavement Marking

• Bus on shoulder
  – Minimal
  – Too much shoulder markings may make passenger car drivers think lane is open to them

• Static shoulder use
  – Static regulatory and warning signs
  – Can have dynamic lane control signs

• Dynamic shoulder use
  – Dynamic lane control signs
Regulatory Sign Examples (static shoulder use)

GA 400 Mainline

GA 400 Ramp
Regulatory Sign Examples (static shoulder use)

I-H-1 (Hawaii)

Massachusetts
Regulatory Sign Examples (static shoulder use)

New Jersey Turnpike Newark Bay Extension (I-78)
Day-to-Day Operation

- **Maintenance**
  - More similar to a general purpose lane than shoulder
  - Presence of traffic clears debris
  - Some major snowfall removal issues if roadside barriers present

- **Incident Management**
  - Plans often in place already on freeways where shoulder use being considered
  - Potential enhancements:
    - Turnouts
    - Service patrols
    - CCTV
    - Changeable lane control signs
Day-to-Day Operation

• Law Enforcement
  – Police must know when lanes are open/closed
  – Targeted enforcement where roadside space available

• Opening and closing
  – “Sweep” the lanes before opening
    • Driving the facility most common
    • CCTV also used
    • Unnecessary for BOS
  – Police and/or TMC have authority to order closure of shoulder for incidents or other reasons.
Public Outreach and Education

- Critical to success
- Use multiple formats and forums
- Ongoing after opening to traffic
FHWA Task Order Next Steps

- **Webinars**
  - This summer through National Operations Center of Excellence
  - One more TBD

- **Conference Presentations**
  - AASHTO Subcommittee on Design in Baltimore later this month
  - Two more TBD

- **5 one-day workshops for states**
Questions and Comments

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