SR 1 WIDENING
SR 273 to the Roth Bridge

Delaware Department of Transportation

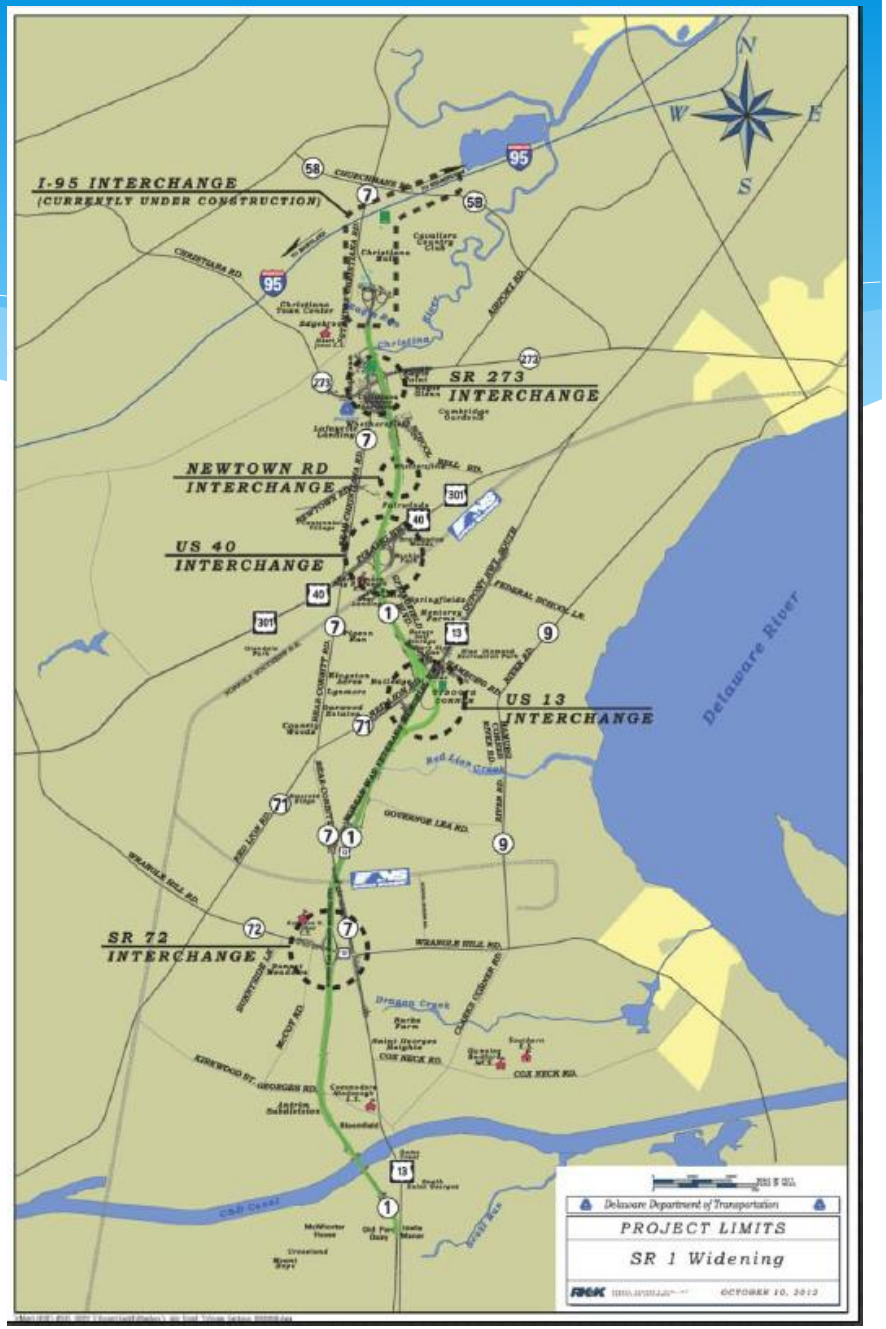
SR 1 Northbound Auxiliary Lane, US 40 to SR 273

Agenda

* Overview of SR 1 Widening Project
* Short-Term Ideas
* Innovation Ideas to accelerate work
* Post-Implementation Assessment

Project Limits

* SR 1, North of SR 273 to Roth Bridge



Purpose & Need

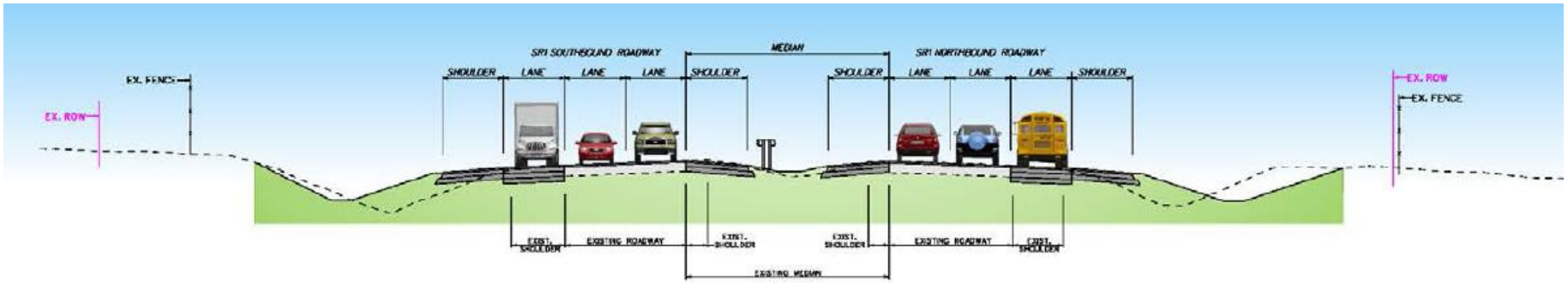
* Address congestion
* Improve system connectivity
* Improve local access
* Improve safety
* Ensure emergency access & evacuation

Long-Term Alternatives

* Add lanes &
* Upgrade interchanges

. . . . . Will take MANY years to implement!

. . . . . And is VERY expensive ($200M+)!



SR 273 TO TYBOUTS

OUTSIDE / OUTSIDE WIDENING

Short Term Ideas?

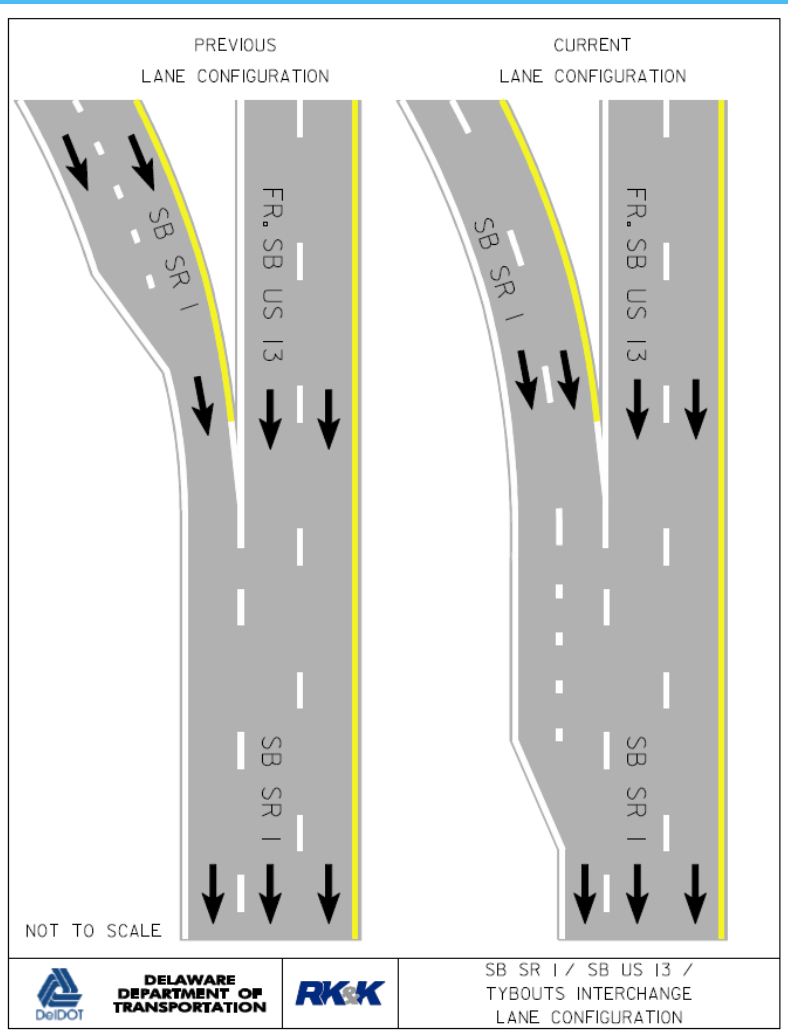
Purpose & Need

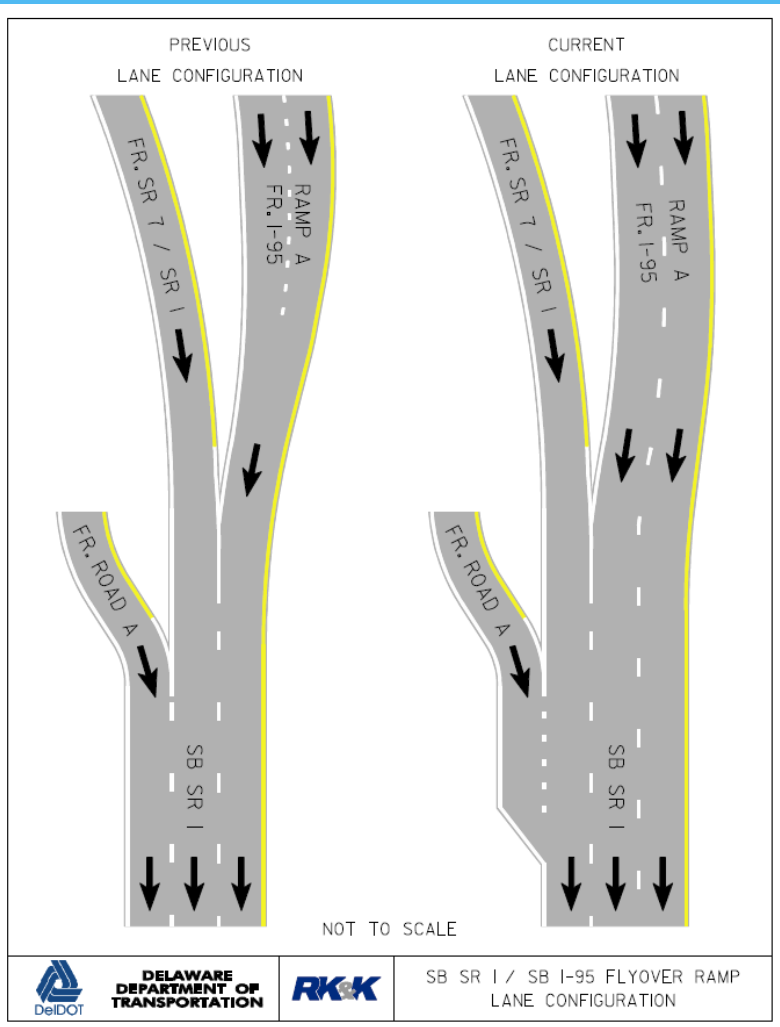
* Address congestion
* Improve system connectivity
* Improve local access
* Improve safety
* Ensure emergency access & evacuation

Short Term Ideas . . .

* Lane Re-Striping, SR 1 SB Merge with US 13 SB
  * Completed 2012
* Lane Re-Striping, SR 1 Flyover SB to SR 1 SB
  * Completed 2014
* SR 1 / SR 72 DDI
  * D-B Contract Awarded Dec. 2015
* **Something to address congestion:**
  * NB SR 1 North of US 40
  * Focus of this presentation

Re-Striping Upgrades





Shailen Says: "I want Ramp Metering!"

* February 2014 "request"
* March 2014 – outline of tasks
* March – June 2014 – analysis
* August 2014 – switch to "hard shoulder running"
* August – December 2014 – additional analysis, alternatives, concept design
* January 2015 – final decision on concept to move ahead

FIGURE 1 - SPEED DATA DASHBOARD FOR MAINLINE – BEFORE CONDITIONS (May/June 2014)

	5:00 AM	5:15 AM	5:30 AM	5:45 AM	6:00 AM	6:15 AM	6:30 AM	6:45 AM	7:00 AM	7:15 AM	7:30 AM	7:45 AM	8:00 AM	8:15 AM	8:30 AM	8:45 AM	9:00 AM	9:15 AM	9:30 AM	9:45 AM	10:00 AM
WAVETRONIX PORTABLE RT1 AT CHRISTIANA MALL	57.7	59.7	61.7	61.7	62.3	60.7	60.3	60.3	59.0	59.0	58.3	58.7	58.0	57.7	57.7	57.7	58.0	57.3	57.3	57.0	56.7
SR1 @ SR 273	67.3	68.0	68.3	68.3	68.7	66.0	60.7	56.7	57.7	57.0	55.7	56.3	55.0	55.3	57.3	57.7	59.0	63.0	64.0	64.0	64.0
DE1 AT CHRISTIANA MEADOWS	67.0	67.0	67.3	67.0	67.7	64.7	50.7	41.7	45.0	43.0	42.7	42.3	41.3	38.0	48.0	45.7	55.0	64.0	64.3	64.0	64.3
DE1 NORTH OF US40	65.7	66.3	67.7	67.7	67.7	66.3	56.0	28.0	31.3	25.7	28.3	25.3	28.0	39.3	51.7	56.7	63.5	65.7	65.7	65.0	65.7
DE 1 AT BEAR RD	68.0	69.7	70.3	70.7	70.7	69.3	64.3	45.0	45.0	30.0	29.0	29.3	36.7	50.3	57.3	60.0	67.0	67.3	68.3	67.3	67.3
DE 1 AT SPRINGFIELDS BLVD	64.7	64.3	66.0	65.7	65.7	64.3	60.7	45.3	47.0	26.0	22.3	24.0	33.3	47.3	54.3	59.7	62.5	62.0	62.7	63.0	62.3
DE 1 AT DE1-US13 SPLIT EXIT 156.N	67.3	68.3	68.7	69.0	68.3	67.3	65.3	61.7	62.3	55.3	41.3	49.7	55.0	59.0	62.7	64.0	64.5	65.7	64.3	64.0	64.0

Approximate Color Scale: in mph

0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75

Ramp Metering

What is a ramp meter?

- Monitors the flow of traffic on the freeway and on-ramp
- Manages the flow onto the freeway by briefly stopping vehicles on the on-ramp

What are the benefits of a ramp meter?

- Reduce Congestion
- Reduce Crashes
- Low Cost Operational Strategy

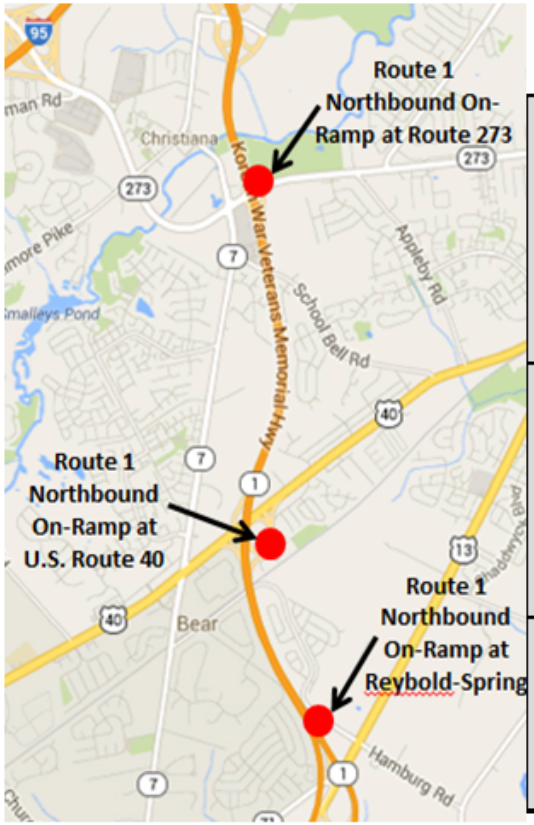
How do ramp meters do this?

- Reduce the flow rate of vehicles onto the freeway
- Reduces the platoon size entering the freeway to make merging easier

Where does ramp metering work?

- At locations where freeway congestion is primarily caused by traffic merging from ramps

Ramp Metering



	Average Vehicles per Hour	Maximum Vehicles per Hour	Recommended Type of Meter	Threshold of Recommended Meter (vph)	Storage Required (ft)	Storage Provided (ft)	Delay per Vehicle on Ramp (min)
Route 1 Northbound On-Ramp at Route 273	817	928	Single Lane, 1 Vehicle per Green	900	870	1360	2.32
Route 1 Northbound On-Ramp at U.S. Route 40	1324	1396	Dual Lane, 1 Vehicle per Green	1600	1,840-4,060**	3,600	2.76-6.09**
Route 1 Northbound On-Ramp at Reybold-Spring	320	432	Single Lane, 1 Vehicle per Green	900	0*	700	0*

*Arrival rate of 320 vph much slower than service rate of 900 vph

**Range based on AZDOT and Caltrans standards

Ramp Metering Dismissed

* Would need two lane ramp
* Operations would either result in:
  * Minimal improvements to SR 1 traffic, or
  * Significant back-ups onto US 40

Hard Shoulder Running Options

* Re-striping effort?
* Extended acceleration lane
* US 40 to SR 273
* US 40 to Christina River Bridge
* Full-time vs. Part-Time

Hard Shoulder Running

SR 1 Northbound Improvements "Year of Opening" CORSIM Results Summary - 2016 AM Peak			
Condition	Delay Per Vehicle	Queue (mi)	User Cost Savings Per Year*
No Build	3 minutes	1.25	0
1,200 foot Acceleration Lane	2 minutes	0.75	$400,000
Full Auxiliary Lane - US 40 to SR 273	20 seconds	0	$1,000,000
Full Auxiliary Lane - US 40 to Christina River Bridge	Free Flow	0	$1,200,000

* Compared to No-Build condition in 2016

SR 1 Northbound Improvements "10-Year Horizon" CORSIM Results Summary - 2025 AM Peak			
Condition	Delay Per Vehicle	Queue (mi)	User Cost Savings Per Year^
No Build	15 minutes	5.9	0
A: 1,200 foot Acceleration Lane	14 minutes	5.8	$700,000
B: Full Auxiliary Lane - US 40 to SR 273	3 minutes	1.7#	$8,000,000
C: Full Auxiliary Lane - US 40 to Christina River Bridge	Free Flow	0	$10,500,000

^ Compared to No-Build condition in 2025

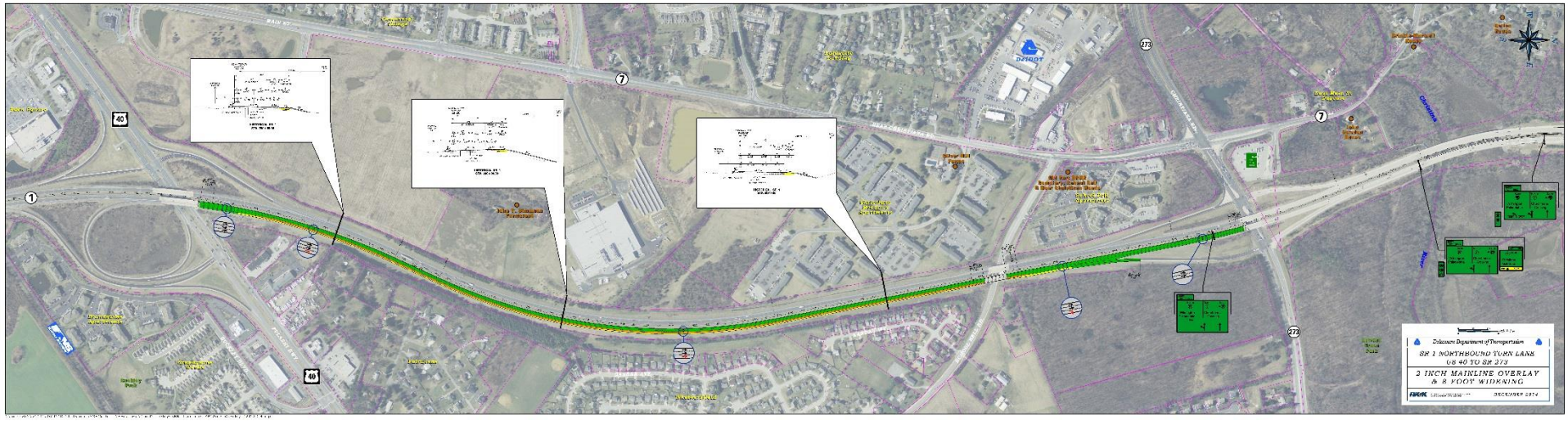
Queue starts at diverge to SR 273

Hard Shoulder Running

SR 1 Northbound Improvements Summary of CTP Cost Estimates	
Condition	**CTP Cost**
No Build	$0
A: 1,200 foot Acceleration Lane	$600,000
B: Full Auxiliary Lane - US 40 to SR 273	$4,800,000
C: Full Auxiliary Lane - US 40 to Christina River Bridge	$8,600,000

Accelerated Design and Innovative Construction

Project Map


Delaware Department of Transportation
SR 1 NORTHBOUND TURN LANE
US 40 TO SR 273
2 INCH MAINLINE OVERLAY
& 8 FOOT WIDENING
DECEMBER 2014

Details of SR 1 Auxiliary Lane Project

* 1.75 Miles of auxiliary turn lanes
* $ 2.1M in construction costs
* 70 days for construction
* Separate sign structure materials contract

Final Project timeline

* Initiated work December 2014
* Preliminary Plans March 2, 2015
* NEPA cleared May 26, 2015
* Project initiation approved FHWA April 10, 2015
* STIP MOD approved by WILMAPCO May 7, 2015
* Final Plans May 29, 2015
* Advanced Sign Structure contract Advertise– June 2015
* SR 1 Auxiliary Job PS&E – June 30, 2015
* Advertised July 23, 2015
* Award August 28, 2015
* Completed November 22, 2015

Innovation for Acceleration

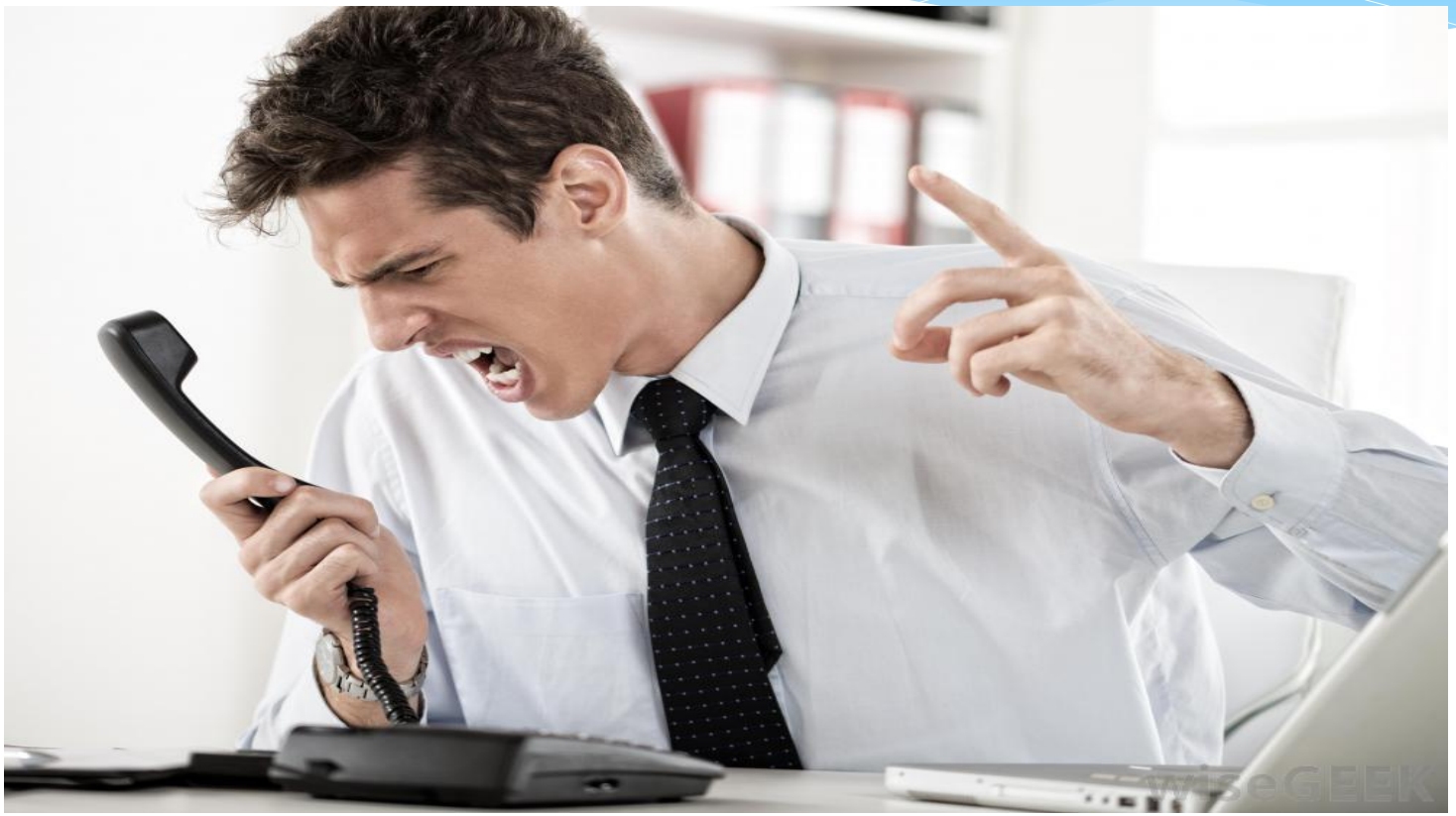
* Smaller More Efficient Projects

Innovation for Acceleration

* Smaller More Efficient Projects
  * Maintain Independent Utility
  * Limited impacts in:
    * Right of way, Utilities, Environmental Impacts
    * Creative solutions
  * Needed visibility of completed projects

Increase Revenue - Project Funding

Where are my projects ???



Get it DONE!

Innovation for Acceleration

* Smaller More Efficient Projects

* Long Lead Time Items - Separate Materials contract for the Cantilever Sign Structure

Monotube Sign Structure
First in the State of Delaware

Benefits

* Cleaner Design over the Truss
* Less Welds
* Fewer Field Inspections
* Reduced Maintenance

Timelines Don't Work

Construction Contract Timeline	70 days
Sign Structure Procurement	15 weeks

Timelines Don't Work

Construction Contract Timeline	70 days
Sign Structure Procurement	15 weeks

15 x 7 > 70 days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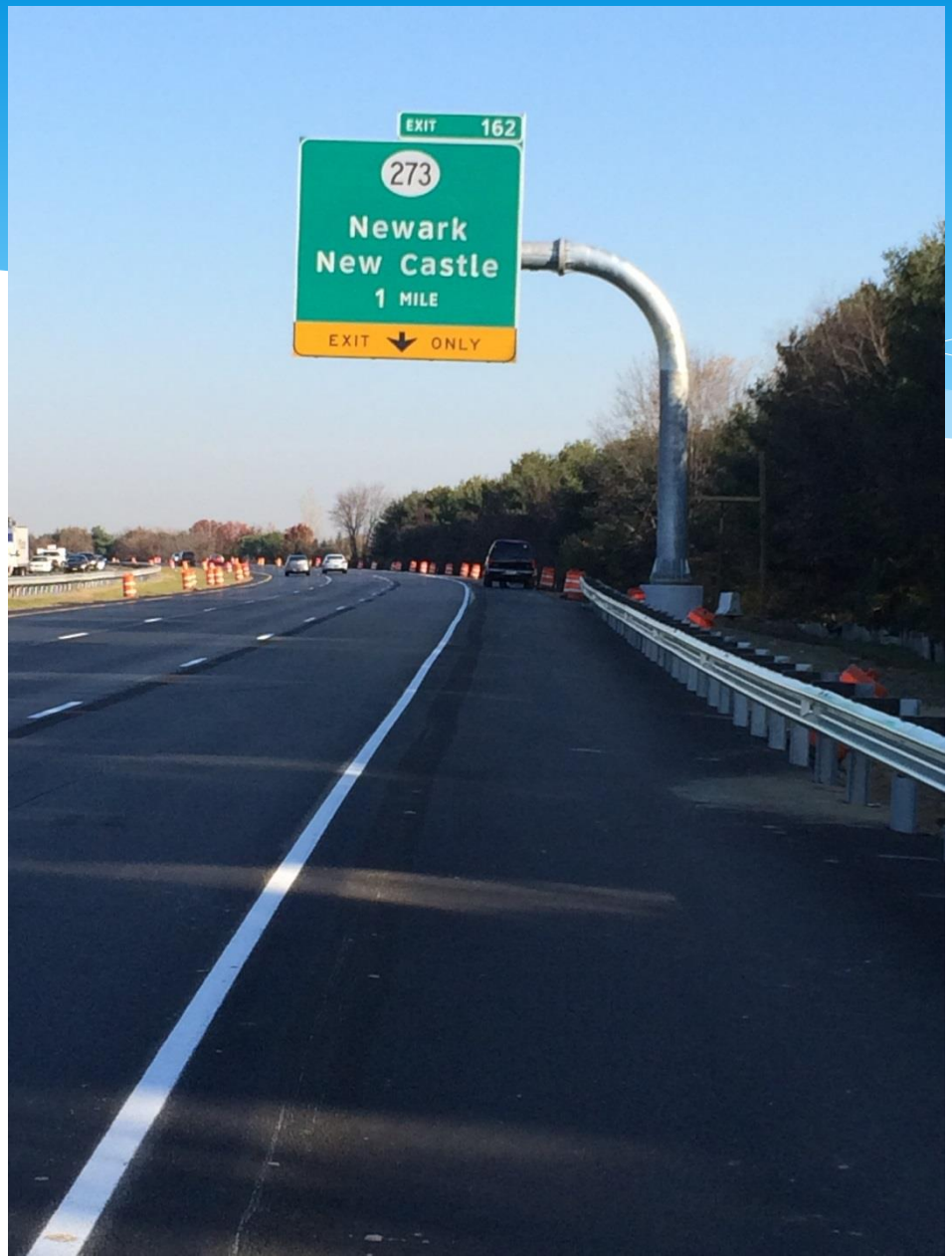
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EXIT ONLY

Innovation for Acceleration

* Smaller More Efficient
* Long Lead items - Separate Procurement contract for the sign structure
* Open End MOT Contract

Asking Districts for Maintenance of Traffic (MOT) Assistance


NO

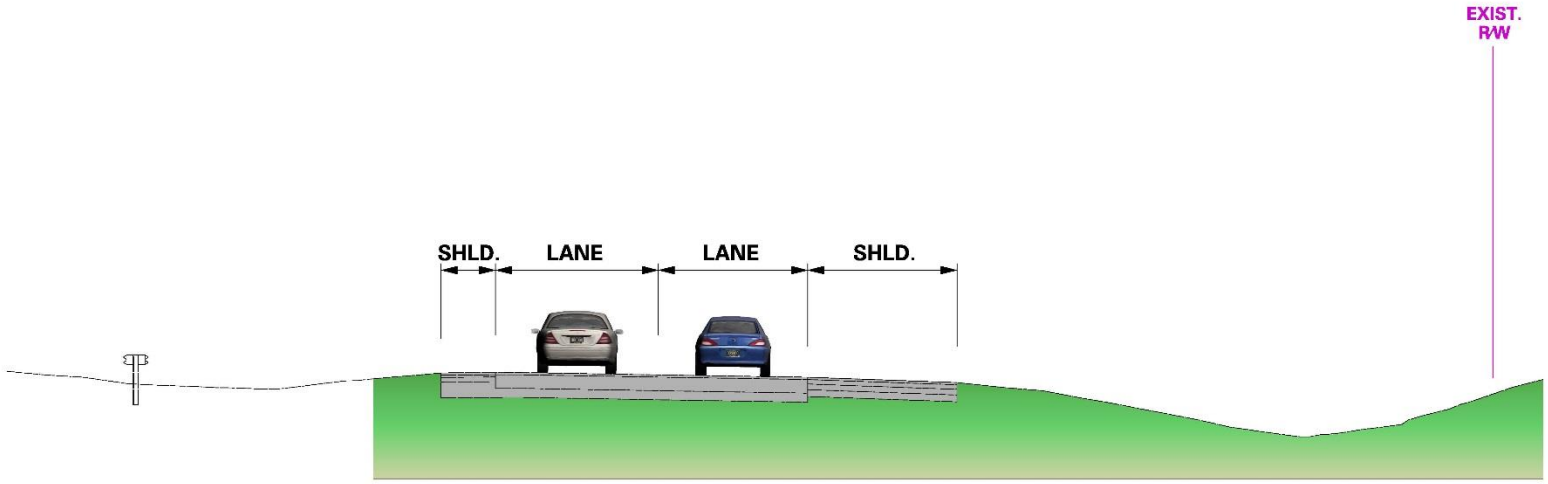
New Open End MOT Contracts

- Quick Turn Around
- Pre Qualified Teams/Companies
- Set unit Pricing
- Groups that know the business and are prepared for the work

Innovation for Acceleration

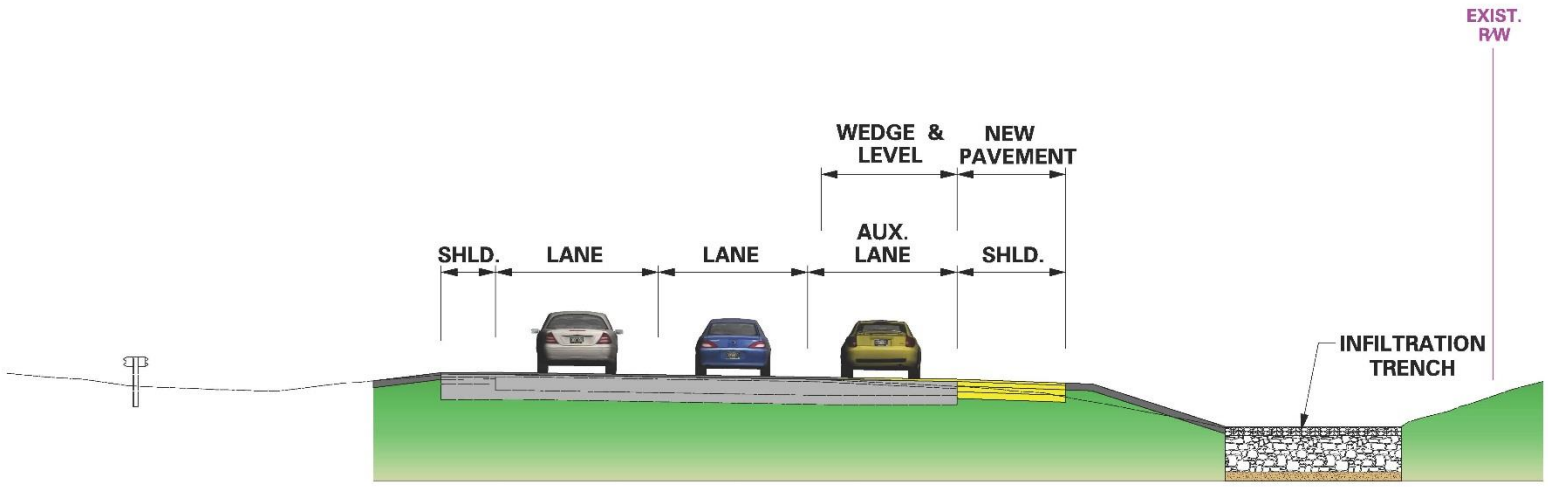
* Smaller More Efficient
  * Provided Secretary with a plan to have it built and done end of 2015
* Long Lead items - Separate Procurement contract for the sign structure
* Open End MOT Contract
* Utilize SWM options to reduce/eliminate right of way needs

Existing Typical Section



EXISTING NB SR 1

Proposed Typical Section



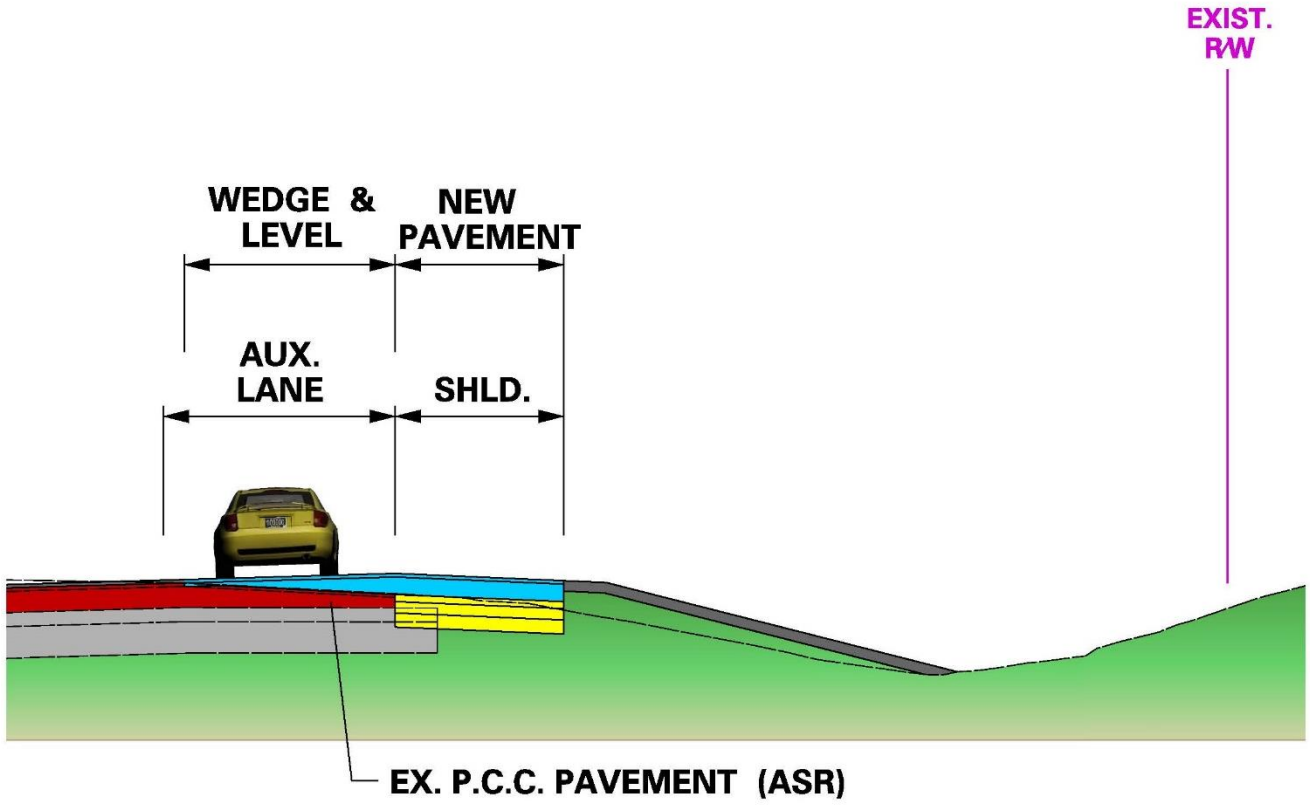
PROPOSED NB SR 1

Innovation for Acceleration

* Smaller More Efficient
  * Provided Secretary with a plan to have it built and done end of 2015
* Long Lead items - Separate Procurement contract for the sign structure
* Open End MOT Contract
* Utilize SWM options to reduce/eliminate right of way needs
* Pavement Section for shoulder – protect ASR

Minimize Existing ASR
Pavement problems under SR 1

ASR Treatment Typical Section



Grading Before Shoulder Removal

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Communications

- Don’t wait for issues to arise

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- Don’t wait for issues to arise
- Always ask if there is anything YOU can do to help them

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- Don’t wait for issues to arise
- Always ask if there is anything YOU can do to help them
- Think outside your comfort zone

Removal with a Milling Machine

Communications

- Don’t wait for issues to arise
- Always ask if there is anything YOU can do to help them
- Think outside your comfort zone
- Get out of your office

Don’t pass along the Problems

Be a Part of the Solution

Results . . .

* Reduced length of queue
* Reduced time of congestion
* Average peak travel time reduced 43%
* Many compliments

FIGURE 2 - SPEED DATA DASHBOARD FOR MAINLINE – BEFORE CONDITIONS (September 8-10&15-17, 2015)

	5:00AM	5:15AM	5:30AM	5:45AM	6:00AM	6:15AM	6:30AM	6:45AM	7:00AM	7:15AM	7:30AM	7:45AM	8:00AM	8:15AM	8:30AM	8:45AM	9:00AM	9:15AM	9:30AM	9:45AM	10:00AM
RT1 AT CHRISTIANA MALL	No Data Available																				
SR1 @ SR 273	67.6	66.5	66.1	66.1	64.5	62.7	58.7	55.4	54.1	53.9	56.6	57.6	57.9	57.8	58.0	56.5	58.2	63.5	63.9	64.0	63.9
DE1 AT CHRISTIANA MEADOWS	68.6	67.5	67.1	66.7	65.2	63.4	52.5	42.5	43.5	42.3	39.8	44.4	45.8	47.3	47.9	45.2	50.8	63.1	64.0	64.3	65.2
DE1 NORTH OF US40	68.3	67.2	67.1	67.0	65.4	63.8	55.6	28.4	29.4	22.8	21.8	22.3	22.3	23.3	27.5	36.6	57.3	66.2	65.6	65.9	66.1
DE 1 AT BEAR RD	70.4	69.4	69.5	69.2	68.1	66.7	62.9	35.2	33.3	27.4	25.0	26.1	27.7	28.8	31.7	48.2	64.3	67.4	66.9	67.6	68.1
DE 1 AT SPRINGFIELDS BLVD	67.6	66.6	66.9	66.4	65.1	63.5	61.0	33.3	30.2	22.5	18.3	20.9	22.6	23.5	30.8	48.8	62.7	65.0	64.6	64.8	65.2
DE 1 AT DE1-US13 SPLIT EXIT 156.N	68.9	68.5	68.7	68.0	67.0	65.1	62.5	54.7	48.5	44.3	41.8	42.7	48.5	58.1	61.4	61.6	67.3	67.4	67.1	67.7	67.4

Approximate Color Scale: in mph

0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75

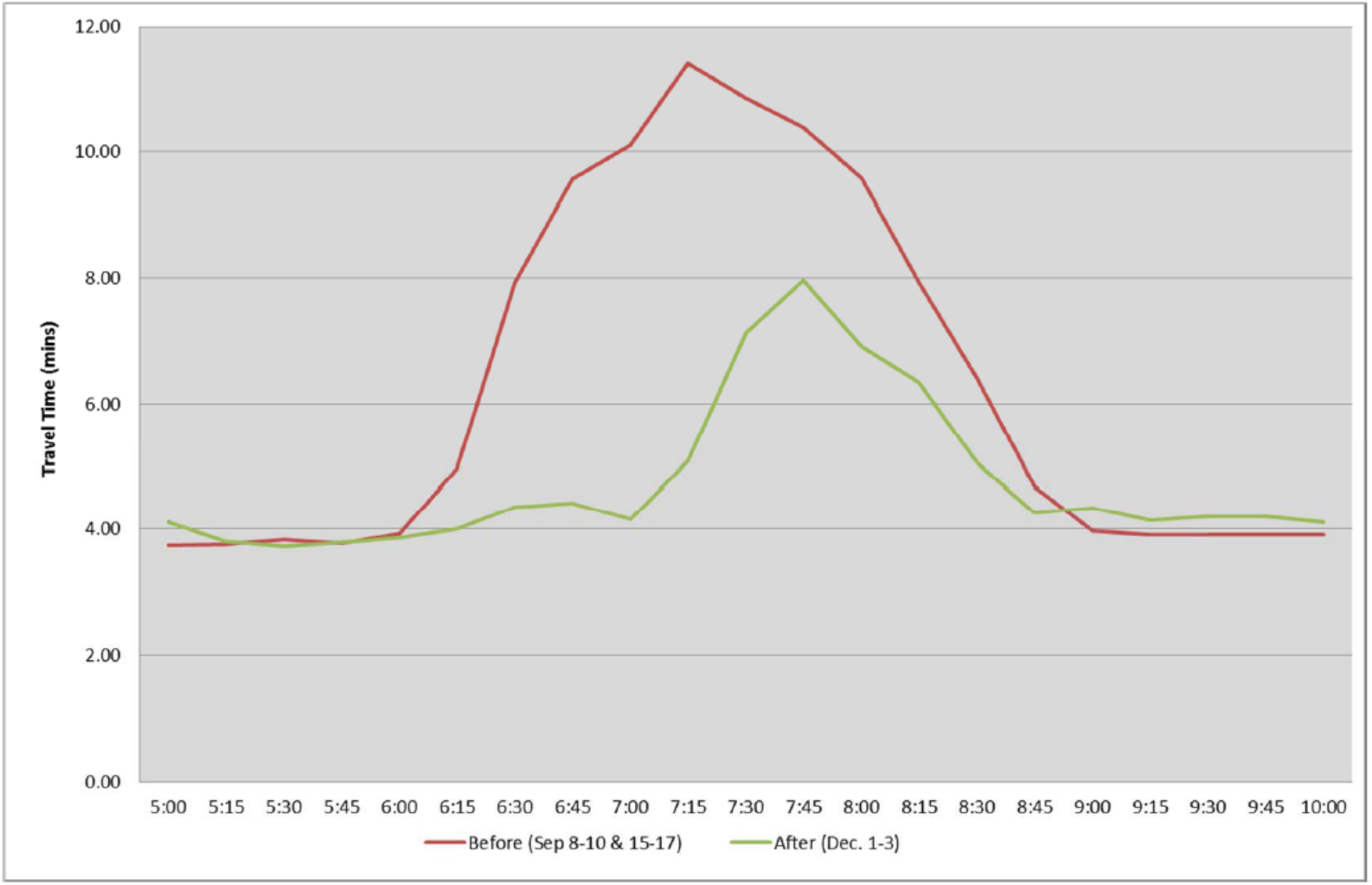
FIGURE 3 - SPEED DATA DASHBOARD FOR MAINLINE – AFTER CONDITIONS (December 1-3, 2015)

	5:00 AM	5:15 AM	5:30 AM	5:45 AM	6:00 AM	6:15 AM	6:30 AM	6:45 AM	7:00 AM	7:15 AM	7:30 AM	7:45 AM	8:00 AM	8:15 AM	8:30 AM	8:45 AM	9:00 AM	9:15 AM	9:30 AM	9:45 AM	10:00 AM
RT1 AT CHRISTIANA MALL	53.6	54.1	53.3	54.1	54.3	53.4	52.6	52.6	52.2	51.5	46.5	46.7	51.4	49.8	50.6	51.1	51.7	51.6	52.0	52.1	52.2
SR1 @ SR 273	64.9	65.2	65.0	65.8	65.2	64.2	59.8	56.3	60.1	54.3	50.5	46.6	56.2	58.4	55.4	57.8	61.7	61.8	61.0	61.3	61.5
DE1 AT CHRISTIANA MEADOWS	65.7	65.4	65.5	66.5	65.8	64.4	59.9	56.4	60.5	49.5	42.7	33.1	49.1	56.7	54.0	58.1	60.0	60.6	60.0	61.0	60.8
DE1 NORTH OF US40	63.4	62.6	64.6	64.2	64.6	62.3	56.5	55.4	56.9	47.5	26.9	33.2	18.0	31.9	46.3	60.4	59.6	60.9	60.3	62.2	61.3
DE 1 AT BEAR RD	67.4	67.0	67.8	68.1	67.4	66.5	63.3	63.1	64.0	58.0	42.2	40.4	47.3	51.0	58.8	64.6	64.4	65.6	64.8	66.7	65.8
DE 1 AT SPRINGFIELDS BLVD	65.7	64.7	65.4	65.7	64.6	63.4	59.8	59.2	61.0	55.7	40.9	38.0	46.1	47.9	58.3	61.2	62.0	63.7	62.7	64.3	63.7
DE 1 AT DE1-US13 SPLIT EXIT 156.N	67.1	67.3	67.5	68.0	66.5	65.3	61.1	56.5	60.5	54.2	50.1	55.7	61.5	61.1	62.4	61.6	64.4	65.5	64.0	65.4	65.4

Approximate Color Scale: in mph

0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75

FIGURE 5 – AVG TRAVEL TIME DASHBOARD FOR ROUTE 1 NB (Sep. to Dec.)



Sent: Tuesday, December 01, 2015 8:42 AM
To: DOT Public Relations (DelDOT)
Subject: Thank you for a job well done!

Just a note of thanks for the speedy, efficient job of adding a specified lane for the Rt. 273 Exit on northbound Rt. 1.

It has enabled a *much faster and smoother* commute from the MOT area to Newark! I am no longer sitting in a traffic jam every morning! ☺

Best regards,

To: VanHorn, Jeffrey (DelDOT)
Cc: Hickman, Kevin (DelDOT)
Subject: Kudos

Good morning Jeff,

If your end of the business is similar to ours, you probably hear complaints a lot more often than praise. But not today!

Just wanted to let the Department know that I am thrilled so far with the addition of the 3rd northbound lane on SR1 from US40 to SR273. I drive northbound SR1 every morning between SR72 and SR273, and the traffic congestion I experience along that stretch has been completely eliminated. SR1 would normally jam up just north of the Tybouts split, and I'd be in stop-and-go traffic from there all the way to my exit at 273. Lately, however, it has been smooooth sailing!

Thanks DelDOT!

Next Steps

* Complete the NEPA Process for the SR 1 Widening Program

* Continue the effort of Smaller More Cost Efficient Projects that can solve immediate issues
  * SR 72/SR 1 Diverging Diamond Interchange
  * SR 1 Barrier Replacement Projects

Thank You