Transportation Systems Management and Operations
Traffic Infrastructure Process (TSMO-TIP)
Stakeholder Summit Report
SW Region Office, Madison, Wisconsin
August 17, 2015, 9:00 a.m. to noon

Executive Summary

On August 17, 2015, a meeting introducing WisDOT BTO's TSM&O Traffic Infrastructure Process (TIP) was attended by 26 of the key stakeholders representing diverse interests across the state.

The objectives of the meeting were to

- ensure internal and external stakeholders are aware of the current status of TSM&O traffic infrastructure and related systems,
- solicit feedback on the data-driven needs assessment methodology, the data inputs, and the relative weights,
- provide information to stakeholders about where highway network operational needs are greatest,
- collect recommendations on what new technologies, systems, or data sources the Department should be pursuing and evaluating, as well as existing components that should be considered for retirement.
- and, address the Project/Program Management (PPM) identified short and long term action items / milestones to conclude the PPM process and to carry forward these items in the TSMO-TIP process.

With priority (direct influence) stakeholders present, this maximized potential for the relevant and efficient evolution of the infrastructure planning process.

The plan to transition from the TOIP through the PPM to TSMO-TIP was discussed in detail. PPM milestones are discussed in the last section (*6 – Next Steps*).

The group was very enthusiastic and showed general support for the process. Many points of clarification were offered and many suggestions were made to improve the process.

The meeting concluded with a discussion on proposed 2016 deployments and application of the TSMO-TIP planning/evaluation process will follow.

A synopsis of the meeting is included in this report.

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1. Introduction

This report summarizes the results of the TSMO-TIP Stakeholder Summit which occurred on August 17, 2015. The report includes:

Section 2: List of attendees
The summit was well attended by stakeholders. There were representatives from all five regions, BTO, DTIM, and Madison city and MPO.

Section 3: Summit Agenda
The summit was split into three main segments: a background on the Traffic Operations Infrastructure Process (TOIP) and Arterial Integration Management (AIM) Plans, an overview of the new TSM&O Traffic Infrastructure Process (TIP), and a discussion of 2016 TSM&O deployments.

Section 4: Meeting Synopsis
Includes notes on all meeting segments with more detail on the main points presented and discussed.

Section 5: Questions to Stakeholders and Feedback
There was vibrant discussion throughout the meeting. Participants were also asked to write responses to ten questions on a feedback sheet handed out at the beginning of the meeting. All responses to these questions are listed.

Section 6: Next Steps for TSMO-TIP
The goal of the summit was to introduce the TSMO-TIP as a process that should be used for all TSM&O traffic infrastructure deployments. In order for the process to gain strength and be viable, momentum needs to continue. Thus the closure of the PPM and the next steps in the process are described.

Appendix A: Summit Slides
For more detail on specific items presented, see the full set of slides presented at the summit.

2. List of Attendees

I. Regions

Name	Agency / Bureau
Jeff Hess	NC Region / DBD
Ron Johnson	NC Region
Chris Blazek	NE Region
Chad Hines	NW Region
Stacey Rusch	NW Region
Mitzi M. Dobersek	SE Region
Elizabeth Lloyd-Weis	SE Region / Signals
Joyce Murphy	SE Region / Signals
Kyle Hemp	SW Region / Traffic
Karen Olson	SW Region / Traffic
Dan Pruess	SW Region

II. WisDOT / BTO

Name	Agency / Bureau
Dean Beakman	WisDOT / BTO
David Karnes	WisDOT / BTO
Paul Keltner	WisDOT / BTO (STOC)
Bill McNary	WisDOT / BTO
Anne Reshadi	WisDOT / BTO
Don Schell	WisDOT / BTO (TSU)
Liz Schneider	WisDOT / BTO (STOC)

III. WisDOT / Other + Consultant Support

Name	Agency / Bureau
Jennifer Sarnecki	WisDOT / DTIM (BPED)
Chris Hager	WisDOT / SEF
Mark Lloyd	WisDOT / STOC
Paul Kutz	HNTB - WISDOT / STOC
Peter Rafferty	TOPS Lab
Jon Riehl	TOPS Lab

IV. MPOs / Local

Name	Agency / Bureau
Scott Langer	City of Madison - TE
Bill Schaefer	MATPB (MPO)

3. Summit Agenda

I. Introductions

a. Purpose of the Meeting

II. Background

b. Traffic Operations Infrastructure Process Summary
    i. History / Methodology
    ii. Current Deployment Status
    iii. PPM Status
    iv. Communications (fiber network)
c. Arterial Integration Management (AIM) Plan Summary
    i. History / Methodology
    ii. TSM&O Relationship

III. TSM&O Traffic Infrastructure Process

a. Process Summary
    i. Annual Cycle
    ii. Needs Assessment
b. Process Expectations Session
c. Investment Decision Support and Planning Tool
    iii. Interactive Planning Tool Demonstration
    iv. Evaluations and Decision Matrix
        1. Discuss example used for decisions on future improvements; to include current equipment and new technology options; Zoo Interchange Example – New DMS
        2. Discuss Cost-Benefit data and match of technology with current business processes
        3. Discuss integration of annual planning cycle into FDM process and policy changes

IV. 2016 TSM&O Infrastructure Deployments

a. Municipal / County Proposed 2016 Deployments
b. Proposed 2016 Deployments (6-Year Constr. Schedule & $10M Standalone)
c. Evaluate 2016 Deployments with TSMO-TIP

V. Next Steps

4. Meeting Synopsis

Refer to the agenda and annotated agenda for a complete list of items that were planned to be covered. Refer to the presentation slides and associated online tools for more information. Most questions and suggestions that came up during the discussions are noted within the Question Summary in the next section.

I. Introductions

Dewayne Johnson, outgoing BTO director, provided welcoming remarks, outlined the background of the evolution from TOIP to TSMO-TIP, and emphasized the importance and objectives of the summit. Mark Lloyd followed with an overview of what the summit was to cover and provided additional information about the objectives of the meeting.

II. Background

Several presenters provided background about what the TOIP was and how it worked, current deployment progress and status, the PPM process and status, the role of communications network planning, and the AIM plan its relationship to the new TSMO-TIP.

III. TSMO-TIP

This part of the discussion began with defining what TSM&O is and is not, and what is (and is not) covered by the TSMO-TIP. The CMM was discussed as well, and the group came away with better clarity on the various aspects of TSM&O. It was emphasized that the TSMO-TIP is a small piece of TSM&O dealing with only the traffic infrastructure element. The BTO framework slides were presented, followed by the annual cycle for the TSMO-TIP.

There was good discussion about the distinction between arterials and freeways, both in terms of agency responsibility and data availability. State routes that are arterials will be included with any data processing updates, recognizing that other arterials necessitate additional ad hoc data collection efforts.

Following an introduction to the needs assessment tool prototype, the group had a very productive discussion about the draft evaluation process flowchart as shown in Figure 1. Key changes include rephrasing the initial need identified; combining the Justifiable, TAG Evaluation, and Viable elements into one; modify how the process shows a deployment landing within a specific program; and remove the Ops Managers' final approval in favor of broader more encompassing oversight. A revised version is included in Figure 3 in Section 6. This discussion consumed more time than planned, so the remaining agenda items were compressed.

The TSMO-TIP agenda item wrapped up with a presentation from the Zoo Interchange project team about how they plan, prioritize, and deploy ITS elements. This served as a good example for how a specific TSM&O deployment grows from idea to implementation.

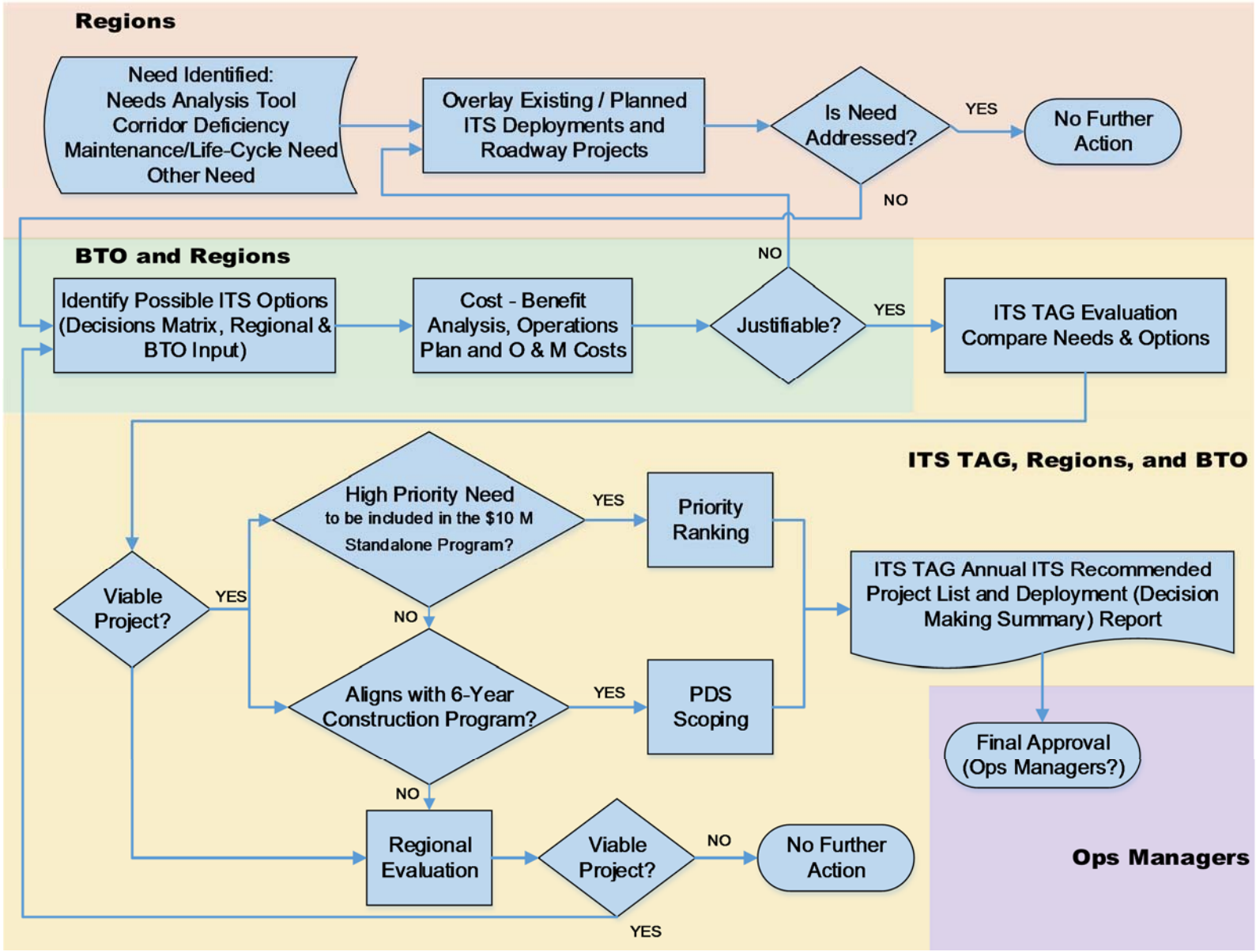


Figure 1: TSMO-TIP Flowchart (version presented at meeting)

IV. 2016 TSM&O Deployments

This agenda portion began later than planned, though not necessarily unexpectedly so. Bill Schaefer from the Madison MPO presented their ITS Strategic Plan, which is wrapping up right now. Draft slides from their upcoming wrap-up meeting are available by request.

Dean Beekman presented the upcoming planned 2016 deployments of DMS and CCTV statewide. This and the remainder of this agenda item were much abbreviated due to time.

V. Next Steps

Mark briefly discussed the next steps of the TSMO-TIP and thanked all participants for their time and enthusiasm towards the process.

5. Questions to Stakeholders and Feedback

I. Feedback Summary

Stakeholders at the meeting were provided with a sheet with ten questions regarding the TSMO-TIP process. The objective of asking these questions was to make the process development as open as possible to all stakeholders and garner as much feedback as possible. The raw feedback, included below, was reviewed and many of the requests have either been incorporated or addressed in this report. Other comments have also been noted for future meeting agenda items where they will have the most impact.

Overall, stakeholders were very receptive and provided a great deal of well-reasoned responses. The team would like to thank all stakeholders who took the time to provide this feedback. An online survey with the same questions asked during the meeting has been created to continue the open lines of communication. All further feedback will also be considered to improve the process. The following is a direct web address to the survey:

https://uwmadison.co1.qualtrics.com/SE/?SID=SV_8lixDZfBE24zqqV

II. Raw Feedback

1. What do you need out of the process to support your efforts (e.g., better cost information, maps of crash history, guidance on recommended technologies, etc.)?

- Easy to understand and defendable implementation guidance or range of deployment capability.
- Existing infrastructure mapping tool (as built) that is also assessable in the field.
- Identifying incident routes – Arterials used when incident on limited access roadways
- A plan approved by upper management similar to what TOIP outlined. This will allow us to get this technology into our projects.
- MPO – Who do we coordinate with? Answer – Regions first, then BTO
- Connecting Highways – Need to Include
- Communication across divisions
- Guidance on recommended technologies – 2 people may have different ideas on what technologies should be used to mitigate the needs
- Cost information for long-term maintenance
- Better cost information and guidance on cost benefit analysis, information about available technologies and recommendations/guidance.
- Backbone projects are required to be scoped 5 yrs prior to PS&E. The TSMO-TIP needs to take that into consideration.
- What is the relationship between BTO and the Regions where the annual cycle is concerned?
- Note that the PDS design process is generally four years ahead of deployment, so TSMO-TIP planning must look at least that far ahead, in large part to ensure deployments are planned and budgeted.

2. What is an example of a traffic infrastructure project you have or are pursuing within TSM&O (e.g., full color DMS, adaptive signals, etc.)?

- SW Region Mega / Major Studies
  - I-39/90/94 Madison-Portage
  - I-39/90/94 Portage-Dells
  - US-12 Beltline Madison PEL
  - US-51 Stoughton Rd Corridor
- In BPED, we plan to pursue a TDM cost/benefit study. Since TSM&O includes TDM, we should collaborate. No need to duplicate efforts if any TDM strategies will be included in your efforts.
- Ramp gates, cameras and DMS for incident management on freeway segments
- Fiber – both closed loop systems and networks
- La Crosse Area Study N-S, E-W arterials through the city of La Crosse

3. What is a performance measure that you already use or want to use to define a successful project (e.g., crash reduction, reduced O&M costs, etc.)?

- How often are the devices used?
- Operations specific performance measures may be independent than overall department measures…
- Reliability
- Travel time - consistency
- Air quality
- Mobility including multimodal trips
- Reduced operations and maintenance costs
- Reduced O&M costs

4. With a less prescriptive infrastructure plan in-place, what TSM&O infrastructure projects would you focus on or prioritize (e.g., surveillance, detection, etc.)?

- Improve traffic detection in high demand, congestion, areas that will more quickly identify traffic operations issues and crashes.
- Surveillance cameras where emergency operations are frequent to increase response and coordination.
- Traffic response and adaptive signal systems
- Surveillance and means to identify incidents
- Communications systems
- Communications systems, surveillance, pavement/weather sensors

5. What is one recommendation you have for a new technology, system, or data source the Department should be pursuing, evaluating, and adopting?

- Identifying the point in the annual cycle where the evaluation date is the most current. When is the Metamanager the most up-to-date during the annual cycle?
- Incident notification from local CAD systems to local signal operators. System should be capable of sending incident to appropriate agency including surrounding agencies (i.e., incident on beltline would notify WisDOT and city of Madison operations)
- Bike/ped counters/monitoring (Strava?)
- Is there an opportunity to include air quality benefits in the cost/benefit analysis? This would be helpful in non-attainment/maintenance areas. I think SEWRPC does this for CMAQ projects already.
- Use of probe data (Tom-Tom, Waze, etc.) as a data source
- Bicycle and pedestrian operations and technologies should be included; a BTO response was that bike and ped ops is not under their purview but should be recognized in the TSMO-TIP.

6. What is a technology, system, or specific device that you would like to see retired?

- Loops
- Approval needs to come before the funding….

7. How would you utilize the needs assessment tools to help select or prioritize your projects? In your opinion, what inputs are most important?

- Timing – Before scoping
- Incident alternate route – arterial system
    - These will likely be construction alternate routes
- Variability potential
    - Could be events
- Microwave input
- Safety and reliability are most important. It would be great to add an active transportation / multimodal component too.
- Growth and ADT – in some cases it may take several years to get the infrastructure in place so need to be proactive and look ahead so we don't get behind
- Would likely use to support / justify project. Traffic volumes, LOS/delay info, crash info, % trucks
- Who is identifying the needs?

8. What gaps do you see between current TSM&O infrastructure deployments and operational needs?

- Does not include non-state corridor alternate routes for incident response
- Use of deployed infrastructure for planned work zone traffic control (not just incident management).
- Need to expand weather / pavement sensors so 511 is not as dependent on field reports
- SER – Where draft arterial map come from?

9. What do you believe is the correct group (existing or new) for approving TSM&O infrastructure investments (e.g., ITS TAG, Ops Managers, BTO management, etc.)?

- Ops managers are involved throughout, although BTO and region management should approve
- Should include signal operations managers
- I think the TAG group (or another group) needs to be involved. If nothing else to keep things somewhat consistent throughout the state. This would allow for good information sharing.
- Planning Chiefs could assist in terms of programming and backbone priorities (along w/ BSHP)
- Upper management before funding mechanism is sought out
- BTO and Ops Managers / Upper Management → Needs to occur before go after funding. Needs to be upper management to ensure support, consistency, etc. Need upper management support to get project scope buy in from other sections (programming, PDS).
- Ops Managers

10. What other recommendations or feedback do you have?

- Bureau of Project Development has previous experience with developing user delay or "lane rental fees" that may prove valuable info.
- Finding way to allow locals to install systems they are capable of installing – can be done quicker and cheaper
- There are various opportunities to collaborate
    - State Highway Plan
    - Transportation Demand Management
    - Freight Plan
    - Asset Management Plan
- As was mentioned in discussions today, difficult to garner support from other sections and implement / deploy without a plan of some sort and without it 4-6 years in advance
- DTIM – Bike / Ped?
- Madison MPO – How does BTO, Regions, MPS's coordinate / make decisions?
- SER – Process (annual) align w/ improvement program
- Regional alternate routes
    - Incident arterials – when interstates have issues, where are the primary alternate routes
    - Old Integrated Corridor Operations Project (ICOP) plan
- Talk to Southeast Freeways about Decision Lens

6. Next Steps for TSMO-TIP

I. Revised Process Flowchart

The original flowchart presented at the meeting was modified using stakeholder input. The updated flowchart is included in Figure 3.

This flowchart is the suggested path to be followed for the entire TSMO-TIP, from identifying a need to implementing the project. Needs identification can be initiated by any interested party. The process then begins with stakeholder review. Once documentation is created by stakeholders, the project goes into ITS TAG review with Ops Managers oversight, funding determination, and final deployment planning and implementation.

II. PPM Actions / Milestones

The Stakeholder Summit initiated the TSMO-TIP process and picks up where the TOIP Project/Program Management (PPM) process concludes. Short and long term action items / milestones identified in the PPM Project Action Plan included:

- Start to track costs for TSM&O Infrastructure Plan (ITS) to include operations, maintenance and lifecycle replacements (business processes/asset management software). (Ongoing and will be reported out at 8/17/15 Summit)

- TSM&O Infrastructure Summit with Operations Managers, Administrator Office, State Patrol and DTIM - will redirect TSM&O infrastructure plan activities and State of the State Report and reconfirm on an annual basis– meet annually in mid-Summer (Next Meetings – Operations Manager Presentation July 8, 2015; Stakeholder Summit August 17, 2015)

- Align TSM&O implementation plans with six year construction plan. (Process will be finalized at 8/17/15 Summit).

- Identify gaps in existing TOIP by overlaying inventory & operational needs; e.g. – potential integration of probe data replacing need for roadside or in-pavement detection.

- Continue to clarify the role and limitations of the TSM&O infrastructure planning tool as a guidebook that feeds planning activities and guides project level decision making. (Ongoing and completed at 8/17/15 Summit).

- Looking to complete TOIP / TSM&O Infrastructure Plan PPM effort in summer 2015 (Contingent on outcomes from 8/17/15 Summit).

These issues were discussed and addressed at the Stakeholder Summit. The annual evaluation process, flowchart illustrated in Figure 3 and discussed above, provides a decision making guide and approval process for infrastructure deployment. The annual planning cycle, Figure 2,

defines the process schedule to align TSMO-TIP with the 6-year construction schedule and budget process. The evaluation of existing and future infrastructure needs and deployment decisions will be facilitated by tools currently being developed / refined. These tools include:

- Needs Assessment – to identify corridor deficiencies
- ITS Inventory – existing deployments identification
- Benefit – Cost Analysis – evaluate options for new and existing deployments and technologies
- Asset Management Software – will identify operation and maintenance costs, life cycle analysis, and future replacement needs

Based on the above listed PPM actions / milestones, the outcome from the Stakeholder Summit should complete the TOIP Project/Program Management process.

III. Other Next Steps

- Continue improving tools
  - Economic analysis, including cost effectiveness and benefit-cost analysis
  - Next generation asset management software and its relationship to the ITS/ITSNet inventory
  - Operations and maintenance (O&M) costs
  - Life cycle costs
- Needs assessment tool
  - Put in place process for receiving MetaManager updates as they become available and providing that to the TOPS Lab
  - Develop reliability performance measure from probe data, bring over to MetaManager GIS, incorporate into planning tool
- Flesh out and use process to evaluate old technology (e.g., HAR)
- Meet with regions to do a process workshop
- Annual schedule tie in with evaluation process (See Figure 2)
- Conclude the TOIP Project/Program Management (PPM) process
- Continue with elements shown on the annual cycle

Figure 2: TSM&O Strategies Annual Planning Cycle

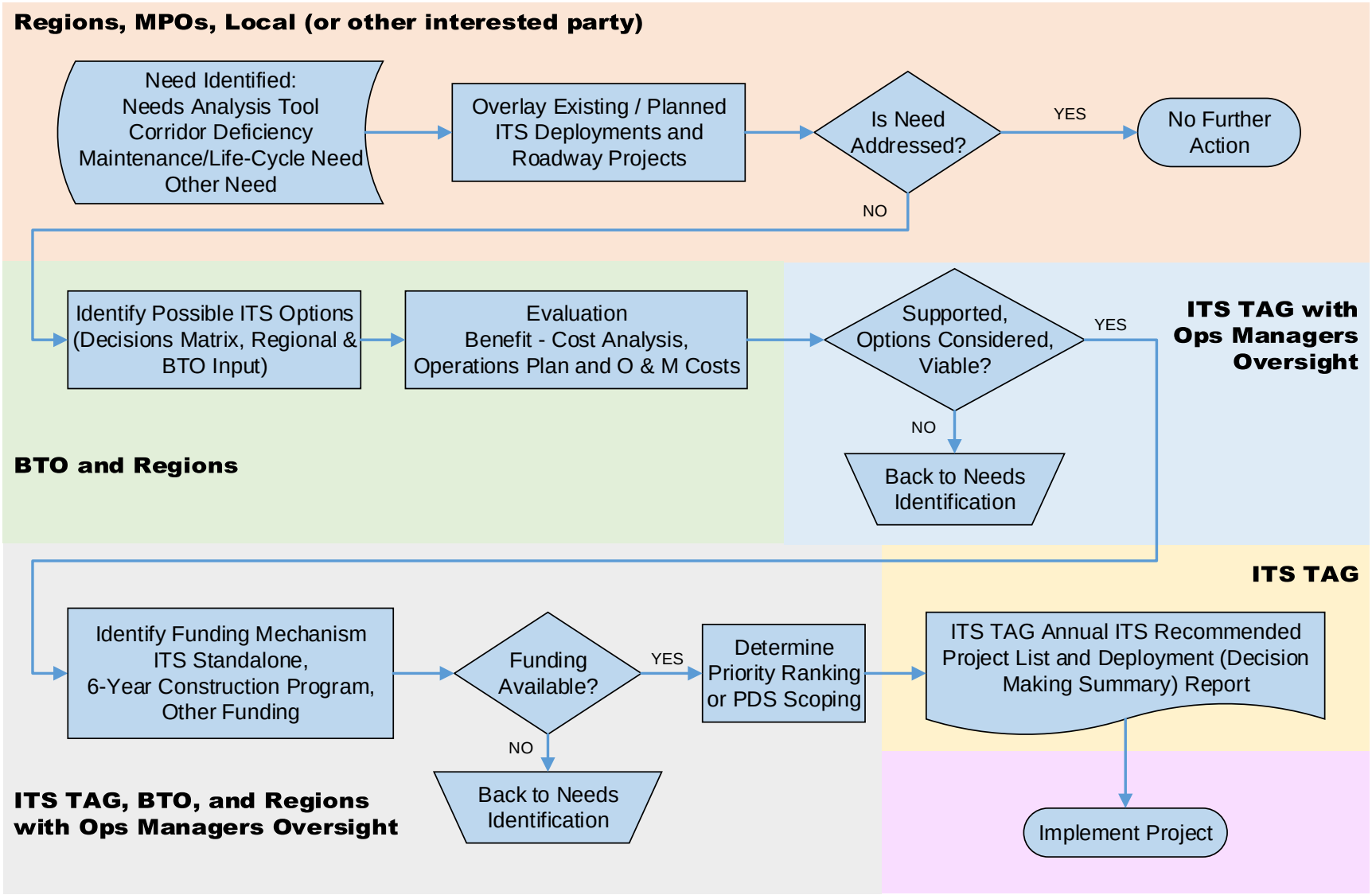


Figure 3: TSMO-TIP Flowchart (updated version based on stakeholder feedback)

Appendix A: Meeting Materials

The link to the prototype of the needs assessment tool is:
http://transportal.cee.wisc.edu/gis/webmaps/tip

Updates are being made frequently at this point to make the tool more useful and user-friendly. Additional feedback from stakeholder both welcome and encouraged.

The link to the map of planned deployments for 2016 presented at the meeting is:
http://www.topslab.wisc.edu/tsmo/tip/

The full set of meeting slides are included on the next several pages. These slides were presented by a variety of speakers from BTO and TOPS Lab.

TSM&O Traffic Infrastructure Process

Stakeholder Summit

Bureau of Traffic Operations
August 17, 2015

Summit Agenda

- Welcome and Introductions
- Objectives and Purpose of the Meeting

Agenda

I. Introductions (10 min)
II. Background (30 min)
III. TSM&O-TIP (60 min)
Break (15 min)
IV. 2016 TSM&O Deployments (60 min)
V. Next Steps (5 min)

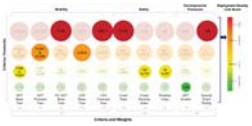
Summit Objectives

- Ensure internal and external stakeholders are **aware** of the current status of TSM&O traffic infrastructure and related systems
- **Solicit feedback** on the data-driven needs assessment methodology, the data inputs, and the relative weights
- Provide information to stakeholders about where highway network **operational needs** are greatest
- **Collect recommendations** on what new technologies, systems, or data sources the Department should be pursuing and evaluating, as well as existing components that should be considered for **retirement**

II. Background

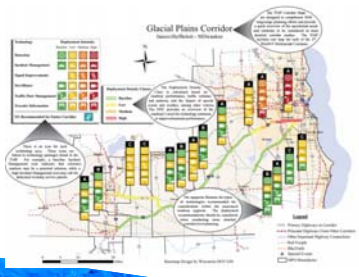
What was the Traffic Operations Infrastructure Plan (TOIP)?

- Structured around Connections 2030 framework
- 37 corridors targeted for specific improvements
- Technology Areas
  - Detection
  - Incident management
  - Traffic signal systems
  - Surveillance
  - Ramp and highway traffic flow management
  - Communications
  - Traveler warning and information
- Used MetaManager data



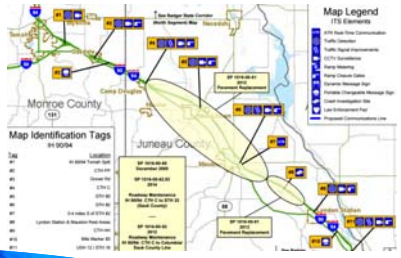
TOIP Development

- Initial methodology and report completed May 2008
  - Scoring method
  - High level cost estimates
  - Deployment density classes
  - "Signpost" guidance
  - FHWA & FTA Transportation Planning Excellence Award



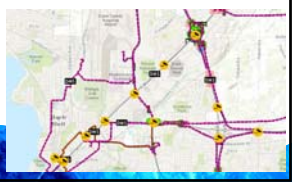
TOIP Development

- Implementation plan completed in 2009
  - Tied to six-year improvement plan
  - Followed on by economic analyses for every region
  - Tracking tool developed



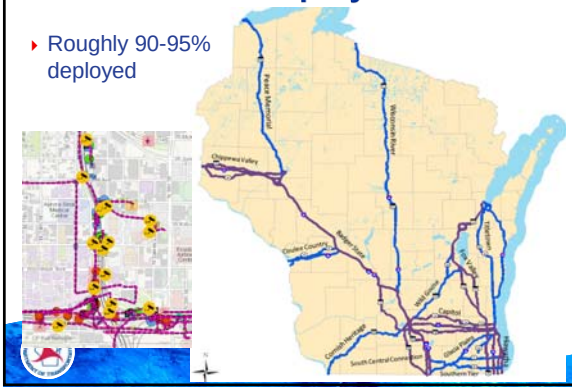
TOIP Development

- 2010: bi-annual updates began
  - Complete re-run of methodology
  - Revised rankings
  - Tracking tool updates
- 2011: Communication Systems Layer (CSL)
  - Fiber and related communication infrastructure needs overlay
  - Brought together an initial spatial inventory
- 2012: integration with ITS/ITSNet inventory
- From 2009 through today, ITS deployments continue



TOIP Current Deployment Status

- Roughly 90-95% deployed



TOIP Current Deployment Status

- Northwest Region Examples

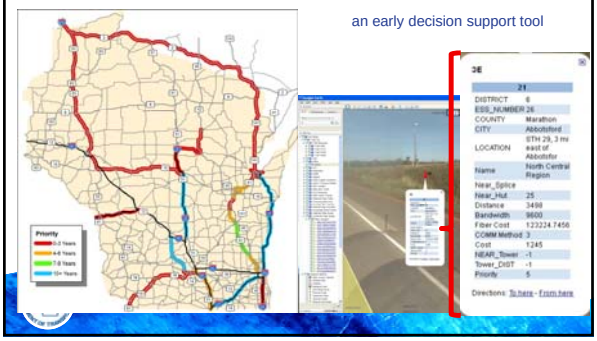
Key TOIP Project/Program Management (PPM) Outcomes

- Develop draft methodology and associated tools
  - Potential operational improvements
  - New technologies
  - Improved GIS analysis, planning, and prioritization
- Focus on ITS deployments
- Inclusive, with regular review
  - Communications Systems Layer (CSL)
  - Traffic signal systems
  - Traffic data, including private sources
  - Supporting IT systems

Communications Network

- TOIP Communication Systems Layer (CSL)

an early decision support tool

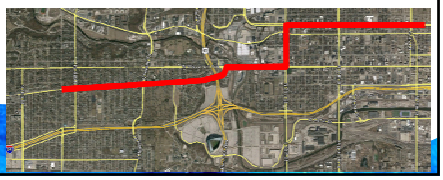


AIM Plan – Need

- Increasing use of ITS for traffic mitigation
- Traditional traffic mitigation measures
  - Lane capacity improvements
  - Intersection improvements
- No statewide plan exists that provides guidance on recommending ITS on non-freeway corridors

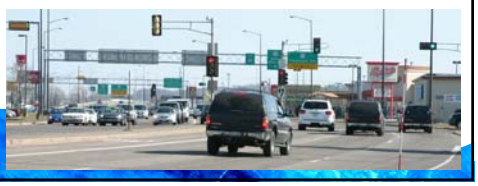
AIM Plan – Project Purpose

- Identify corridors that may benefit from ITS planning efforts
  - Corridors with mobility issues
  - Poor performance
  - Local agency partnership
  - Project opportunities for improvement
  - Particularly those near MAJORS projects



AIM Plan – Project Purpose

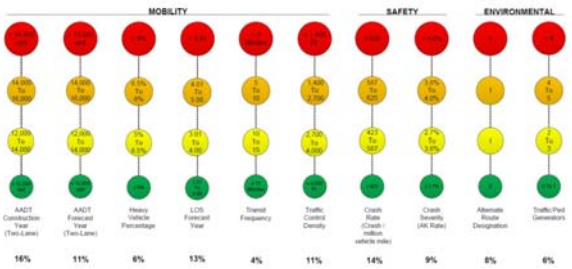
- Provide tool to evaluate arterials for ITS planning
  - Data-driven methodology
  - Range of technologies
  - Statewide compatibility
  - Unique, need driven analyses



AIM Plan – Evaluation Criteria

- Construction year ADT
- Forecast year ADT
- Heavy vehicle ADT
- Forecast year LOS
- Traffic & pedestrian generators
- Alternate route designation
- Traffic control density
- Transit frequency
- Crash rate
- Crash severity

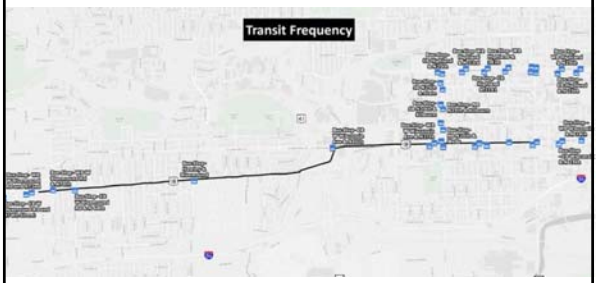
AIM Plan – Criteria Development



AIM Plan – Data Collection

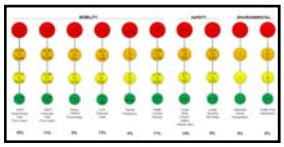
- Data sources used for AIM
  - MetaManager
  - WisDOT traffic data maps
  - WisDOT crash database
  - MAJORS traffic analysis
  - Aerial imagery of corridors
  - Local agency discussions

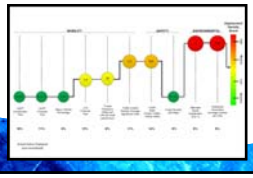
AIM Plan – Conditions Mapping



AIM Plan – Scoring Method

- Threshold scores for a particular criteria summed across all MM segments
- Threshold scores normalized, weighted, and summed to generate corridor score





AIM Plan – Additional Steps

- Develop ITS deployment spectrum
- Develop cost estimate for corridors
- Establish performance measures
- Local agency partnerships

- AIM Plans remain under the TSM&O-TIP umbrella but drills down into arterial needs with additional data

III. TSM&O-TIP

Defining TSM&O – MAP-21

MAP-21 revised the federal definition of TSM&O to the following (23 U.S.C. § 101(a)(39)):

(A) In general. -- The term 'transportation systems management and operations' means integrated strategies to optimize the performance of existing infrastructure through the implementation of multimodal and intermodal, cross-jurisdictional systems, services, and projects designed to preserve capacity and improve security, safety, and reliability of the transportation system.

(B) Inclusions. -- The term 'transportation systems management and operations' includes --

(i) actions such as traffic detection and surveillance, corridor management, freeway management, arterial management, active transportation and demand management, work zone management, emergency management, traveler information services, congestion pricing, parking management, automated enforcement, traffic control, commercial vehicle operations, freight management, and coordination of highway, rail, transit, bicycle, and pedestrian operations; and

(ii) coordination of the implementation of regional transportation system management and operations investments (such as traffic incident management, traveler information services, emergency management, roadway weather management, intelligent transportation systems, communication networks, and information sharing systems) requiring agreements, integration, and interoperability to achieve targeted system performance, reliability, safety, and customer service levels.

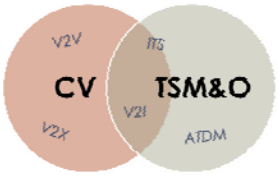
Defining TSM&O – Continued

- FHWA states, "*Transportation Systems Management and Operations (TSM&O) is an integrated program to optimize the performance of existing multimodal infrastructure through implementation of systems, services, and projects to preserve capacity and improve the security, safety and reliability of the transportation system.*"

- The WisDOT TSM&O State of the State Report further adds: "*Plans to retire system components that no longer provide sufficient benefit to warrant continuation or are technologically obsolete.*"

TSM&O ≠ ITS

- ITS is part of TSM&O, specifically the technology applications and supporting communications to improve safety and efficiency
- Contrast that with connected vehicle (CV) applications, which overlap with TSM&O



- With the TOIP retired, the TSM&O traffic infrastructure process takes a broader and more flexible approach

Example TSM&O Traffic Infrastructure Strategies

- Work Zone Management
- Traffic Incident Management
- Service Patrols
- Special Event Management
- Road Weather Management
- Transit Management
- Traffic Signal Coordination
- Surveillance and Monitoring
- Traveler Information
- Ramp Management
- Managed Lanes
- Active Traffic Management
- Integrated Corridor Management
- Truck Parking

TSM&O-TIP Objectives

- Develop a high level process and associated spatial analytical tool for WisDOT TSM&O traffic infrastructure
- Continuous performance improvement
- Prioritize investments where potential benefit is greatest
  - Decision-making support
- Support federal requirements:
  - Systems engineering and ITS architecture
  - Real time system management information program
  - MAP-21 performance management

TSM&O Stakeholders

- Division of Transportation System Development (DTSD)
  - Bureau of Traffic Operations (BTO)
    - Systems Operations Section
    - Traffic Engineering Section
  - Bureau of Highway Maintenance (BHM)
  - Regional operations managers
  - Regional traffic staff
  - Bureau of Project Development (BPD)
- Division of Transportation Investment Management (DTIM)
  - Bureau of State Highway Programs (BSHP)
  - Bureau of Planning and Economic Development (BPED)
- Wisconsin State Patrol (WSP)
- Wisconsin TOPS Lab
- Federal Highway Administration (FHWA)
- Select Counties
  - Milwaukee and Dane County Sheriffs
- Select Municipalities
  - City of Milwaukee
  - City of Madison Traffic
- Select Planning Organizations
  - Southeast Wisconsin Regional Planning Commission (SEWRPC)
  - Madison Area Transportation Planning Board (MATPB)

TSM&O Capability Maturity Model

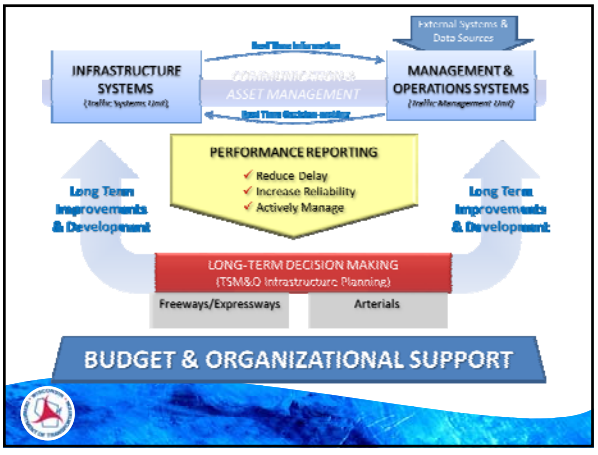
Six Dimensions

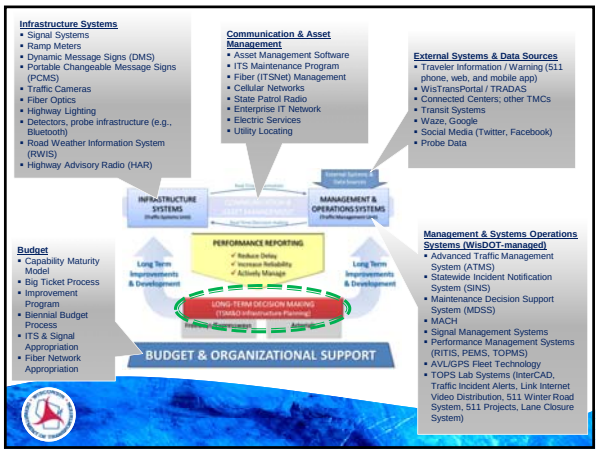
- Business Processes
- **Systems & Technology**
- Performance Measurement
- Culture
- Organization / Workforce
- Collaboration

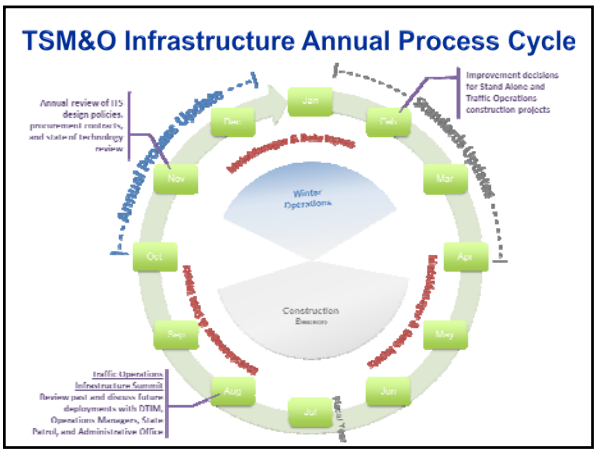
Relevant Examples

- Develop this new traffic infrastructure process
- Peer review and working group
- Annual cycle with updates and linkages to other WisDOT business processes
- Truck parking, ITS architecture, regional coordination, etc.

WisDOT recently received a federal grant to advance these







Process Cycle Case Study Example

A WisDOT region requests a new device – e.g., DMS, detector, etc. – and these are some questions to consider:

- Is it effective?
- Does WisDOT have capability to operate and maintain?
- Is it optimally placed?
  - How does it meet priority needs?
- Is the technology the best option?
  - Are there other options to consider?
- How does it fit with ITS architecture and WisDOT policy documents?

Stakeholder Input

Refer to Handout

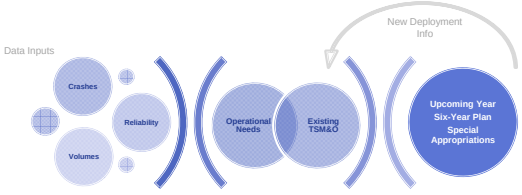
1. What do you need out of the process to support your efforts?
2. What is an example of a traffic infrastructure project you have or are pursuing within TSM&O?
3. What is a performance measure that you already use or want to use to define a successful project?
4. With a less prescriptive infrastructure process in place, what TSM&O infrastructure projects would you focus on or prioritize?
5. What is one recommendation you have for a new technology, system, or data source the Department should be pursuing, evaluating, and adopting?

Stakeholder Input (continued)

6. What is a technology, system, or specific device that you would like to see retired?
7. How would you utilize the needs assessment tools to help select or prioritize your projects? In your opinion, what inputs are most important?
8. What gaps do you see between current TSM&O infrastructure deployments and operational needs?
9. What do you believe is the correct group (existing or new) for approving TSM&O infrastructure investments (e.g., ITS TAG, Ops Managers, BTO management, etc.)?
10. What other recommendations or feedback do you have?

please write down some thoughts and leave this sheet behind when you leave

TSM&O-TIP Process Overview



Needs Identification
- Data Driven
- MetaManager
- Updated 3x/year

Needs Analysis
- Mapping
- Prioritization
- Ongoing

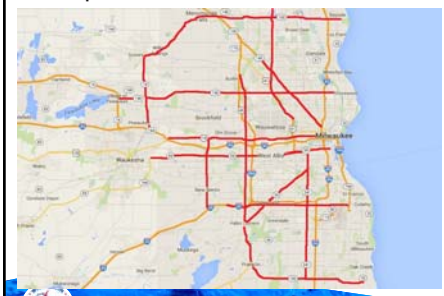
Deployment Plans
- Policy Determination
- Design Processes
- Regional Priorities

Statewide TSM&O Deployment MAPSS Corridors

- North Central Region
- Northwest Region
- Northeast Region
- Southwest Region
- Southeast Region
- Municipalities

Draft Arterial System

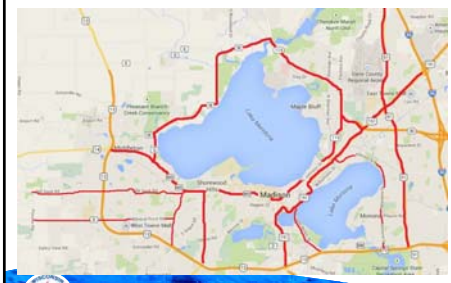
Example: Milwaukee & Waukesha Counties



Draft Arterial System
— Coordinated & Connected Corridors
Transit, emergency, & connected vehicle adaptation

Draft Arterial System

Example: Dane County



Draft Arterial System
— Coordinated & Connected Corridors
Transit, emergency, & connected vehicle adaptation

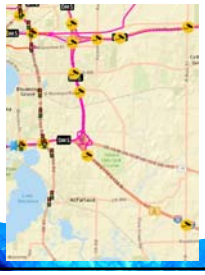
Process Tools

- Performance driven spatial analytics
- Data driven: identify gaps between need and current TSM&O infrastructure deployment

Network Inputs:

- AADT (present and future)
- Growth
- Trucks
- LOS (present and future)
- Crash Rate
- Crash Severity
- Weather Impact
- Special Events
- Reliability

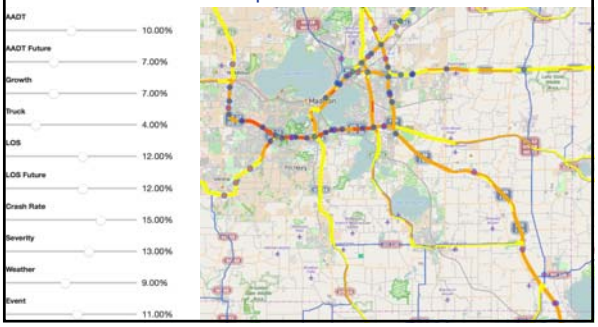
Existing Field Coverage:



Process Tools

- Statistical and analytical model
- Interface is in development

More Need — Less Need



Process Tools – Examples

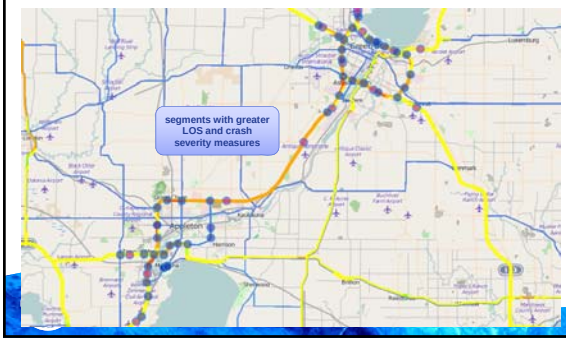
Northwest Region

Process Tools – Examples

North Central Region

Process Tools – Examples

Northeast Region



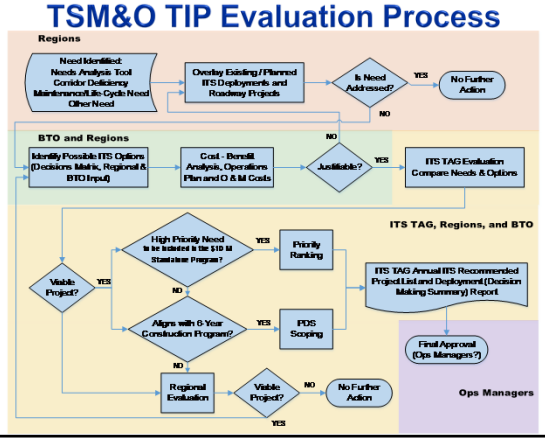
Process Tools – Examples

Southwest Region

Process Tools – Examples

Southeast Region

TSM&O TIP Evaluation Process



TSM&O Evaluations

- Summary information for current technologies and infrastructure strategies
  - VSL state of the practice example
- Evaluation framework for new or emerging technologies or infrastructure strategies
  - Efficacy
  - Cost effectiveness and benefit-cost analysis
  - Life cycle costs
- Retiring or phasing out old or ineffective equipment or systems
  - HAR example

TSM&O Decision Matrices

Technology Matrix

Traditional Infrastructure Based

	Loop	Microwave – G4	Microwave - Wavetronics
Initial Cost	$17,000 per site[1]	$18 to $21K per site[1]	$20 to $23K per site[1]
Annual Operations & Maintenance Cost	$500 per site[1]	$400 per site[1]	$400 per site[1]
Total Cost for 10 Years (including initial, O&M and replacement cost)	$45,000 per site	$43,000 per site	$47,000 per site
Data Content	Traffic volume, speed, lane occupancy and vehicle classification	Traffic volume and speed is measured directly	Traffic volume and speed is measured directly
Data Quality	High capture rate with little lag time	High capture rate with little lag time	High capture rate with little lag time
Data Collection	Continuous data collection of all vehicles (based on equipment reliability and position)	Continuous data collection of all vehicles (based on equipment reliability and position)	Continuous data collection of all vehicles (based on equipment reliability and position)

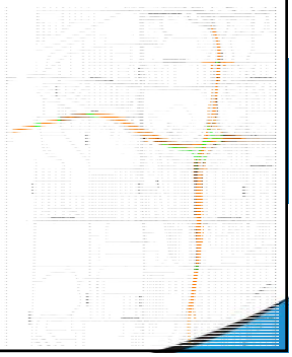
TSM&O Traffic Infrastructure Process Stakeholder Summit
August 17, 2015

Zoo Interchange Project Proposed DMS

zoo interchange

2016-2017 Construction Zoo Interchange Phase 2

- Lane closure I-94 eastbound
- W-N closed for 10 months
- N-E closed for 6 months



Zoo North Leg Construction

- Construction will follow Phase 2
- Lane restrictions on I-41/US 45
- North Avenue Ramps closed for over a year
- North Avenue closed for the summer

Decision Making Process

1. Do the signs fill a need for the TMP and ICMS?
2. Do the signs capitalize on existing investment (travel time and communication infrastructure, ICMS investments)?
3. Do the proposed signs provide a significant improvement over the existing signs?

TMP Strategies

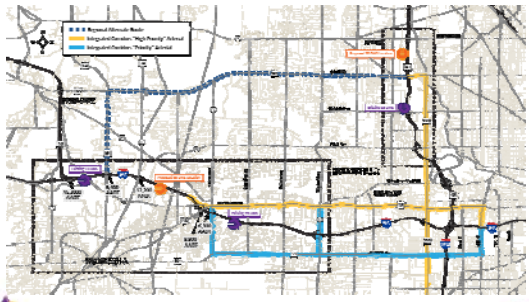
Strategy must…	DMS
Provide lasting benefit to commuter safety and mobility	Yes – signs continue to provide a benefit after construction
Be proven successful and provide positive benefit cost ration	Yes – studies indicate signs have a benefit cost of about 15 under normal conditions, much higher during construction
Align with WisDOT's TMP policy goals and eligible TMP Strategies	Yes

Integrated Corridor Management System

Goals

- **Optimize corridor operations versus individual networks**
- Maximize available capacity through the corridor
- Improve travel time reliability and predictability
- **Manage congestion**
- **Provide traveler information to improve decision making**

Proposed and Existing Sign Locations



Proposed Signs

- Full color, high resolution sign provides more flexibility with signage and more visibility to motorists
- Capitol Drive and Barker Road provide improved alternate route options
- Eastbound sign reaches about 35,000 more vehicles daily

DMS Benefit - Cost

- Long-term B/C calculations are based on 15% of peak hour motorists saving 5 minutes of delay
  - Results in B/C of 15 to 1
  - Based on TOIP economic analysis

DMS Benefit - Cost

- Construction B/C calculations are based on 50% of peak hour motorists saving 7 minutes
  - Results in B/C of 67 to 1
  - Based on microsimulation study

IV. 2016 Deployments

2016 TSM&O Deployments

- Municipal and County Proposed Deployments
- Proposed 2016 Deployments
  - 6-year construction schedule
  - $10M standalone
- Evaluating 2016 Deployments with TSM&O-TIP

Proposed 2016 Camera Deployments

Region	Device ID	Location	Project
NE	CCTV-05-0042	US 41 @ Oneida St	* USH 41 Expansion Project, 1133-09-71
NE	CCTV-05-0047	US 41 @ I-43	* USH 41 Expansion Project, 1133-10-77
NE	CCTV-05-0048	US 41 @ East Deerfield Drive	* USH 41 Expansion Project, 1133-10-77
NW	CCTV-27-0036	I-94 @ County O	1023-00-80
NW	TBD	US 53 @ Golf Rd.	$10M Appropriation
NW	TBD	US 53 @ STH 93	$10M Appropriation
NW	TBD	US 53 @ Melby Rd.	$10M Appropriation
NW	TBD	US 53 @ STH 124	$10M Appropriation
NW	TBD	US 53 @ STH 29	$10M Appropriation
NW	TBD	US 53 @ STH 29 (2nd camera)	$10M Appropriation
NW	TBD	US 53 @ Bus 29/CTH X	$10M Appropriation
SE	CCTV-30-0133	I-94 @ Hwy E	1030-23-72
SE	CCTV	I-894 @ Hale Interchange	$10M Appropriation
SE	CCTV	I-894 @ 51st St.	$10M Appropriation
SE	CCTV	I-43 @ Locust	$10M Appropriation
SE	CCTV	I-794 @ Howard Ave.	$10M Appropriation
SE	CCTV	I-43 @ Calhoun Rd.	$10M Appropriation
SE	CCTV	I-94 @ 35th St.	$10M Appropriation
SW	CCTV-13-0128	US 151 @ WIS 19	1111-02-78
SW	CCTV-13-0129	US 151 @ CTH N	1111-02-78

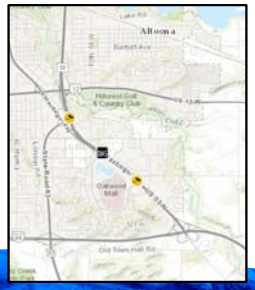
Proposed 2016 DMS Deployments

Region	Device ID	Location	Project
NW	DMS-55-0009	WIS 35/64 WB @ Anderson Boy Scout Camp Rd	8110-02-75
NW	TBD	US 53 NB (Between Golf Rd. & STH 93)	$10M Appropriation
NW	TBD	US 53 NB South of STH 29	$10M Appropriation
NW	TBD	US 53 SB North of STH 29	$10M Appropriation

Proposed 2016 TSM&O Deployments

Northwest Region

Eau Claire / Chippewa Falls (US 53)



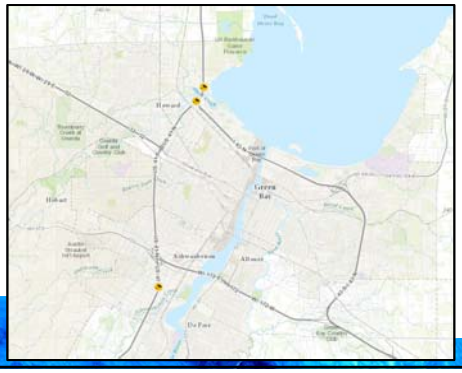
Proposed 2016 TSM&O Deployments

Northwest Region

Saint Croix County / Jackson County

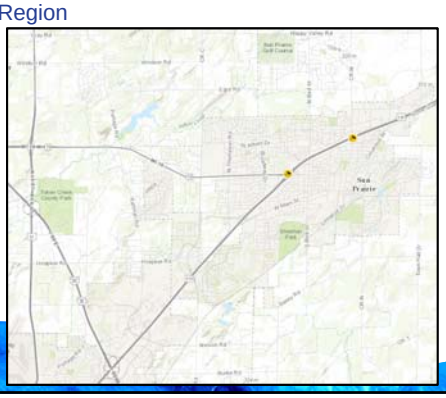
Proposed 2016 TSM&O Deployments

Northeast Region



Proposed 2016 TSM&O Deployments

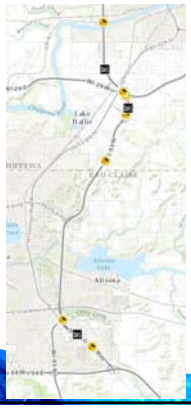
Southwest Region



Proposed 2016 TSM&O Deployments

Southeast Region

Needs Tool and 2016 Planned Deployments



Next Steps

- Continue improving tools (Needs, CBA, future Asset Management Software for Inventory, O&M, and Life Cycle)
- Use Process to Evaluate Old Technology (HAR)
- Meet with Regions to do a Process Workshop
- Annual Schedule tie in with Evaluation Process

- Questions?
- Thank you

TSM&O Process Contacts

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