Innovative Intersection Designs

May 20, 2015
2015 DESIGN SUMMIT

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Safety Aspects of Innovative Intersections

Design Summit
May, 2015

Caroline Trueman
FHWA NJ Division Office
% Pedestrian Facilities 2010

Percent of Fatalities; at State Level

- **0% to 11%**
- **12% to 14%**
- **>15%**

U.S. Department of Transportation
Federal Highway Administration

Roundabouts
What is a Modern Roundabout?

600+ feet
What is a Modern Roundabout?

120-250 ft
What is a Modern Roundabout?

• A compact circular intersection
• Entering traffic yields
• Approaches are channelized
• Designed to slow the speed of vehicles
Key Features

Splitter islands separate, deflect, and slow traffic.

Where trucks are common, a properly designed apron may be necessary.
Vehicle Conflict Points

- Crossing (0)
- Diverging (4)
- Converging (4)

- Crossing (16)
- Diverging (8)
- Converging (8)
Search Results

There were 29 CMFs with star ratings returned for this filter selection. [modify your search]

Having trouble deciding between similar CMFs? Check out our FAQs.

Results Control: Collapse All | Expand All

Click on the links below to expand individual categories.

- Category: Bicyclists (1)
- Category: Intersection geometry (28)
  - Subcategory: Intersection geometry reconfiguration (25)
  - Countermeasure: Conversion of intersection into high-speed roundabout

0.28 71.2 ★★★★★ All  Fatal, Serious injury, Minor injury  Urban and suburban  Srinivasan et al., 2011  Countermeasure name has been slightly...
71% Reduction of Fatal & Injury Crashes
Capacity

- Ratio of peak-hour to daily traffic (K) of 0.09 to 0.10,
- Direction distribution of traffic (D) of 0.52 to 0.58,
- Ratio of minor street to total entering traffic of 0.33 to 0.50, and
- Acceptable volume-to-capacity ratio of 0.85 to 1.00.
Actuaries Like Them!

GOING FULL CIRCLE

Traffic roundabouts make dangerous intersections safer for drivers. Here’s how to navigate them with ease.

Communities across America are acknowledging the impressive safety benefits of modern traffic roundabouts. Smaller in scale and designed with sharper curves than old-fashioned rotary or traffic circles, they force traffic to slow down.

Compared to the rest of the world, the U.S. has been slow to accept driving in circles. To date, about 3,600 traffic roundabouts have been built across the country, contrasted with more than 35,000 in France alone.

Research by the Insurance Institute for Highway Safety (IIHS) shows that roundabouts reduce collisions by slowing traffic and eliminating left turns in front of oncoming traffic.

“Where a roundabout has replaced traffic signals or four-way stops, head-on collisions have been virtually eliminated,” says Dave Melson, industry director of transportation with the Liberty Mutual Research Institute for Safety. “And fender benders that do occur tend to be a lot less severe.”

How do you successfully go through a roundabout without getting yourself into a spin?

1. Slow down as you approach, and yield to traffic coming from your left that’s already within the roundabout.
2. Keep moving. If there’s no approaching traffic, you’re not required to stop, so ease into the circle. Once inside the roundabout, don’t stop unless it’s to avoid a collision.
3. Want to take the first exit? Stay in the right lane—and always use your turn signal.

If you’re in a multilane roundabout, stay in your lane and plan your exit strategy early. Avoid the inside lane next to an 18-wheeler or any vehicle with a long trailer. They need extra room and can cut into the inside lane during tight turns.

Roundabouts

Roundabouts reduce collisions by 40% and accidents involving injuries by 80%*

Visit www.iihs.org/research/qanda/roundabouts.html for more information about roundabouts and their safety record.

*Source: Insurance Institute for Highway Safety
• Quieter
• Functional
• Aesthetically pleasing
Right-of-Way Requirements

Before

After
<table>
<thead>
<tr>
<th>Where to Consider Roundabouts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intersections with high crash rates/high severity rates</td>
</tr>
<tr>
<td>Intersections with complex geometry, skewed approaches, &gt;4 approaches</td>
</tr>
<tr>
<td>Rural intersections with high-speed approaches</td>
</tr>
<tr>
<td>Closely spaced intersections</td>
</tr>
<tr>
<td>Replacement of all-way stops</td>
</tr>
<tr>
<td>Replacement of signalized intersections</td>
</tr>
<tr>
<td>At intersections with high left turn volumes</td>
</tr>
<tr>
<td>Replacement of 2-way stops with high side-street delay</td>
</tr>
<tr>
<td>Intersections with high U-turn movements</td>
</tr>
<tr>
<td>Transitions from higher-speed to lower-speed areas</td>
</tr>
<tr>
<td>Where aesthetics are important</td>
</tr>
<tr>
<td>Where accommodating older drivers is an objective</td>
</tr>
</tbody>
</table>
Roundabout Resources

http://www.fhwa.dot.gov/everydaycounts/edctwo/2012/geometrics.cfm
http://safety.fhwa.dot.gov/
Investing in Modern Roundabouts

Route 3, Route 46, Valley Road & Notch / Rifle Camp Road Interchanges
City of Clifton, Township of Little Falls, Borough of Woodland Park, Passaic County

- Over $200 Million Operational & Safety Improvement Project
- Two Single-Lane Urban Roundabouts
- One Multi-Lane Urban Roundabout
Concept Development
Clove Road – Signalized Intersection

- High volume of left-turns
- Clove Road NB left-turn queue extends south of the NJ Transit overpass
- Requires widening Clove Road to provide a NB left-turn lane
- Requires replacing the existing NJ Transit Rail Bridge over Clove Road

Little Falls, Passaic County
Clove Road – Single Lane Roundabout

- Eliminates traffic signal and need for exclusive turning lanes
- Single Lane NB Approach – No widening of Clove Road
- Avoids impacts to the NJ Transit Rail Bridge
- Est. $4 Mil. dollar cost savings
Valley Road – Signalized Intersection

- High volume of left turns – queue extends beneath the Route 46 Bridge
- Wider Valley Road section requires longer bridge structure
- Obstructed view of traffic signal on the NB approach
Valley Road (Existing)

Overlook Corporate Center driveway

Signalizing Valley Road eliminates NB U-Turn Access to Oak Hill Road
Valley Road - Multi-Lane Roundabout

- Eliminates traffic signal
- Eliminates left-tune lane beneath the Route 46 bridge – reduces bridge length
- Est. $1.5 Mil. dollar cost savings
- Provides convenient access to Oak Hill Road from Valley Road NB
Public Input

Initial Public Reaction:
- “I thought New Jersey was getting rid of Traffic Circles?”
- “These will never work in New Jersey!”

Gaining Public Support:
- Understand that new ideas will always be met with skepticism
- 3D Traffic Models – A picture is worth 1,000 words
What is a Diverging Diamond Interchange?

- Essentially a diamond interchange with crossover intersections at the ramp terminals
What is a Diverging Diamond Interchange?

- Essentially a diamond interchange with crossover intersections at the ramp terminals

2-phase signals
What is a Diverging Diamond Interchange?

- Essentially a diamond interchange with crossover intersections at the ramp terminals.
• Relatively small footprint
• Existing bridge can often be retained on retrofits
• Versatile alternative for wide range of volumes and locations
• Advantages for non-motorized users
Early DDI Safety Results

Crash Reductions By Crash Type

<table>
<thead>
<tr>
<th>Left-Turn Type</th>
<th>Left-Turn Right Angle</th>
<th>Total Crashes</th>
</tr>
</thead>
<tbody>
<tr>
<td>100%</td>
<td>72%</td>
<td>46%</td>
</tr>
</tbody>
</table>

Conventional Diamond
26 conflict points

Diverging Diamond
14 conflict points

1. Diverging Diamond Interchange Performance Evaluation, MODOT, February 2011
INNOVATIVE INTERSECTION DESIGNS

- ROUTE 33 / 34 / CR 547 CIRCLE TO ROUNDABOUT
- ROUTE 73 & BOWMAN DRIVE – OFF SYSTEM ROUNDABOUT
- ROUTE 18 & PAULUS BLVD. – OFF SYSTEM ROUNDABOUT
- ROUTE 18 SERVICE ROAD & GEORGES ROAD – GREEN “T” LEFTS
- ROUTE US 1 & RT. 130 / 171 – TOP SIDE SPUI
- ROUTE 33 & ROUTE 133 / NJTPK INTER. 8 – UNDERDECK SPUI
- ROUTE 72 & RECOVERY ROAD – MOD. ENGLISH STYLE
INNOVATIVE INTERSECTION DESIGNS

WHAT DID WE LEARN?

- Retrofitting circles to roundabouts can still reduce crash severity
- Minimized phasing – improves capacity
- Space is a premium – use compact designs
- Don’t outsmart the pedestrians
- Now you see them, now you don’t – programmed signals
- Height versus sight
Adaptive Signals Systems

New Jersey Department of Transportation
2015 Design Summit
What is Adaptability
Adaptive System Architecture

1. Monitor
2. Implement Change
3. Modify for Change
4. Detect Change
5. Check System Status
6. System Stabilized State

Example of Adaptable Systems

- Human eye to light
- Flexibility of some trees in winds
- Transition Lenses
- Spring & Coils flexibility
What is Permanent?

Constant Change

CHANGE

The only constant is change.
Constant Changes
Fluctuation in Traffic Volume

Traffic by nature is supposed to change

### Short Term
1. Weather
2. Incidents
3. Construction
4. Special Events

### Long Term
1. Background Growth
2. Developments
3. Economic Activity
4. Construction
Traffic Signals – Objective

• Allocate signal time in the most efficient manner - minimize delay, improve safety and mobility

• Develop “Timing Plans” or “Signal Directives”
Signal Timings Optimization Process

• Data is collected
• Data is processed
• Timing plans are implemented and tested
• Timing is adjusted
• Signal Timings are now “OPTIMIZED”
Signal Timings Optimization Process

AUTOMATE THE ENTIRE PROCESS AND MAKE IT RESPONSIVE / ADAPTABLE TO THE CHANGES THAT WILL HAPPEN IN TRAFFIC PATTERNS
Treatment for an Optimized Signal – Signal Timing Plans

- Significantly Higher Traffic Volumes
- Significantly New Traffic Patterns
- New Traffic Peaks

Rt 1 and Aaron Rd. Current Conditions
It is not the strongest species that survive, nor the most intelligent, but the ones most responsive to change.

- Charles Darwin
Adaptive Control in Signals

Controller develops timings

Information to controller

Modify signals

Detection
Best Location for Adaptive

- Extreme Variability of Traffic Volumes both Long and Short Term
- Frequent Signal Timings Readjustment Due to Event Stages (Construction / Event - Stadium)
- Historic Data or Patterns are not Reliable
Adaptive Signal Decision Diagram

Issues and Concerns Identification

- It is **Not** a Capacity issue
- Does it meet warrants
- Resources are available
- Staff, Cost, Traffic Operation Center and Training
- Maintenance Responsibility is defined

STEP 1

STEP 2

STEP 3

STEP 4

Provide Adaptive Traffic Signal System

Traditional Optimizations
Major Advantages of Adaptive – Road Users

- **Efficient**
  - Best allocation of timings

- **Reliability**
  - Travel Time Reliability

- **Delay**
  - Less Delay and Fewer stops

- **Safety**
  - Less prone to violations

- **Fuel Economy**
  - Improves Fuel Consumption
## Major Advantages of Adaptive – Operators / Managers

<table>
<thead>
<tr>
<th>Category</th>
<th>Advantage</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Management</strong></td>
<td>• Less Management Automatic Adjustment</td>
</tr>
<tr>
<td><strong>Complaints</strong></td>
<td>• Fewer Complaints</td>
</tr>
<tr>
<td><strong>Cost</strong></td>
<td>• Reduces Recurring Retiming Cost</td>
</tr>
<tr>
<td><strong>Proactive</strong></td>
<td>• Proactive Response rather than Reactive</td>
</tr>
<tr>
<td><strong>Goal Setting</strong></td>
<td>• Real Time Data Driven Results</td>
</tr>
</tbody>
</table>
Important Things to Consider

• System Will Not Work Efficiently – If Detection Fails
• System Will Not Work Efficiently – If Communication Fails
• System Will Not Work Efficiently – If Issue is Capacity Related
• Staff Requires Knowledge of Networking and Communications
• Steep Learning Curve for road users and Agency Personal – Inconsistency and Variation of Operations
• Heavy Vendor Reliance and Dependability
• Some Systems Will Not Work with Transit Preemption, Pedestrian Calls and Emergency Preemption
When is Adaptive the best solution?

Answer = Somewhere in between never and always

Successfully being used on Rt. 1 & 9T as part of the Pulaski TMP
Magic Roundabout UK
Stormwater Management

Saving the Environment One Drop at a Time
Stormwater Management Panelists

Tony Sabidussi – FHWA  
*Environmental Specialist*

Elizabeth Dragon – NJDEP  
*Division of Water Quality*

David Ahdout – NJDOT  
*Stormwater Management SME*

Robert Anastasia, PE, CFM  
*Director of Hydrology & Hydraulics, Taylor Wiseman & Taylor*
Many Types of Stormwater Management
Stormwater Management for today’s Session

Media Filter Drain

Biofiltration Swales
HISTORY OF STORMWATER REGULATIONS

- Rivers & Harbors Act 1899
- 1948 Water Quality Law
CLEAN WATER ACT 1972
AKA: FEDERAL WATER POLLUTION ACT

- 1970: Earth Day & EPA
- 1972: Clean Water Act
  National Pollution Discharge Elimination System (NPDES)
  BMPs Introduced
- 1977-1983: National Urban Runoff Program (NURP)
- 1987: Start of Phased Approach - Municipal Separate Storm Sewer Systems (MS4s)
1987 WATER QUALITY ACT PHASED APPROACH

- CWA Revised

- Phase I 1990:
  - Introduced MS4s
  - 5 Acres + Disturbance
  - Industrial & construction site runoff

- Phase II 1999:
  - Smaller MS4s included
  - Population volume & density
  - 1 acre + disturbance
GOALS

- Reduce pollutants
- Improve recreational waters
- Improve aquatic environment
- Reduce/eliminate post development flows
  - Volume
  - Velocity
  - Damage
REGULATORY AUTHORITIES

- EPA: Clean Water Act
- State Environmental Departments (NJDEP)
- Army Corps of Engineers
- Local/Regional/Watershed Authorities
Stormwater Management Innovations
Four NJPDES General Permits

– Tier A Municipalities
  • Coastal or Urban Municipalities

– Tier B Municipalities
  • Rural Municipalities

– Public Complex
  • County, State, Interstate, and Federal Agencies
  • 2 or More Buildings, 1000 or More People, and 6 or More H/D

– Highway Agency
  • County, State, Interstate, and Federal Agencies
  • Highways, Streets, Bridges, Tunnels, Maintenance Facilities, Service and Rest Areas
Highway Agency General Permit
SBRs

• Post-Construction Stormwater Management for New Development and Redevelopment

• Local Public Education

• Improper Disposal of Waste

• Illicit Connection Elimination and Outfall Mapping

• Solids and Floatable Controls

• Maintenance Yard Operations

• Employee Training
3. Post-Construction Stormwater Management in New Development and Redevelopment

- Design and performance standards, N.J.A.C. 7:8 for major development
- Operation and maintenance of BMPs
- Attachment C - solid and floatables
Stormwater Management
NJAC 7:8

- Subchapter 2. General Requirements for Stormwater Management Planning
- Subchapter 3. Regional Stormwater Management Planning
- Subchapter 4. Municipal Stormwater Management Planning
- Subchapter 5. Design and Performance Standards for Stormwater Management Measures
Important Definitions 7:8-1.2

• **Major Development**
  – Disturbance of one acre or more of land

• **Disturbance**
  – Placement of impervious surface
  – Exposure and/or movement of soil or bedrock
  – Clearing, cutting or removing vegetation
NJAC 7:8-5, Design and Performance Standards

- Exemptions
- Nonstructural Stormwater Management strategies
- Groundwater Recharge
- Stormwater Quantity
- Stormwater Quality
- Stormwater Facilities Maintenance

NJAC 7:8-6, Safety Standards

- Trash Racks
- Overflow Grates
- Escape Provisions
Guidance Documents

Chapter 1: Introduction/Background
Chapter 2: Stormwater Pollution Prevention Plans and Example Forms
Chapter 3: Public Notice
Chapter 4: Post-Construction Stormwater Management in New Development and Redevelopment
Chapter 5: Local Public Education
Chapter 6: Improper Disposal of Waste
Chapter 7: Solids and Floatables
Chapter 8: Maintenance Yard Operations
Chapter 9: Employee Training
Chapter 10: Additional Measures
Chapter 11: Optional Measures
Chapter 12: Annual Report and Certification, and Blank Forms
Chapter 13: Industrial and Construction Activity Operated by the Public Complex
Chapter 14: Important Names, Addresses, and Contacts

http://www.nj.gov/dep/dwq/highway_guidance.htm
UPDATED / NEW BMPS

- Chapter 9.1 Bioretention Systems (Revised 02/09)
- Chapter 9.2 Standard Constructed Wetlands ***UPATED***
- Chapter 9.3 Standard for Dry Wells
- Chapter 9.4 Extended Detention Basins ***UPATED***
- Chapter 9.5 Standard for Infiltration Basins
- Chapter 9.6 Standard for Manufactured Treatment Devices
- Chapter 9.7 Standard for Pervious Paving Systems
- Chapter 9.8 Standard for Rooftop Vegetated Cover (reserved)
- Chapter 9.9 Sand Filters ***UPATED***
- Chapter 9.10 Vegetative Filter Strips ***UPATED***
- Chapter 9.11 Wet Ponds ***UPATED***
- Chapter 9.12 Grass Swales ***NEW***
- Chapter 9.13 Subsurface Gravel Wetlands ***NEW***

http://www.njstormwater.org/bmp_manual2.htm
<table>
<thead>
<tr>
<th>Bioretention Systems</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dry Wells</td>
</tr>
<tr>
<td>Infiltration Basins</td>
</tr>
<tr>
<td>Pervious Paving</td>
</tr>
<tr>
<td>Blue Roofs</td>
</tr>
<tr>
<td>Green Roofs</td>
</tr>
<tr>
<td>Cisterns</td>
</tr>
</tbody>
</table>
9.2 STANDARD CONSTRUCTED WETLANDS

Standard constructed wetlands are stormwater management systems designed to maximize the removal of pollutants from stormwater runoff. Flow is directed through an engineered, open marsh system where pollutants are removed through settling and vegetative uptakefiltration. The total suspended solids (TSS) removal rate is 90%.

N.J.A.C. 7:8 Stormwater Management Rules - Design and Performance Standards

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nonstructural Strategy</td>
<td>Assist with #7</td>
</tr>
<tr>
<td>Water Quantity</td>
<td>When designed to receive runoff from all storm events (on-line)</td>
</tr>
<tr>
<td>Groundwater Recharge</td>
<td>No</td>
</tr>
<tr>
<td>Water Quality</td>
<td>90% TSS</td>
</tr>
</tbody>
</table>

Water Quality Mechanisms and Corresponding Criteria

<table>
<thead>
<tr>
<th>Settling</th>
<th>Minimum Length to Width Ratio 1:1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sinuous Flow Pathway</td>
<td>Recommended</td>
</tr>
<tr>
<td>Presence of a Permanent Pool</td>
<td>Required</td>
</tr>
</tbody>
</table>

Vegetative Uptake and Filtration

| Minimum Density of Vegetation     | 85%                                               |
| Appropriate Species Selection     | See Chapter 7: Landscaping                       |
| Minimum Inflow Drainage Area      | Pond Category: 25 acres                         |
|                                  | Marsh Category: 25 acres                         |
|                                  | Extended Detention: 10 acres                     |

Introduction
- Illustration
- Function
- % TSS Removal

Rule Compliance
- Nonstructural Strategies
- Numerical Requirements

Functionality
- Summary of Mechanism Specific Design Criteria
- Additional Reference to Key Information as Needed
Manufactured Treatment Devices

VERIFICATION APPENDIX

http://njstormwater.org/treatment.html

http://www.njcat.org/verification-process/technology-verification-database.html
Field Manual

- Cover Page and BMP Overview
- Basic Design Information/Visual Aid for BMP Inspection
- Inspection Checklist/Maintenance Actions
- Preventative and Corrective Maintenance Records
Stormwater Training

www.njstormwater.org/training.htm
Stormwater Management Process

- Rules Apply?
- C1 Water or Other
- What Stage of Project Delivery Process Does SWM Begin?
- Soil Testing
- Selection of BMP
- Design
- NJDEP Permitting or Self-Certified
The Stormwater Management rules apply:

• If a project proposes over one-quarter of an acre of net added impervious surface (treat for water quality, quantity, and recharge)

OR

• If a project proposes over an acre of full-depth disturbance (treat for water quantity and recharge).
Runoff from net new added impervious surfaces must be treated at 80% TSS removal.

Runoff from any full-depth reconstructed areas must be treated for 50% TSS removal.

Runoff from new impervious surfaces discharging to or through Category 1 (C1) Waters must attain a TSS removal rate of 95% (instead of 80%).
The post-construction peak runoff rates must be reduced from the existing rates by the following proportions:

- 50% of the 2-year storm
- 75% of the 10-year storm
- 80% of the 100-year storm
Stormwater Management
Groundwater Recharge

• The pre-development rate of recharge must be maintained or reduced in the post-construction condition.
C1 water is designated in the NJDEP Surface Water Quality Standards (N.J.A.C. 7:9B):

- C1 waters are protected from any measurable change in water quality
- A Special Water Resource Protection Area (SWRPA) is 300 ft. from the top of bank
Problem Screening – There exists the possibility for SWM, but this has not yet been determined.

Concept Development – It is determined if SWM will apply (more than 1/4 acre net added impervious or more than 1 acre disturbed).

Preliminary Engineering – Determination of the feasibility and type of BMP to be used. This is determined through soil borings and by ROW and utility constraints.
Stormwater Management

Soil Borings

- SWM Soil Boring or Test Pit
- Importance to SWM?
- When Should Testing Be Done?
- How Many/Where?
- Depth & Why?
- Surrounding Area
Stormwater Management
Soil Testing

• Major Soil Testing methods are Soil Borings and Test Pits.

• Very important for determining soil permeability and depth to the seasonal high water table (SHWT).
  ➢ The optimal testing period is late-winter or early-spring, to ensure the SHWT is at its highest level.

• Critically important for determining the use and location of certain Best Management Practices (BMPs), such as basins, swales, and underground detention and filters.
  ➢ A minimum of two soil boring/test pit sites are required per water treatment basin.

• Protocol is from NJDEP BMP Manual - Appendix E.
Stormwater Management

Selection of BMP

Major considerations for BMP selection are:

- Available space
- Utility conflicts
- Soil conditions
- Topography
- Quality of the adjacent waterways
- Depth and quality of the water table
- Type of treatment required
Stormwater Management
Selection of BMP Example

- If the soil is permeable and the depth to the seasonal high water table (SHWT) is sufficient, infiltration and detention basins and swales can be used.

- If there are space constraints (e.g., built up or urban areas), mechanical treatment devices (MTDs), porous pavement, or small bio-swales can be used.
# Stormwater Management

## Selection of BMP - Comparisons

<table>
<thead>
<tr>
<th>Type of BMP:</th>
<th>TSS Removal Rate (%):</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bioretention Systems</td>
<td>80-90</td>
</tr>
<tr>
<td>Constructed Wetlands</td>
<td>90</td>
</tr>
<tr>
<td>Extended Detention</td>
<td>40-60</td>
</tr>
<tr>
<td>Infiltration</td>
<td>80</td>
</tr>
<tr>
<td>Mech. Treatment Devices (MTDs)</td>
<td>50*</td>
</tr>
<tr>
<td>Sand Filters</td>
<td>80</td>
</tr>
<tr>
<td>Vegetative Filter Strips</td>
<td>80</td>
</tr>
<tr>
<td>Wet Ponds</td>
<td>50/90**</td>
</tr>
<tr>
<td>Grass Swales</td>
<td>&lt;=50</td>
</tr>
<tr>
<td>Subsurface Gravel Wetlands</td>
<td>90</td>
</tr>
</tbody>
</table>

* DOT doesn’t accept MTDs with 80% TSS removal rates because of the high maintenance costs

** 50% TSS removal for 1:1 pool volume ratio; 90% if extended detention is also provided
Stormwater Management Design Considerations

All considerations for BMP selection are identical for determination of the BMP and drainage design. This will determine:

- The overall placement of BMPs, with respect to the overall project site and other drainage features (space, topography, soils).
- The overall placement of multiple BMPs (in series and order), to achieve the necessary required treatment.
- Pipe sizes, slope, and shape (utilities, topography, quantity of flow (Q), cover, water table).
- Inlet placement, sizes, and invert depths (utilities, topography, quantity of flow (Q), water table, flooding problems, head).
Stormwater Management
NJDOT Self-Certification

DOT self-certifies if the following permits are not required:

- Flood Hazard
- Wetland
- CAFRA
- Waterfront Development
- Pinelands
- D&R Canal
• If a project requires Stormwater Management and also requires any permit (i.e. Flood Hazard Area, Waterfront Development, Freshwater Wetlands, Pinelands, D&R Canal, or CAFRA), the application will be reviewed by the NJDEP, or the appropriate regulating agency.

• If a project requires Stormwater Management and does not require any permit, it is then reviewed by the NJDOT as a Self-Certification.
Stormwater Management

DOT Projects Requiring Self-Certification:

• Resurfacing/Reconstruction of Existing Pavement
• Sidewalk
• ADA Compliance
• Guiderail Improvement
• Curbing
• Etc.
Stormwater Management

Projects Lessons Learned
SWM – Project #1
Issue – Basin didn’t perform sufficiently

• Originally proposed BMP: Infiltration Basin (with an approved 80% TSS removal rate)

• Clay in the soil column which impeded soil permeability, leaving standing water
Stormwater Management
Resulting Problems

- Roadway flooding & mosquito problems
Stormwater Management
Solving the Problem

• Basin has been retrofitted for detention (60% TSS removal)

• Because of the lower TSS removal rate, there is now a water quality deficit. To now achieve water quality compliance, another BMP must be added, in series with the detention basin, to raise the TSS removal rate.

• For detention, an outlet structure now needs to be added to the basin, thereby changing the drainage characteristics of the project.

• These changes will result in additional design and construction costs.
Stormwater Management Project Recap

Issue: Basin didn’t perform sufficiently

Cause: - Lack of infiltration (Seasonal High Water Table Proximity)  
- Lack of emergency outlet

Problems: Road flooding after project completion

Lesson Learned: Not all SWM designs that meet NJDEP criteria work
Originally proposed BMP: Grass Swales (with an approved TSS removal rate of less than 50%)

Due to errors in design and construction, there were erosion problems which led to fine particles clogging the swales and left standing water.
Stormwater Management
Resulting Problem

- Erosion undermined the roadway and caused accidents
Stormwater Management
Solving the Problem

• The swales had to be redesigned and reconstructed.
• The side slopes were modified to stop the erosion and future potential accidents.
• Any existing erosion to the pavement and swales were fixed.
• These changes will ultimately result in additional design and construction costs.
Stormwater Management
Project Recap

Issue: Swales didn’t perform sufficiently

Cause: Swale designed too close to existing pavement

Problems: Erosion, Safety, Undermined Pavement

Lessons Learned: Not all BMP options are practical based on location, soil type, etc.
Stormwater Management
Overall Lessons Learned

• Although proper SWM guidance and procedures were followed, design resulted in insufficient SWM treatments

• Need to better understand project/site conditions and customize SWM treatments accordingly
Case Study

Clean Water Barnegat Bay Watershed Project
Ocean County, NJ

Retrofit Existing Extended Detention/Infiltration Basins with Gravel Wetlands
Background

• Group of Design Consultants to Design Basins
• Each Design Consultant Designed a Portion
• 7 Basins Each Provided Individual Design Challenges
Issue: High Nitrogen content in Barnegat Bay

Solution: Enhance Existing BMPs in watershed

Lessons Learned: Thinking Beyond Limits of Project Site
Enhancing Quality Performance:
Increase TSS and TN Removal
Retrofit half of the bottom of extended detention and infiltration basin to a gravel wetland

Constructed wetlands and wet ponds are not suitable for retrofitting
Gravel Cell under Construction
Inflow Structure under Construction
Inflow Structure showing final grading
Completed basin with wetlands planting
Questions?
Partnering for the Public: What We Do Matters

Patrick Barton, MS

May 20, 2015
What made civil engineering appealing to you?
Performance – Praise – Preference
Preference – Performance - Praise
Civil:

- Of the ordinary life and affairs of citizens, as distinguished from military or ecclesiastical life and affairs
- Respectful, gracious, courteous, polite
Share an example of a project from early in your career when you made a difference.
124,000

A. Average annual salary of a civil engineer after 12 years on the job
B. Current number of USDOT employees
C. Approximate number of potholes patched by NJDOT over 12 months ending March 2010
D. Daily vehicular traffic crossing the Brooklyn Bridge
Partnering for the Public: What We Do Matters

124,000

D. Daily vehicular traffic crossing the Brooklyn Bridge
Partnering for the Public: What We Do Matters

4.2 billion
4.2 billion

A. Cost of building the Brooklyn Bridge in 2015 dollars
B. Number of KwH of electricity supplied annually by the Hoover Dam
C. Combined annual total of transportation dollars spent by the world’s 5 largest economies
D. Number of people worldwide who travel on a highway at least once each year
4.2 billion

B. Number of KwH of electricity supplied annually by the Hoover Dam
Partnering for the Public: What We Do Matters

Share an example of a current project where you are making a difference.
5,757

A. Number of citizens affected by Manasquan stormwater management plan
B. Number of NJDOT employees in 1992
C. Number of combined miles of interstate highway in NJ, NY, and PA
D. Number of bridges nationwide maintained by state DOTs
5,757

A. Number of citizens affected by Manasquan stormwater management plan
Discuss how civil engineering will make a difference to the citizens of the future.
Partnering for the Public: What We Do Matters
Partnering for the Public: What We Do Matters

Patrick Barton, MS
www.reflectionsfromthebellcurve.com
pbarton112349@aol.com
908-217-5961
What’s New
NJDOT

• Americans With Disabilities Act (ADA)
• Risk Management
• Cost Estimating Guideline
• Construction Barrier Curb
What’s New
FHWA

• Every Day Counts (EDC3)
• STIC Structure
• EDC Round 3 Initiatives
What is Every Day Counts?

• Finite set of initiatives aimed at getting projects built FASTER, BETTER, AND SMARTER.
• Initiatives are ready to be used and have been used by others.
• Two-year cycle
• First rolled out in 2010; now in round 3 (EDC-3).
• Theme for EDC-3 is, “efficiency through technology and collaboration.”
State Transportation Innovation Council (STIC)
## Technical Advisory Groups (TAGs)

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<tr>
<th>Technical Advisory Group</th>
<th>FHWA Liaison</th>
<th>NJDOT Liaison</th>
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<td>Design</td>
<td>Brett Steinberg</td>
<td>Rick Jaffe</td>
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<td>Kostas Svarnas &amp; Diane Kretz</td>
<td>Shaun Sheehy</td>
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<td>Shaun O’Hanlan</td>
<td>Robert Signora</td>
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<td>Sophia Azam</td>
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NJ’s EDC 3 Initiatives

- Regional Models of Cooperation
- E-Construction
- Locally Administered Federal-Aid Projects: Stakeholder Partnering
- Data-Driven Safety Analysis
- Road Diets
- Smarter Work Zones
- Ultra High Performance Concrete
Funding Programs

Technology and Innovation Deployment Program (TDIP)

STIC Incentive Program
• Up to $100,000 per STIC per year
• Rolling application process and no competition
• Support cost of standardizing innovative practices (i.e., developing standards, specifications, technical guidance, MOAs, training, reporting)

Accelerated Innovation Deployment (AID) Program
• Rolling application process and no competition
• Offsets the risk of trying an innovation
• Up to full cost of innovation – max. $1M
• State DOT applies
• 6 months to obligate funds
Where can I get information on EDC???

The FHWA’s EDC website:

http://www.fhwa.dot.gov/everydaycounts/
On April 12, 2014......

The Department of Transportation did the UNTINKABLE...
Thinking Outside the Box
Rehabilitating the Pulaski Skyway
Segment 1: The Problem
• The problem
• The plan

NJDOT’S Approach
6 High Cost Bridges: $1.5 Billion

3 over Passaic = $256 M
1&9 / St. Pauls Ave = $180 M
72 Manahawkin = $240 M

35 Victory Bridge = $120 M
52 Causeway = $391 M
7 Wittppenn = $400 M
Mixed capital program strategy to minimize tax dependency

- Marketable toll projects
  - Cross subsidies from strong to weak projects
- Mixed tax & toll Finance
  - Federal Credit Support: TIFIA, SRLF (SIB), Sec 129 Loans
  - Mixes of tolls, taxes and fees
- Traditional PAYGO (tax funding)
  - GARVEE (Grant Anticipation Notes for selected hurry-up projects) where need or inflation indicates
  - BRIDGE BOND - programmatic
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**Case 1 Discussion**

- At $1.00 toll, $150M is required to help fund the project
- At $2.00 toll, the project generates $20M (~ break even)
- At $3.00 toll, the project generates $160M
- At $4.50 toll, the project generates $10M
Alternatives:

No Build – Bridge Closed and Removed
No Provision for Displaced Traffic

No Build – Bridge Closed and Removed
Provide Alternate Route Improvements

New Parallel Structure
& Rehab Existing

New Parallel Structure
& Demolish Existing
Alternatives: Rehabilitate Skyway
- Widen Skyway
- Relocate Center Ramps to Outside

Rehabilitate Skyway in Current Configuration (PPA)
Segment 2: The Hard Decisions
Projects with potential to impact the Skyway Rehabilitation
Full Deck Replacement Has Regional Traffic Impacts

✓ Explore Construction/Staging Options to Redeck
✓ Explore Mitigation Strategies
✓ Develop Comprehensive TMP
• Reduced I-295 from 3 lanes to 2 lanes in Each Direction

• **12 Miles - 24 Hours / 7 Days**

• Reduced Peak Period Capacity

• *Expanded Communications*
Redecking Options

Night & Weekend Closure Only

Close 1 Bound

Close 1 Bound & Maintain 1 Lane in Each Direction

Close 1 Bound w/Peak Period Reversible Lanes
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<th>Alt 2 – Non peak closures</th>
<th>Alt 3 - Hybrid</th>
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<td><strong>Cost</strong></td>
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<td><strong>Annual cost</strong></td>
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* 2/3 of total construction cost
### Pulaski Skyway Deck Rehabilitation and User Costs

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**Construction Costs (mill)***

- 1A: $670.0
- 1B: $571.0
- 1C: $555.0
- 1C ALT: $555.0
- 2A: $562.0
- 2A ALT: $632.0
- 2B: $690.0
- 3C: $534.0
- 3C ALT: $534.0

**User Costs (mill)***

- 1A: $16.0
- 1B: $6.4
- 1C: $29.3
- 1C ALT: $74.8
- 2A: $1.6
- 2A ALT: $1.6
- 2B: $0.2
- 3C: $7.3
- 3C ALT: $7.3

**TOTAL COSTS (mill)***

- 1A: $686.0
- 1B: $777.4
- 1C: $384.3
- 1C ALT: $429.8
- 2A: $633.6
- 2A ALT: $635.0
- 2B: $692.1
- 3C: $568.2
- 3C ALT: $621.3

**Motor Public Impact (years)***

- 1A: 15
- 1B: 6
- 1C: 3
- 1C ALT: 3
- 2A: 1.5
- 2A ALT: 1.5
- 2B: 2
- 3C: 3.5
- 3C ALT: 3.5

**Construction Duration (Years)***

- 1A: 15
- 1B: 6
- 1C: 3
- 1C ALT: 3
- 2A: 4.5
- 2A ALT: 4.5
- 2B: 5
- 3C: 3.5
- 3C ALT: 3.5

**Configuration (AM / PM / GP)***

- 1A: 2x2 / 2x2 / 1x1
- 1B: 2x2 / 2x2 / 1x1
- 1C: 2x0 / 0x2 / 1x1
- 1C ALT: 1x1 / 1x1 / 1x1
- 2A: 2x2 / 2x2 / 1x2
- 2A ALT: 2x2 / 2x2 / 1x2
- 2B: 2x2 / 2x2 / 1x1
- 3C: 2x0 / 0x2 / 1x1
- 3C ALT: 1x1 / 1x1 / 1x1

---

*Note: Costs are in millions of dollars.*

**Bar Graph:**

- **Red:** Road User Cost
- **Blue:** Construction Cost

Graph showing cost breakdown for different scenarios.
NB Closure is Preferred Alternative

- Closing Bound Saves Significant Time & Money
  - $216M and 4.5 Years  Overnights & Weekends Closures

- Time Savings Allows Pulaski Deck to be Completed Before Other Major Regional Projects with Traffic Impacts Begin

- Similar Traffic impacts for NB or SB Closure if no Other Construction Projects

- SB Closure May Have Queues Reaching Holland Tunnel/NYC
NB Closure is Preferred Alternative

- SB closure Would Conflict with I-78/NB-HCE WB Construction Causing Backups onto 14th Street/Holland Tunnel
- NB Closure Better Facilitates Evacuation of NYC
- NB Closure Offers Detour Options Earlier in Route Choice, Presenting More Opportunities for Motorists than SB Closure
- SB Closure Would Result in Traffic Shifts as Far North as Tappan Zee; as Far South as Outer Bridge
Now We Had to Mitigate Impacts & SELL IT

**Design Advanced with Closure of One Bound – NO GOING BACK**

- Performed Operational Analysis of Existing System
- Evaluated the Expected Impact of Various Mitigation Measures on Traffic Congestion
- Used the Task Force as a Sounding Board
- Begin Development of the Transportation Management Plan
Developed Core Mitigation Strategies

- Transit &TDM Estimated at 5% - 10% Reduction
- Rt. 1&9T & NJTPK Eastern Spur and 1-78/NB-HCE Absorb Most of Detoured Traffic
- 3rd Lane NB on 1-78/NB-HCE Improves Ability to Handle Displaced Traffic
Unveiling the Plan
1-10-13
Segment 3: The Countdown to Closing
January 10, 2013

Countdown to Closing

Pulaski Skyway to Close to NY-Bound Drivers for Years: Sources
NJDOT and THE PLAN Scrutinized During Legislative Public Hearings

Soon to Be Jersey City Mayor Steven Fulop

Assistant Commissioner Anthony Attanasio
Pulaski Skyway shutdown: Two-year traffic nightmare to begin April 12

Pulaski Skyway closure: No access to NYC for 2 years, commuters scramble for options

Impact of 2-year Pulaski Skyway lane closures discussed at Hudson County hearing
We Need Information

Traffic Alerts

Help NDDOT minimize your delay when the Skyway is closed.

Take the survey at [www.pulaskiskyway.com](http://www.pulaskiskyway.com)

Help us help you take survey at [pulaskiskyway.com](http://pulaskiskyway.com)

PUBLIC MEETING
on potential improvements to mass transit service within Liberty State Park.

The City of Jersey City Mayor Bernardini Italy
on the Division of City Planning.

Thomas DeCiccio
Hudson County Executive
Transportation Management Plan
Why Did We Need One?

PULASKI SKYWAY
REHABILITATION PROJECT

TRANSPORTATION MANAGEMENT PLAN

prepared for: New Jersey Department of Transportation

prepared by: PARSONS BRINCKERHOFF

2013
Transportation Management Plan Task Force

NJDOT Project, but Regional Problem
TMP Sub-Committees

- Incident Management
- Traffic Control & Operations
- TDM & Transit
- Construction & Contracting
- Public Information
- ITS Management
PULASKI SKYWAY NORTHBOUND LANES CLOSING APRIL 12, 2014

FOR ALTERNATE ROUTES AND TRANSIT INFO VISIT PULASKISKYWAY.COM OR CALL 5-1-1 FOR TRAVEL ALERTS

Travel smarter.

pulaskiskyway.com
@skywayrehab
TRAVEL ALERT

Starting March 2014, the Pulaski Skyway Northbound lanes, toward Jersey City and New York, will be closed for two years.

Center lane entrance and exit ramps at the Marion section of Jersey City and at South Kearney will also be closed.

PLAN ALTERNATE ROUTES TO AVOID DELAYS

- **New Jersey Turnpike I-78 Extension** will have increased capacity by opening the eastbound shoulder lane during peak hours (6 to 10 a.m. and 3 to 7 p.m. weekdays); 11 new overhead sign structures will indicate when the extra lane is open.

- **Route 189 Truck and Route 440** will have an adaptive signal system—the first of its kind in the state—to constantly adjust traffic lights at 15 intersections according to traffic flow, thus reducing delays and optimizing “green” time for drivers.

- **The Lincoln Tunnel and George Washington Bridge** are other options to New York City.

FOR REAL-TIME TRAFFIC UPDATES AND ALTERNATE ROUTE INFORMATION

- Call 511 or go to 511nj.org
- Visit pulaskiskyway.com
- Follow us on twitter @skywayrehab
- Look for variable message signs along your route

PULASKI SKYWAY
REHABILITATION
Travel smarter.

FOR ALTERNATE ROUTES AND TRANSIT INFO
CALL 5-1-1 OR VISIT PULASKISKYWAY.COM

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PULASKI SKYWAY
NORTHBOUND LANES CLOSING MARCH 2014.

PULASKI SKYWAY
NORTHBOUND LANES TOWARD JERSEY CITY CLOSING MARCH 2014.

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PULASKI SKYWAY
NORTHBOUND LANES CLOSING MARCH 2014.

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REHABILITATION
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PULASKI SKYWAY
REHABILITATION
Travel smarter.

VANPOOL SUBSIDY AVAILABLE NOW

To qualify for the subsidy participants must be registered with a local 511A. Contact the 511A serving your office or workplace location to learn more about enrolling, or to sign up for a vanpool. Click on the link below for a list of local 511As.

http://www.511nj.org/demandresponse/commutersignupsteps.htm

Vans pool with commuters within one-half mile of INTRA offices and begin in locations with street or bus service will not be eligible.

PULASKI SKYWAY
Travel smarter. Share a ride.

pulaskiskyway.com
Meeting with Major Employers in Jersey City
Unprecedented Partnership with the TMAs

HUDSON TMA
Getting you there...

Traffic Alerts

Watch our own Telly Award winning video!

HOW WILL YOU COMMUTE TOMORROW?

THOMAS DEGISE
Hudson County Executive

It is no secret that smart commuters help keep our air clean. Let's work together with the TMA to improve our urban environment. We can benefit even more by participating in many of the TMA's programs as your trip can become faster, more affordable, safer and more reliable.

Pulaski Skyway
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<td>TNT</td>
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<tr>
<td>Summit Import</td>
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<td>Christ Hospital</td>
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<td>14</td>
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<tr>
<td>NJ Public Adjustment</td>
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<td>20</td>
<td>1</td>
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<tr>
<td>UBS Weehawlen</td>
<td>4000</td>
<td>1</td>
<td>250 plus company intranet</td>
<td>250</td>
</tr>
<tr>
<td>US Postal Service卣nt Bulk Facilit</td>
<td>2500</td>
<td>1</td>
<td>250</td>
<td></td>
</tr>
<tr>
<td>Port Authority Tech Center</td>
<td>1000</td>
<td>2</td>
<td>25</td>
<td></td>
</tr>
<tr>
<td>Hudson County Plaza</td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>
Visualization - YouTube
NJDOT 'Finally' embraces social media

Delays on GSP SB Essex Toll Plaza to South of Exit 149 - CR 506 1 mile due to accident

Accident with Injuries on Garden State Parkway SB South of Exit 149 - CR 506 left and center lanes blocked
pulaskiskyway

NJDOT - Pulaski Skyway The Pulaski Skyway is a 3.5-mile long steel structure, with two river-crossing spans. The Skyway opened on Thanksgiving Day, November 24, 1932.
http://pulaskiskyway.com
Learning the Marketing Language

RADIO FLIGHT: FEB 3-MAR 16 (6 WKS)

<table>
<thead>
<tr>
<th>STATION</th>
<th>DIAL</th>
<th>FORMAT</th>
<th>SPOTS</th>
<th>GROSS IMP</th>
<th>CPM</th>
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</thead>
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<tr>
<td>WPLI-FM</td>
<td>95.5</td>
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<td>190</td>
<td>6,399,800</td>
<td>$5.91</td>
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<td>104.3</td>
<td>CLASSIC ROCK</td>
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<td>6,423,600</td>
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<td>NEWS/TALK</td>
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<td>$9.48</td>
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<tr>
<td>WFAN-A/F</td>
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<td>SPORTS</td>
<td>104</td>
<td>4,378,800</td>
<td>$5.65</td>
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<td>WBL5-FM</td>
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<td>URBAN</td>
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<tr>
<td>WXNY-FM</td>
<td>96.3</td>
<td>HISPANIC</td>
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<td>WHTZ-FM</td>
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<td>CHR</td>
<td>156</td>
<td>9,347,400</td>
<td>$5.23</td>
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<tr>
<td>WINS-AM</td>
<td>1010</td>
<td>NEWS/TALK</td>
<td>162</td>
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<td>SPORTS</td>
<td>118</td>
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<td>$3.74</td>
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<td>TOTAL</td>
<td></td>
<td></td>
<td>1,414</td>
<td>59,253,600</td>
<td>$5.33</td>
</tr>
</tbody>
</table>
Advertising

PULASKI SKYWAY
NORTHBOUND LANES...
TO JERSEY CITY
AND NEW YORK
CLOSING FOR TWO YEARS...
There is even a warning at the mall!! @skywayrehab #PulaskiSkyway #pulaskiclosure
Keeping the Story in the Press
Traffic Reporters are Important Too!
PULASKI SKYWAY NORTHBOUND LANES CLOSING APRIL 12, 2014

FOR ALTERNATE ROUTES AND TRANSIT INFO VISIT PULASKISKYWAY.COM OR CALL 5-1-1 FOR TRAVEL ALERTS

PULASKI SKYWAY REHABILITATION

Travel smarter.
pulaskiskyway.com @skywayrehab
First Day Jitters
Command Center
Jersey City
# Hourly Executive Summary

**4/14/14: 6AM to 7AM**

## Major Roadway Travel Times (min)

<table>
<thead>
<tr>
<th>NJ Turnpike</th>
<th>Before Turnpike (Interchange 14)</th>
<th>Base TT (min)</th>
<th>Today TT (min)</th>
<th>% Diff</th>
</tr>
</thead>
<tbody>
<tr>
<td>NB</td>
<td>Holland T. via NB-HCE (Int. 14C)</td>
<td>18.3</td>
<td>15.7</td>
<td>-14%</td>
</tr>
<tr>
<td></td>
<td>Holland T. via Route 1&amp;9T (Int. 15E)</td>
<td>18.9</td>
<td>22.3</td>
<td>18.2%</td>
</tr>
<tr>
<td>NB</td>
<td>Holland T. via NB-HCE (Int. 14C)</td>
<td>22.5</td>
<td>19.8</td>
<td>-12.3%</td>
</tr>
<tr>
<td></td>
<td>Holland T. via Route 1&amp;9T (Exp. &amp; Loc.)</td>
<td>21.1</td>
<td>26.8</td>
<td>26.6%</td>
</tr>
<tr>
<td>EB</td>
<td>West of Interchange 14</td>
<td>17.5</td>
<td>14.5</td>
<td>-17.5%</td>
</tr>
<tr>
<td></td>
<td>Holland T. via Turnpike</td>
<td>17.8</td>
<td>22.7</td>
<td>28.0%</td>
</tr>
<tr>
<td>EB</td>
<td>Before Rt. 1&amp;9 / Rt. 21 / Rt. 22 Split (West of Int. 14)</td>
<td>19.5</td>
<td>16.5</td>
<td>-15.6%</td>
</tr>
<tr>
<td></td>
<td>Holland T. via Turnpike</td>
<td>18.9</td>
<td>23.9</td>
<td>26.4%</td>
</tr>
</tbody>
</table>

## Jersey City Travel Times (min)

<table>
<thead>
<tr>
<th>Location</th>
<th>Base TT (min)</th>
<th>Today TT (min)</th>
<th>Diff</th>
</tr>
</thead>
<tbody>
<tr>
<td>Garfield @ Gates to Grand St. @ Marin Blvd</td>
<td>9.0</td>
<td>8.6</td>
<td>-0.4</td>
</tr>
<tr>
<td>Center/Columbus @ Montgomery to Christopher Columbus Blvd @ Greene St</td>
<td>3.5</td>
<td>3.9</td>
<td>0.4</td>
</tr>
<tr>
<td>Communipaw Ave. @ US 1&amp;9T to Grand St. @ Marin Blvd</td>
<td>7.4</td>
<td>8.0</td>
<td>0.7</td>
</tr>
</tbody>
</table>
## HOURLY EXECUTIVE SUMMARY

### 4/14/14: 6AM to 7AM

<table>
<thead>
<tr>
<th>Major Roadway Travel Times (min)</th>
<th>BASE</th>
<th>Today 4/14/14</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>TT (min)</td>
<td>TT (min)</td>
</tr>
<tr>
<td><strong>NJ Tpke</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NB</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Before Turnpike (Interchange 14)</td>
<td>18.3</td>
<td>15.7</td>
</tr>
<tr>
<td>Holland T. via NB-HCE (Int. 14C)</td>
<td>18.9</td>
<td>22.3</td>
</tr>
<tr>
<td>Holland T. via Route 1&amp;9T (Int. 15E)</td>
<td>22.5</td>
<td>19.8</td>
</tr>
<tr>
<td><strong>Rt 1&amp;9</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NB</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Before Turnpike (Interchange 14)</td>
<td>21.1</td>
<td>26.8</td>
</tr>
<tr>
<td>Holland T. via Route 1&amp;9T (Exp. &amp; Loc.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>I-78</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EB</td>
<td></td>
<td></td>
</tr>
<tr>
<td>West of Interchange 14</td>
<td>17.5</td>
<td>14.5</td>
</tr>
<tr>
<td>Holland T. via Turnpike</td>
<td>17.8</td>
<td>22.7</td>
</tr>
<tr>
<td><strong>Rt 22</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EB</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Before Rt. 1&amp;9 / Rt. 21 / Rt. 22 Split (West of Int. 14)</td>
<td>19.5</td>
<td>16.5</td>
</tr>
<tr>
<td>Holland T. via Turnpike</td>
<td>18.9</td>
<td>23.9</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Jersey City Travel Times (min)</th>
<th>BASE</th>
<th>Today 4/14/14</th>
<th>Diff</th>
</tr>
</thead>
<tbody>
<tr>
<td>Garfield @ Gates to Grand St. @ Marin Blvd</td>
<td>9.0</td>
<td>8.6</td>
<td>-0.4</td>
</tr>
<tr>
<td>Center/Columbus @ Montgomery to Christopher Columbus Blvd @ Greene St</td>
<td>3.5</td>
<td>3.9</td>
<td>0.4</td>
</tr>
<tr>
<td>Communipaw Ave. @ US 1&amp;9T to Grand St. @ Marin Blvd</td>
<td>7.4</td>
<td>8.0</td>
<td>0.7</td>
</tr>
</tbody>
</table>
Biggest Challenge
Comprehensive Data Collection & Monitoring Program
TO HOLLAND TUNNEL

VIA

I-78     - 18 MINS.
RT.1&9T  - 28 MINS.
Reported Incidents

As of 1:28pm, there’s a Fuel spill and a Jack-knifed tractor trailer on I-280 Eastbound ramp to Exit 13 - Orange St/1st St in Newark. Right lane blocked.

As of 11:41am, there’s a Drawbridge open on NJ 7 in both directions at Wittppen Bridge in Jersey City. All lanes subject to closure on 08/06/14 at 9:50 AM.

As of 11:39am, there’s a Drawbridge open on NJ 7 in both directions at Wittppen Bridge in Jersey City. All lanes subject to closure on 08/06/14 at 4:30 AM.

As of 11:39am, there’s a Drawbridge open on US 1/89 Truck Route in both directions at Hackensack River Drawbridge in Kearny/Jersey City. All lanes subject to closure on 08/06/2014 at 10:00 AM.

As of 11:38am, there’s a Drawbridge open on US 1/89 Truck Route in both directions at Hackensack River Drawbridge in Kearny/Jersey City. All lanes subject to closure on 08/06/2014 at 4:20 AM.

As of 2:15am, there’s a Watermain break on Sip Avenue in both directions between US 1/9 Truck Route and Freeman Avenue in Jersey City. All lanes remain closed and detoured until 11:59 P.M. on September 30, 2014.

As of 2:16am, there are Delays on
## Holland Tunnel Trips Via

<table>
<thead>
<tr>
<th>Route</th>
<th>Description</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>I-78 East Bound</td>
<td>from Exit 58 via NJ Turnpike/Hudson County Extension (10mi.)</td>
<td>:13</td>
</tr>
<tr>
<td></td>
<td>exiting at Exit 58 via US 1&amp;9/US 1&amp;9 Truck Route/NJ 139 (10mi.)</td>
<td>:23</td>
</tr>
<tr>
<td></td>
<td>from GSP (express lanes) via NJ Turnpike/Hudson County Extension (16mi.)</td>
<td>:19</td>
</tr>
<tr>
<td></td>
<td>from GSP (local lanes) via NJ Turnpike/Hudson County Extension (16mi.)</td>
<td>:19</td>
</tr>
<tr>
<td></td>
<td>from GSP (express lanes) exiting at Exit 58 via US 1&amp;9/US 1&amp;9 Truck Route/NJ 139 (16mi.)</td>
<td>:29</td>
</tr>
<tr>
<td></td>
<td>from GSP (local lanes) exiting at Exit 58 via US 1&amp;9/US 1&amp;9 Truck Route/NJ 139 (16mi.)</td>
<td>:29</td>
</tr>
</tbody>
</table>

## Lincoln Tunnel Trips Via

<table>
<thead>
<tr>
<th>Route</th>
<th>Description</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Garden State Parkway South Bound</td>
<td>exiting at Exit 153 via NJ 3/NJ 495 (13mi.)</td>
<td>:16</td>
</tr>
</tbody>
</table>

*Disclaimer: Traffic information is subject to change at any time.*

* - portions based on historical data.

Travel Times are displayed in HH:MM format.

This page auto-refreshes every 2 minutes.
Jersey City Travel Times Unaffected

- Negligible impact
- Comparable to Base condition (±1 minute)
Travel Time Routes Monitored

-5 to -10 minutes

+8 to 10 minutes

DMS used to share real-time commuter alerts
NJ Turnpike Interchange 15E / US Route 1&9T Bridge

Spring 2014 'before'
median queue length: 0 ft
(based on 7 mornings)

Spring 2014 'after'
median queue length: 2000 ft
(based on 11 mornings)

Fall 2014
median queue length: 2200 ft
(based on 3 mornings)

SEPTMBER 9, 2014
8:42 AM
NB-HCE Shoulder Lane carrying significant volume

Average Mid-Week Peak Period Volume (6-10am)

Spring 14' | Summer 14' | Fall 14' | Dec 14' | Jan 15' | Feb 15'
---|---|---|---|---|---
3,119 | 2,878 | 3,374 | 3,209 | 3,290 | 3,183

Shoulder Lane carries ~20%

Shoulder (HWESH) | Inner (HWE1) | Outer (HWE2)
Off to the PARC

Daily briefings for first two weeks of closing
PULASKI SKYWAY: DAILY MONITORING REPORT

Synopsis: Wednesday April 30, 2014

Today was our first “rain” day and the system seemed to respond fairly well. Although there are a number of incidents listed, there really was not much going on in the region this morning. Most of the early morning delays seemed to be related to high volumes and probably the weather as well. But travel times seemed to stay within the normal ranges we have been seeing with the NBHCE tracking below the base travel times and Route 1&9T tracking just above normal base travel times.

Emerging Trends:

- The trend has been that 6 AM to 8 AM is the peak of the peak period with most of the congestion (and increased travel times) concentrated in this time period.
- From 8 AM to 10 AM congestion starts to subside and travel times approach normal (base) times.
- Based on how we have seen the system respond to incidents, it seems that the system is not overtaxed. There is some available and redundant capacity in the system to handle minor incidents without causing major disruptions. We have had no major incidents to date. However the system adjusted/reacted well to the signal issues at Communipaw in the early days and at Jersey Avenue last week.
- We have not seen significant congestion on Jersey City streets (except for Communipaw Avenue westbound – please see below) for the travel times that we are tracking, although we have seen some diversions onto County Route 612 near Liberty Science Center when traffic backs up near Interchange 14C.
- The signals at Communipaw Avenue/Route 1&9T and Route 440 have been performing well since they were converted to one controller and placed under adaptive control. The one issue of excessive backups on Communipaw Avenue westbound is still being investigated.
- Thus far, the Shoulder Lane addition has been a success in drawing more traffic at a good level of service based on travel times and speeds through interchange 14C.
- Daily adjustments continue to be made at the Jersey Avenue signal to balance the throughput between Route 139 and the NBHCE.
- Traffic at the Holland Tunnel has gone down since the Skyway closed and volumes on the PATH are generally up but it is still too early to say the two are linked but we will continue to watch this trend.
- PANYNJ bridge and tunnel traffic is generally down although it is too early to make a conclusion. We will investigate the 2013 monthly trends (March and April) to see if the “base” volumes need to be adjusted across the board.
- Based on higher observed volumes and queues on the NJ Turnpike approach 5 seconds of green time were shifted from the NJ 139 approach to the NJ Turnpike.

Key Areas/Issues

- As reported by PANYNJ: based on higher observed volumes and queues on the NJ Turnpike approach 5 seconds of green time were shifted from the NJ 139 approach to the NJ Turnpike. This will become the new “Base” timing plan as it seems to be a developing pattern that there is more demand on the NJ Turnpike approach.
QUICK FACTS

- Travel times on NB-HCE continue to show improvement over pre-closure levels - up to 8 minutes of travel time savings outside the peak hour.
- Travel times on Route 1&9T continue to show an increase over pre-closure conditions (up to 8 minutes of additional travel times).
- Travel times in Jersey City decreased from the previous reporting period and pre-closure levels.
- Transit usage has remained steady with previous months, maintaining over 1,150 additional transit riders daily on bus and ferry compared to the base condition.
- The weekly number of crashes has decreased from 9 per week pre-closure to 8 per week this reporting period (a decrease from the previous reporting period as well).
- All of the Port Authority river crossings showed decreased volumes compared to pre-closure levels due to lower volumes during the Thanksgiving holiday weekend.

INTRODUCTION

This is the seventh edition in a series of monthly traffic monitoring reports for the Pulaski Skyway Rehabilitation project. The reports are intended to inform NUDOT and other stakeholder agencies of any changes in traffic patterns, and report on the performance of various traffic mitigation measures. The report summarizes changes in key metrics identified by the Pulaski Skyway Rehabilitation TMP Monitoring Guidelines. This seventh volume covers the period from November 1st through November 30th.

Traffic volumes and travel times have generally decreased for November compared to October. Overall, traffic conditions continue to operate similar to pre-closure conditions.

The regional roadway system continues to perform well under the diverted traffic conditions. The NB-HCE continues to carry a significant amount of the detoured traffic, while maintaining travel speeds close to the free flow speeds across all lanes. Travel times in November generally decreased compared to October, averaging approximately a 2.5 minute decrease in the peak hours. Travel times from 6 to 8 AM show a -1 to +3.5 minute variation from the base travel time data, while travel times from 8 to 10 AM have improved compared to the base travel time data (4 to 7 minute decrease), which was measured before the implementation of the shoulder lane.

Route 1&9T has continued to absorb a significant volume of northbound traffic. Average peak period travel times remained steady to those reported in previous report of this series and on average remained 6 minutes longer than pre-closure levels.

Travel times on local Jersey City streets continue to indicate minimal impact of the Skyway closure on city traffic. For the seven routes being monitored, travel times are generally between 1 minute shorter to even with the base condition.

Overall, the volumes of traffic on the Hudson River Crossings in the last month were approximately 6% lower than October as well as the base conditions. PATH ridership was lower in November than in the previous month but higher than the base. NJ TRANSIT bus and Seastreak Ferry ridership has remained steady with the previous months.

The New Jersey Department of Transportation would like to thank the following agencies for their timely cooperation and contribution of the data and analyses in this report:

- Port Authority of NY/NJ
- New Jersey Turnpike Authority
- TRANSCOM
- PATH
- NJ TRANSIT
- Regional Transportation Management Associations – Hudson TMA and Meadowlink.
Major trends revealed limited impacts to traffic

- Impacts from lane closure moderate as predicted
- Addition of Shoulder lane increased NB-HCE utilization
- 5-10 fewer minutes to travel the NB-HCE
- 8-10 more minutes to travel Route 1&9T
- Minimal impact on Jersey City streets (<1 minute)
- 150+ people switched to bus and ferry daily
Quick Incident Response Important
SSP Use Proved to be Vital
How can we leverage Big Data in the Future?
Questions?