OREGON TRAFFIC CONTROL DEVICES COMMITTEE

Meeting Agenda

January 20, 2017

ODOT TLC Bldg., Alsea Conf. Room,
4040 Fairview Industrial Dr., Salem

9:00 – 9:10	Welcome / Introductions / Approve Previous Minutes	Julia Uravich
9:10 – 9:15	Select Chair & Vice Chair for 2017 / Review Proposed Meeting Schedule for 2017 *Decision*	Julia Uravich
9:15 – 9:20	Business from the Audience *Public Comment on Non-Agenda Topics*	Chair
9:20 – 9:40	Bike Box Interim Approval *Information / Discussion / Recommendation for Approval*	Eric Leaming
9:40 – 9:55	ATC Controller *Information*	Scott Cramer
9:55 – 10:25	Performance Measures for ATC *Information*	Julie Kentosh
10:25 – 10:35	BREAK	
10:35 – 10:55	ADA Update *Information*	Mike Kimlinger
10:55 – 11:05	SIDEWALK CLOSED AHEAD Sign *Recommendation for Approval*	Scott McCanna
11:05 – 11:15	Bicycles KEEP LEFT (RIGHT) Sign *Recommendation for Approval*	Scott McCanna
11:15 – 11:30	Roundtable *Local Jurisdiction Issues - Discussion*	All Committee Members
11:30 – 11:40	Not-on-Agenda Items	Chair
11:40 – 11:45	Agenda Items for Future Meetings	Chair

Proposed 2017 OTCDC Meeting Schedule

Date	*Location*
January 20	ODOT TLC Bldg., Alsea Conf. Rm., 4040 Fairview Ind. Dr., Salem
March 17	ODOT TLC Bldg., Alsea Conf. Rm., 4040 Fairview Ind. Dr., Salem
May 19	(w/ITE), TBD
July 21	ODOT TLC Bldg., Alsea Conf. Rm., 4040 Fairview Ind. Dr., Salem
September 15	ODOT TLC Bldg., Alsea Conf. Rm., 4040 Fairview Ind. Dr., Salem
November 17	ODOT TLC Bldg., Alsea Conf. Rm., 4040 Fairview Ind. Dr., Salem

2017 OTCDC Meeting Agenda-Build Schedule and Rules

Proposed Nov. 1, 2016

Meeting Date	*Location*	*Agenda Item Due to Kathi*	*Handouts / Supporting Material Due to Kathi or Craig*	*Final Agenda Sent to Committee*
January 20	**ODOT TLC Bldg., Salem**	**January 4**	**January 11**	**January 13**
March 17	**ODOT TLC Bldg., Salem**	**March 1**	**March 8**	**March 10**
May 19	**ODOT TLC Bldg., Salem**	**May 3**	**May 10**	**May 12**
July 21	**ODOT TLC Bldg., Salem**	**July 5**	**July 12**	**July 14**
September 15	**ODOT TLC Bldg., Salem**	**August 30**	**September 6**	**September 8**
November 17	**ODOT TLC Bldg., Salem**	**November 1**	**November 8**	**November 10**

Agenda Items

Agenda items are due to Kathi McConnell 2½ weeks before the meeting. Items must include the following information:

- Subject and presenter.
- Amount of time needed.
- Purpose or Response Required. Agenda items should be labeled with one of the following categories:
  - Decision – An issue that requires a vote of the committee.
  - Discussion / Direction – An item for which the committee would provide, without an official vote, suggestions and direction to the topic presenter about what would be needed before the committee might be willing to take an official position.
  - Information – An item presented to the committee for information sharing. There would be no expectation that the committee would take any action or make any recommendations.

Agenda items that are received after the due date will be put on a list to be included in future meeting agendas.

Supporting Materials and Handouts

It is our intent to send only one transmittal, which will include the agenda and all handouts, to all OTCDC members at least one week in advance of scheduled meetings. For this to happen, supporting material and handouts, in electronic format, are due to Kathi or Craig Chadwick 1½ weeks before the meeting. (This is especially critical for Decision items.) Supporting materials and handouts not received by Kathi or Craig one week in advance of the meeting will be the responsibility of the presenter to bring to the meeting in sufficient quantity for members and guests. (25 copies for members and other attendees). You are also asked to provide Craig with an electronic copy of any such handouts for the record.

All materials are to be concise and have page numbers and attachment numbers to facilitate discussion at the meeting

Contacts: Kathleen.E.McConnell@odot.state.or.us (503) 986-3609

Craig.W.Chadwick@odot.state.or.us (503) 986-3571

DRAFT

Oregon Traffic Control Devices Committee

September 16, 2016

Meeting Minutes

ODOT Technical Leadership Center, 4040 Fairview Industrial Drive SE, Salem, Oregon

Members Present: Bob Pappe, Secretary, ODOT State Traffic Engineer; Brian Barnett, City of Springfield;; Joseph Marek, Clackamas County: Pam O'Brien, DKS Associates; Julia Uravich, Vice-Chair, Marion County; Jeff Wise, ODOT Region 5

Members Present via Join Me: Mike Caccavano, City of Redmond; Ed Chastain, Lane County;

Members Absent: Alex Georgevitch, City of Medford, Chairperson; Jeff Lewis, OSP

Others Present: Cecilia Hague, Washington County; Kevin Hottman, City of Salem; Jabra Khasho, City of Beaverton; Matthew Machado, City of Portland; Doug Bish, Craig Black, Scott Cramer, Kevin Haas, Katie Johnson, Marie Kennedy, Mike Kimlinger, Justin King, Kathi McConnell, Gary Obery, Zahidul Siddique, Matt Wilson, ODOT Traffic/Roadway Section; Trevor Sleeman, ODOT Federal Affairs

Others Present via Join Me: Steve Gallup, City of Eugene; Charles Radosta, Kittelson & Associates

Introduction/Building Orientation/Approval of Minutes/Additional Agenda Items

Vice-Chair Julia Uravich called the meeting to order at 9:00 a.m. Julia provided building orientation information and called for introductions from attendees (see above). Bob Pappe moved, Joe Marek seconded, and the committee approved the May 20, 2016 OTCDC meeting minutes.

Business from the Audience/Public Comment on Non-Agenda Topics

None to report. However, Mike Caccavano had one future agenda item. He asked for ODOT's latest interpretation regarding ADA and how it influences non-traditional modernization projects, whether it's interconnect ITS type projects or minor signal related projects He's been hearing rumors these may trigger ADA. Bob Pappe said we could add it as an agenda item next time. ODOT is working on operational notices to

address the subject. It's tough to talk broadly about this since there is ADA litigation going on.

Guide to School Area Safety

Gary Obery presented what he hoped was the final draft to this document so the committee could recommend approval to Bob Pappe. He summarized significant changes to the 2009 Guide, including ORS-inspired revisions, MUTCD-inspired changes, and evolving practice changes.

Joe Marek suggested future work to address guidance on rural school areas (not for this edition of the Guide). He doesn't think he has adequate tools to address school safety concerns in cases which don't involve students walking to school. A higher rural school speed limit might be helpful. Kevin Haas noted it will take outreach to the Legislature to add a rural school speed limit.

Joe noted on page 2, the use of the term "full time" public or private elementary or middle school and asked if there was a definition for this. Gary said he wasn't sure; he'll look into this.

The committee discussed the difference between prohibition of school crossing assembly at STOP/YIELD signs and discouragement of them at signalized intersections. Given this is a guide rather than policy; this is probably okay as is.

Pam suggested a legal description of a school zone be added to the start of page 6.

Pam also asked about adding phone numbers to all of the resources starting on page 33. The committee agreed hot links to agency websites would be better than phone numbers.

On page 27 under Advance Stop Lines, Pam noted a parenthetical "see below", which doesn't seem to have a below. Gary said yes, he needed to include a picture.

Decision: Joe Marek moved recommending approval of the draft to Bob Pappe with changes discussed in the meeting. Pam O'Brien seconded the motion. The committee voted in favor. The final document will be sent to contacts at local jurisdictions and interest groups, LOC and AOC.

Pedestrian Hybrid Beacons

Kevin Haas introduced Trevor Sleeman from ODOT's Federal Affairs unit, and reviewed the history of PHB's starting with the first approval of them by FHWA in the 2009 MUTCD. Kevin showed some typical examples of PHB installations in Oregon. He noted Representative Peter DeFazio's July 12, 2016 letter urged ODOT to mandate

uniform standards for cities and counties in the State to follow when installing traffic devices at pedestrian crosswalks. He noted complaints about lack of uniformity leading to driver confusion.

ODOT's response to Representative DeFazio was shared. In the response, ODOT committed to engaging local agencies to better understand the usage and effectiveness of PHB's, which is why he was bringing the subject to the OTCDC. Kevin reviewed key findings from FHWA's July 2016 evaluation report on the PHB's, including high compliance but also persistent confusion noted. FHWA therefore recommended some new signing to address the confusion which might replace the current R10-23 sign in the 2009 MUTCD. Mike Kimlinger said this was discussed at the NCUTCD meeting he just attended. The committee discussed concerns regarding long messages and placement/size of sign issues.

Brian Barnett said the sign Springfield developed intended to educate drivers on when they can proceed (after stopping for pedestrians then proceeding on flashing red when crosswalk is clear). He said compliance and understanding seems to have gone up in the five years since the signs first went up. He said Springfield has requested permission to experiment with an alternative to the PHB but using the same concept in a 3-section head, operating with a flashing green, then flashing yellow. Brian said that Eric Niemeyer on his staff would welcome others joining Springfield's request.

Kevin showed video of drivers' behavior in Eugene at a mid-block crossing in Eugene. Understanding was uneven with some moving after pedestrian crossed, others not. Brian said a lot of students who live nearby don't hit the button to make the crossing because there's a nearby signal not interconnected with the PHB so they don't correctly use it.

Kevin then showed ODOT's only PHB on OR 39 at Portland Street in Klamath Falls where drivers did not always proceed after the steady red went to flashing wig-wag until the light went dark. The signal isn't included in Oregon's Driver's manual, which may be part of the problem and is something which needs to be addressed.

Kevin then showed an operation in Portland on E Burnside Street at 41st Street in 2008. He discussed inconsistency in regard to a bike signal not being followed by bicyclists in the area.

Trevor said Congressman DeFazio wants ODOT to impose statewide standardization to address the issue. ODOT said we'd look into it but did not commit as of yet. We have a federal standard in the 2009 MUTCD but it's inconsistent in application nationwide, as evidenced by findings in the July 2016 FHWA report. Mike said there is still some question as to whether this is a good traffic control device. It could be quite problematic when autonomous vehicles are introduced. It will be difficult to program these vehicles to handle the signal safely. This conversation is ongoing. ODOT is not itself promoting PHB's, preferring RRFBs instead. But Congressman DeFazio wants ODOT to provide leadership even though it's the local jurisdictions primarily installing PHBs in Oregon.

Steve Gallup, from Eugene reported on their PHB on Broadway Street. The pedestrian has to wait up to 90 seconds before the walk signal comes up because of congestion. He said the delay is calculated based on advance loops in the pavement. Kevin said FHWA notes this kind of operation can lead to poor pedestrian compliance, which Steve agreed was happening in Eugene on Broadway Street. The pedestrians may see the dark signal after pushing the button as indicating the signal is not working.

Ed Chastain said on the Bob Straub Parkway, they are looking at installing a pedestrian ahead sign with flasher in advance of their planned PHB because of the higher speed.

Kevin Haas said his preference with Congressman DeFazio's request is for ODOT to hold off on taking any additional action until FHWA and the NCUTCD decide whether to incorporate recommendations from the July 2016 FHWA report into revised guidance for PHBs that would be issued in an interim Approval or some other revision to the MUTCD. ODOT is not asking for any action or correspondence from the committee at this time. If ODOT did require it, it would be in compliance with the federal and state requirements to follow the MUTCD and Oregon Supplement.

ODOT Research Project (SPR 773), Smart Red Clearance Extensions to Reduce Red Light Running Crashes

Craig Black presented ODOT's research project published earlier this year. The full report can be read here. This research was aimed at red light running crashes and how to address them by developing best practices for detector placement and signal timing settings to maximize the benefits of the red clearance extension feature.

Based on the results of this study, the following recommendations were presented:

- The duration of the yellow change and red clearance intervals have a considerable influence on driver behavior. As such ODOT should consider adopting the kinematic equations recommended in NCHRP Report 731, "Guideline for Timing Yellow and All-Red Intervals at Signalized Intersections".

- Currently ODOT uses the posted speed limit as the approach velocity for the kinematic timing equations. ODOT should consider using an operational speed as recommended in NCHRP Report 731, which could provide more precise estimations for yellow change and red clearance durations.

- The overrepresentation of semi-trucks and light trucks in RLR events observed in the field indicates more attention should be paid to detection strategies and timing durations which consider vehicle classification.

- The HIL simulation environment is a robust tool for testing and evaluating signal treatment alternatives and should be considered as a viable resource for ODOT.

- Adding upstream detection can enhance the efficiency of RLE systems which could in turn increase the safety of signalized intersections in Oregon.

Craig said ODOT is considering adopting the recommendations of NCHRP 731. He asked for the committee's thoughts. Does the OTCDC think local agencies will want to adopt this approach to calculating yellow and red clearance values or use something else?

Brian Barnett noted people are not necessarily stopping at the stop line, which may need to be considered in looking at the red clearance. The ITE equation does not reduce by one second.

He said the impact of assuming 7 mph in excess of the posted speed may be applicable. Each context is different so measuring it may be superior. Otherwise, using 7 mph speed at 25 mph may impact different than at 55 mph for the underlying speed. There is likely a disparate impact.

Finally, Brian asked what kind of speed was used in the yellow clearance equation for the left turns and right turns (to a lesser degree). They clearly don't approach an intersection at the same speed as through traffic would. So we could end up having yellow clearances which are in essence short of the time required to get into and through the intersection. This could also penalize the driver using a reasonable speed in the auto enforcement environment of red light running cameras.

Craig said he hasn't really looked at the left turns yet, he plans to do so and see what the difference is. He suspects there may be a little increase, but this may not be critical. This is an attempt to balance safety with efficient operations, with safety being primary. The next step is being able, especially on high speed corridors where the laws of physics are the most dramatic to motorists for fatal and serious injuries, to predict when you may have red light runners and when to extend the red times. But the essence of this report follows the recommendations in NCHRP 731.

Pam O'Brien asked about consideration for rounding up for calculations of signal timing. Craig said NCHRP 731 talks about rounding but he hasn't gotten into it in great detail. He doesn't have a strong opinion either way on rounding. With the Excel spreadsheets, you should be able to just put in the numbers and allow it to do the calculations for you. He's more inclined to not round, just keep the numbers on file in case needed if somebody asks.

All red extensions were discussed in response to Jeff Wise but it wasn't considered in the research, which was based upon a simulation of one intersection. Pam said they tend to require at least a minimum of .5 red because drivers are expecting it. Craig said he hasn't even begun thinking of drafting policy language based on the research because he's more into presenting the information so far.

Bob said ODOT's director is interested in this report and what we intend to do about it. Craig said he is gathering input now and was assigned to develop a work plan on how to proceed with this. He hasn't received formal feedback from anybody. He wants to take it to TOLT and signal user group and then move forward.

More discussion was had as to important considerations and what information would be valuable and how best to make it available. Craig said he would take the discussion and give it more thought after the meeting. Brian suggested care be taken the timing not be adjusted so much drivers are set up to believe they can go through a stale yellow and easily clear an intersection. There hasn't been any indication the Legislature is looking at changing the law on yellow signals. Jabra Khasho suggested presenting the information to an Oregon ITE meeting.

Craig ended by presenting a graph on red light monitoring and use for identifying safety trends and engineering countermeasures in hopes of reducing crashes.

NCUTCD/AASHTO June Meeting Update

Mike Kimlinger and Scott Cramer reported on 22 pages of notes regarding what they learned at the June 6-10 NCUTCD/AASHTO SCOTE meeting in Savannah, Georgia. This was the first time Scott was able to attend one of these meetings. Scott discussed issues the people developing connected vehicles are having with programming given there are so many variations from the MUTCD on how jurisdictions do things, for example, lane drops. Scott also said there was a good amount of disappointment in the removal of interim approval for the Clearview font on signs. This doesn't happen very often. There was therefore a proposal to look at the font again, and at the least, the creation of a process to review this kind of action and comment before it is done in the future.

Scott said ADA issues are going to be a big problem for other states. Maryland, like Oregon, has been sued and others who haven't, think the MUTCD will protect them since it has some requirements in there and they are using engineering judgement since the PROAG (document on best practices) hasn't yet been advanced from draft form.

In the Technical Committee, they had the Pedestrian Committee come in and ask for pedestrian signals to be required at every intersection. There is a lot of push-back against this from some states, including Texas, so it didn't go anywhere.

Scott said the NCUTCD committee had it made clear to them by FHWA they are advisory to FHWA for the MUTCD and thus their input is advisory.

Mike Kimlinger then went through the 22-page presentation of meeting highlights. See the linked hand-out Mike reported from, including links to even more information.

Roundtable

Brian asked if there are any safety corridors in cities since Springfield is considering putting one in. Joe Marek said there used to be one in Oregon City but it has been decommissioned. Ann Holder was suggested as a resource.

Pam O'Brien shared transportation-related pictures from her recent vacation in Norway.

Not On Agenda

Mike Kimlinger updated the committee on what is going on regarding the ADA lawsuit ODOT is dealing with. All ramps on the state system are going to need to have a verification form filled out showing whether or not they meet ADA. There's also a matrix to show when the form is required. Further information is available on ODOT's website.

Local agencies who have been successfully sued may be required to follow other requirements as dictated by the verdict or settlement. Where federal money is involved, their requirements will also apply. If anybody has other questions, please contact Mike.

Agenda Items for Future Meetings

- ADA request from Mike Caccavano earlier
- Bike Keep Left/Right Signs (Scott McCanna)
- ATC Controller – (Scott Cramer)
- Yellow beacons on garbage trucks (leftover from May meeting's future agenda items)

Adjournment

Julia Uravich adjourned the meeting at 12:10 p.m.

Next Meeting: The next meeting is scheduled for November 18th at 9:00 a.m. at the TLC Building in Salem.

I N T E R O F F I C E M E M O

TECHNICAL SERVICES
Traffic-Roadway Section
Office Phone: (503) 986-3568
Fax Phone: (503) 986-3749

DATE: January 20, 2017

TO: Oregon Traffic Control Devices Committee

FROM: Eric S. Leaming, P.E.
Interim State Sign Engineer

SUBJECT: **Statewide Interim Approval for Optional Use of Intersection Bicycle Boxes**
Request for Committee's Recommendation on ODOT Request to FHWA

The FHWA issued an Interim Approval for optional use of intersection bicycle boxes (IA-18) on October 12, 2016. As a condition of the Interim Approval, a State may request Interim Approval for the optional use of intersection bicycle boxes for all jurisdictions in that State.

Several installations of bicycle boxes in the FHWA experimental process were at Oregon intersections, and ODOT sees a benefit to all Oregon jurisdictions by requesting statewide Interim Approval. This would add an optional traffic control device for use by Oregon jurisdictions; this does not impose any requirement or recommendation for use of an intersection bicycle box.

Because this affects Oregon cities and counties, ODOT would like OTCDC's recommendation on this question: **should ODOT request Interim Approval for the optional use of intersection bicycle boxes for all jurisdictions in Oregon?**

The Interim Approval and its attachments are attached with this memo and are available at the following website: http://mutcd.fhwa.dot.gov/res-interim_approvals.htm.

The Interim Approval does not specify where bicycle boxes are appropriate besides at signalized intersections. ODOT is in the process of developing criteria for use of bicycle boxes on ODOT facilities, similar to how it approaches other traffic control strategies. When finalized, these criteria would only apply to ODOT facilities; cities and counties would only be held to the conditions of the Interim Approval.

CC: Kathi McConnell, ODOT
Craig Chadwick, ODOT

ESL

Attachments (1)

\\scdata\7611shar\SIGNING-STRIPING\PAVEMENT MARKINGS\SECURE\DESIGN PRACTICE\General Practice\OTCDC_Bicycle Box IA Request.docx

U.S. Department of Transportation
Federal Highway Administration

Memorandum

Subject: **INFORMATION:** MUTCD – Interim Approval for Optional Use of an Intersection Bicycle Box (IA-18)

Date: OCT 12 2016

From: Robert E. Arnold
Acting Associate Administrator for Operations

In Reply Refer To: HOTO-1

To: Federal Lands Highway Division Engineers
Division Administrators

Purpose: The purpose of this memorandum is to issue an Interim Approval for the optional use of intersection bicycle boxes. Interim Approval allows provisional use, pending official rulemaking, of a new traffic control device, a revision to the application or manner of use of an existing traffic control device, or a provision not specifically described in the *Manual on Uniform Traffic Control Devices for Streets and Highways* (MUTCD).

Background: With an increasing number of bicycle lanes marked on the curb side of streets, the Federal Highway Administration (FHWA) has been requested to provide traffic control devices to facilitate bicyclists positioned to the right side of general-use travel lanes to enter the center of the general-use lanes at the approach to a signalized intersection. The intersection bicycle box is a designated area on the approach to a signalized intersection, between an advance stop line and the intersection stop line, intended to provide bicycles a space in which to wait in front of stopped motor vehicles during the red signal phase so that they are more visible to motorists at the start of the green signal phase. Positioning bicyclists in the center of the appropriate lane allows them to turn from a location where they are more visible to surrounding traffic, can increase the visibility of stopped bicycle traffic at an intersection, can reduce conflicts between bicycles and motor vehicles, can help mitigate intersection right-turn ("right-hook") conflicts, and can help group bicycles together to clear intersections more quickly.

The intersection bicycle box described in this Interim Approval memorandum is a new traffic control device and has been used in the United States only on an experimental basis through the MUTCD official experimentation process, which is described in Section 1A.10.

Research on Bicycle Boxes: Agencies around the country have shown significant interest in intersection bicycle boxes, with over 25 experiments approved under the 2009 Edition of the MUTCD for a variety of State, County, and local government agencies including the Minnesota Department of Transportation; the District of Columbia Department of Transportation; and the cities of Austin, TX; Columbus, OH; Madison, WI; Missoula, MT; and Portland, OR.

These experiments have used a relatively consistent design of a bicycle box that includes the following elements:

- An advance stop line placed at least 10 feet in advance of the pedestrian crosswalk or the intersection stop line;
- A bicycle symbol pavement marking within the space beyond the advance stop line to indicate that bicyclists may wait in this area;
- At least a short length of bicycle lane approaching the bicycle box provided as a clear and predictable path for bicyclists to enter the box;
- Prohibition of turns on red if they would normally be allowed from the lane where the bicycle box is installed; and
- Countdown pedestrian signals provided across the approach on which the bicycle box is located if the bicycle box is installed across more than one lane of a signalized approach.

FHWA Evaluation of Results: The Office of Transportation Operations has reviewed the available data and considers the experimental bicycle box to be satisfactorily successful for the applications that were tested. Positive operational effects have been documented in the experiments after the installation of bicycle boxes, including:

- Reductions in the number of conflicts between bicyclists and turning drivers at the study intersections;
- Reductions in the number of avoidance maneuvers by both bicyclists and motorists;
- Reductions in the number of bicycles and motor vehicles encroaching into pedestrian crosswalks when stopped at an intersection;
- Road-user surveys and observations in multiple experiments that showed that motorists and bicyclists understood the purpose and proper usage of the bicycle box.

The design of the intersection bicycle box is not proprietary and can be used by any jurisdiction that requests and obtains Interim Approval from the FHWA to use bicycle boxes in accordance with Paragraphs 14 through 22 of Section 1A.10 of the MUTCD. The FHWA believes that the intersection bicycle box as detailed in this memorandum has a low risk of safety or operational concerns.

This Interim Approval does not create a new mandate compelling the use of intersection bicycle boxes, but will allow agencies to install intersection bicycle boxes, pending official rulemaking revising the MUTCD, to facilitate more efficient operations at intersections. Interim Approval of a provisional device typically results in its inclusion in a future Notice of Proposed Amendments to revise the MUTCD. However, this Interim Approval does not guarantee adoption of the provisional device, either in whole or in part, in any future rulemaking that revises the MUTCD.

Conditions of Interim Approval: The FHWA will grant permission for the optional use of intersection bicycle boxes under this Interim Approval to any jurisdiction that submits a written request to the Office of Transportation Operations. A State may request Interim Approval for all jurisdictions in that State. Jurisdictions seeking permission to use intersection bicycle boxes under this Interim Approval must agree to:

- Comply with the technical conditions detailed below;
- Maintain an inventory list of all locations where bicycle boxes are installed; and
- Comply with Item D of Paragraph 18 of Section 1A.10 of the MUTCD.

1. **General Conditions:** The use of bicycle boxes is optional. However, if an agency opts to use bicycle boxes under this Interim Approval, such use shall be limited to signalized intersections. The design of the bicycle box shall comply with the design conditions provided below.

2. **Design of Intersection Bicycle Boxes:** The design of the bicycle box (see Attachments IA-18-1 and IA-18-2) shall comply with the following provisions:

    a. A bicycle box shall be formed by an advance stop line placed at least 10 feet in advance of the intersection stop line.

    b. At least one bicycle symbol shall be placed within a bicycle box (see Attachments IA-18-1 and IA-18-2 for placement details).

    c. Where a bicycle box is provided across multiple lanes of an approach, countdown pedestrian signals (see Section 4E.07 of the 2009 MUTCD) shall be provided for the crosswalk across the approach on which the bicycle box is located to inform bicyclists whether there is adequate time remaining to cross to an adjacent lane before the onset of the green signal phase for that approach.

    d. Turns on red shall be prohibited from the approach where a bicycle box is placed using a NO TURN ON RED (R10-11 series) sign.

    e. At least 50 feet of bicycle lane should be provided on the approach to a bicycle box so bicyclists will not need to ride between lanes to enter the bicycle box.

    f. A STOP HERE ON RED (R10-6 or R10-6a) sign should be provided at the advance stop line defining the bicycle box with an EXCEPT BICYCLES (R3-7bP) word legend plaque below (see Attachments IA-18-1 and IA-18-2).

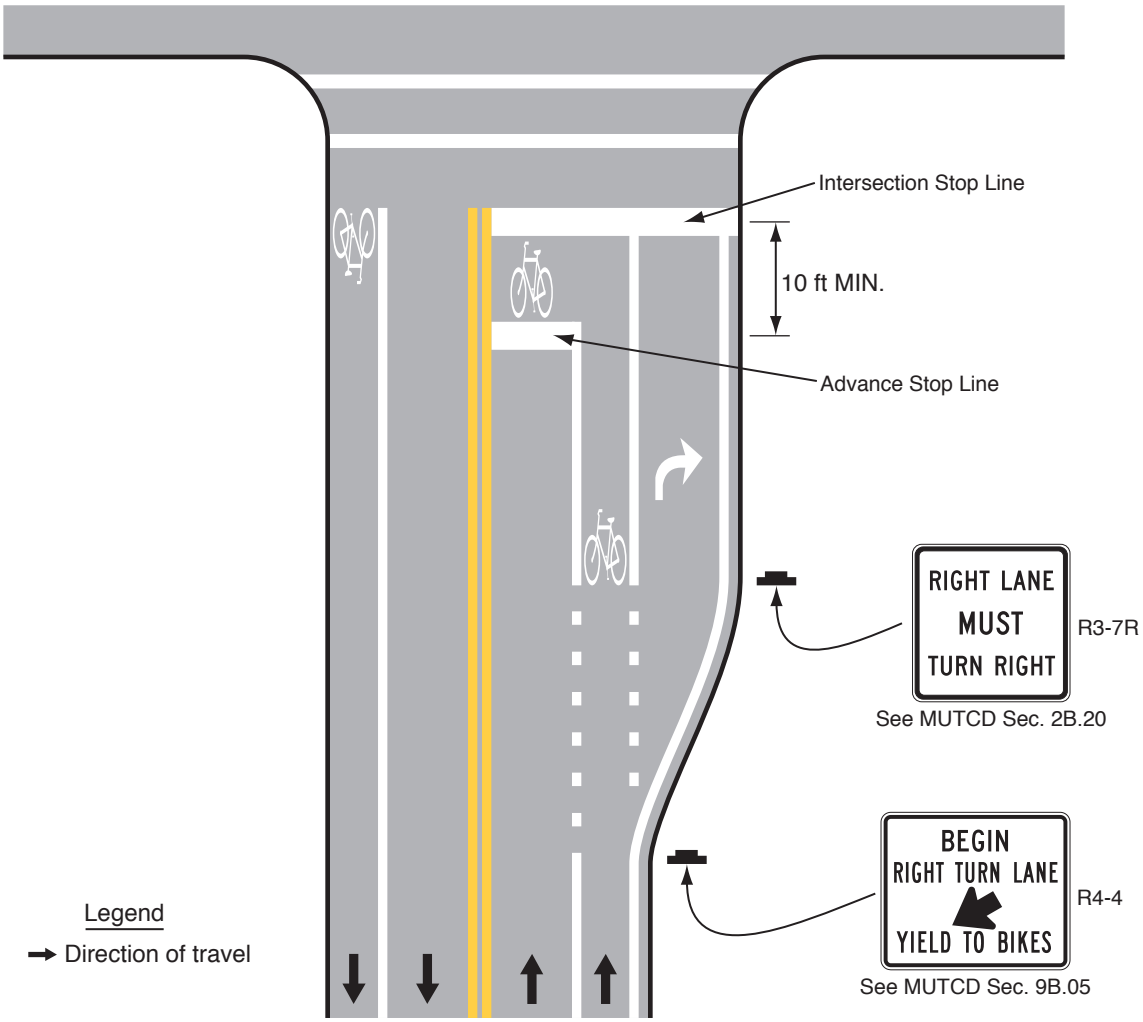
    g. Green-colored pavement (see Interim Approval No. 14) may be used within a bicycle box and the approach bicycle lane, where one is provided. A separate request for Interim Approval for green-colored pavement is required if the agency has not already received such an approval.

Any questions concerning this Interim Approval should be directed to Mr. David Kirschner at david.kirschner@dot.gov.

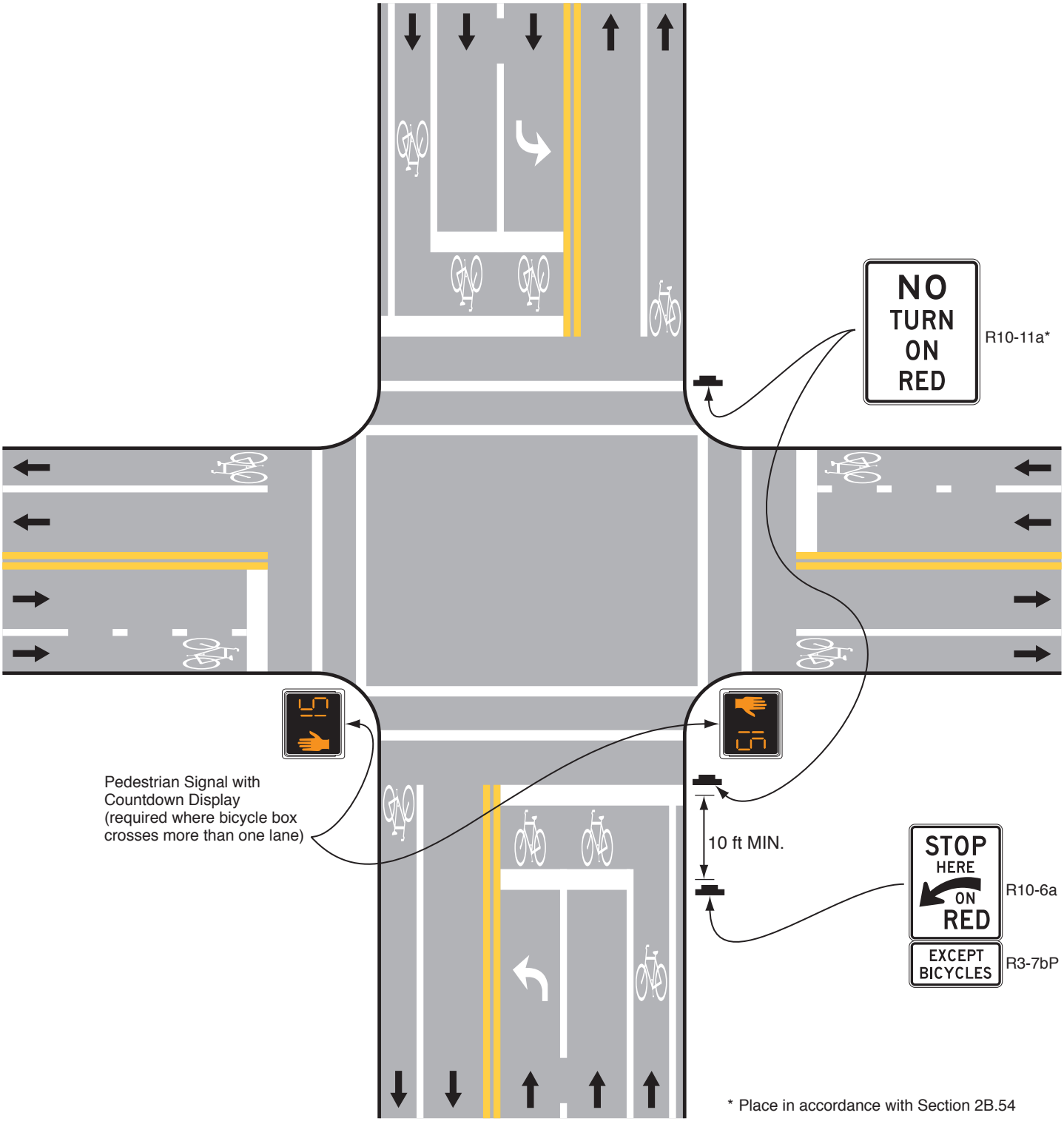
Attachments

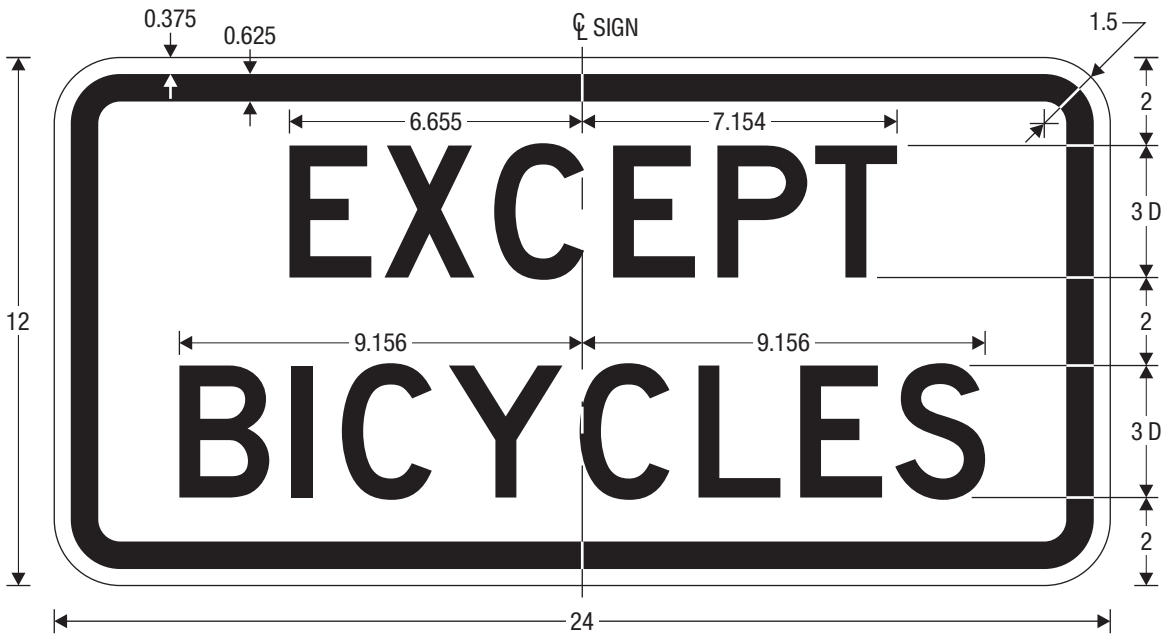
cc: Associate Administrators
Chief Counsel
Chief Financial Officer
Directors of Field Services
Director of Technical Services

Attachment IA-18-1



Attachment IA-18-2





R3-7bP

EXCEPT BICYCLES (PLAQUE)

COLORS: LEGEND, BORDER — BLACK
BACKGROUND — WHITE (RETROREFLECTIVE)

OREGON TRAFFIC CONTROL DEVICES COMMITTEE

ATC Signal Upgrades

Scott B Cramer P.E.

January 2017

Advanced Transportation Control System

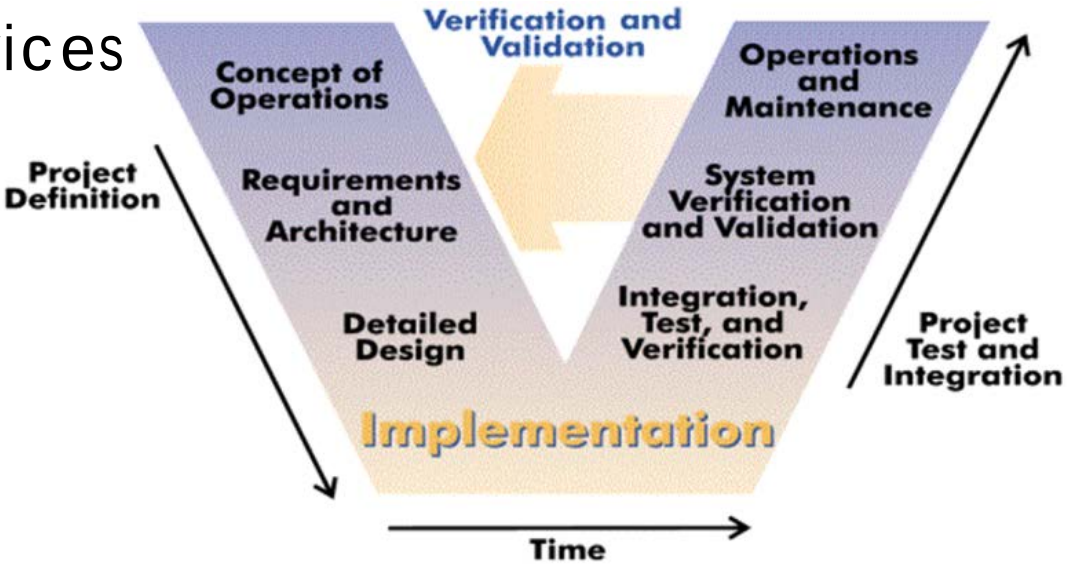
- What is it?
  - Controller
  - Software
  - Cabinet

Advanced Transportation Controller

- What is it?
  - Field Computer, National Standards Compliant
  - Systems Engineering & RFP based
  - On Price Agreement with Intelight
  - Currently used at all Ramp Meters

Signal Software – Needed!

- Systems Engineering
- Request For Proposal (RFP)
  - ATC Firmware
  - Central Signal System
  - Adaptive Signal Software
  - Programming Services
- Intent-to-Award
  - Intelight



Advanced Transportation Cabinet

- What is it?
  - Based on National Standards
    - Systems Engineering
    - 80% Complete Spec
    - Final summer 2017
  - Inputs: 56 to ~unlimited
    - 48 inputs per file
    - SDLC Direct Connect
  - Outputs: 48 to 96 monitored
  - Half the space required

Why Upgrade?

- Vendor support
- CV Readiness
  - SPaT Challenge
- Improved data
  - Performance measures
- Industry direction & Standards Compliance
- Improved computing capability
- Support Local Agencies

Next Steps

- Controller & Software
  - Staff Training
    - Beginner – Early 2017
    - Advanced – Mid 2017
  - Deployment
    - 2017 Optional
    - 2018 Recommended
    - 2019 Required
- Cabinet
  - Mid 2017 Complete Specifications

The ATC and Signal Performance Metrics in Lincoln City, Oregon

Julie Kentosh, P.E., PTOE

ODOT Region 2 Signal Operations Engineer

Overview

- The ATC
- Signal Performance Metrics (SPMs)
- Why Lincoln City
- How we're using SPMs in Lincoln City
- How other agencies are using SPMs

ODOT Signal Controllers

170 Controller (1970s technology)

2070 Controller (1990s technology)

ATC (modern technology)

The ATC

- Linux based operating system
- Can run multiple applications (traffic signal, ramp meter, weather station, etc)

Signal Performance Metrics

- Controller Enumerations

Active Phase Events:

0	Phase On
1	Phase Begin Green
2	Phase Check
3	Phase Min Complete
4	Phase Gap Out
5	Phase Max Out
6	Phase Force Off
7	Phase Green Termination
8	Phase Begin Yellow Clearance
9	Phase End Yellow Clearance
10	Phase Begin Red Clearance
11	Phase End Red Clearance

Detector Events:

81	Detector Off
82	Detector On
83	Detector Restored
84	Detector Fault- Other
85	Detector Fault- Watchdog Fault
86	Detector Fault- Open Loop Fault

Preemption Events:

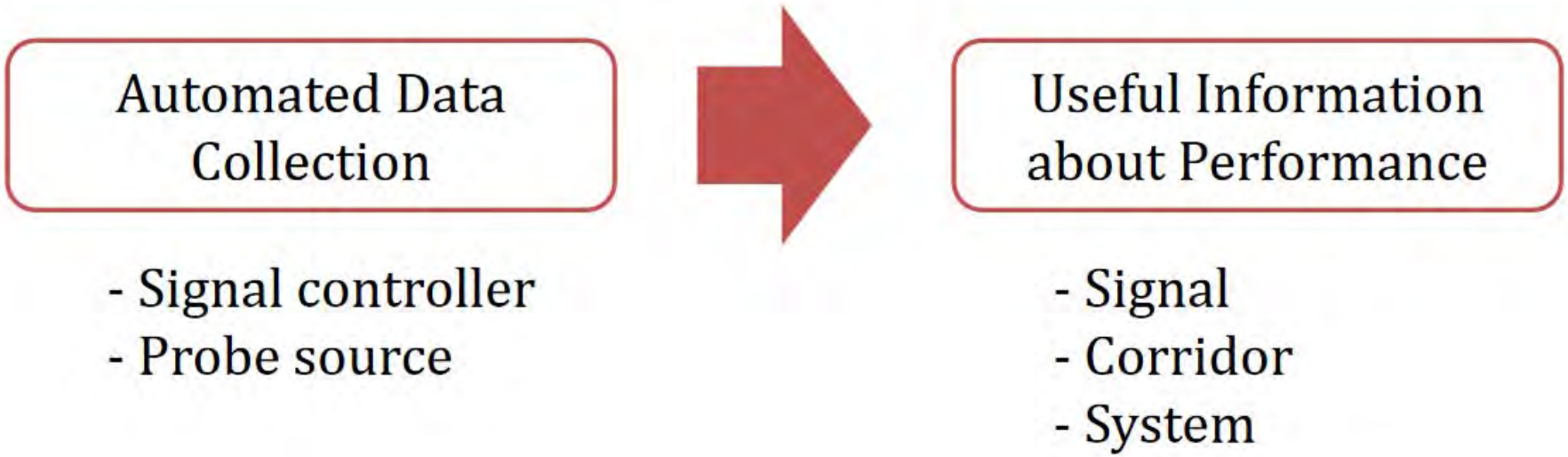
101	Preempt Advance Warning Input
102	Preempt (Call) Input On
103	Preempt Gate Down Input Received
104	Preempt (Call) Input Off
105	Preempt Entry Started

Signal Performance Metrics

Timestamp	Category	Type	Event Value
6/1/2016 7:57:59 AM	Detector On/Off Events	Detector On	5
6/1/2016 7:57:59 AM	Phase/Ped Call Events	Phase Call Dropped	2
6/1/2016 7:57:58 AM	Detector On/Off Events	Detector Off	3
6/1/2016 7:57:58 AM	Phase/Ped Call Events	Phase Call Registered	2
6/1/2016 7:57:58 AM	Detector On/Off Events	Detector On	3
6/1/2016 7:57:57 AM	Detector On/Off Events	Detector Off	5
6/1/2016 7:57:57 AM	Detector On/Off Events	Detector Off	18
6/1/2016 7:57:57 AM	Detector On/Off Events	Detector On	18
6/1/2016 7:57:57 AM	Detector On/Off Events	Detector On	5
6/1/2016 7:57:56 AM	Phase/Ped Call Events	Phase Call Dropped	2
6/1/2016 7:57:56 AM	Detector On/Off Events	Detector Off	3
6/1/2016 7:57:56 AM	Detector On/Off Events	Detector Off	4
6/1/2016 7:57:56 AM	Phase/Ped Call Events	Phase Call Registered	2
6/1/2016 7:57:56 AM	Detector On/Off Events	Detector On	3
6/1/2016 7:57:55 AM	Detector On/Off Events	Detector On	4
6/1/2016 7:57:55 AM	Phase/Ped Call Events	Phase Call Dropped	2
6/1/2016 7:57:54 AM	Detector On/Off Events	Detector Off	3
6/1/2016 7:57:54 AM	Phase/Ped Call Events	Phase Call Dropped	6
6/1/2016 7:57:54 AM	Detector On/Off Events	Detector Off	17
6/1/2016 7:57:54 AM	Phase/Ped Call Events	Phase Call Registered	6
6/1/2016 7:57:54 AM	Phase/Ped Call Events	Phase Call Registered	2
6/1/2016 7:57:54 AM	Detector On/Off Events	Detector On	17
6/1/2016 7:57:54 AM	Detector On/Off Events	Detector On	3

Signal Performance Metrics

SPM Basic Concept



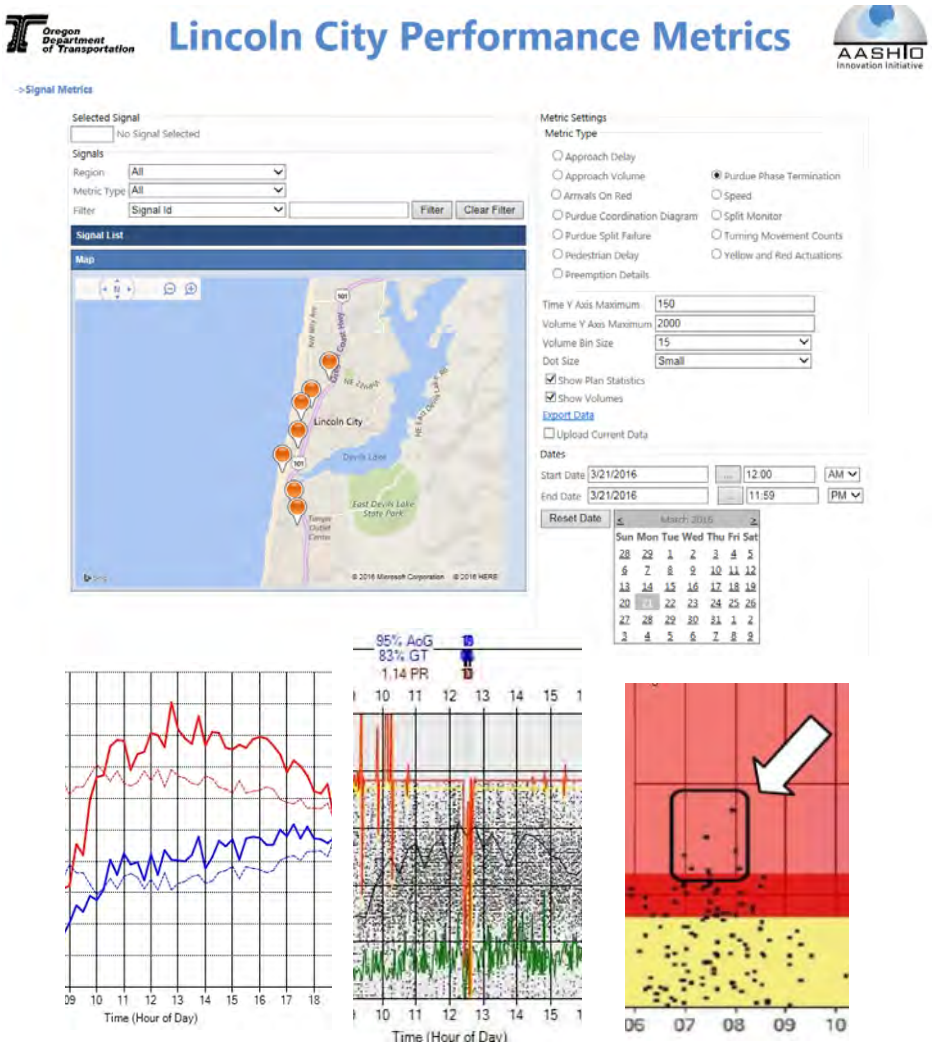
Automated Traffic Signal Performance Metrics

ATSMP = Fitness Tracker for Traffic Signals

High Resolution Data Collection

Data Analysis and Performance Report Tools

Automated Traffic Signal Performance Metrics



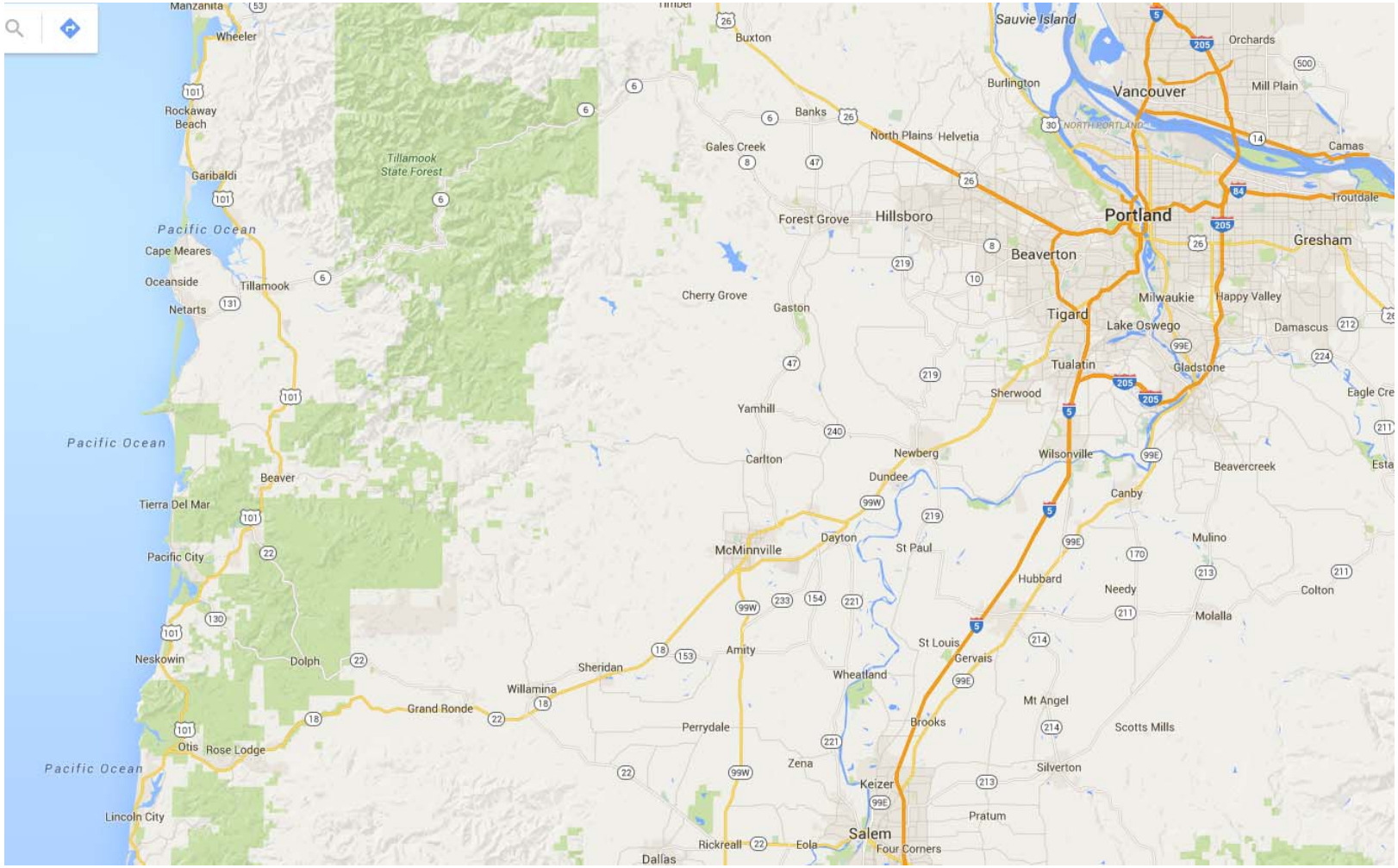
Agencies using SPMs – Separate systems deployed
(16 and growing)

The Lincoln City Project put ODOT on the Map!

Why Lincoln City?

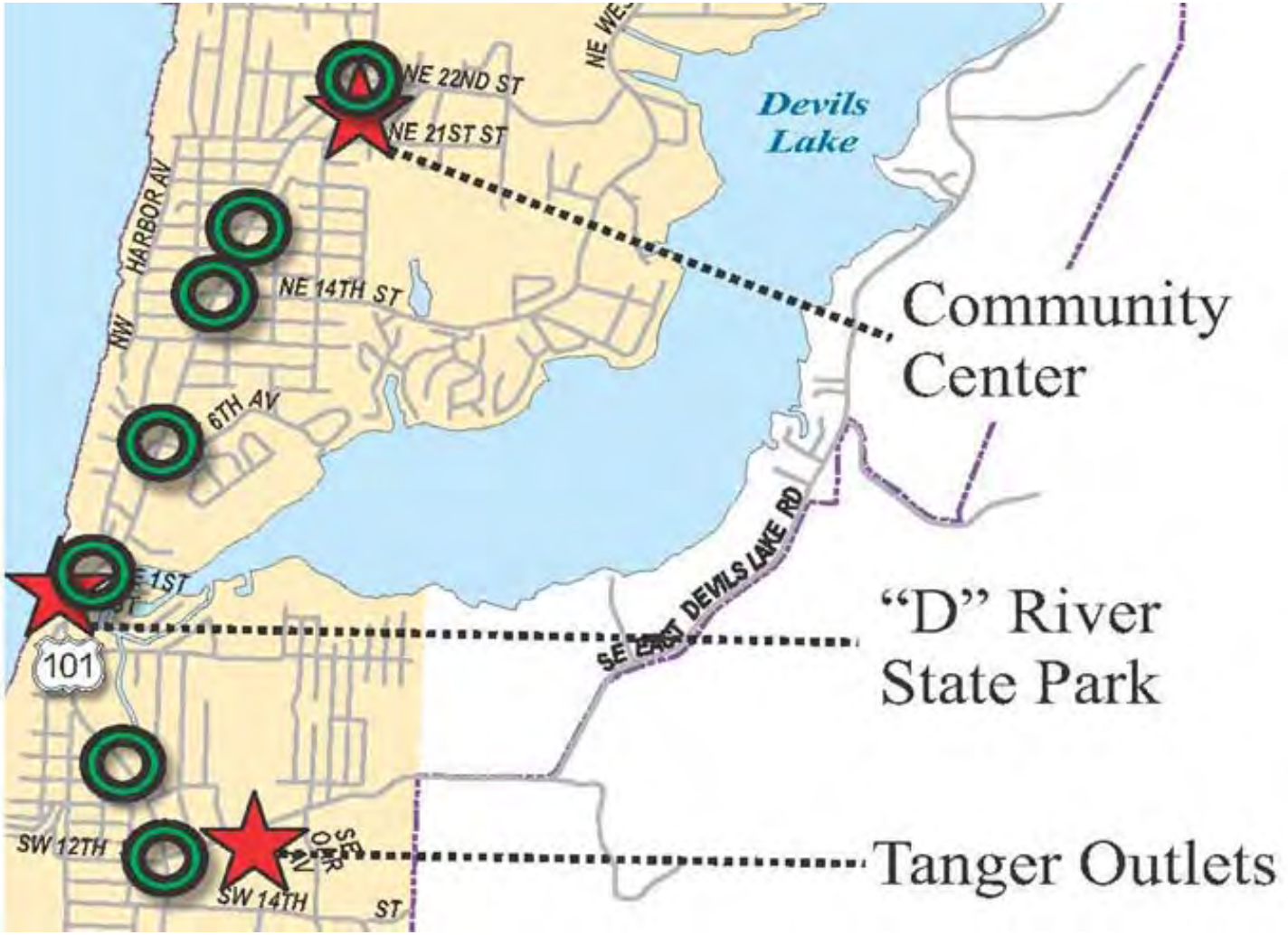
- Adaptive signal timing project funded through ODOT's Innovation and Demonstration Effort resulted in the selection of ATC controllers for Lincoln City.
- FHWA defines adaptive signal timing as "technology that captures current traffic demand data to adjust traffic signal timing to optimize traffic flow in coordinated traffic signal systems."

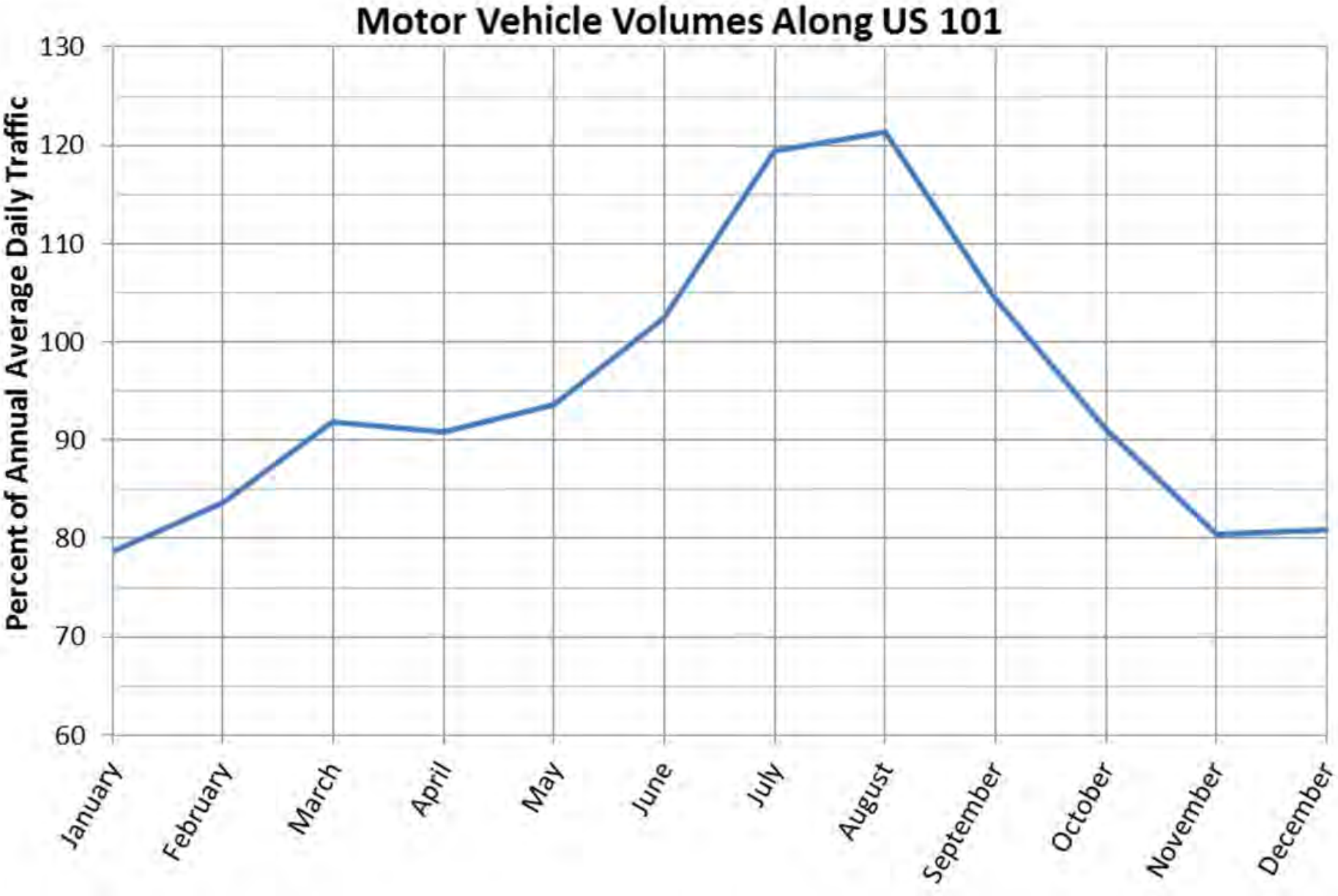
Lincoln City, OR



Lincoln City, OR

Intersection Locations




Motor Vehicle Volumes Along US 101
Percent of Annual Average Daily Traffic
130
120
110
100
90
80
70
60
January
February
March
April
May
June
July
August
September
October
November
December

TRAFFIC ALERT: Extreme traffic along Highway 101 Lincoln City

Traffic Jam

Posted: Saturday, June 27, 2015 11:55 am

The News Guard | 0 comments

Highway 101 south bound through Lincoln City is bumper to bumper today, Saturday, June 27, as thousands visit the city and many enjoy local events such as the annual summer kite festival at the D River Wayside.

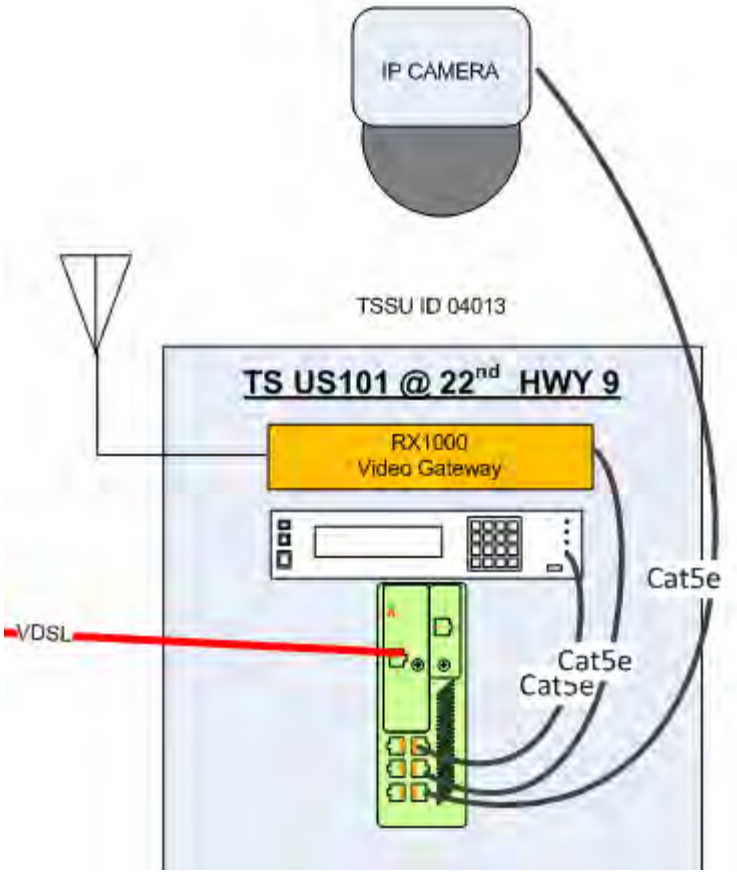
Police are asking motorists to be patient and allow room between vehicles for sudden stops.

Seasonal and Weather-Dependent

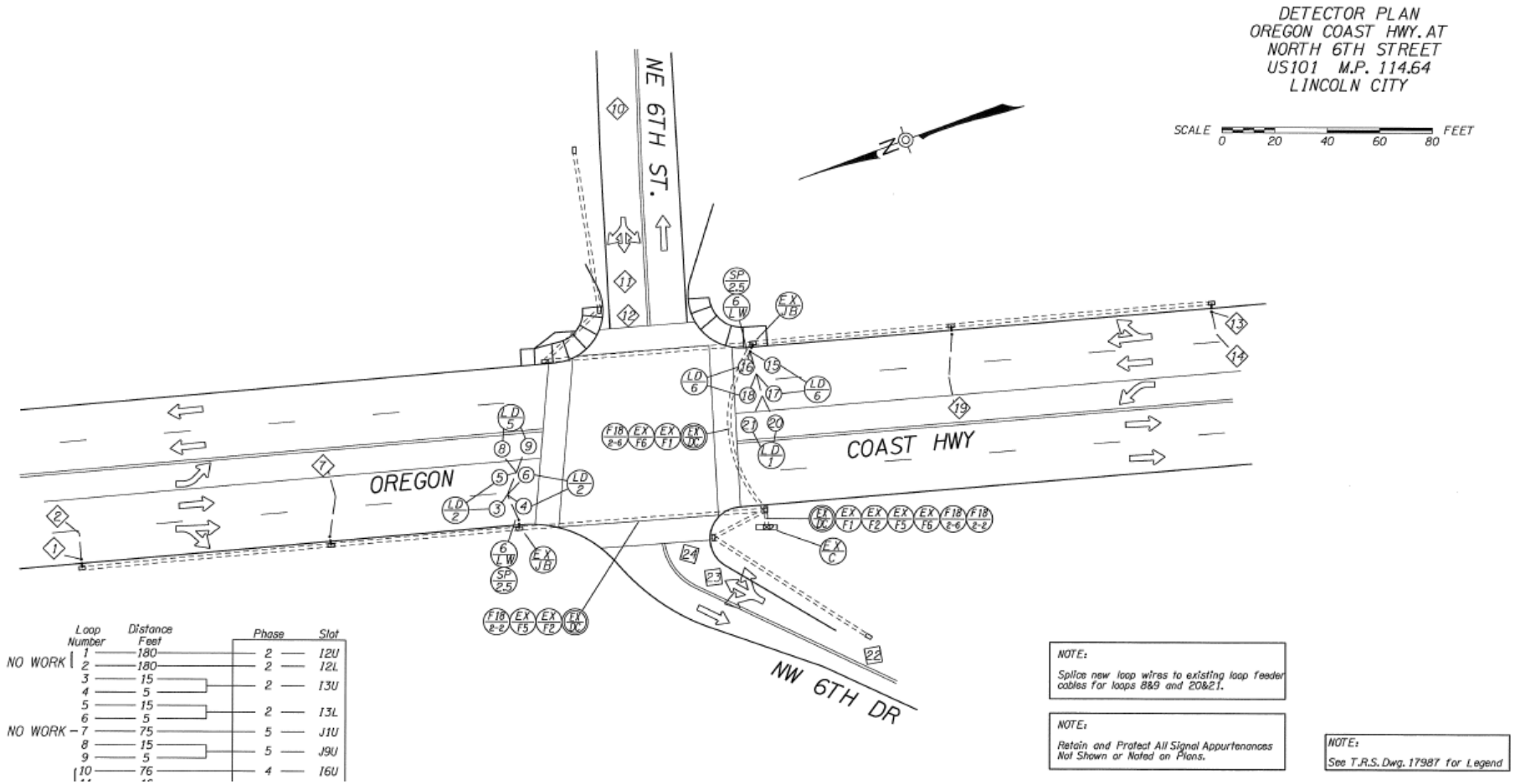
Roadside Improvements

- ATC controllers
- Network equipment
- New loop detectors
- PTZ Cameras
- Bluetooth readers
- local firmware and central software procurement

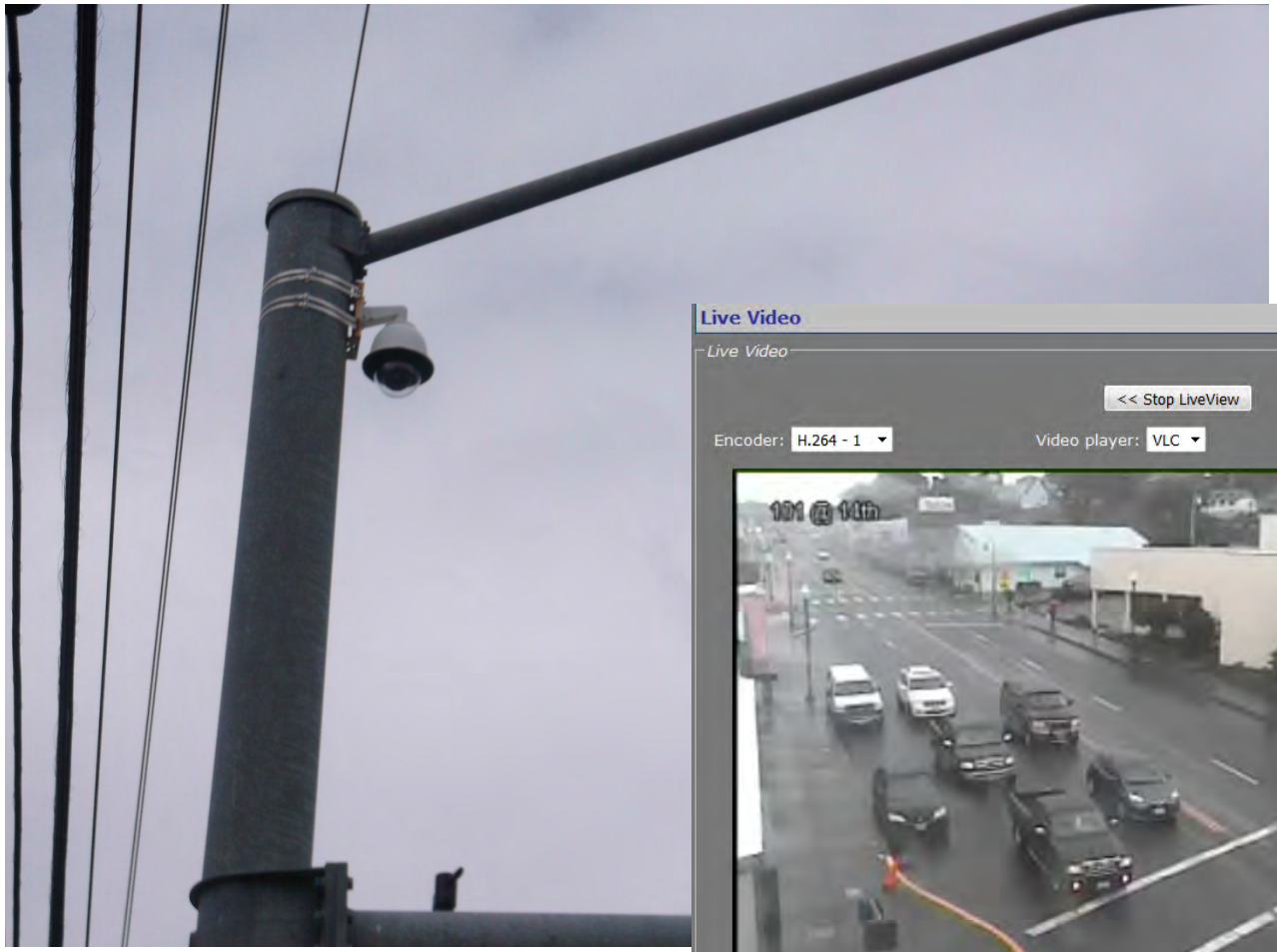
ATC Controllers & Network Equipment



New Loop Detectors



PTZ Cameras



Live Video
Live Video
<< Stop LiveView
Encoder: H.264 - 1
Video player: VLC
101 @ 14th
001
PTZ Control
Preset
GO
1
2
3
4
5
6
7
8
9
Clear
0
SET
On Screen Menu
On

Blutooth Readers

Local Firmware & Central Software

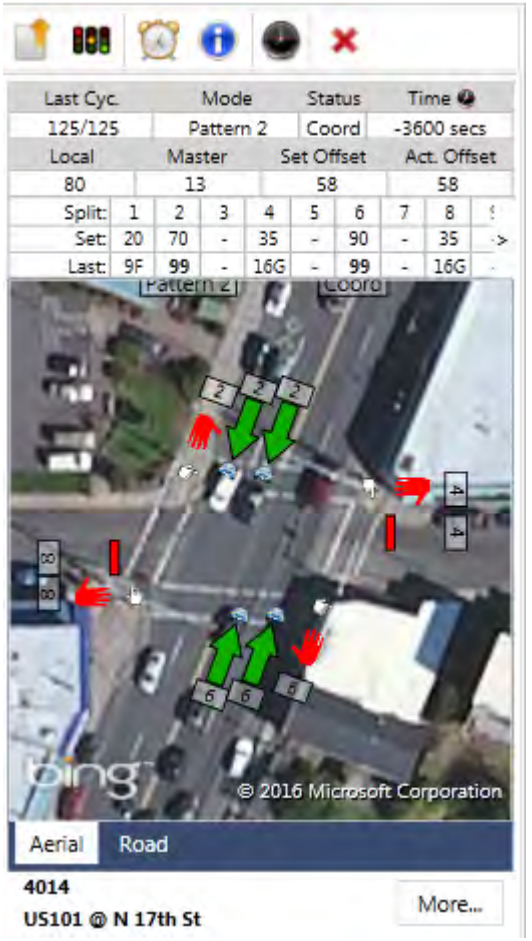
Phase Times

Phase	1	2	3	4
Description	NB	SB		WB
Walk	0	7	0	7
Ped Clear	0	10	0	13
Steady Don't Walk	0	0	0	0
Min Green	3	10	0	5
Passage	2.5	6.0	0.0	2.5
Max 1	15	65	0	25
Max 2	20	86	0	35
Max 3	0	0	0	0
Yellow Change	4.0	4.0	3.0	4.0
Red Clear	0.5	0.5	0.0	0.5

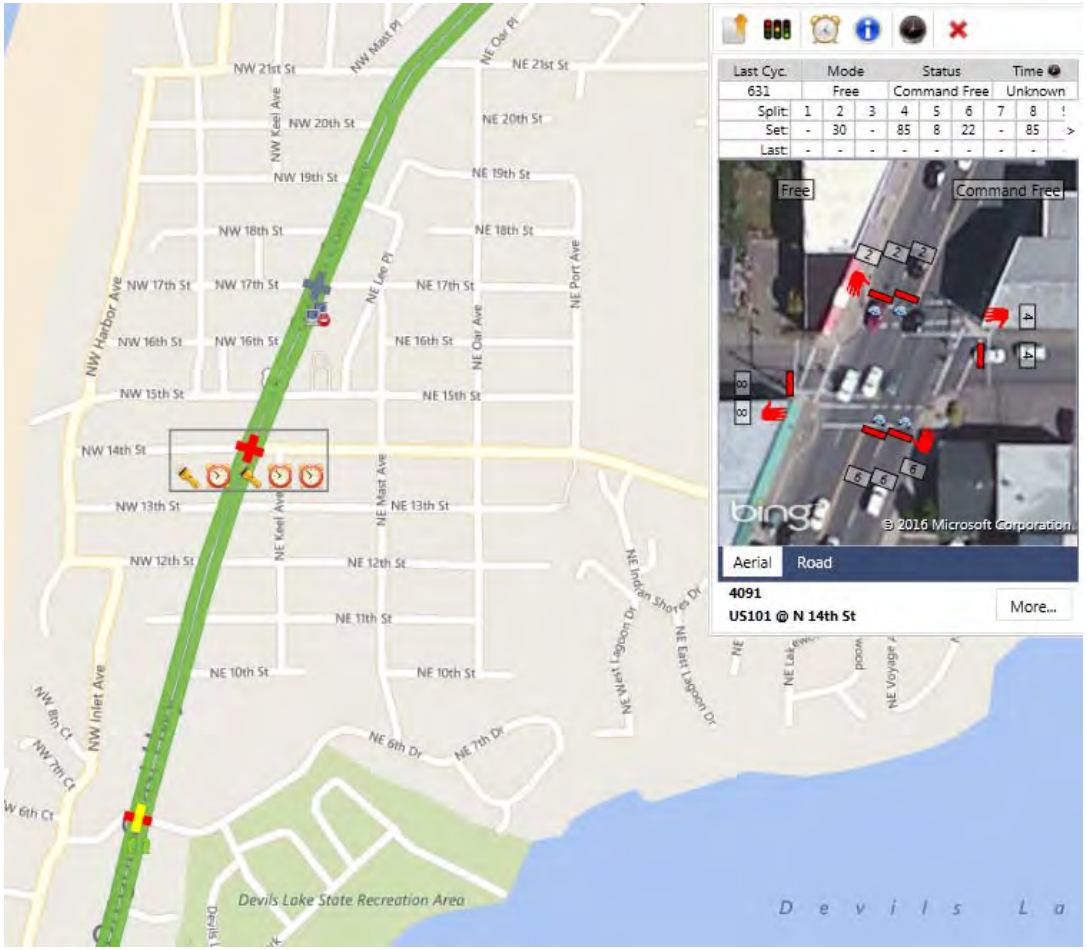
Phase Status

	1								2							
Phase Group	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Reds	●			●				●								
Yellows																
Greens		●				●										
Veh Calls	🚗	🚗				🚗										
Min Calls	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Max Calls	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Ped Calls		☞				☞										
Ped Call	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Alt Ped Calls																
Dont Walks				✋				✋								
Ped Clears																
Walks		🚶				🚶										

Apply



Central System + Alerts



Lincoln City Performance Metrics

->Signal Metrics

Selected Signal

No Signal Selected

Signals

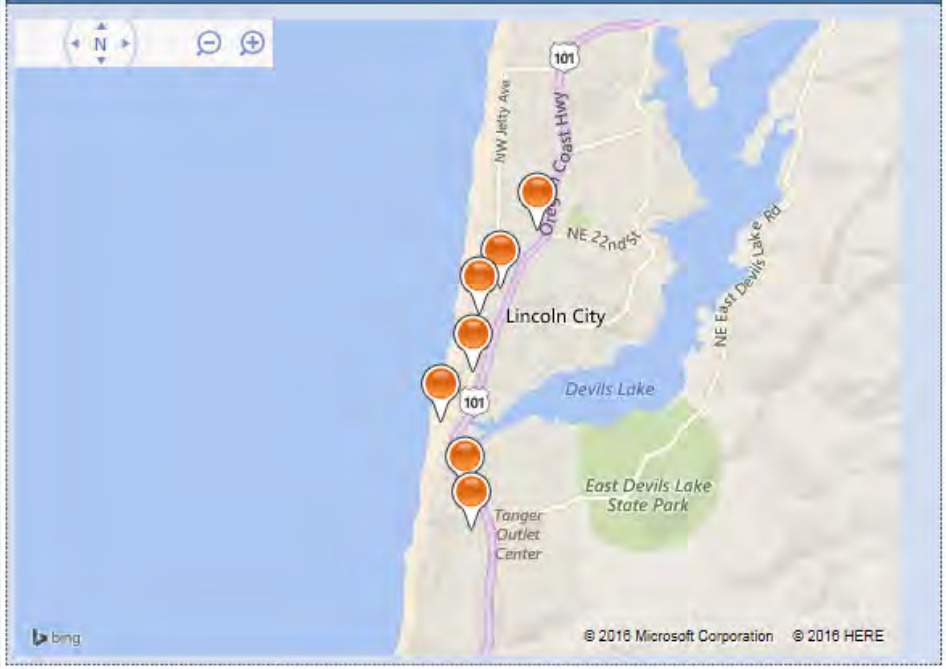
Region: All

Metric Type: All

Filter: Signal Id | Filter | Clear Filter

Signal List

Map



Metric Settings

Metric Type

- Approach Delay
- Approach Volume
- Arrivals On Red
- Purdue Coordination Diagram
- Purdue Split Failure
- Pedestrian Delay
- Preemption Details
- Purdue Phase Termination
- Speed
- Split Monitor
- Turning Movement Counts
- Yellow and Red Actuations

Time Y Axis Maximum: 150

Volume Y Axis Maximum: 2000

Volume Bin Size: 15

Dot Size: Small

☑ Show Plan Statistics

☑ Show Volumes

Export Data

☐ Upload Current Data

Dates

Start Date: 3/21/2016 ... 12:00 AM

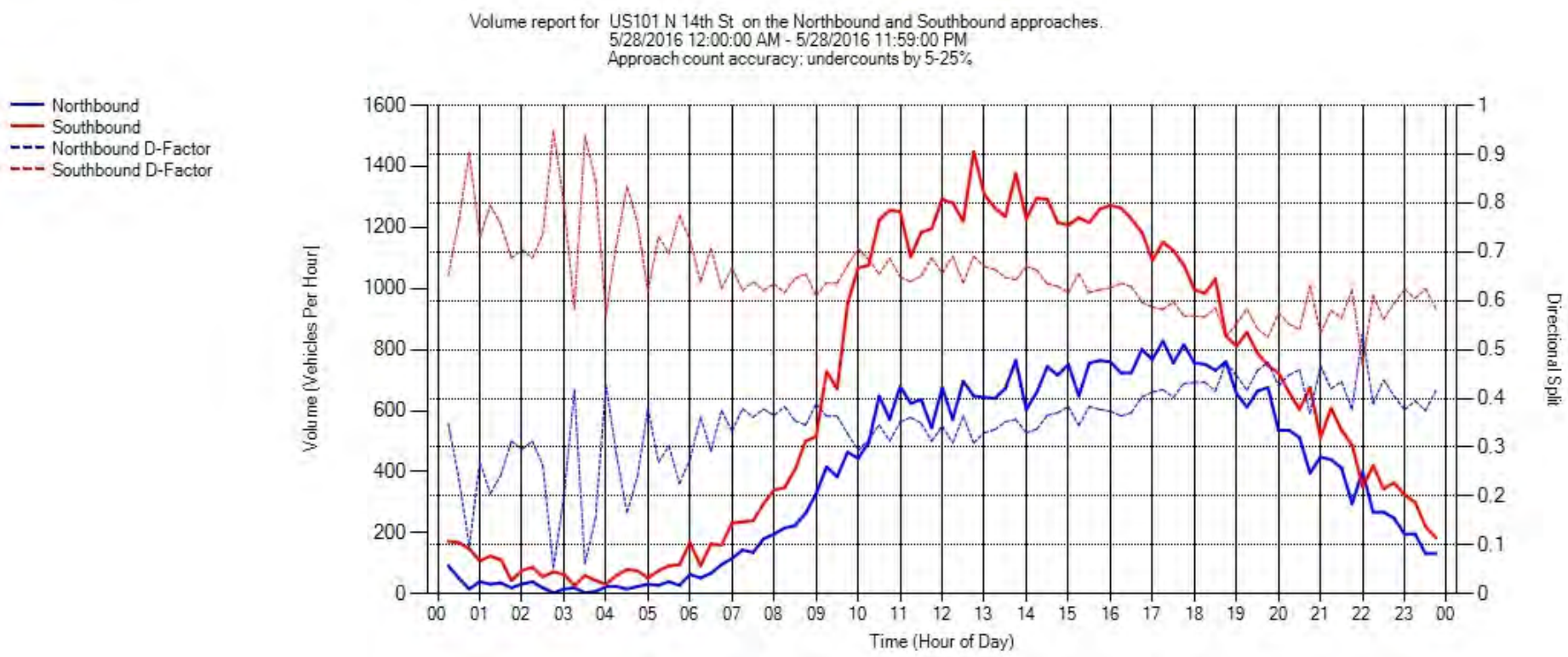
End Date: 3/21/2016 ... 11:59 PM

Reset Date

< March 2016 >

Sun	Mon	Tue	Wed	Thu	Fri	Sat
28	29	1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31	1	2
3	4	5	6	7	8	9

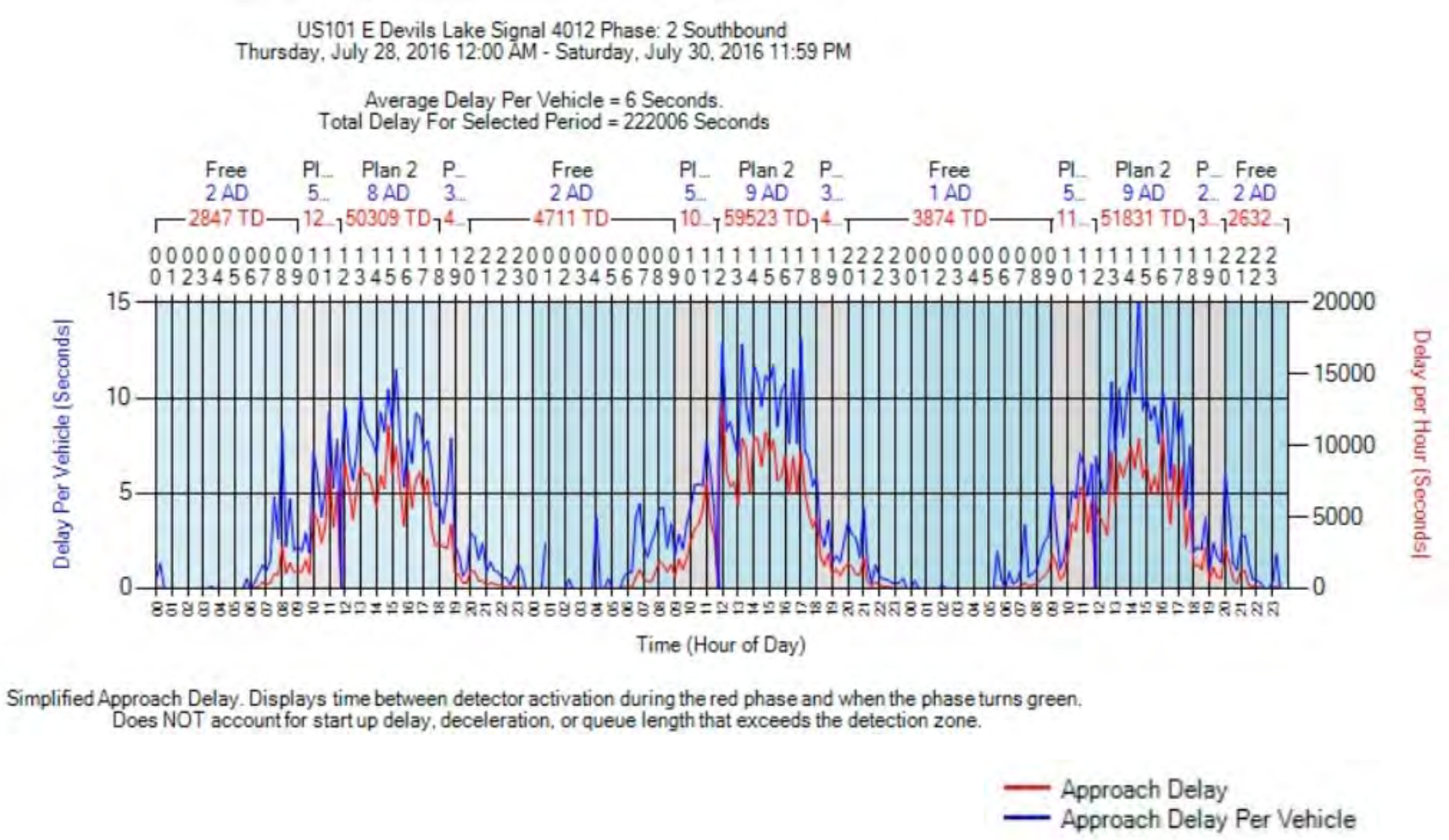
Approach Volumes



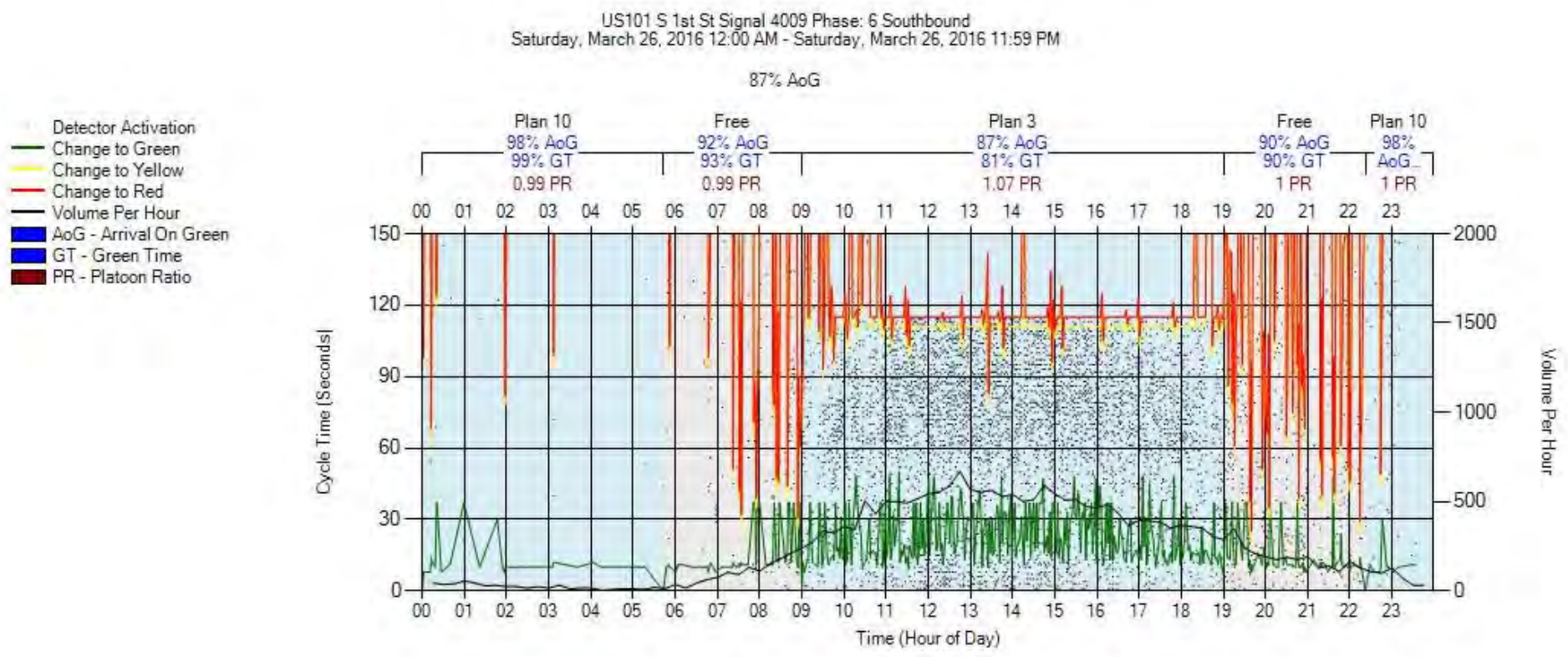
Approach Volumes

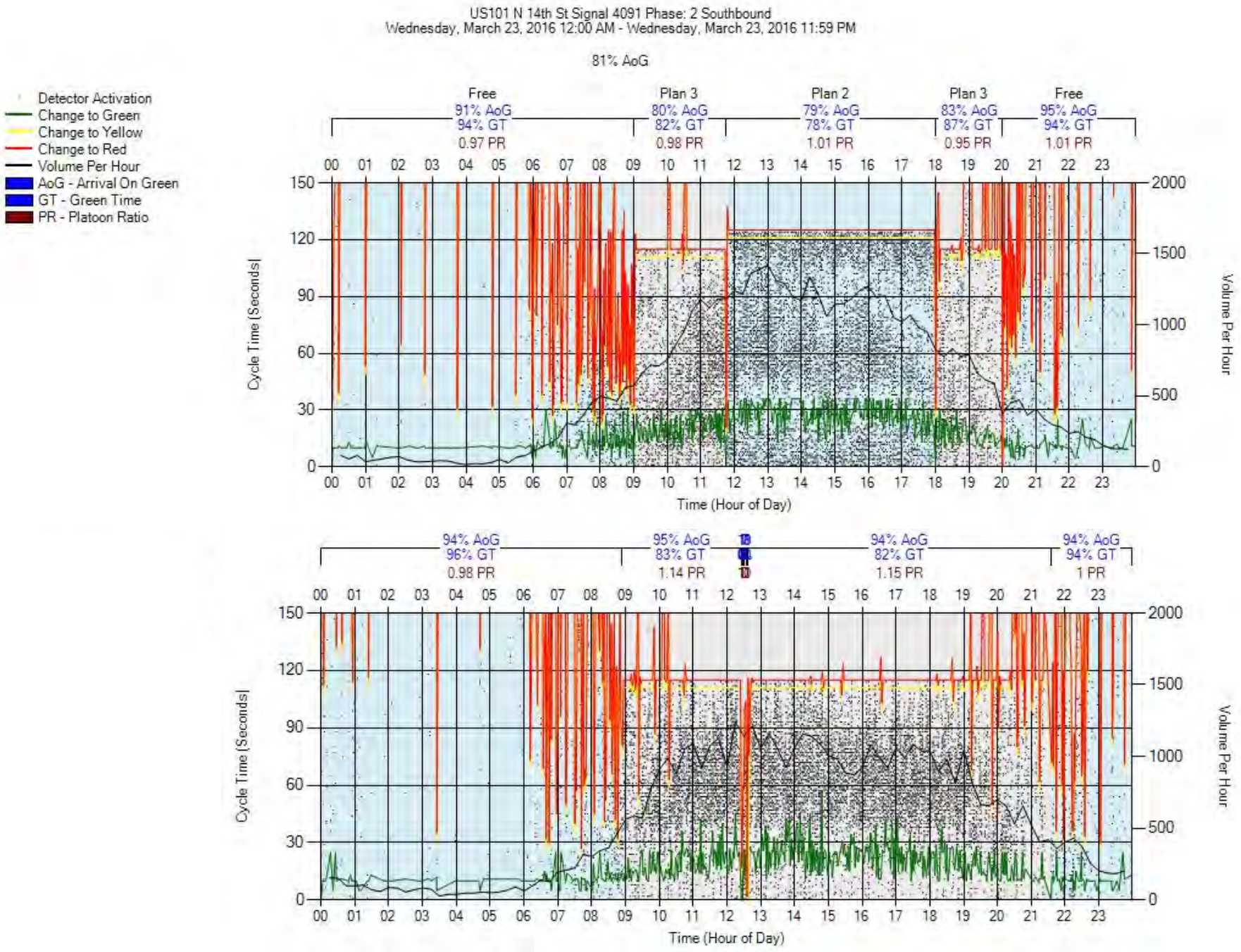
Metric	Value
Total Volume	24,569
Peak Hour	3:30 PM - 4:30 PM
Peak Hour Volume	2,004
PHF	0.986
Peak-Hour K-factor	0.0816
Northbound Total Volume	9,199
Northbound Peak Hour	5:00 PM - 6:00 PM
Northbound Peak Hour Volume	792
Northbound PHF	0.957
Northbound Peak-Hour K-factor	0.0861
Northbound Peak-Hour D-factor	1.4
Southbound Total Volume	15,370
Southbound Peak Hour	12:15 PM - 1:15 PM
Southbound Peak Hour Volume	1,314
Southbound PHF	1
Southbound Peak-Hour K-factor	0.0855
Southbound Peak-Hour D-factor	0.487

Approach Delay

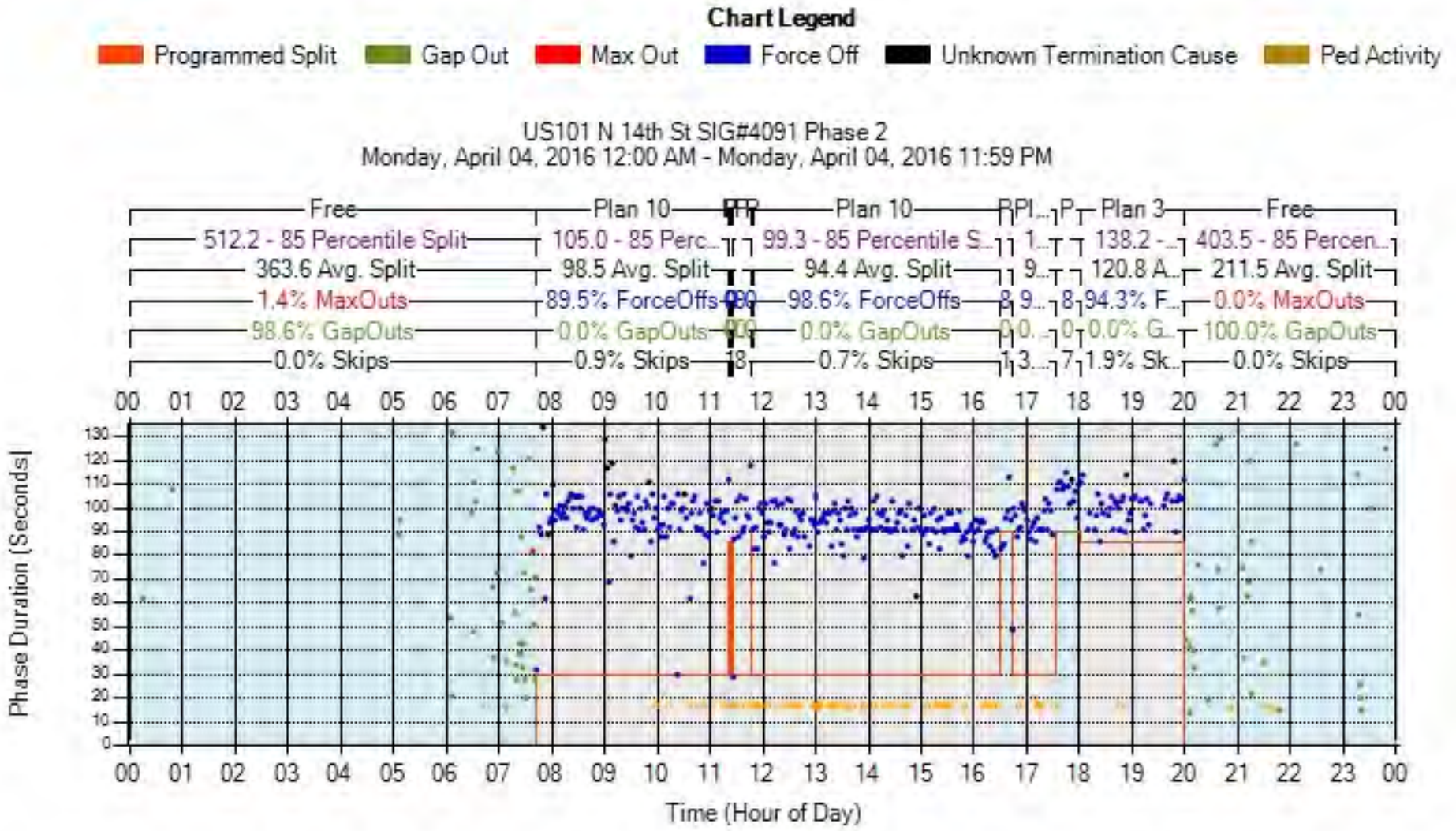


Purdue Coordination Diagram



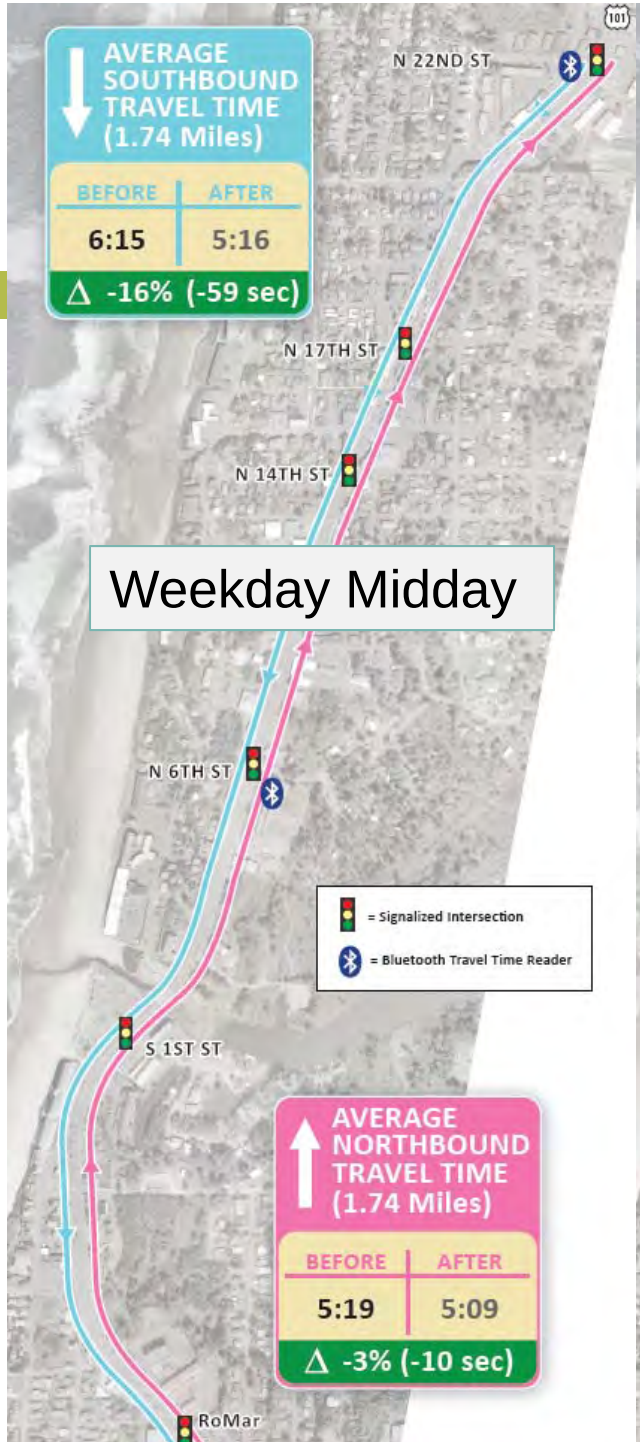

US101 N 14th St Signal 4091 Phase: 2 Southbound
Wednesday, March 23, 2016 12:00 AM - Wednesday, March 23, 2016 11:59 PM
81% AoG
Detector Activation
Change to Green
Change to Yellow
Change to Red
Volume Per Hour
AoG - Arrival On Green
GT - Green Time
PR - Platoon Ratio
Free
91% AoG
94% GT
0.97 PR
Plan 3
80% AoG
82% GT
0.98 PR
Plan 2
79% AoG
78% GT
1.01 PR
Plan 3
83% AoG
87% GT
0.95 PR
Free
95% AoG
94% GT
1.01 PR
Cycle Time (Seconds)
Volume Per Hour
Time (Hour of Day)
94% AoG
96% GT
0.98 PR
95% AoG
83% GT
1.14 PR
94% AoG
82% GT
1.15 PR
94% AoG
94% GT
1 PR
Cycle Time (Seconds)
Volume Per Hour
Time (Hour of Day)

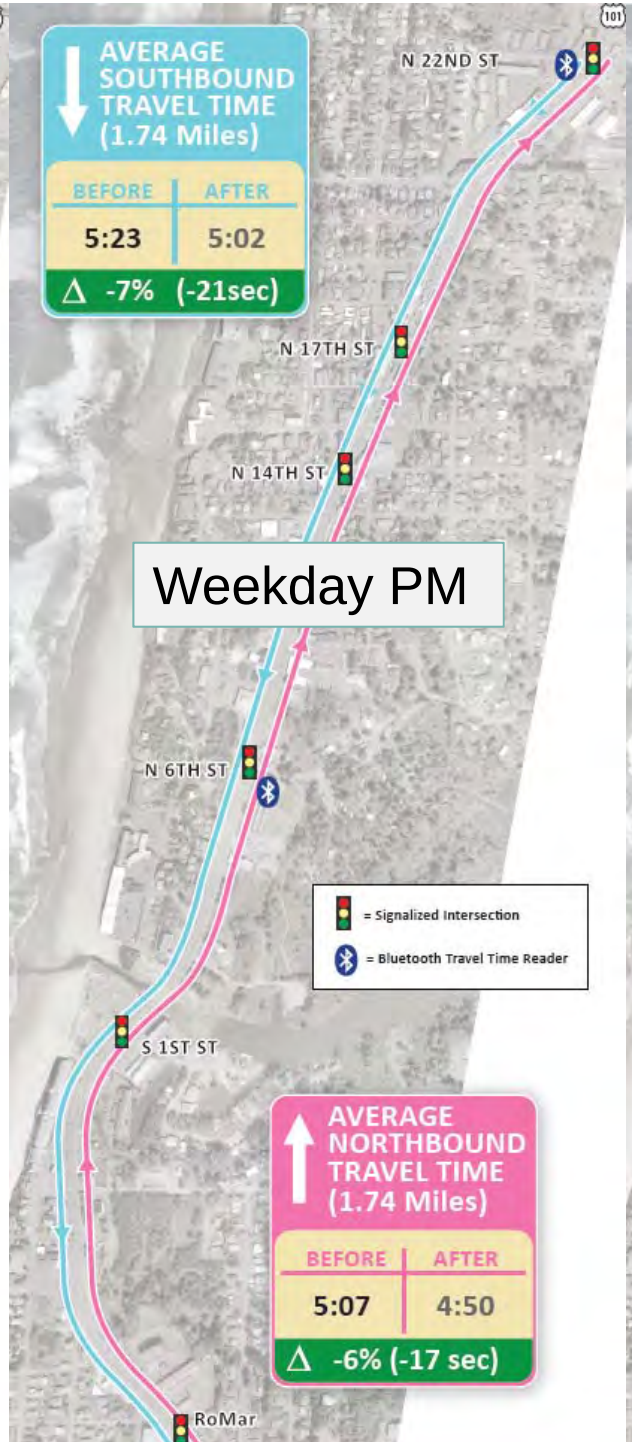
Split Monitor

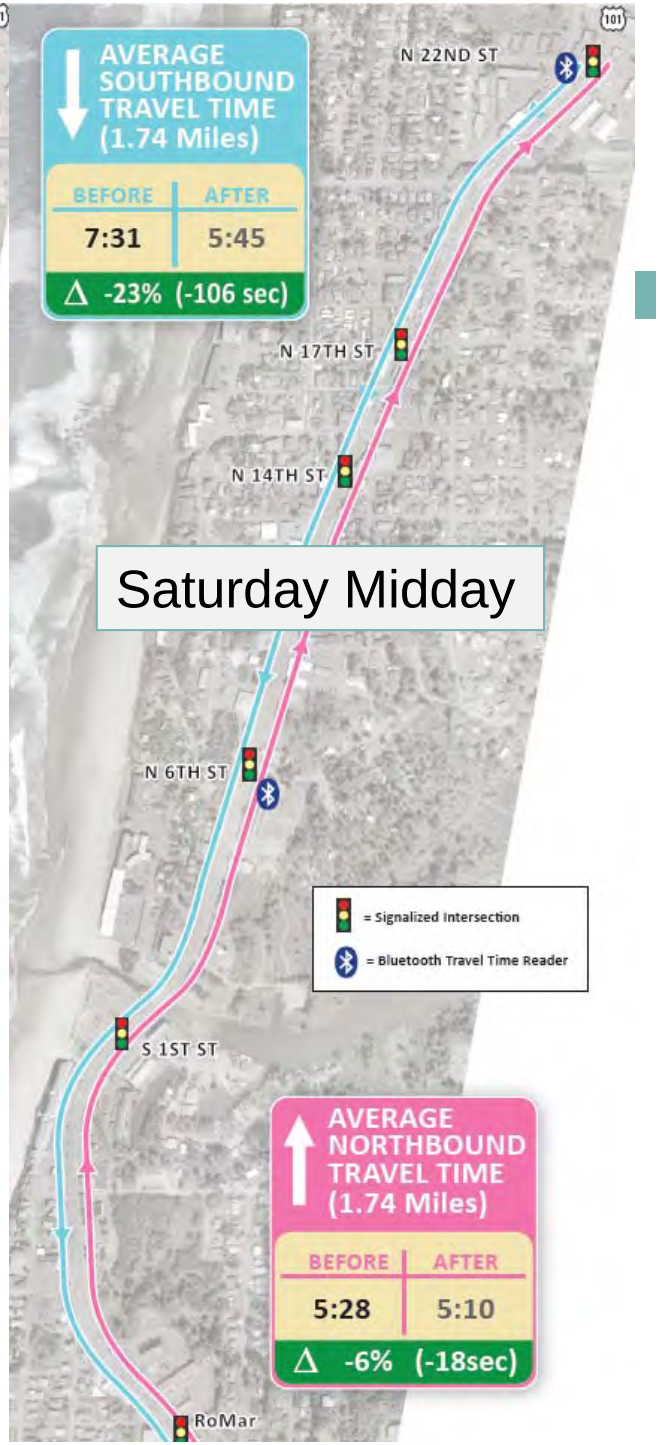


Lincoln City System Evaluation

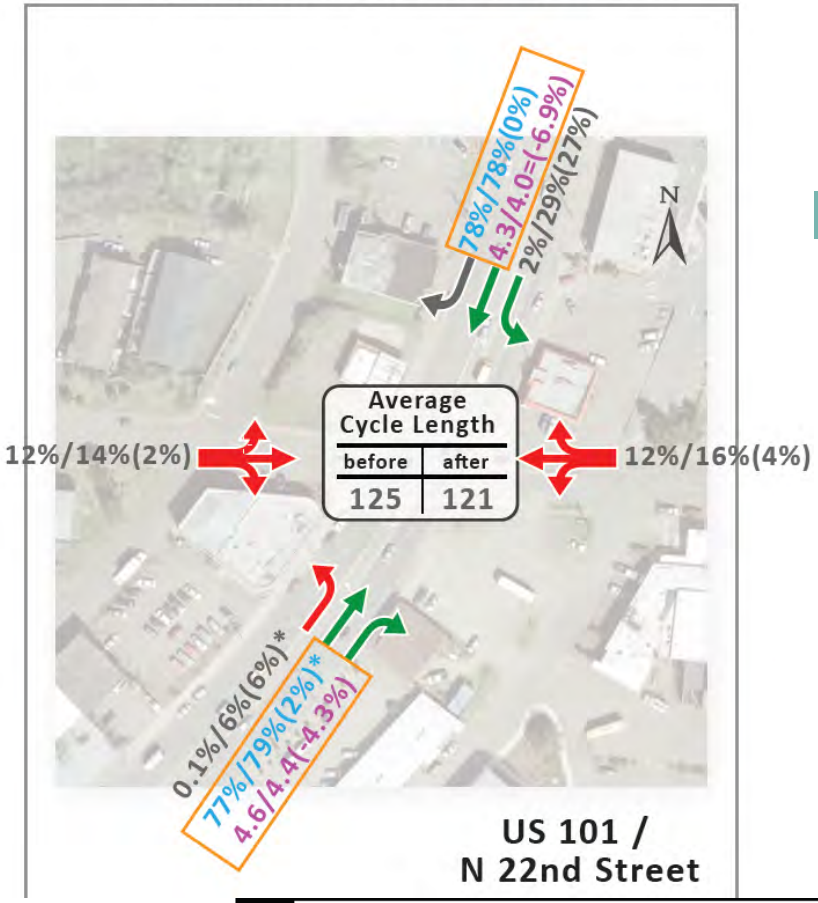
- Hired Consultant for before/after evaluation
  - Before: time of day plans implemented in 2014
  - After: MaxAdapt version 1.0
- Evaluation Strategy
  - Bluetooth travel time readers
  - High-Res. Controller Signal Performance Measures (SPMs)

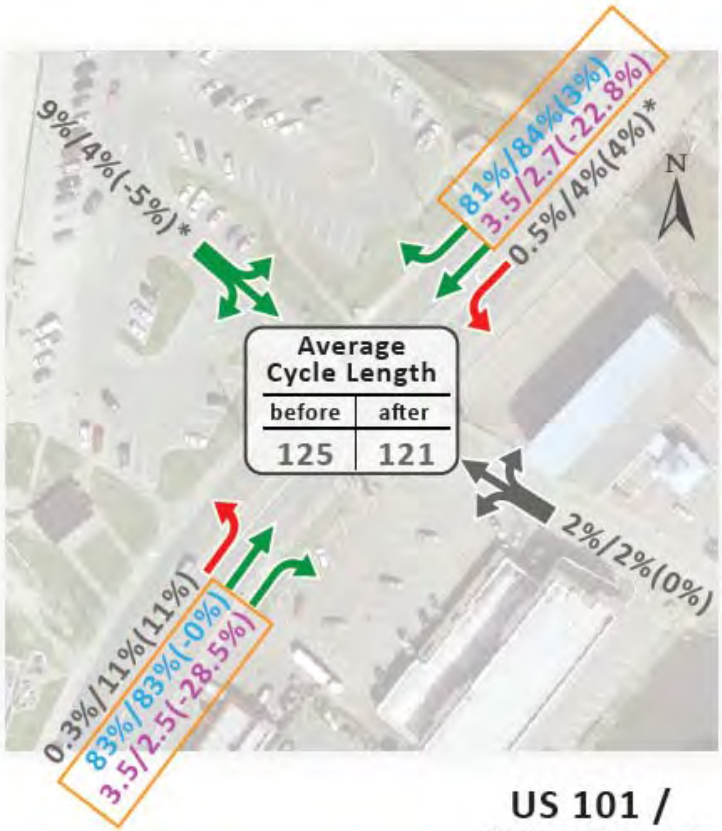

AVERAGE SOUTHBOUND TRAVEL TIME (1.74 Miles)
BEFORE
AFTER
6:15
5:16
Δ -16% (-59 sec)
N 22ND ST
N 17TH ST
N 14TH ST
N 6TH ST
S 1ST ST
RoMar
Weekday Midday
= Signalized Intersection
= Bluetooth Travel Time Reader
AVERAGE NORTHBOUND TRAVEL TIME (1.74 Miles)
BEFORE
AFTER
5:19
5:09
Δ -3% (-10 sec)


AVERAGE SOUTHBOUND TRAVEL TIME (1.74 Miles)
BEFORE
AFTER
5:23
5:02
Δ -7% (-21sec)
N 22ND ST
N 17TH ST
N 14TH ST
N 6TH ST
S 1ST ST
RoMar
Weekday PM
= Signalized Intersection
= Bluetooth Travel Time Reader
AVERAGE NORTHBOUND TRAVEL TIME (1.74 Miles)
BEFORE
AFTER
5:07
4:50
Δ -6% (-17 sec)


AVERAGE SOUTHBOUND TRAVEL TIME (1.74 Miles)
BEFORE
AFTER
7:31
5:45
Δ -23% (-106 sec)
N 22ND ST
N 17TH ST
N 14TH ST
N 6TH ST
S 1ST ST
RoMar
Saturday Midday
= Signalized Intersection
= Bluetooth Travel Time Reader
AVERAGE NORTHBOUND TRAVEL TIME (1.74 Miles)
BEFORE
AFTER
5:28
5:10
Δ -6% (-18sec)

Comparative Signal Performance





LEGEND

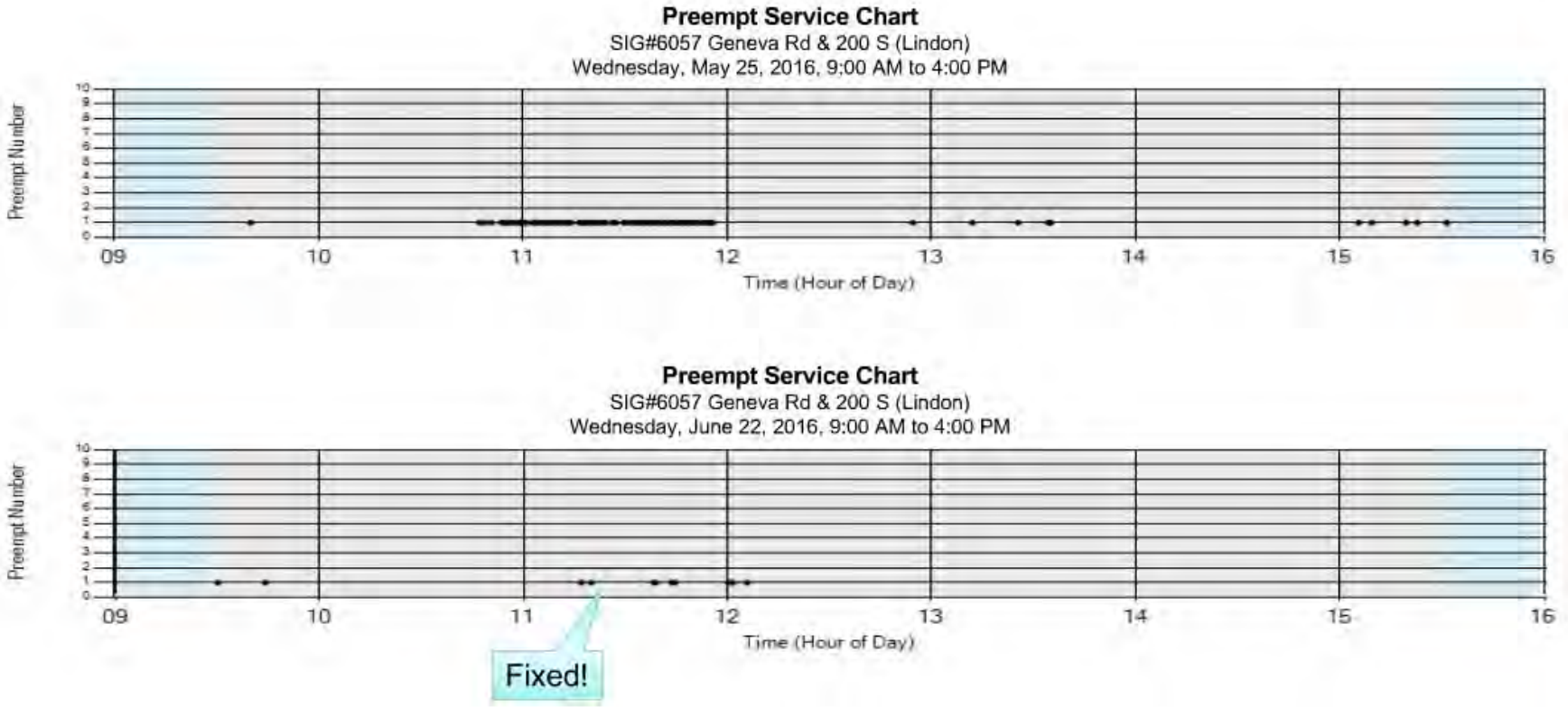
- ###/### = Percent force offs termination: Before/After
- (###%) = Percent change in % of force offs phase termination: Before/After
- ###/### = Percent arrival on green (~quality of progression): Before/After
- (###%) = Percent change in % arrival on green: Before/After
- ###/### = Average approach delay: Before/After
- (###%) = Percent change in average approach delay: Before/After
- * = Significant Change (P <0.05)

→ Improved with adaptive → Degraded with adaptive

Lincoln City Adaptive - Results

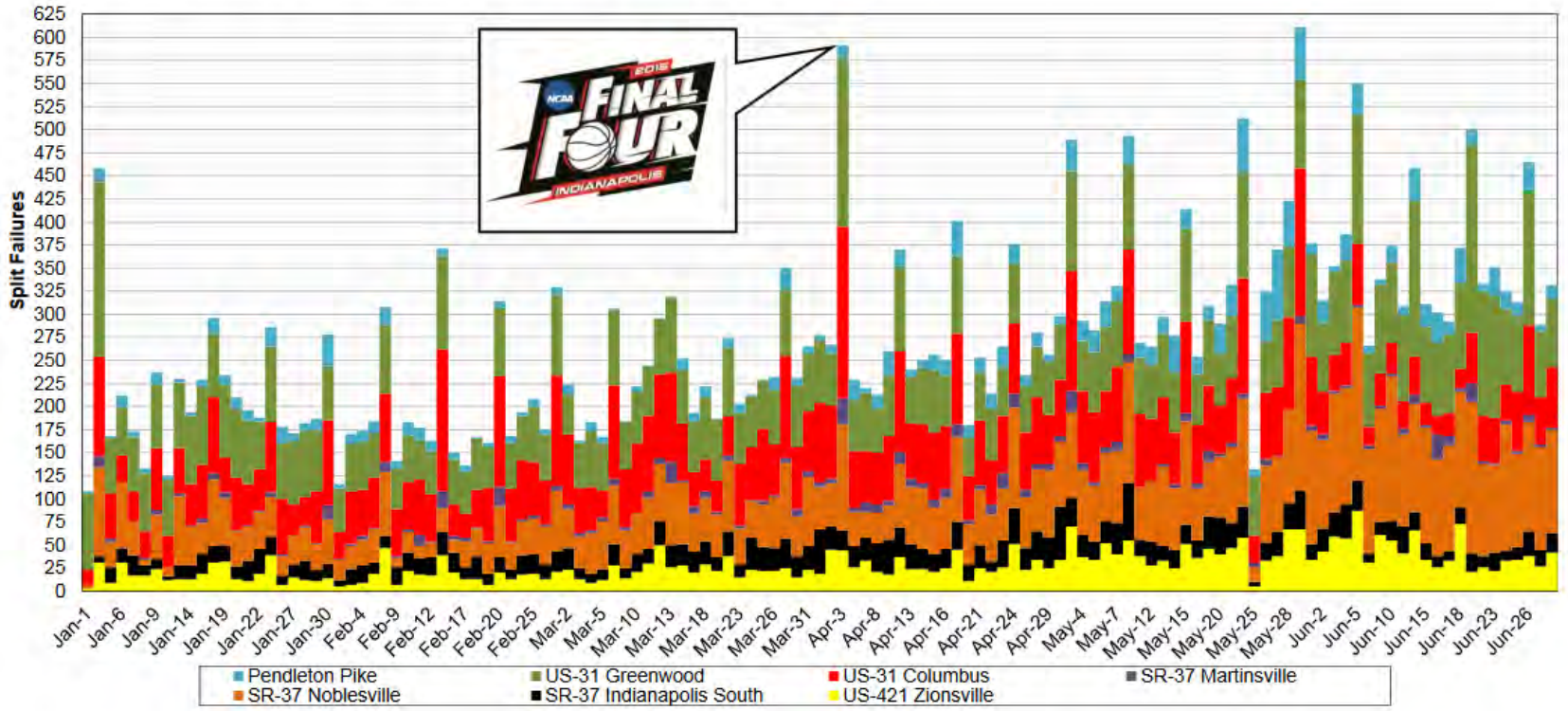
- Decrease in average travel time during all analysis periods (-5% to -23%)
- Largest improvement in southbound direction

What Other Agencies are Doing - Troubleshooting Example

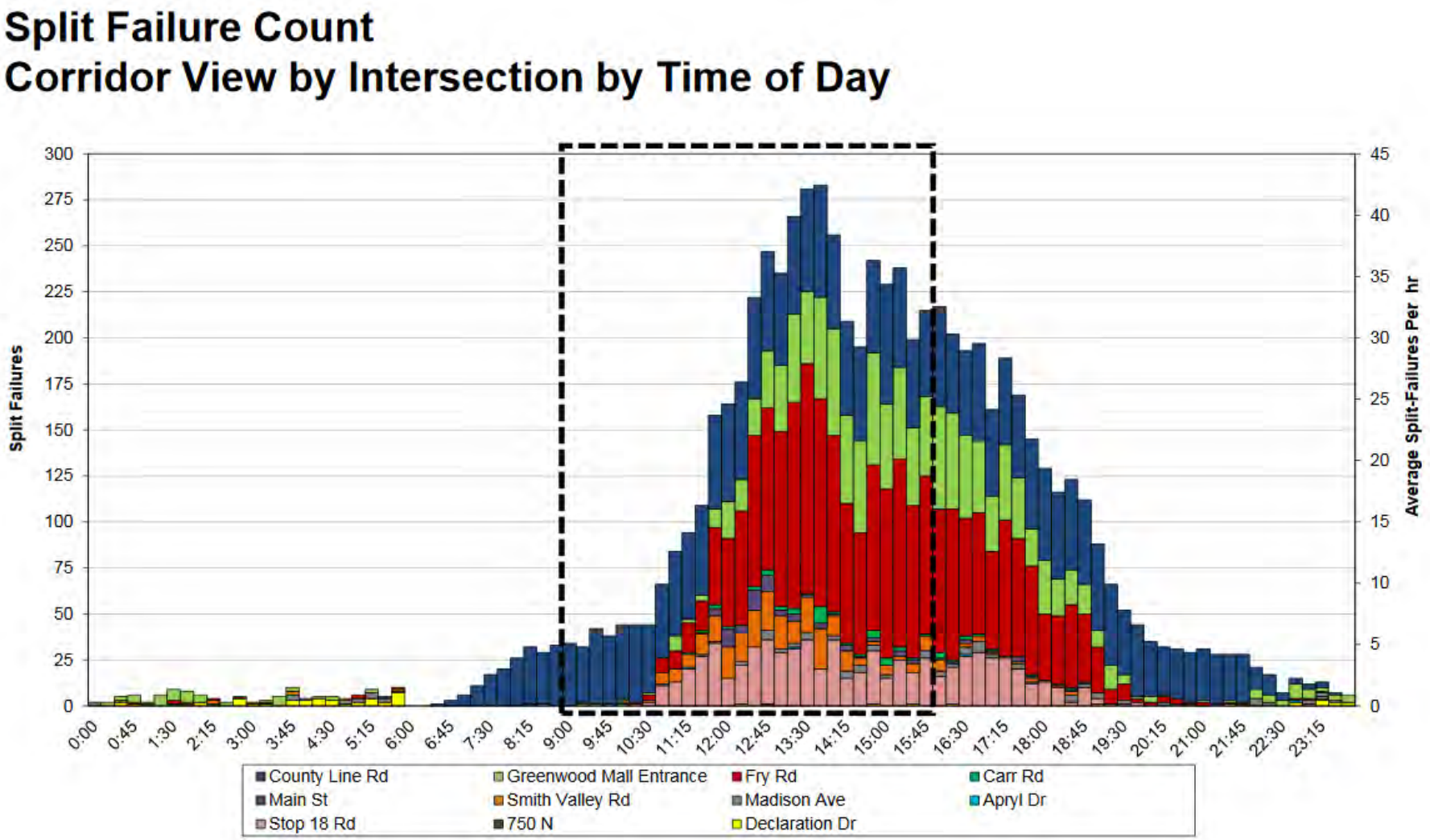


What Other Agencies are Doing

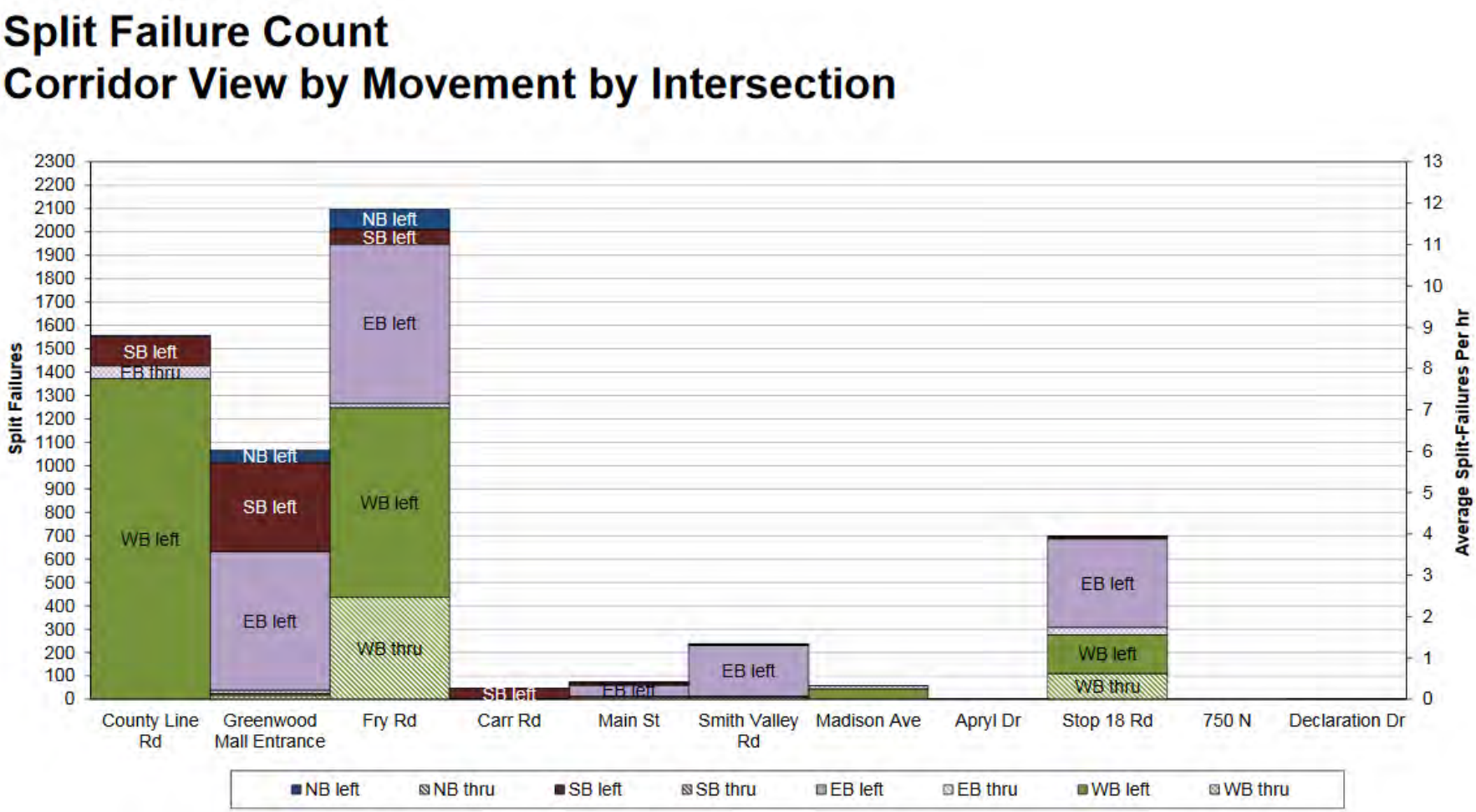
Segmentation by Time of Day:
Looking Only at the Midday (0900-1600)



What Other Agencies are Doing

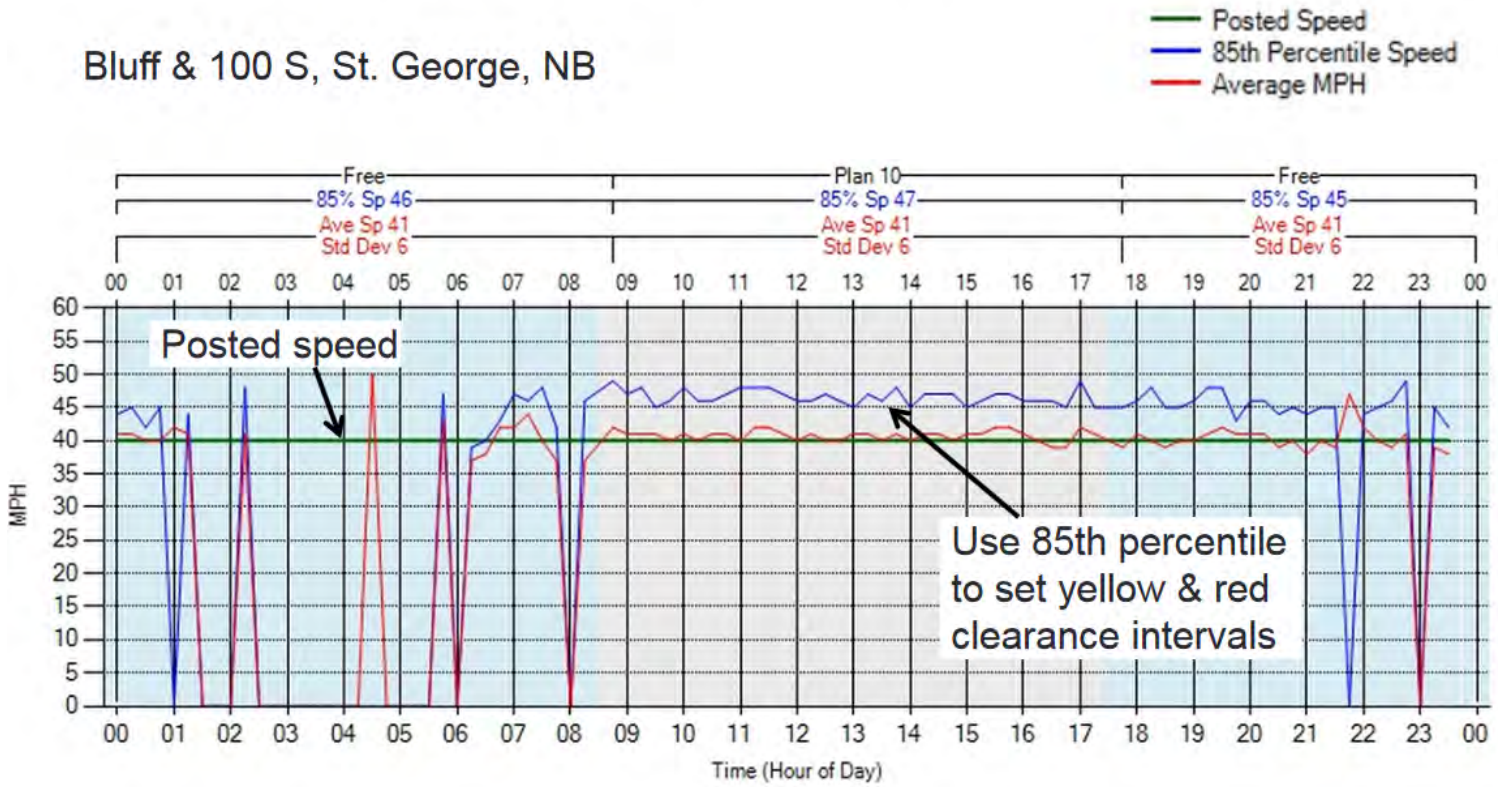


What Other Agencies are Doing



What Other Agencies are Doing

Approach Speeds



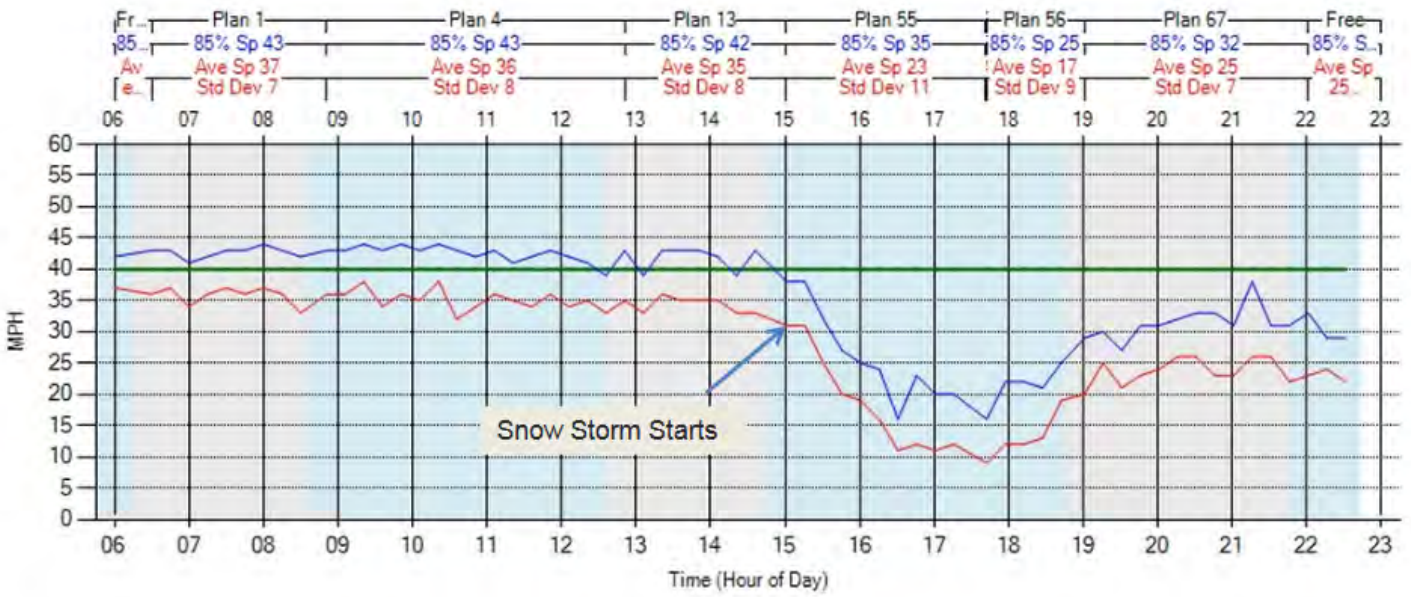
Metric: Approach Speeds

Detection Requirements: Wavetronix Advance Radar

What Other Agencies are Doing

Operations & Traffic Study Example:

Vehicle Speeds at Intersections

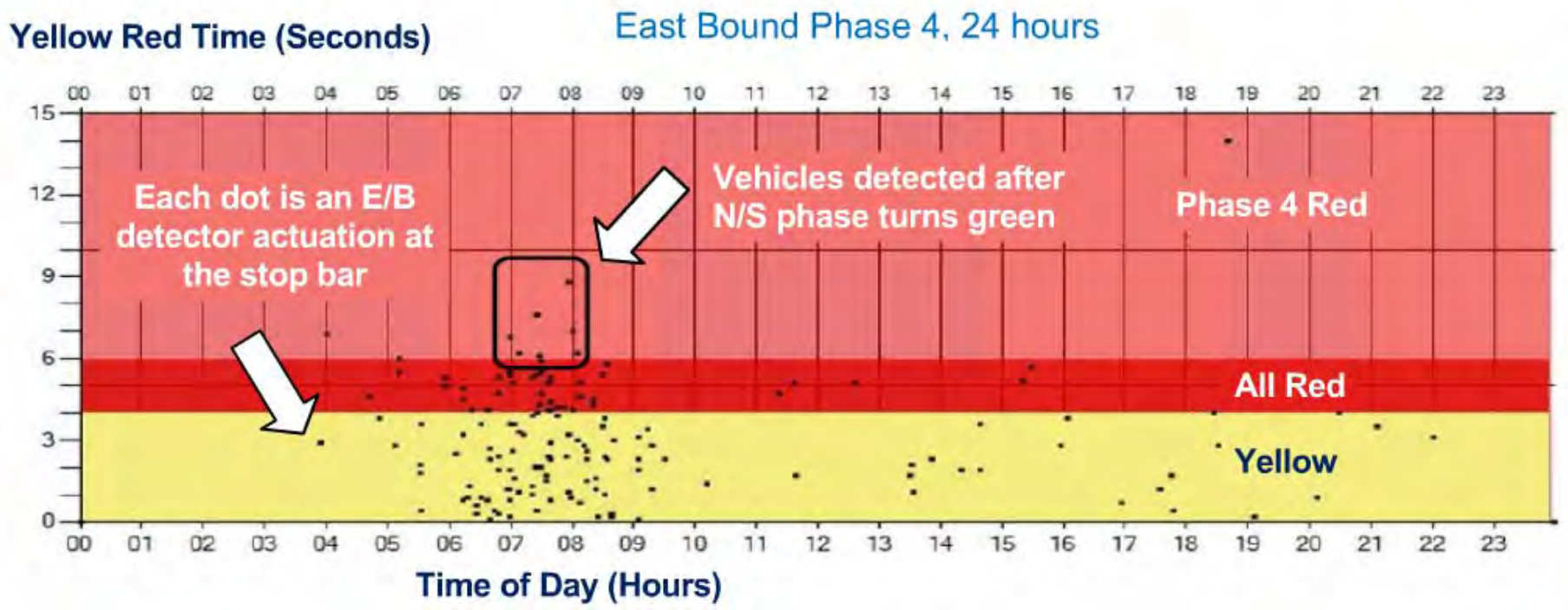


Metric: Approach Speeds

Detection Requirements: Wavetronix Advance Radar

What Other Agencies are Doing

Red Light Monitoring



Performance Measures Tied to Agency Goals

Goal	Context	Objective and Strategy	Performance Measure
Safety	**Traffic demand:** Light, moderate, heavy, congested	Smooth flow, Queue management	Purdue Coordination Diagram, Arrivals on Red, Travel Time,
Good State of Repair	**Network:** CBD, Urban, Suburban (Linear Arterial, Grid, Interchange)	• Equitable distribution of green time, • Frequent service of peds and bikes	Approach Volume, Split Failure, pedestrian / bicycle delay vehicle delay
Mobility	**User mix:** peds, bike, transit, vehicle, freight	**Throughput:** high density at stop bar	Turning Movement Counts, Split Monitor, Preemption Details
Quality Customer Service	Organizational capability	Safely Transfer Right of Way	Yellow and Red Actuations, Queue length

Opportunity to Transform the Practice

- Benefits
  - Active management of systems
  - Identify and fix problems before the public does
  - Tie performance measures to agency goals
  - Increase Safety
  - Improve Operations

- Future Innovations in SPMs

Thank You

- Julie Kentosh, P.E., PTOE
  - (503) 986-2826
  - julie.l.kentosh@odot.state.or.us

Oregon

Department of Transportation
Traffic-Roadway Section
Traffic Control Plans Unit

INTEROFFICE MEMO

DATE: October 3, 2016

TO: Oregon Traffic Control Devices Committee (OTCDC)

FROM: Scott M. McCanna, P.E.
State Work Zone Engineer

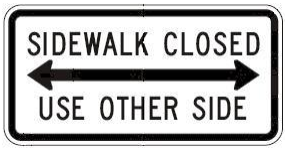
SUBJECT: "SIDEWALK CLOSED AHEAD" Sign

When a sidewalk is temporary closed as part of a roadway construction/maintenance project, the temporary traffic control plan (TCP) includes mitigations for the closure – including temporary signing.

Current MUTCD signing is limited to regulatory signs and confusing applications for pedestrians – particularly in providing advance warning of a sidewalk closure downstream:

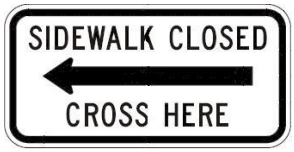
CURRENT SIGNS AVAILABLE:

R9-9



R9-10

R9-11



R9-11a

For the purpose of advance warning of a sidewalk closure, the closest sign available is the "SIDEWALK CLOSED" (R9-9) sign. However, the MUTCD provides the following guidance for the use of this sign:

> *The SIDEWALK CLOSED (R9-9) sign should be installed at the beginning of the closed sidewalk, at the intersections preceding the closed sidewalk, and elsewhere along the closed sidewalk as needed.*

While the guidance provides a clear message based on its current use and location, its ambiguity as an advance warning sign is the impetus behind an improved measure.

PROPOSAL:

For motor vehicle traffic, when we warn motor vehicle traffic of a pending work zone, lane closure, approaching signal, or change in speed, standard signing includes orange diamond (warning) signs:

For consistency in managing *all* road users in Oregon work zones, the advance warning for pedestrians should mimic the messages and formats provided to motor vehicle users.

Therefore, the following sign is being proposed to provide advance warning for pedestrians of a pending sidewalk closure:

DESIGN & IMPLEMENTATION:

The "SIDEWALK CLOSED AHEAD" sign would be designed as a 24" x 24" (min.) sign which serves two functions – Useful in limited right of way environments; and, the smaller size would minimize distractions to motor vehicles. The sign can be installed either as a roll-up sign on a portable sign support; on a single-post TSS; or, on a Type II barricade.

The sign will be referenced on ODOT Standard Drawings, where applicable. Use of the sign will be particularly valuable where the distance to the closure, and corresponding detour location, might exceed a standard block length and normal pedestrian expectations.

The sign would also be included in the TCP Design Manual, the TCP Cost Estimator Excel-based tool, and the update to the 2011 Oregon Temporary Traffic Control Handbook (OTTCH).

As shown earlier, use and placement of standard regulatory signing would remain unaffected, and be included at closure points and locations identified in the MUTCD, ODOT Standard Drawings and the OTTCH.

Oregon

Department of Transportation
Traffic-Roadway Section
Traffic Control Plans Unit

INTEROFFICE MEMO

DATE: December 5, 2016

TO: Oregon Traffic Control Devices Committee (OTCDC)

FROM: Scott M. McCanna, P.E.
State Work Zone Engineer

SUBJECT: Work Zone Bicycle Accommodations – "Bicycles KEEP LEFT (RIGHT)" Sign Design Changes

---

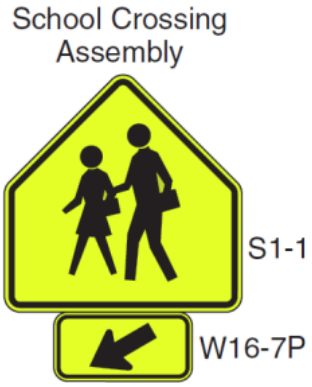
BACKGROUND:

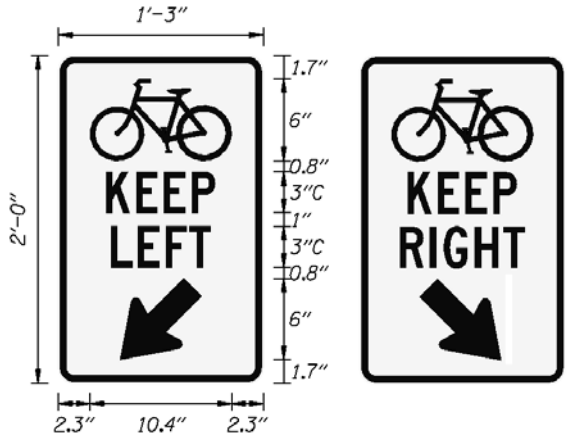
The OTCDC provided recommendations to ODOT regarding the development of the "Bicycles KEEP LEFT (RIGHT)" sign – currently in the ODOT Sign Policy & Guidelines as Sign #CR4-22a (b).

Following the Bicycle/Pedestrian Work Zone Demonstration in May, 2016, in Salem, comments received from cyclists, other ODOT Region participants and the State Work Zone Engineer, the following changes are being proposed to improve the overall usability and effectiveness of this sign.

Recommended design modifications include:

1) Increasing the sign size. The 12" x 18" size is too small to be readily seen, immediately read or interpreted at a distance of more than approximately 50 feet. As shown below, the new size would be 15" x 24" – including 3" text; and, 6" tall bicycle and 6" tall arrow symbols.
2) Changing the direction of the arrow on the sign to point <u>down</u> to the left (or right). The Work Zone Demo revealed a different approach. Commenters pointed out the similarity of the directional arrows used at school crossing locations – positioned and pointed directly at the pedestrian facility. A down-left (right) arrow pointing at the temporary bicycle pathway might serve in this same capacity.





New Sign Designs

Additional comments suggested more strategic locations for the signing to better guide cyclists into/along the temporary bicycle pathway. Feedback suggested placing the sign at/near the beginning of the BCD run/taper, but behind the devices to avoid riders from contacting the sign or support. These ideas will be incorporated into any subsequent TCP standard drawings or details.