PENNDOT COLOR DMS TEST PLAN

TRANSPORTATION ENGINEERING AND SAFETY CONFERENCE 2017

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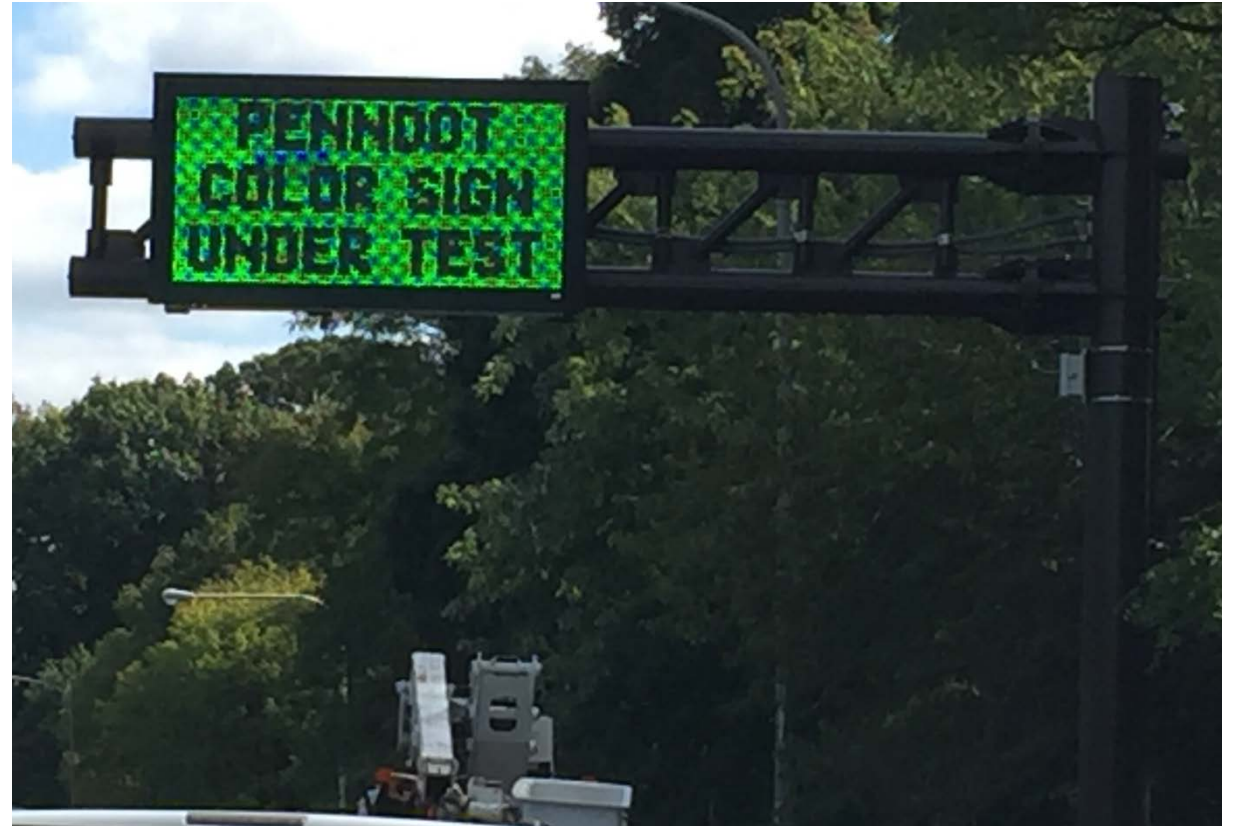
State College, PA

Presented by:

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Overview

- Background
- Current Color DMS Deployment
- How Does PennDOT plan to use color
- Color Considerations
- Potential Message Formats
- Current ATMS capabilities
- PSU Testing
- ATMS Upgrades/Testing
- Test Corridor/Pilot Program
- Current Project Status
- Steps Moving Forward
- Questions

BACKGROUND

- As a part of an effort to **Build a Smart Future** PennDOT recently began deploying and integrating full matrix DMS with color functionality

- Currently no standard for how color functionality/messages are to be utilized.
  - MUTCD provides some guidelines

- Need to evaluate and test how different color message formats are interpreted by the driving public.

- Compatibility of proposed message formats with PennDOT ATMS

CURRENT COLOR DMS DEPLOYMENT

- Currently 47 Color DMS integrated/in the process of integration with More on the way!

- PennDOT District 6-0 Projects with Color DMS Deployments
  - I-95 GIR (Sections GR1/GR2/GR3/GR7) – 22 Color ADMS
    - GR1- 16 Color ADMS (5-36x76-34; 11-18x60-34)
    - GR2 – 2 Color ADMS (2-18x60-34)
    - GR3 – 1 Color ADMS (1-18x60-34)
    - GR7 - 3 Color ADMS (3 -36x75-34)
  - I-95 CPR (Section CP2) – 13 Color ADMS
    - 13 Color ADMS (12-18X60-34; 1-36x75-34)
  - I-95 BRI (Section BR0) – 4 Color ADMS
    - 4 Color ADMS (4-64x160-20)
  - SR 422 SRB – 2 Color Mainline DMS; 4 Color ADMS
    - 2 Color Mainline DMS (2-96x352-20)
    - 4 Color ADMS (4-64x176-20)
  - From PTC – 2 Color Mainline DMS
    - 2 Color Mainline DMS (96x288-20)

- PennDOT District 2-0 Color DMS
  - SR 322/717 Seven Mountains ITS
    - 1 Color Mainline DMS (96x304-20)

CURRENT COLOR DMS DEPLOYMENT

- Color DMS deployed throughout District 6-0 vary by: height, width, pixel pitch

Color DMS Size	Font Size	# of Lines	Characters/Line
96x352-20	12" (18")	4 (3)	27 (18)
96x304-20	18"	3	15
96x288-20	12" (18")	4 (3)	22 (15)
64x176-20	12" (9")	3 (3)	13 (17)
64x160-20	12" (9")	3 (3)	12 (16)
36x75-34	12" (9")	3 (4)	9 (12)
18x60-34	12" (9")	1 (2)	7 (10)

- The differences impact several key factors including: lines of text, characters per line, font sizes

- District 6-0 in the process of determining a baseline Color DMS size to be used for future projects to promote consistency.

HOW DO WE USE THE COLOR

- PennDOT wants to utilize the color functionality for the following purposes:
  - Color Coded Real Time Travel Messages
  - Color Graphics for Destination/Routes
  - Work Zones (not apart of this project)

COLOR CONSIDERATIONS

- Current MUTCD Requirements/Factors
  - Table 2A-5 of MUTCD notes that currently Changeable messages can only use the following colors:
    - Background colors – Black, Blue, Green
   - Legend colors – Red, White, Yellow, Orange, Fluorescent Yellow-Green
  - Section 2L.04 12 states "Contrast Orientation of changeable message signs should always be positive, that is, with luminous characters on a dark or less laminated background."
  - Colors need to be MUTCD compliant. How will this impact DMS visibility?

- How will messages be interpreted by Color Blind drivers?

- How will color thresholds be determined?

- Will color message formats be able to utilized on full matrix amber signs?
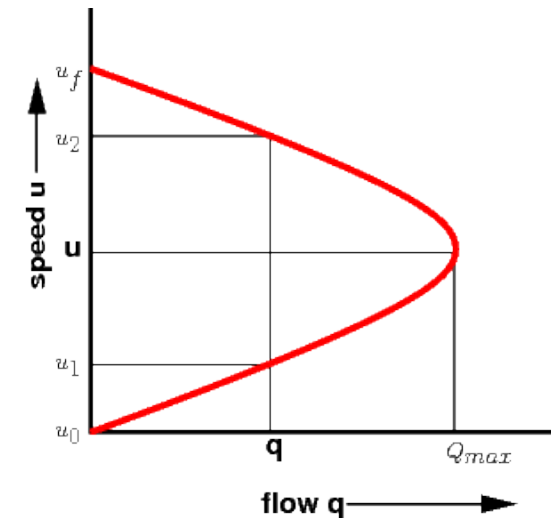
POTENTIAL MESSAGE FORMATS

- Color Travel Time Messages
  - Color Symbols – Dot/Circle, Square, asterisk
  - Color Text
  - Color Bands – Shading, Boxing/Outlining

- How many colors thresholds should be provided?
  - Provide multiple colors for various thresholds (green/yellow/red)?
  - Only provide colors to notify a "bad" travel time?

- Color Graphic Messages
  - Single/Dual Destination Route Marker graphics
  - Single/Dual Route graphics
  - Combination of Route/Destination graphics

POTENTIAL MESSAGE FORMATS

CURRENT ATMS CAPABILITIES

- PennDOT ATMS (OpenTMS by Q-Free) currently has the following capabilities:
  - Can post color graphics
  - Can post color foregrounds (text)
  - Can post color backgrounds

- PennDOT ATMS (OpenTMS by Q-Free) currently has the following color limitations:
  - Cannot place graphic anyway on a DMS, only can post at certain justifications (top left, bottom right)
  - Can only display one background color at a time
  - Entire background has to have same color
  - Shapes are not currently in the font files

PENN STATE SIGN TESTING

- Penn State Larson Transportation Institute on board to test proposed message formats

- PSU will investigate how other DOT's are utilizing color DMS

- Message testing will evaluate human factors/how drivers interpret the various messages
  - Measure time it takes to recognize and interpret message
  - Survey regarding how driver thinks they should react to proposed message formats
  - Approximately 25 message formats to be tested

- Testing Sample Size will include
  - Various Driver Ages (18-65)
  - Various Vision abilities (color blind)

- Estimated 4-6 month time line

- Results will be used to coordinate ATMS upgrades

ATMS UPGRADES/TESTING

- Based on results of PSU testing, upgrades will need to be made to ATMS in order to utilize the proposed color message formats.

- Color thresholds would be determined on a corridor by corridor basis.

- Potential for Q-Free to integrate color messages/automation with the upcoming ICM module deployment.

TEST CORRIDOR/PILOT PROGRAM

Color DMS Test Corridor
Broad St to I-676 via I-95 or Columbus Blvd

Legend
- Columbus Blvd (I-676 to Broad Street)
- I-95 (Broad St to I-676)

- FHWA has agreed to use the proposed color message formats as part of a pilot program to examine to use of color coded travel time messages.

- In order to determine travel time/delay thresholds for color coded messages, operational delay needs to be analyzed

- Freeway/Arterial test corridor selected in Philadelphia
  - I-95 NB/SB from Exit 17- Broad St to Exit 22 – Ben Franklin Bridge
  - Pattison Ave/Columbus Blvd from Broad St to I-676

- Test Corridor data to be evaluated for color thresholds include:
  - Speed vs Volume Relationship to determine operational delay
  - Travel Time Data
    - Inrix
    - BR links
    - Travel Time Runs
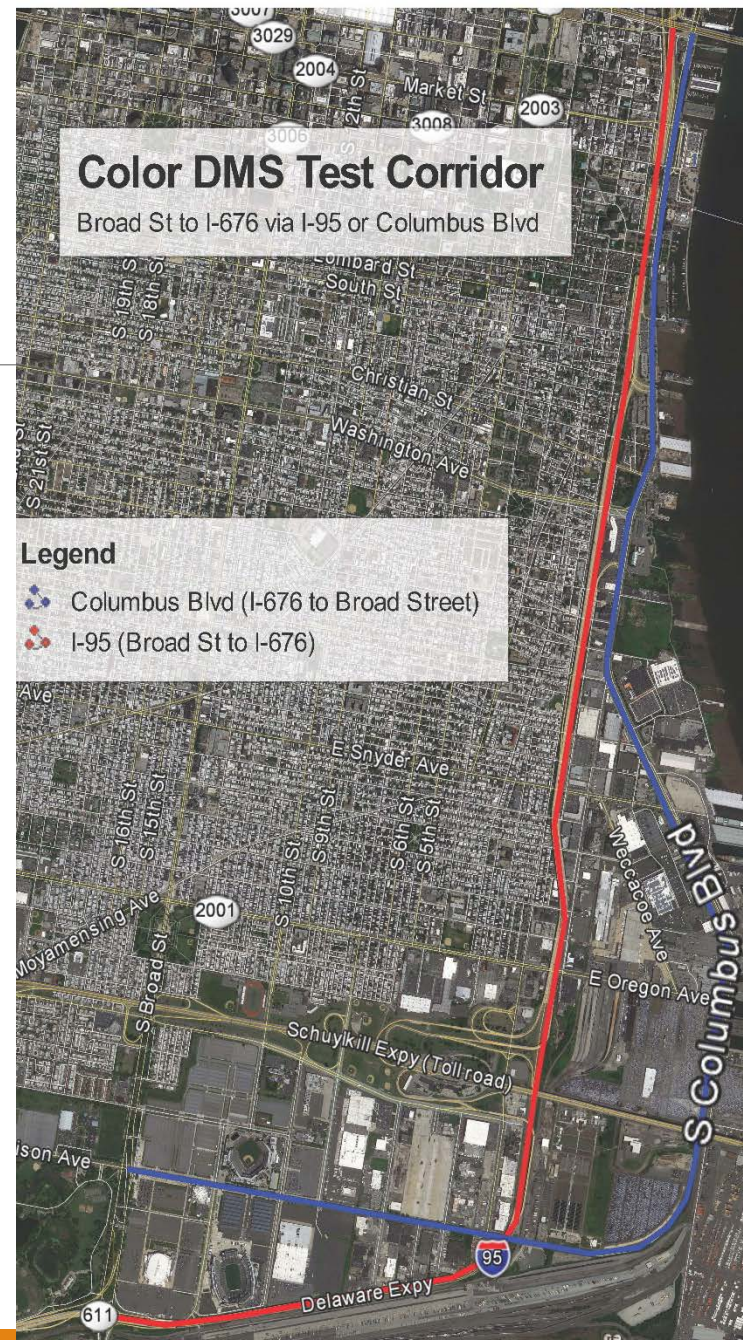
CURRENT PROJECT STATUS

- Coordination effort ongoing. Parties involved up to this point include
  - FHWA
  - PennDOT Central Office
  - PennDOT District 6-0 and ITS Integration consultant Jacobs
  - Penn State
  - Q-Free
  - Drive Engineering

- PennDOT Central Office currently finalizing agreement with Penn State

- Proposed message formats being finalized

- PSU will begin with Literature Review

- I-95 Section GR1 BR link integration nearing an end

MOVING FORWARD

- PennDOT is going to continue to deploy more and more color DMS

- Color Thresholds will need to be determined as part of part of DMS Message white papers.

- ATMS will be able to update color messages automatically.

- Color Messages along with ICM module to help dynamically reroute traffic based on operational delay analysis.

Questions

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