Memorandum

TO: Wisconsin Department of Transportation

FROM: Cambridge Systematics

DATE: February 24, 2014

Subject: TOPM Task 6 Organizational Mapping – Revision #3

Purpose

This memorandum summarizes the results of Task 6 of the Traffic Operations Performance Management System (TOPMS) project. The TOPMS project supports the next logical step in identifying how mobility and safety information can influence how and where the Department provides key services to keep its citizens moving safely while supporting the state's economic engine. This project involves the introduction of new traffic data sources and mapping of the ways in which existing information is used to provide traveler information and traffic management services. The objective of this task was to map existing and potential operations performance measures to WisDOT organizational goals, objectives and activities. An important goal is to expand the use of performance measurement to enhance and refine operations with the desired outcome of improved customer service, accountability resource management, external competition and program advocacy.

This memorandum summarizes the results of the Organizational Mapping task and includes the following sections:

- A summary of high-priority performance management opportunities with information and data flows identified
- A summary of the methodology used to conduct the organizational mapping effort
- Relation to other components of TOPM project
- A summary of all performance management opportunities shortlisted for consideration (Table 1)

There are three appendices included:

- Appendix A - A summary of key databases and source that could be used to support the performance measurement

- Appendix B – A table of all STOPP report objectives and actions that could be measured quantitatively and incorporated into a performance management system

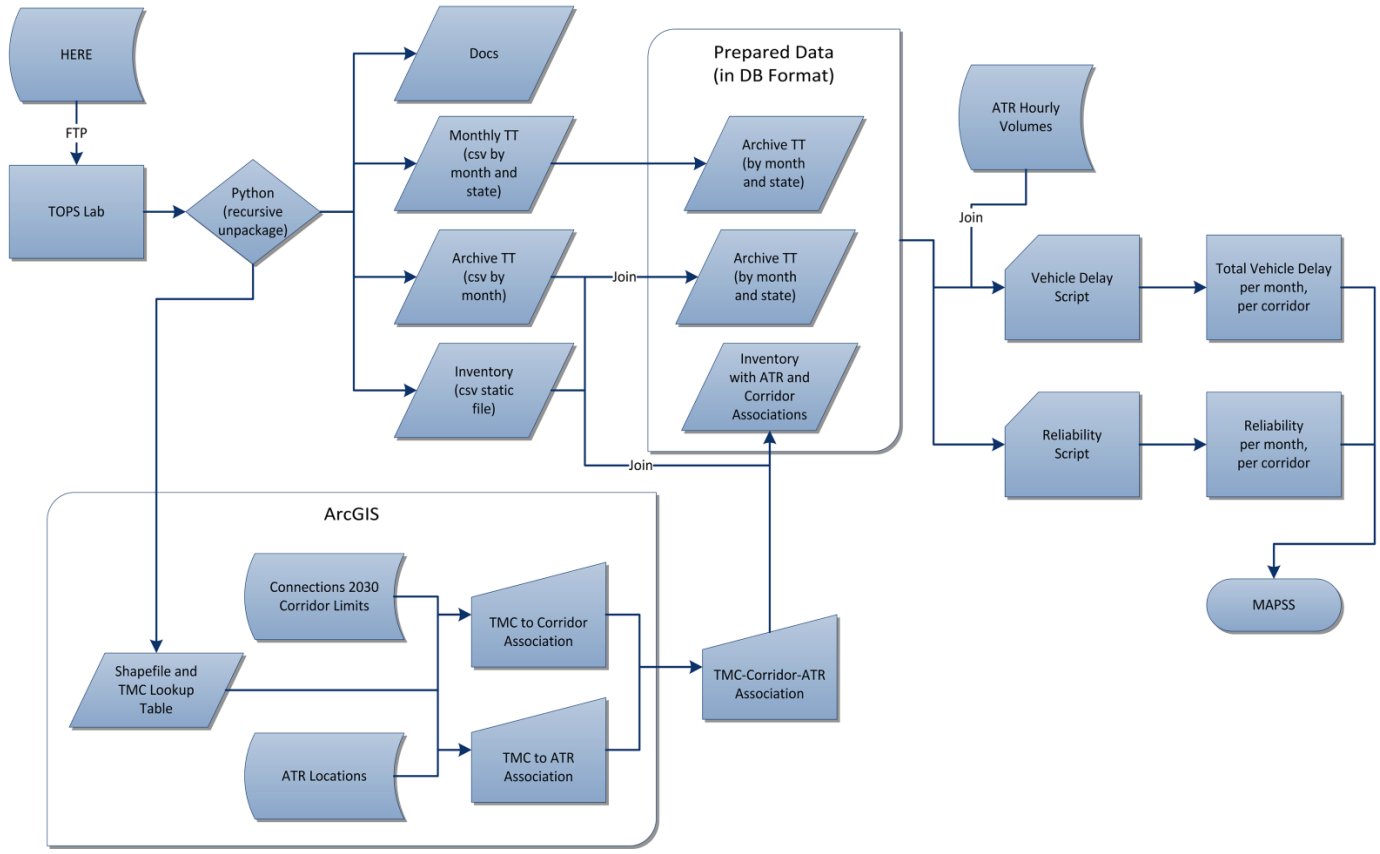
- Appendix C – A table of all STOPP report objectives and actions with potential performance measures, including both quantitative and qualitative measures.

Summary of Performance Management Opportunities

A key objective of Phase I of the TOPM project is to identify specific Performance Management opportunities that have significant potential benefits and can be advanced rapidly into an implementation phase. As demonstrated in the tables that are included in this memorandum there are numerous opportunities for using both existing and emerging data sources for Performance Management feedback. Attempting to implement a large number of these initiatives simultaneously would stretch resources and limit their effectiveness in the short term. As a result, five initiatives for Performance Measure feedback were proposed as high priority. These were selected based on review of the BTO's Strategic Operations Program Plan (STOPP) and interviews with personnel of BTO and the planning bureau of the Division of Transportation Investment Management (DTIM). This process is described in more detail later in this memorandum. These include:

MAP-21 Performance Measures – MAP-21 performance measures will be developed using current databases, supplemented by new sources such as the National Performance Management Research Data Set (NPMRDS) supplied to State and local agencies through FHWA. The final required MAP-21 measures have not been issued by FHWA but it is anticipated they will include hours of user delay and at least one of several reliability indices (http://ops.fhwa.dot.gov/publications/tt_reliability/brochure/ttr_brochure.pdf). These measures may also be applied separately to freight traffic. WisDOT has selected two new measures for its MAPSS dashboard report; user hours of delay and Planning Time Index (ratio of 95 percentile travel time to free flow travel time). These measures are being developed under a separate task of the TOPM project for several major corridors in the State. In addition to meeting reporting requirements, these and similar measures can be used to identify corridors that exhibit poor reliability or are showing increases in user delay. WisDOT can use information to help identify causes, such as incidents, work zones, weather or special events, and determine whether the changes are likely to be temporary or part of a trend. This analysis can be used to help allocate ITS and operational resources to where they will have the greatest impact. Figure 1 shows the process utilized to develop the new MAPSS-21 Mobility measures.

Figure 1 - MAPSS Mobility Measures Development (source: U of Wisconsin TOPS Lab)



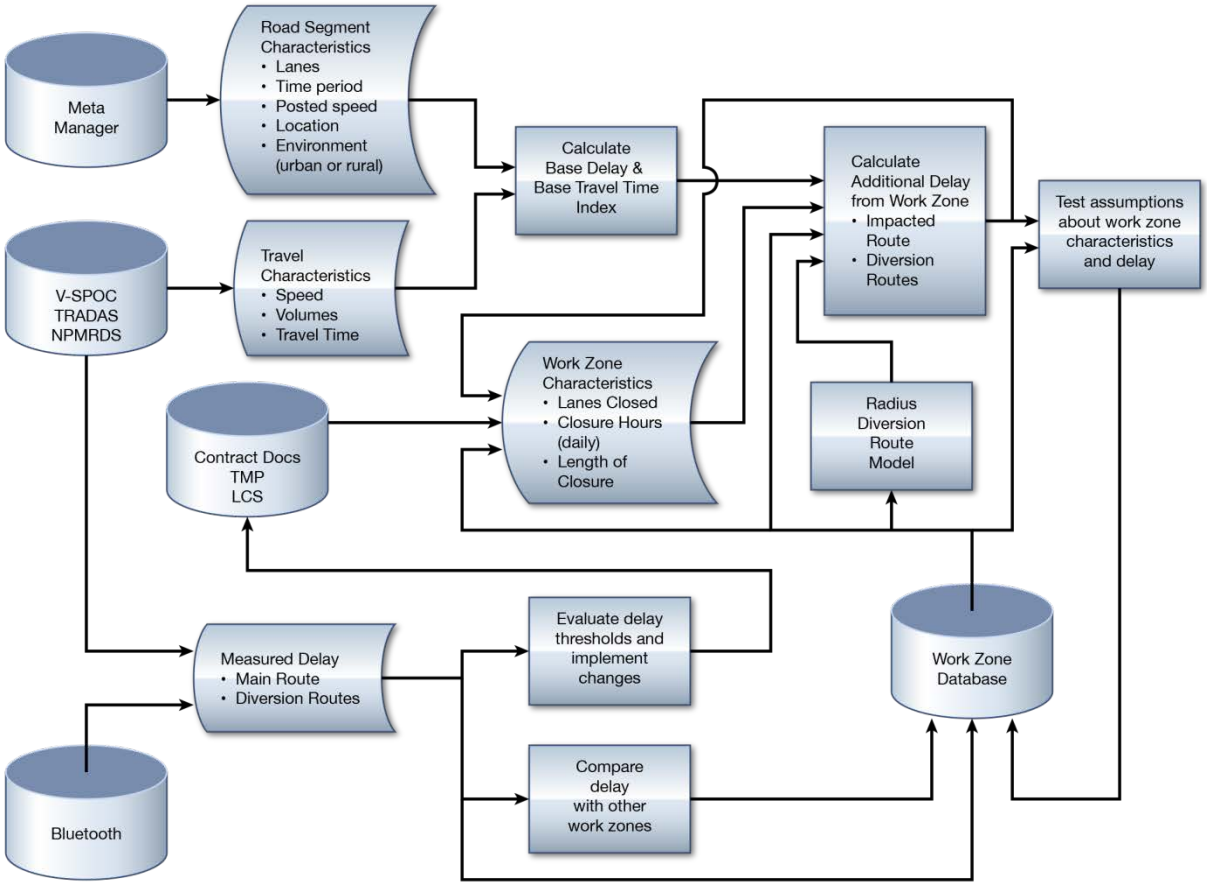
Work Zone Analysis Tool – WisDOT work zones go through an extensive process which involves development of Traffic Management Plan (TMPs), work zone design, TMP/plan review and monitoring of work zones once they are in place. Staff interviews and review of the STOPP report indicate that WisDOT would benefit from a work zone database and related set of analytical tools that facilitate work zone analysis and review. This will allow the various WisDOT staff who have work zone responsibilities to work from a common set of data to improve work zone performance. One of the key metrics is user delay, so the speed and delay metrics discussed above are relevant to this initiative as well. Additional data sources are coming on line, particularly in heavily –traveled areas. These include temporary deployment of ITS systems at the work zone location and deployment of bluetooth technology along both the impacted route and diversion routes. The latter provides a more complete set of information on system impacts of the work zone. Other key measures such as crash reduction can be incorporated into the tool as well. As the database is populated, users would be able to look at impacts of similar work zones and suggest modifications that could reduce delay and save cost. Requirements can be tailored more effectively to the specific location and traffic patterns in the construction area. Some of the specific areas that the tool could address include:

- Allowable lane closure times;

- Number of lanes closed;
- Length of work zones
- Impact of shoulder/ramp closures
- Diversion impacts
- Requirements for temporary ITS and operational resources

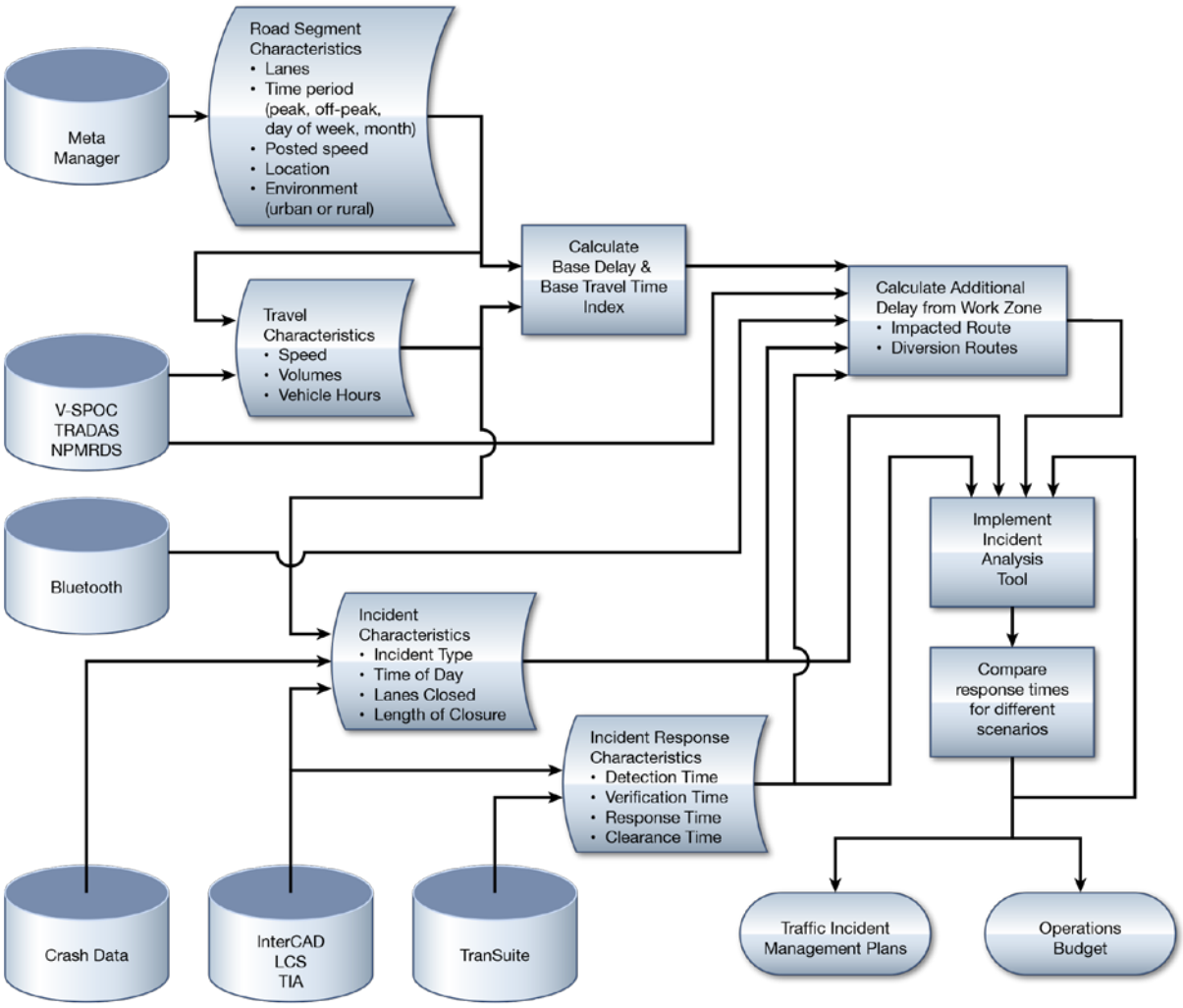
The initial proposed data sources and flows are shown in Figure 2.

Figure 2 - Work Zone Performance Management Tool



Incident Management Analysis Tool – Information on WisDOT system incidents are reported to the State Traffic Operations Center (STOC) in a number of ways depending on the location of the incident and relationships between the STOC and responder agencies. A direct feed is available from the Wisconsin State Patrol and Milwaukee County Sherriff Department CAD systems while other incident reports are received by phone. The event manager software is the primary vehicle for entering incident data. Other sources of information include a database of Traffic Incident Alerts and safety information. Information on travel speeds and volumes discussed in the categories above can be brought into this tool as well to help identify the impacts of different type of incidents on traffic flow. Feedback from detailed measurement of incident response times can help to identify areas for improvement and refine coordination strategies. Looking at the components of incident response time; detection, verification, response and clearance, can be particularly helpful in determining how to allocate resources and determine which investments bring the greatest return in time saved and crashes prevented. The initial proposed data sources and flows are shown in Figure 3.

Figure 3 - Incident Management Analysis Tool



Diversion Route Analysis Tool – WisDOT is already developing a diversion route modeling tool, called RADIUS that will be used to estimate diversions that occur during construction, incidents or special events. This would serve as a component of a diversion route analysis tool that would also include a database of diversion route impacts. Changes in volume, travel time and user delay would be measured where possible and categorized based on location, surrounding land use, roadway type and event. Over time this will help staff involved in planning work zones, incident response and special event transportation to better plan for diversions. Key questions that can be addressed include:

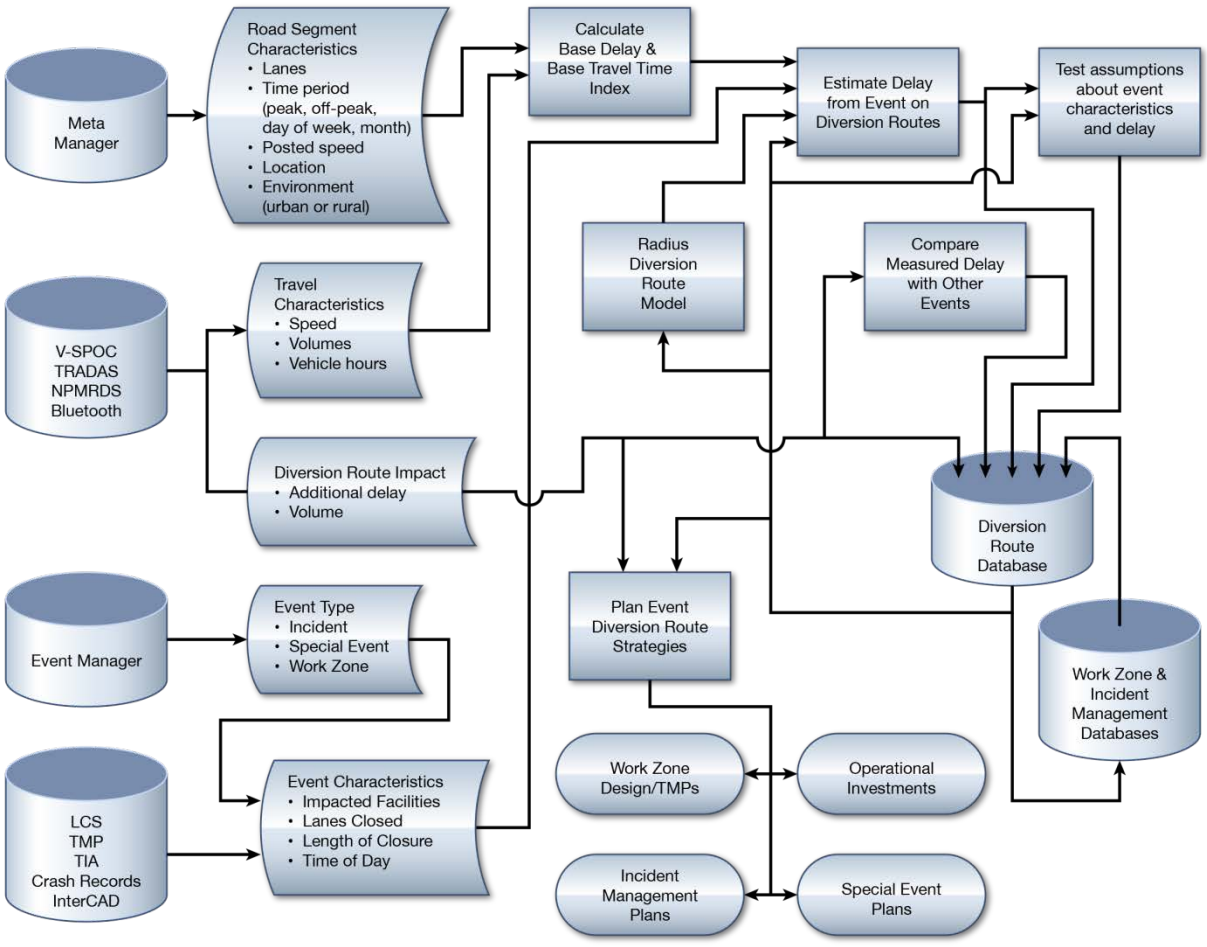
- Where and when should diversion be encouraged and supported and where should it be discouraged?
- What actions and level of investment is required to assure satisfactory operation of diversion routes?

Specific actions that might be triggered based on the diversion route tool include:

- Measure diversion route speeds through bluetooth readers, probe data or temporary detectors;
- Changeable Message Signs/Traveler Information;
- Trailblazer signs; and
- Signal timing changes.

The initial proposed data sources and flows are shown in Figure 4.

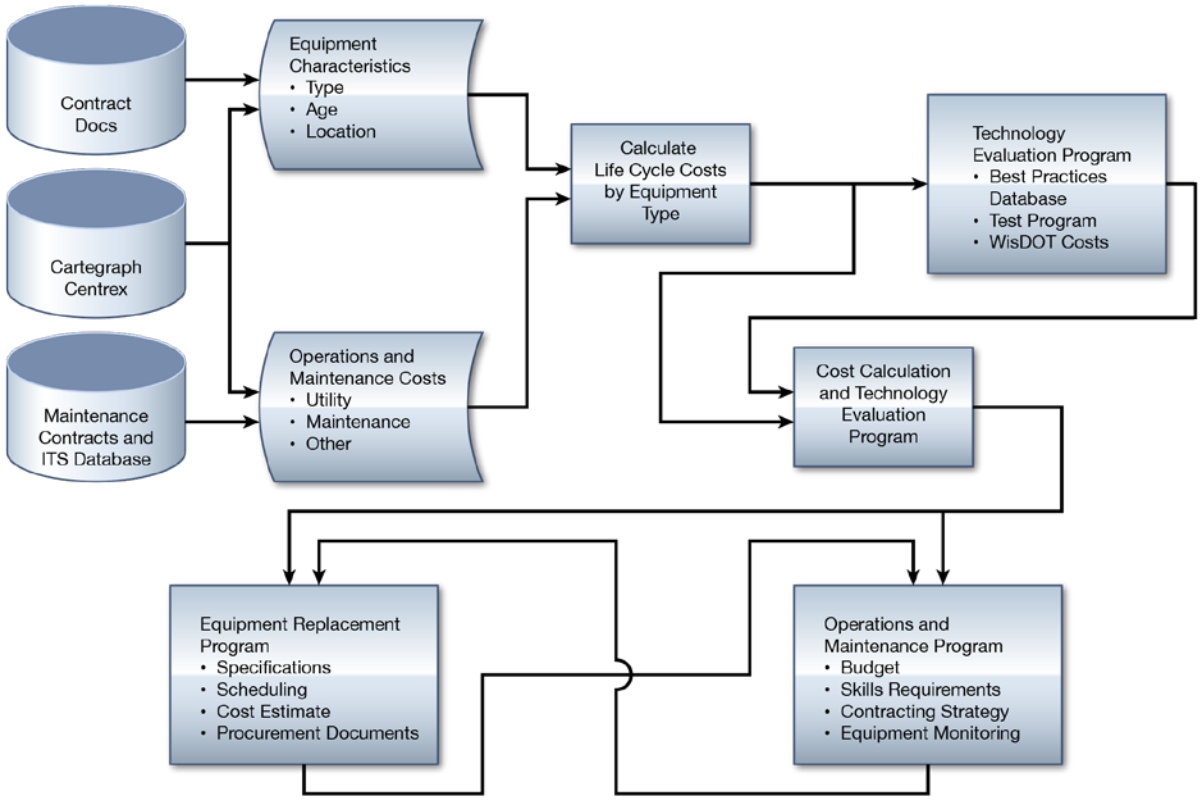
Figure 4 - Diversion Route Analysis Tool



Life Cycle Cost Analysis for Field Equipment – WisDOT has multiple sources of information on maintenance cost and asset condition, including an ITS maintenance database, the

Cartegraph asset management system, and the Centrex signal control system that is currently being deployed. During the interview process for this project staff noted a need to improve the linkages between maintenance and asset management databases with the goal of incorporating life cycle costs more effectively into capital planning efforts. The proposed tool would create this link by helping to identify optimal strategies for replacement of equipment, in particular the age of equipment when operations and maintenance costs begin to exceed the cost of replacement. The performance of specific equipment types can be tracked to help inform future purchases, with actual performance (mean time to failure, cost of repair, etc.) ultimately being incorporated into the bid process. Another capability would be development of a risk profile for assessment of new technologies, incorporating the experience of demonstration projects and other agencies. The initial proposed data sources and flows are shown in Figure 5.

Figure 5 - Life Cycle Cost Performance Management Tool



Based on review by WisDOT staff, the Work Zone analysis tool was selected for the next task, development of Visualization software.

Methodology

The focus of this task was on the functions and activities of the Bureau of Traffic Operations but work also included identification of opportunities for data-sharing and joint efforts with other Bureaus of WisDOT. This analysis was conducted through a review of BTO's Strategic

Operations Program Plan (STOPP) and interviews with personnel of BTO and the planning bureau of the Division of Transportation Investment Management (DTIM). The STOPP report provided a structure for the mapping exercise. The report identified the 11 specific functions of the BTO and defined a series of goals and objectives for each function. Specific actions required to achieve goals and objectives were also listed in the STOPP report. A large number of actions were listed, some of which can be measured quantitatively (user delay), some of which can be measured with a yes or no answer (whether or not an action has been completed) and others which can be measured qualitatively.

This exercise used the actions defined in the STOPP report as a starting point and then used the results of interviews and reviews of existing data sources to identify the following:

- Performance measures appropriate to each action;
- Existing datasets that either are being applied or could be applied to develop performance measures;
- Current data gaps and new or emerging datasets that could be applied to develop performance measures, including combinations of existing sources; and
- Opportunities to use performance measures and new datasets for feedback to management decisions, including those related to capital investment, operations, traveler information, maintenance and system management.

Interviews with BTO and DTIM personnel were utilized to identify:

- Functions that their group performs;
- Performance measures currently in use;
- Primary data and systems used to perform functions and current gaps in data and systems used to perform those functions; and
- Needs related to data and performance management.

Based on the interviews and review of the STOPP report, the team identified potential performance measures for each action identified in the report. For those performance measures which were data-driven existing data sources and gaps were identified along with opportunities for feedback of data for performance management. Table 1 provides a summary table of specific performance management opportunities and the organizational links required to implement them. Appendix A provides additional information on the primary existing and emerging data sources that could be used to feed the performance management systems. Appendix B summarizes the specific STOPP-related actions for which performance management opportunities were identified. Appendix C shows the entire list of proposed STOPP actions and performance measures identified. The numbering system developed for the STOPP report is used in both Appendices B and C. Since the actions with no feeback opportunities were eliminated from Appendix B, there are gaps in the numbering system.

Table 1 consolidates the more detailed actions identified in Tables 2 and 3, many of which overlap. It is clear that there are numerous opportunities to use both existing and enhanced performance measures to inform management decisions at all levels and for most of the functions performed by BTO. There is great potential to refine both investment decisions, deployment of resources and operational strategies by measuring the impact of specific actions on user mobility and safety.

Table 1 – Summary of Performance Management Feedback Opportunities

Performance Management Action	Primary Function Involved	Other BTO Function(s) Involved	Other DOT Functions
Measurement of Work Zone delay • Feedback findings to traffic management plan development and general planning of construction activity	Work Zone Management and Operations	ITS Planning and Design STOC Control Room and IT Systems Traffic Engineering and Operational Analysis Traffic Engineering and Speed Management Traveler Information	Bureau of Project Development Regions DTIM Planning WSP
Measurement of incident delay • Feedback findings to refine incident response strategies and real-time reporting	STOC Control Room and ITS Systems	Emergency Traffic Operations (ETO)/Traffic Incident Management (TIM) Traveler Information	WSP Other First Responder Agencies
Detailed measurement of incident response time including components of response • Feedback from measurement of incident response time components to identify improvements and coordination strategies	ETO/TIM	STOC Control Room and IT Systems	WSP Other First Responder Agencies

Identification and evaluation of secondary crashes and their impacts • Feedback from incident and crash data to identify emergency response, traffic management and incident response strategies that can reduce secondary crashes	ETO/TIM	STOC Control Room and IT Systems Traffic Safety Engineering and Speed Management Work Zone Management and Operations Traveler Information	WSP Other First Responder Agencies
Measurement of diversion impacts from construction and incidents • Feedback findings to refine diversion route plans and investment in diversion route ITS infrastructure	Emergency Traffic Operations (ETO)/Traffic Incident Management (TIM) STOC Control Room and ITS Systems	ITS Planning and Design Traveler Information Traffic Engineering and Operational Analysis Work Zone Management and Operations	Bureau of Project Development Regions WSP
Technology evaluation of new products and systems • Feedback to design and product approval	ITS Planning and Design Electrical and Communications Systems	STOC Control Room and IT Systems	Bureau of Project Development Regions
Before and after measurement of traffic management strategy impact of system delay • Feedback to refine or modify existing traffic management strategies (examples: ramp metering, variable speed limits, integrated corridor management)	STOC Control Room and ITS Systems	ITS Planning and Design Traveler Information Traffic Engineering and Operational Analysis Traffic Engineering and Speed Management Electrical and Communications Systems	Regions WSP

Before and after measurement of ITS/operations project impacts including benefit/cost analysis and measurement of user delay • Feedback to refine investment priorities in technology, including both current TOIP and arterial TOIP	STOC Control Room and ITS Systems	ITS Planning and Design Traffic Engineering and Operational Analysis Electrical and Communications Systems Traffic Operations Program Support	DTIM Planning Bureau of Project Development
Evaluation of Traffic Management Plans • Feedback through knowledge database of which strategies work under which conditions. Would include both quantitative and qualitative data.	Work Zone Management and Operations	STOC Control Room and IT systems ITS Planning and Design Traffic Engineering and Operational Analysis	Regions Bureau of Project Development
Evaluation of STOC Staffing Levels, qualifications and duties • Feedback to adjust staffing levels, job descriptions, duties, training program and procedures as technologies and activities change	STOC Control Room and IT systems	Electrical and Communications Systems ETO/TIM Electrical and Communications Systems Traffic Operations Program Support	WSP Regions
Evaluation of equipment performance • Review of maintenance costs, downtime and life cycle costs for ongoing evaluation of ITS equipment and systems	Electrical and Communications Systems STOC Control Room and ITS systems	ETO/TIM ITS Planning and Design	Regions Bureau of Project Development

Evaluation of traveler information messaging strategies • Review of surveys and other feedback to review messaging provided through 511, DMS and other outlets.	Traveler Information	STOC Control Room and IT Systems ETO/TIM Work Zone Management and Operations	Bureau of Project Development Regions
Adapt traveler information strategies to rapidly-changing information market • Review of survey data and other feedback to modify scope and coverage of traveler information program to adapt to changing technologies and proliferation of private data sources.	Traveler Information	STOC Control Room and IT Systems ETO/TIM Work Zone Management and Operations	Bureau of Project Development Regions
Respond to specialized needs of freight market • Use survey data and estimates of freight-related delay to develop information strategies tailored to freight market	Traveler Information	STOC Control Room and IT Systems Traffic Safety Engineering and Speed Management	DTIM Planning DMV WSP
Establish automated database for speed declaration review • Link to other sources of speed data to support review of speed declaration requests and measure impact of speed limit changes on actual speeds	Traffic Safety Engineering and Speed Management	Traffic Engineering and Operational Analysis Work Zone Management and Operations	Bureau of Project Development

Establish knowledge database for Traffic Impact Analysis • Link sources of in GIS format for use in tracking TIA data and identifying improvements	Traffic Engineering and Operational Analysis	Traffic Safety Engineering and Speed Management Work Zone Management and Operations	Bureau of Project Development
Consolidation of lighting-related data • Link maintenance information, asset management data and utility costs for lighting. Use to review equipment specifications and develop warrants for lighting.	Electrical and Communications Systems	ITS Planning and Design	Bureau of Project Development Regions
Develop performance measure program for arterial operation • Use feedback from arterial systems to develop performance measures and refine timing strategies	Traffic Engineering and Operational Analysis Electrical and Communications Systems	STOC Control Room and IT Systems	Regions
Develop life cycle cost analysis for field equipment • Link maintenance information, asset management data and utility cost data to establish life cycle costs for field equipment and inform decisions on replacement strategies and specifications.	Electrical and Communications Systems	STOC Control Room and IT Systems ITS Planning and Design Traffic Operations Support Program	Bureau of Project Development Regions

Relationship to Other Components of the TOPM Project

Of particular interest was the deployment of Bluetooth™ readers, which is a related component of the TOPM project. This technology uses roadside sensors to detect unique, anonymous identifications known as MAC addresses, broadcast by Bluetooth-enabled devices. Subsequent sensors detect these MAC addresses again, enabling the system to track them as their respective devices move through the road network. Calculations of detection data provide a direct measure of travel time between devices, or across multiple devices on a network. Road speeds and origin-destination information for the study area can also be derived from these calculations. While the MAC addresses are anonymous through the sales channels of the devices, they can also be encrypted to further protect privacy.

Bluetooth sensors are being deployed as part of major construction projects on both affected and alternate routes. This enables the impact of construction activity to be measured across an entire corridor, rather than just on the impacted facility. As part of the TOPM project, Bluetooth sensors are being deployed on several major arterial corridors in the Milwaukee and Madison areas. These corridors serve significant traffic volumes but currently have limited detection capability from legacy systems. Bluetooth technology is relatively fast and cost-effective to install; individual sensors can be moved efficiently to different locations as needs require. Combined with other sources of data, this technology has the potential for addressing key data requirements of the bureau, particularly user delay and reliability measures that are likely to be required as part of the U.S. DOT's MAP-21 requirements.

BTO utilizes a variety of datasets for its work that are generated both internally and externally. The MAPSS (Mobility, Accountability, Preservation, Safety, Service) dashboard system is already using a number of these data sources to report performance measures across all of WisDOT (http://www.dot.wisconsin.gov/about/performance/index.htm). Those related strongly to BTO functions include those related to mobility (Urban Freeway Congestion, Bicycle Accommodation, Incident Response and Winter Response), safety (Traffic Fatalities, Injuries and Crashes) and Service (Phone/web traffic information). A related portion of the TOPM project is the incorporation of two new Mobility measures into MAPSS, hours of vehicle delay and the planning time index (PTI) which is the ratio of actual travel time to free flow. PTI is being reported for peak hour traffic on twenty-eight urban freeway segments and nine Wisconsin Interstate corridors. Different sources of data are being tested on several corridors for MAPSS inclusion. It should be noted that these measures, particularly vehicle delay, are likely to be key sources for most of the proposed Performance Management tools described above. Other key datasets are described in Appendix A.

APPENDICES

Appendix A – Performance Management Datasets

A large number of datasets can be used to feed proposed Performance Management systems. A comprehensive summary of these datasets was prepared by the UW TOPS Lab, which houses a most of the relevant datasets through its WisTransPortal. These databases can be accessed through the website although some areas require permission.

http://www.topslab.wisc.edu/its/topms/data/

Some of the key datasets relevant to this effort are listed below:

- Traffic and delay data
    - FHWA NHS Probe Data – Recently available source of archived data that provides speeds for passenger and commercial vehicles on NHS roads at 5-minute intervals.
    - MetaManager – This data management system is built on the State Trunk Network GIS system and is maintained by DTIM's Planning group. It contains a variety of traffic and roadway condition data which are utilized to help make investment decisions in both the short- and long-term. This dataset was used, and continues to be used, to develop the prioritization scheme for the Traffic Operations Infrastructure Program, that sets priorities for ITS investment.
    - TRADAS - Archived hourly volume count data are available through WisDOT's TRAffic DAta System (TRADAS, a product from Chaparral Systems). TRADAS is managed by the Bureau of State Highway Programs. It houses continuous (e.g., from fixed automated traffic recorders (ATRs) and short duration (e.g., pneumatic tube counts) volume, speed, and vehicle classification data. Data are available in several formats including summaries, tables and maps.
    - V-SPOC – The Volume, Speed and Occupancy database includes records from 4000 loop and microwave detectors that send real-time data to the STOC. Detectors are located primarily in the major urban areas of the State. Data are stored at the UW TOPS Lab in 5-minute increments.
    - 511 XML – Traffic condition data are disseminated to the 511 system and the public through xml feeds. Data include traffic conditions, lane closure information and weather data.
    - Project Related Data – Increasingly detectors are being deployed as part of construction projects for work zone monitoring purposes. Systems include a variety of detectors including Bluetooth technology for speed detection and origin-destination information. This information is not currently available through a central database.

- Private Sources – A number of private sources are providing traffic data, most through their own websites. Some are supplying data through public channels, such as the FHWA NHS Probe Dataset described above. These sources, along with the project-related data described above have great potential to support performance measurement and management systems.

- Incident Data

  - InterCAD data – The InterCAD system is for real-time data exchange between law enforcement and traffic operations, and the data is archived and available through an online interface on the WisTransPortal.

  - Traffic Incident Alert (TIA) System – This system incorporates email alerts and media releases about higher impact incidents and events which are made available through an archive that is available through WisTransPortal.

  - Lane Closure System - All lane closures on WisDOT facilities are entered into the Wisconsin Lane Closure System (WisLCS), also a part of the WisTransPortal. In addition to being a tracking and approval system, all closures are archived. Closure information includes detailed location, description, dates, and times. The WisLCS data is also provided in real-time via XML.

  - Crash Data Sources – There are several sources available on crash data) including:

    - MetaManager – The MetaManager database includes crash counts and rates located on the State Trunk Network. Summaries are provided by a selection of classifications, followed by a selection of indicator flags for relatively higher crash occurrences of different types.

    - MV4000 – This is the State crash reporting form. The WisTransPortal includes all reported crashes in Wisconsin from 1994.

    - WisDOT Transportation Safety Resource Portal – This database includes a variety of resources related to safety. http://wisconsinsafetydataportal.org/

- Weather related data - Weather related data are available from two sources. Wisconsin State Patrol reports road conditions on 120 State Trunkline segments which are displayed on the 511 site. This is being shifted over in 2014 to a new application called the Winter Roads System (WRS). WisDOT operates 65 Environmental Sensor Stations (ESS) around the State that report detailed weather conditions every 30 minutes. These observations are available in tabular format through WisTransPortal. An interactive map is being planned in the near future.

Appendix B Priority TOPM Feedback Opportunities

ITS Planning and Design Strategic Objectives

Objectives (in gray) and Actions (in white)	Measures of Effectiveness	Existing Data Source	New Data Source	Feedback Opportunity
(1) Evaluate and Implement Emerging ITS Technologies				
Coordinate Bluetooth Detection Procurement and Software Integration (WP)	▪ Number of Bluetooth units deployed ▪ Number of miles covered with Bluetooth units	▪ TranSuite for reporting ▪ Cartegraph for inventory	▪ Equipment inventory and status details ▪ Bluetooth data	▪ Measure work zone delay ▪ Measure incident-related delay ▪ Measure diversion impacts during construction and incidents
Develop ongoing research and evaluation process for new technologies	▪ Number of technologies evaluated using the process	▪ UW TOPS Lab evaluation reports		▪ Technology evaluation results feed design and product approval
(2) Maximize Funding Mechanisms				
Be proactive in identifying and leveraging all opportunities to build an efficient and effective ITS network	▪ Miles of ITS systems in the network ▪ Funding secured for ITS projects ▪ Total vehicle hours of delay at ITS sites before and after project deployment	Delay: ▪ FHWA HERE probe data ▪ TranSuite detector data ▪ V-SPOC ▪ Work zone detector data Cartegraph ITS maintenance database TOIP	▪ Arterial TOIP	▪ Measure impact of ITS investments on delay ▪ Measure delay resulting from work zones and incidents

(3) Identify and Justify Use of Existing and Future Expansion of ITS Devices				
Collect and Analyze Corridor-level Traffic Data (to identify best practices and improve future implementation of traffic management tools) (2030)	▪ Development and implementation of traffic analysis tools ▪ Corridor miles covered by data collection effort	Delay: ▪ FHWA HERE probe data ▪ TranSuite detector data ▪ V-SPOC ▪ Work zone detector data Volume: ▪ TRADAS ▪ V-SPOC TOIP	▪ Bluetooth installations ▪ More detailed temporal output from detectors ▪ Centrex signal management	▪ Analysis of traffic management strategy impact on system delay
Continue to Study, Collect and Analyze Traffic Data Over Time (and incorporate findings during the design phase of subsequent projects) (2030)	▪ Number of projects for which the traffic data has been used ▪ Dates of available data for all types (VMT, delay, volume, etc.) ▪ Number of performance measures that are evaluated using the data	Delay: ▪ FHWA HERE probe data ▪ TranSuite detector data ▪ V-SPOC ▪ Work zone detector data Volume: ▪ TRADAS ▪ V-SPOC	▪ Bluetooth installations ▪ More detailed temporal output from detectors ▪ Centrex signal management	▪ Before and after measurement of project impacts used for future design efforts
Continue to Work with Transportation Management Areas (to develop and update their congestion management processes) (2030)	▪ Implement data-driven process with TMAs	Delay: ▪ FHWA HERE probe data ▪ TranSuite detector data ▪ V-SPOC ▪ Work zone detector data	▪ Database of CMP impacts through CMP toolbox	▪ Feedback to ITS planning and design ▪ Feedback to operational strategies

Identify Large Traffic Bottlenecks and Potential Solutions (2030)	▪ Number of bottlenecks with candidate solutions identified and analyzed (e.g., total delay reduction, cost of project) ▪ Number of bottleneck solutions implemented ▪ Total vehicle hours of delay identified for bottlenecks, and potentially saved through solutions analyzed	Delay: ▪ FHWA HERE probe data ▪ TranSuite detector data ▪ V-SPOC ▪ Work zone detector data Volume: ▪ TRADAS ▪ V-SPOC Construction cost data	▪ Database of bottleneck solution impacts	▪ Feedback to ITS planning and design ▪ Feedback to operational strategies ▪ Feedback to Traffic Engineering and Safety ▪ Feedback to Traffic Engineering project review process
Develop prototype for Traffic Operations performance management system	▪ Number of reliability and congestion measures integrated into the prototype ▪ Lane-miles covered by the prototype system	Delay: ▪ FHWA HERE probe data ▪ TranSuite detector data ▪ V-SPOC ▪ Work zone detector data Volume: ▪ TRADAS ▪ V-SPOC Travel times: ▪ FHWA HERE probe data ▪ Wis511XML feed Incident information: ▪ InterCAD ▪ Event Manager ▪ Traffic Incident Alert ▪ Safety Data Portal Weather information: ▪ RWIS ▪ 511 Winter Roads System ▪ Wisconsin State Patrol	▪ Speed and delay form Bluetooth installations	▪ Which areas of investment in TOPM have greatest payback?

ITS Installation (backlog)	▪ Size of the installation queue/backlog ▪ Total additional hours of delay incurred as a result of the delayed projects	Delay: ▪ FHWA HERE probe data ▪ TranSuite detector data ▪ V-SPOC ▪ Work zone detector data TOIP	▪ Total ITS installation list and status of each project ▪ Scheduled completion date versus actual completion date	▪ Use delay as input to ITS investment priorities
ITS Life Cycle Replacement	▪ Total number of projects that are past their life cycle replacement times ▪ Estimated costs associated with additional maintenance for upkeep of old systems that are in need of replacement	▪ Cartegraph ▪ INOC ▪ TOIP ▪ ITS deployment costs	▪ Next Gen asset management	▪ Feedback to ITS investment strategies

STOC Control Room and IT Systems Strategic Objectives

Objectives (in gray) and Actions (in white)	Measures of Effectiveness	Existing Data Source	New Data Source	Feedback Opportunity
(1) Consistently Utilize Traffic Management Tools to Reduce Delay and Enhance Safety				
Incorporate lane closure guidelines into WisDOT business operation	▪ Development and implementation of lane closure guidelines	▪ Lane closure system	▪ Work zone knowledge database ▪ Bluetooth data on travel times	▪ Feedback to TMP process
Explore channels for disseminating traveler information and traveler warning, including social media, mobile solutions, and web sites and third party distributions.	▪ Number of channels being used for information dissemination ▪ Number of users receiving information by those channels	▪ Number of 511 callers and web site users ▪ Survey results regarding traveler information sources	▪ Expanded survey covering wider range of traveler information sources	▪ Feedback to identify WisDOT role in traveler information as new sources proliferate

Develop and implement a freeway system ramp meter timing program (baseline)	▪ Implement program ▪ Vehicle hours of delay saved through metering modifications ▪ Total freeway miles covered by meters	Delay: ▪ FHWA HERE probe data ▪ TranSuite detector data ▪ V-SPOC Volume: ▪ TRADAS ▪ V-SPOC	▪ Bluetooth speed data ▪ Ramp metering timing	▪ Use change in delay on ramps and mainline to fine tune ramp metering algorithms
Actively manage and adjust ramp meter operations for incidents, construction, special events, weather	▪ Implementation of ramp metering algorithms for special conditions ▪ User delay hours saved	Delay: ▪ FHWA HERE probe data ▪ TranSuite detector data ▪ V-SPOC ▪ Work zone detector data Volume: ▪ TRADAS ▪ V-SPOC Lane Closure System Incident information: ▪ InterCAD ▪ Event Manager ▪ Traffic Incident Alert ▪ Safety Data Portal Weather information: ▪ RWIS ▪ 511 Winter Roads System ▪ Wisconsin State Patrol	▪ Bluetooth speed data ▪ Ramp metering timing	▪ Use change in delay on ramps and mainline to develop incident- and event-driven ramp metering algorithms
Integrate corridor management into control room operations (signals, arterial detection, arterial DMS, incident management, traveler information, surveillance)	▪ Total lane miles of managed corridors ▪ Reduction in user delay through ICM deployments	▪ TranSuite ATMS	▪ Centrex signal management system ▪ Arterial TOIP ▪ Bluetooth speed data	▪ Utilize arterial data to implement ICM strategies

Institute an annual review of control room operations. System and infrastructure expansions are increasing demands on control room staff.	▪ Total overtime hours worked by staff ▪ Ratio of personnel to number of systems that must be monitored/ operated	▪ Staff overtime hours reported ▪ Staff size	▪ Time study of operator activities	▪ Feedback to adjust staffing levels and duties
Actively address control room software and equipment life cycle replacement needs (video wall)	▪ Hardware/softw are elements that are past their life cycle replacement times ▪ Additional costs for systems that are in need of replacement	▪ Cartegraph ▪ INOC ▪ STOC Inventory	▪ Incorporate STOC equipment into Cartegraph software	▪ Feed back maintenance time/cost records to determine life cycle and refine replacement plan
(2) Develop the Skills and Potential of Control Room Staff				
Manage performance of staff and identify and expand training for staff in traffic management center work zone support, traveler information and traveler warning support and emergency traffic operations support.	▪ Staff survey feedback ratings of preparedness in different areas ▪ Number of training hours budgeted and used each quarter	▪ Staff personnel reviews and records	▪ Quarterly budget records ▪ Survey results	▪ Identify gaps in training and performance and identify training or other actions required
Via the consolidated contract mechanism, institute an operator certification and performance management program	▪ Number of certifications ▪ Number of remaining certification program slots, and number of uncertified employees	▪ Staff personnel reviews and records	▪ Employee certification records ▪ Certification class records	▪ Identify impact of certification activities on operator performance

(3) Foster Partnerships				
Develop and distribute freight-specific traveler information/traveler warning products	▪ Frequency of messages disseminated to truckers via traveler information systems (radio, cellular device, etc.) ▪ Number of agency-supported information dissemination products	Freight-specific messages disseminated: ▪ 511 xml feeds ▪ Web site usage ▪ Call usage ▪ Survey data FHWA HERE database – truck speeds	▪ Freight-specific survey to determine usage of information sources	▪ Feedback survey data to identify additional methods of disseminating freight-related information
(5) Support the ITS Maintenance Consolidated Contract				
Provide timely, reliable service request information	▪ MTTR ▪ Average turnaround time for service requests ▪ Percent of requests that were not resolved by the first response	▪ ITS maintenance ticketing system	▪ Combine asset management and ITS maintenance ticketing system	▪ Feedback from maintenance to asset management system to refine replacement strategies
Provide support to development of asset management software.	▪ MTTF by equipment type	▪ Cartegraph	▪ Combine asset management and ITS maintenance ticketing system	▪ Feedback from maintenance to asset management system to refine replacement strategies

Traveler Information Strategic Objectives

Objectives (in gray) and Actions (in white)	Measures of Effectiveness	Existing Data Source	New Data Source	Feedback Opportunity
(1) Enhance and Promote Existing Service and Functionality				
Launch Phase 2 of 511 Construction Projects and 511 Winter Road System	▪ Usage of 511 ▪ Phone and web site hits on construction and winter road information	▪ 511 system	Combine with RWIS data to estimate: ▪ 511 usage during weather events Bluetooth data to estimate travel time changes due to construction	• Feedback usage data to identify where to expand 511 reporting • Usage of system can provide input to TOIP refinements in certain corridors
Enriching DMS Signing (particularly for adverse weather conditions and unexpected congestion)	▪ Number and category of messages delivered on adverse weather and unexpected congestion	▪ 511 xml	▪ User surveys	▪ Feedback to identify potential improvements in messaging during periods of adverse weather and congestion
Continue to explore value of alternative traffic data sources, including local, transit and third party sources	▪ Number of alternative sources identified and analyzed		▪ User surveys on use of third party traffic information sources	▪ Feedback to identify opportunities for linking 511 to third party sites
Define social media role in traveler information	▪ Usage of social media for traveler information	▪ Usage of WisDOT social media sites	▪ User surveys to identify usage of third party social media sites	▪ Feedback to identify opportunities for linking 511 to third party sites
(2) Expand User Options				
Continue to explore alternative dissemination methods	▪ Number of alternative dissemination methods identified and implemented ▪ Usage of alternative dissemination channels for traveler information	▪ 511 system	▪ User surveys on use of third party traffic information sources	▪ Feedback to identify opportunities for disseminating 511 data through other outlets

Address freight industry-specific needs (Truck Parking Information, Width Restrictions)	▪ Number of freight-specific messages provided ▪ Usage by freight industry	▪ 511 system	▪ User survey of freight industry	▪ Feedback to assess effectiveness of freight information
(3) Improve Internal Coordination				
Incorporate the use of automation and analysis Tools in Road Weather Assessments, including Maintenance Decision Support System (MDSS), Road Weather Information Systems (RWIS), regional maintenance coordination and advanced forecasting information integration	▪ Number of tools and processes that are integrated with automatic weather information ▪ Number of adjustments made to information disseminated in response to MDSS-related information	▪ Labor resources expended on weather-related information	▪ Record of MDSS inputs into traveler information system	▪ Feedback to determine whether labor resources can be saved due to incorporation of automated MDSS data
(4) Enhance Performance Measurement and Policy Creation				
Performance Management (integrate reliability and congestion measures into traveler information systems)	▪ Number and frequency of reliability and congestion measures reported ▪ Use of reliability/congestion measures by staff and public ▪ Perceived usefulness of reliability measures	▪ 511 system usage ▪ Number accessing reliability reports	▪ User surveys, focus groups	▪ Feedback to adjust number and format of reliability measures provided

Emergency Traffic Operations (ETO) and Traffic Incident Management (TIM) Strategic Objectives

Objectives (in gray) and Actions (in white)	Measures of Effectiveness	Existing Data Source	New Data Source	Feedback Opportunity
(1) Integrate Program Functions with Other BTO Initiatives				
Use ETO program knowledge to influence and enhance the development of both NextGen 511 systems and NextGen ATMS systems	▪ Number of emergency-related activities documented in ATMS ▪ Number of emergency-related messages disseminated by 511	Incident information: ▪ InterCAD ▪ Event Manager ▪ Traffic Incident Alert ▪ Safety Data Portal TIME program records 511 system usage	.	▪ Feedback of incident information to identify priorities for next gen ATMS and 511
(2) Leverage Technology for ETO Purposes				
Continue to investigate mobile technologies and their value to the ETO process	▪ Use of mobile technologies	▪ ATMS (Incident records)	▪ Research project into benefit/cost analysis of increased mobile technology	▪ Feedback on role of mobile technologies in incident response
(5) Cultivate Statewide TIM Relationships				
Work with Partners to Develop Agreements on Responsibilities for Transportation Incident Management and Emergency Transportation Operations (2030)	▪ Number of formal agreements established ▪ Average incident clearance times	Incident information: ▪ InterCAD ▪ Event Manager ▪ Traffic Incident Alert ▪ Safety Data Portal After-action reviews		▪ Feedback of response time data and after-action review to modify agreements as needed
Develop DSP/Division of Transportation System Development (DTSD) MOU (identifies roles and responsibilities pertaining to traffic incident management)	▪ Date of MOU establishment	Incident information: ▪ InterCAD ▪ Event Manager ▪ Traffic Incident Alert ▪ Safety Data Portal After-action reviews		▪ Feedback of response time data and after-action review to modify MOU as needed

(7) Evaluate Best TIM practices				
Investigate Application of Traffic Incident Management Techniques Along Key Corridors Around the State (2030)	▪ Criteria and toolbox established ▪ Number of corridors analyzed ▪ Percent of entire network investigated ▪ Priority ranking of corridors for action	Incident information: ▪ InterCAD ▪ Event Manager ▪ Traffic Incident Alert ▪ Safety Data Portal After-action reviews Delay: ▪ FHWA HERE probe data ▪ TranSuite detector data ▪ V-SPOC ▪ Work zone detector data Volume: ▪ TRADAS ▪ V-SPOC Travel times: ▪ FHWA HERE probe data ▪ Wis511XML feed	▪ Bluetooth data where available	▪ Feedback from analysis to establish project objectives and refine strategies as needed
(8) Improve TIM Performance Measurement				
Develop a first responder database	▪ Completion of database ▪ Database linked to other related DOT databases ▪ Usage of database	Incident information ▪ InterCAD ▪ Event Manager ▪ Traffic Incident Alert ▪ Safety Data Portal After-action reviews	▪ Incident response times by component (detection, verification, etc.) ▪ Identify useful input from first responders	▪ Feed data back to first responders, STOC and service patrol personnel to identify operational improvements
Institute secondary and strike by incident measurement procedure for the Department	▪ Date the procedure was initiated ▪ Reduction in average incident clearance times for incidents that were addressed by this initiative	Incident information ▪ InterCAD ▪ Event Manager ▪ Traffic Incident Alert ▪ Safety Data Portal After-action reviews	▪ Measure of secondary incidents	▪ Feedback to identify conditions under which secondary incidents are most likely to occur and mitigation strategies

Develop effective and relevant performance measure for longer-term incidents	▪ Anticipated length of longer-term incidents ▪ Measure of anticipated length versus actual length	Delay: ▪ FHWA HERE probe data ▪ TranSuite detector data ▪ V-SPOC ▪ Work zone detector data Volume: ▪ TRADAS ▪ V-SPOC Lane Closure System Incident information ▪ InterCAD ▪ Event Manager ▪ Traffic Incident Alert ▪ Safety Data Portal	▪ Travel times on impacted routes and alternate routes ▪ Analysis of incident length by type ▪ Summary of required actions that impact incident removal (fatalities, hazardous clean-up, etc.)	▪ Feedback to identify improved strategies for alternate routing ▪ Feedback to develop strategies for reducing long-term incident response and recovery times

Traffic Engineering and Operational Analysis Strategic Objectives

Objectives (in gray) and Actions (in white)	Measures of Effectiveness	Existing Data Source	New Data Source	Feedback Opportunity
(1) Improve Data Management Systems				
Develop a statewide Traffic Impact Analysis GIS database for users to enter or track TIA-related data	▪ Number of registered users ▪ Number of assets in the database	Volume: ▪ TRADAS ▪ V-SPOC Travel times: ▪ FHWA HERE probe data ▪ Wis511XML feed Safety Data Portal	▪ Consolidate information into common GIS data system ▪ Update database after system change to identify before and after comparison	▪ Use database as input to review of TIA
Develop a statewide speed management database	▪ Roadway mileage covered in speed database ▪ Pct of roadway mileage covered in speed database	Delay: ▪ FHWA HERE probe data ▪ TranSuite detector data ▪ V-SPOC ▪ Work zone detector data Travel times: ▪ FHWA HERE probe data ▪ Wis511XML feed	▪ Automated database that links speed declarations with existing speed data	▪ Use database as input to review of TIA

Traffic Safety Engineering and Speed Management Strategic Objectives

Objectives (in gray) and Actions (in white)	Measures of Effectiveness	Existing Data Source	New Data Source	Feedback Opportunity
(4) Create More Effective Safety Decision Processes and Improve Incident Management in Bad Weather (SHSP Issue Area)				
Complete 70 MPH freeway speed feasibility study	▪ Completion of study ▪ Change in actual speed on 70 mph roads	Delay: ▪ FHWA HERE probe data ▪ TranSuite detector data ▪ V-SPOC ▪ Work zone detector data Volume: ▪ TRADAS ▪ V-SPOC	▪ Bluetooth Installations	▪ Measure impact of speed change on actual speeds

Work Zone Management and Operations Strategic Objectives

Objectives (in gray) and Actions (in white)	Measures of Effectiveness	Existing Data Source	New Data Source	Feedback Opportunity
(1) Consistently Utilize Traffic Management Tools to Reduce Delay and Promote Safety in Work Zones				
With Local Agencies, Conduct Work Zone Safety and Mobility Analyses, Identify and Coordinate Enforcement Needs, Incorporate Lane Closure Guidelines into Work Zone Plans and TMPs, Identify Potential Routing Alternatives, and Use Signage to Communicate Relevant Information Such as Expected Time Delays (2030)	▪ Documentation of tools listed	Delay: ▪ FHWA HERE probe data ▪ TranSuite detector data ▪ V-SPOC ▪ Work zone detector data Volume: ▪ TRADAS ▪ V-SPOC Travel times: ▪ FHWA HERE probe data ▪ Wis511XML feed Lane Closure System	▪ Bluetooth data on both work zone routes and alternate routes ▪ Heat map based on volumes to determine queue length and lane closure impacts	▪ Utilize user delay data to refine work zone, TMP and lane closure guidelines

(3) Work with Stakeholders to Monitor and Improve Work Zone Safety				
Investigate alternatives to improve work zone speed enforcement	▪ Results of speed zone enforcement evaluations ▪ Speed compliance in work zones	Lane Closure System: ▪ TranSuite detector data ▪ V-SPOC ▪ Work zone detector data	▪ Automated speed declaration database ▪ Bluetooth data from	▪ Feedback speed profiles from work zones to help in review of speed declarations
(4) Continue to Enhance Work Zone Policies				
Develop design guidelines for nighttime work zone lighting	▪ Number of work zone where guidelines are applied	Lane Closure System Incident information: ▪ InterCAD ▪ Event Manager ▪ Traffic Incident Alert ▪ Safety Data Portal	▪ Lighting cost database	▪ Feedback of work-zone related incidents and lighting costs to work zone requirements
Enhance guidance on work zone capacity and user delay analysis as part of smart work zones (WP)	▪ Completion of guidance ▪ Application of guidance and delay calculations for work zones	Delay: ▪ FHWA HERE probe data ▪ TranSuite detector data ▪ V-SPOC ▪ Work zone detector data Lane Closure System	▪ Bluetooth data ▪ Heat map based on volumes to determine queue length and lane closure impacts	▪ Use delay data for review and modification of TMIPs

Electrical and Communication Systems Strategic Objectives

Objectives (in gray) and Actions (in white)	Measures of Effectiveness	Existing Data Source	New Data Source	Feedback Opportunity
(1) Manage and Maintain Field Infrastructure				
Evaluate NW Region electrical maintenance outsourced staffing pilot project	▪ Maintenance cost differences resulting from outsourcing	▪ Cartegraph ▪ SpatialNet inventory	▪ Interface for region/contractors to enter data in Cartegraph	▪ Feedback experience of NW region to decisions on other outreach opportunities ▪ Feedback to statewide FiberOptic cable network expansion plan

Continually evaluate the impacts of ITS, signals and lighting field infrastructure deployments on operations and maintenance costs	▪ Development of evaluation procedure and database	TOIP Delay and travel time data Incident data Weather data Lane Closure Capital costs Operations and maintenance costs SpatialNet inventory	▪ Benefit/cost database ▪ Arterial TOIP	▪ Feedback results of benefit/cost analysis to investment decisions ▪ Feedback to statewide FiberOptic cable network expansion plan
(6) Improve the Reliability and Efficiency of State Trunk Highway System Operations				
Develop ongoing research and evaluation process for new technologies	▪ Total amount invested in research (in dollars) ▪ Number of new technologies researched or evaluated	▪ Research budget	▪ Research ideas incorporated into operation	▪ Feedback from research activities to operations. Document performance and/or cost improvement
Address signal system performance measure improvements in the areas of signal systems communications and retiming	▪ Overall reduction in delay resulting from signal systems communications improvements and signal retimings	Delay: ▪ InSync Adaptive Signal Performance summary ▪ Work zone detector data Volume: ▪ TRADAS	▪ Bluetooth data	▪ Use performance measure data to refine signal timing strategies
(8) Develop Lighting Asset Management and Life Cycle Replacement Process				
Develop implementation options and cost benefit analysis for LED lighting upgrades in SE Region	▪ Number/percentage of lighting upgrades completed ▪ Life cycle cost savings from LED implementation	▪ Cartegraph	▪ Utility cost database ▪ Incorporate lighting into asset management database	▪ Use cost data to develop regional plan
Develop implementation options and life cycle cost plan for statewide LED lighting systems	▪ Number/percentage of lighting upgrades completed ▪ Life cycle cost savings from LED implementation	▪ Cartegraph	▪ Utility cost database ▪ Incorporate lighting into asset management database	▪ Use cost data to develop a statewide plan

(9) Improve Energy Efficiencies of Lighting System				
Expand implementation of LED lighting for freeway systems	▪ Percent of freeway system with LED lighting ▪ Energy costs used for freeway lighting	▪ Cartegraph	▪ Electrical usage ▪ Utility cost database	
Collect data and evaluate the efficiencies of LED lighting since first deployment	▪ Energy costs and total power usage for portions of system using LED lights, compared to portions of system using conventional lights		▪ Electrical usage ▪ Utility costs	

Appendix D Mapping Matrix with all STOPP Actions Included

ITS Planning and Design Strategic Objectives

Objectives (in gray) and Actions (in white)	Measures of Effectiveness	Existing Data Source	New Data Source	Feedback Opportunity
(1) Evaluate and Implement Emerging ITS Technologies				
Coordinate Bluetooth Detection Procurement and Software Integration (WP)	▪ Number of Bluetooth units obtained ▪ Number of Bluetooth units set up and integrated with the software ▪ Number of miles covered with Bluetooth units	▪ TranSuite for reporting ▪ Cartegraph for inventory	▪ Equipment inventory and status details	▪ Measure work zone delay ▪ Measure incident-related delay ▪ Measure diversion impacts during construction and incidents
Develop ongoing research and evaluation process for new technologies	▪ Number of technologies evaluated using the process	▪ UW TOPS Lab evaluation reports	▪ The research evaluations themselves	▪ Technology evaluation results feed design and product approval
Develop arterial Traffic Operations Infrastructure Plan (TOIP)	▪ Number and mileage of arterial ITS deployments included in the plan as part of megaprojects		▪ The arterial TOIP evaluation process (currently under development)	▪ Feedback from deployment experience to refine Arterial TOIP process
Review and update ITS design standards via ITS Technical Advisory Group forum	▪ Number of ITS design standards reviewed ▪ Number of ITS designs updated		▪ The current and past versions of the design standards	

(2) Maximize Funding Mechanisms				
Assess effects of Act 16 amendments on ITS Planning and Design Program	▪ Number of ITS projects approved since Act 16 ▪ Total funds awarded to ITS projects since Act 16 ▪ Project approval rate for ITS projects compared to other highway projects since Act 16		▪ Overall department budget information broken down by projects	
Be proactive in identifying and leveraging all opportunities to build an efficient and effective ITS network	▪ Miles of ITS systems in the network ▪ Funding secured for ITS projects ▪ Total vehicle hours of delay at ITS sites before and after project deployment	Delay: ▪ FHWA HERE probe data ▪ TranSuite detector data ▪ V-SPOC ▪ Work zone detector data Cartegraph ITS maintenance database TOIP	▪ Arterial TOIP	▪ Measure impact of ITS investments on delay ▪ Measure delay resulting from work zones and incidents
Support the development of NextGen asset management system	▪ Progress in NextGen system toward deployment ▪ Number of assets managed by NextGen system ▪ Work-hours committed to NextGen development	▪ Cartegraph ▪ INOC (fiber optic system)	▪ NextGen system	
Continue ITS Program Management services	▪ Chart showing dates when ITS program management services were initiated and discontinued (if applicable)		▪ Monthly budget information showing active projects over each interval	

(3) Identify and Justify Use of Existing and Future Expansion of ITS Devices				
Collect and Analyze Corridor-level Traffic Data (to identify best practices and improve future implementation of traffic management tools) (2030)	▪ Development and implementation of traffic analysis tools ▪ Corridor miles covered by data collection effort	Delay: ▪ FHWA HERE probe data ▪ TranSuite detector data ▪ V-SPOC ▪ Work zone detector data Volume: ▪ TRADAS ▪ V-SPOC TOIP	▪ Bluetooth installations ▪ More detailed temporal output from detectors ▪ Centrex signal management	▪ Analysis of traffic management strategy impact on system delay
Continue to Study, Collect and Analyze Traffic Data Over Time (and incorporate findings during the design phase of subsequent projects) (2030)	▪ Number of projects for which the traffic data has been used ▪ Dates of available data for all types (VMT, delay, volume, etc.) ▪ Number of performance measures that are evaluated using the data	Delay: ▪ FHWA HERE probe data ▪ TranSuite detector data ▪ V-SPOC ▪ Work zone detector data Volume: ▪ TRADAS ▪ V-SPOC	▪ Bluetooth installations ▪ More detailed temporal output from detectors ▪ Centrex signal management	▪ Before and after measurement of project impacts used for future design efforts
Continue to Work with Transportation Management Areas (to develop and update their congestion management processes) (2030)	▪ Implement data-driven process with TMAs	Delay: ▪ FHWA HERE probe data ▪ TranSuite detector data ▪ V-SPOC ▪ Work zone detector data	▪ Database of CMP impacts through CMP toolbox	▪ Feedback to ITS planning and design ▪ Feedback to operational strategies

Identify Large Traffic Bottlenecks and Potential Solutions (2030)	▪ Number of bottlenecks with candidate solutions identified and analyzed (e.g., total delay reduction, cost of project) ▪ Number of bottleneck solutions implemented ▪ Total vehicle hours of delay identified for bottlenecks, and potentially saved through solutions analyzed	Delay: ▪ FHWA HERE probe data ▪ TranSuite detector data ▪ V-SPOC ▪ Work zone detector data Volume: ▪ TRADAS ▪ V-SPOC. Construction cost data	▪ Database of bottleneck solution impacts	▪ Feedback to ITS planning and design ▪ Feedback to operational strategies ▪ Feedback to Traffic Engineering and Safety ▪ Feedback to Traffic Engineering project review process

Develop prototype for Traffic Operations performance management system	▪ Number of reliability and congestion measures integrated into the prototype ▪ Lane-miles covered by the prototype system	Delay: ▪ FHWA HERE probe data ▪ TranSuite detector data ▪ V-SPOC ▪ Work zone detector data Volume: ▪ TRADAS ▪ V-SPOC Travel times: ▪ FHWA HERE probe data ▪ Wis511XML feed Incident information: ▪ InterCAD ▪ Event Manager ▪ Traffic Incident Alert ▪ Safety Data Portal Weather information: ▪ RWIS ▪ 511 Winter Roads System ▪ Wisconsin State Patrol	▪ Speed and delay form Bluetooth installations	▪ Which areas of investment in TOPM have greatest payback?
ITS Installation (backlog)	▪ Size of the installation queue/backlog ▪ Total additional hours of delay incurred as a result of the delayed projects	Delay: ▪ FHWA HERE probe data ▪ TranSuite detector data ▪ V-SPOC ▪ Work zone detector data	▪ Total ITS installation list and status of each project ▪ Scheduled completion date versus actual completion date	▪ Use delay as input to ITS investment priorities

ITS Life cycle Replacement	▪ Total number of projects that are past their life cycle replacement times ▪ Estimated costs associated with additional maintenance for upkeep of old systems that are in need of replacement	▪ Cartegraph ▪ INOC ▪ TOIP ▪ ITS deployment costs	▪ Next Gen asset management	▪ Feedback to ITS investment strategies

STOC Control Room and IT Systems Strategic Objectives

Objectives (in gray) and Actions (in white)	Measures of Effectiveness	Existing Data Source	New Data Source	Feedback Opportunity
(1) Consistently Utilize Traffic Management Tools to Reduce Delay and Enhance Safety				
Continue to use existing and new technologies to more robustly communicate real-time traffic information (new messaging schemes, full color matrix DMS)	▪ Number of channels used to communicate travel times ▪ Number of travel times queried by SMS, web site, 511, etc. ▪ Number of travel time messages displayed on DMSs ▪ Surveyed number of users who use travel times from agency	▪ 511 xml feeds ▪ Web site usage ▪ Call usage ▪ Survey data	▪ Origin of 511 calls and web site hits ▪ Usage of private services	
Incorporate lane closure guidelines into WisDOT business operation	▪ Development and implementation of lane closure guidelines	▪ Lane closure system	▪ Work zone knowledge database ▪ Bluetooth data on travel times	▪ Feedback to TMP process

Develop and implement NextGen 511 system	▪ Percent completion for 511 system ▪ Number of features included in the NextGen 511 system ▪ Expected days to deployment of NextGen 511 system		▪ WisDOT staff and consultants related to NextGen 511 project	
Explore channels for disseminating traveler information and traveler warning, including social media, mobile solutions, and web sites and third party distributions	▪ Number of channels identified as feasible ▪ Number of channels with active projects for development ▪ Number of channels being used for information dissemination ▪ Number of users receiving information by those channels that log this information.	▪ Number of 511 callers and web site users ▪ Survey results regarding traveler information sources	▪ Expanded survey covering wider range of traveler information sources	
Review, update and implement policies and procedures for real-time posting of adverse weather conditions affecting travel	▪ Number of revisions to procedures ▪ Number of weather announcements given to the public ▪ Number of missed weather announcements that the public could have benefitted from	Weather information: ▪ RWIS ▪ 511 Winter Roads System ▪ Wisconsin State Patrol		

Develop and implement a freeway system ramp meter timing program (baseline)	▪ Number of metered entrances ▪ Number of algorithms tested in simulation ▪ Vehicle hours of delay saved through metering ▪ Total freeway miles covered by meters	Delay: ▪ FHWA HERE probe data ▪ TranSuite detector data ▪ V-SPOC Volume: ▪ TRADAS ▪ V-SPOC	▪ Bluetooth speed data ▪ Ramp metering timing	▪ Use change in delay on ramps and mainline to fine tune ramp metering algorithms
Actively manage and adjust ramp meter operations for incidents, construction, special events, weather	▪ Number of events that the ramp metering algorithm can handle ▪ Number of missed events that should have been addressed by special ramp metering ▪ Number of simulated scenarios	Delay: ▪ FHWA HERE probe data ▪ TranSuite detector data ▪ V-SPOC ▪ Work zone detector data Volume: ▪ TRADAS ▪ V-SPOC Lane Closure System Incident information: ▪ InterCAD ▪ Event Manager ▪ Traffic Incident Alert ▪ Safety Data Portal Weather information: ▪ RWIS ▪ 511 Winter Roads System ▪ Wisconsin State Patrol	▪ Bluetooth speed data ▪ Ramp metering timing	▪ Use change in delay on ramps and mainline to develop incident- and event-driven ramp metering algorithms

Integrate corridor management into control room operations (signals, arterial detection, arterial DMS, incident management, traveler information, surveillance)	▪ Number of systems integrated into the control room ▪ Number of agencies working together with the control room staff ▪ Number of corridors being managed ▪ Total lane miles of managed corridors	▪ TranSuite ATMS	▪ Centrex signal management system	
Institute an annual review of control room operations. System and infrastructure expansions are increasing demands on control room staff	▪ Total overtime hours worked by staff ▪ Ratio of personnel to number of systems that must be monitored/ operated	▪ Staff overtime hours reported ▪ Staff size	▪ Time study of operator activities	▪ Feedback to adjust staffing levels and duties
Actively address control room software and equipment life cycle replacement needs (video wall)	▪ Total hardware/software elements that are past their life cycle replacement times ▪ Estimated costs associated with additional maintenance needed for upkeep of old systems that are in need of replacement ▪ Total number of "overdue" hours for all systems that need replacing	▪ Cartegraph ▪ INOC ▪ STOC Inventory	▪ Incorporate STOC equipment into Cartegraph software	▪ Feed back maintenance time/cost records to determine life cycle and refine replacement plan

Continue operations of 24/7 statewide traffic management facility	▪ Total downtime for 24/7 facility per month or per week ▪ Number of backup systems for ensuring 24/7 operation	▪ Time off line	.	
Integrate TMC software Phase 2	▪ Percent completion for Phase 2 software ▪ Number of missing features in Phase 2 software	▪ Phase 2 software documentation		
Develop and implement NextGen ATMS software	▪ Percent completion for NextGen ATMS software ▪ Number of assets managed by NextGen ATMS system ▪ Work-hours committed to NextGen ATMS development	▪ Contract documents related to project ▪ WisDOT resources to the project		
Support State Traffic Operations Center (STOC) hardware and software needs	▪ Number of hardware and software systems supported ▪ Number of unmet needs in terms of hardware and software	▪ STOC Inventory		
Continue the support of WisTransPortal	▪ Number of users ▪ Frequency of use ▪ Resources required			
Enhance V-SPOC and GIS databases	▪ Miles of coverage in V-SPOC data ▪ Number of users	▪ Database details	▪ Access statistics	

Enhance communication network reliability	▪ Network availability ▪ Number of communication failures ▪ Mean time to failure ▪ Mean time to repair	▪ INOC	.	
(2) Develop the Skills and Potential of Control Room Staff				
Manage performance of staff and identify and expand training for staff in traffic management center work zone support, traveler information and traveler warning support and emergency traffic operations support	▪ Staff survey feedback ratings of preparedness in different areas ▪ Number of training hours budgeted and used each quarter	▪ Staff personnel reviews and records	▪ Quarterly budget records ▪ Survey results.	▪ Identify gaps in training and performance and identify training or other actions required
Via the consolidated contract mechanism, institute an operator certification and performance management program	▪ Number of certifications ▪ Number of remaining certification program slots, and number of uncertified employees	▪ Staff personnel reviews and records	▪ Employee certification records ▪ Certification class records	▪ Identify impact of certification activities on operator performance
(3) Foster Partnerships				
Packaging and advertising STOC control room support for response agencies and transportation partners	▪ Survey responses among other agencies regarding familiarity with STOC offerings ▪ Number of established relationships with other agencies/ partners	▪ Phone logs ▪ InterCAD	▪ CAD records received from new agencies	
Investigate and pursue advantageous colocation opportunities	▪ Number of colocation opportunities investigated, pursued/ analyzed, and established		▪ Benefit/cost analysis of colocation	

Participate in full-scale exercises with agencies and states beyond WisDOT	▪ Person-hours committed to exercises with other agencies	▪ Timesheet records ▪ Outside resources procured		
Develop an environment that encourages face to face communication and coordination	▪ Percent of personnel that are collocated in one building or floor			
Update media agreements	▪ Average number of months since last update for all media agreements	▪ Documented agreements	.	
Utilize technologies to create more collaborative and more consistent partnerships (Smart board, video conferencing, web conferencing)	▪ Number of smart boards in office ▪ Percent of employees with access to web/video conferencing (as hosts or participants)	▪ STOC inventory		
Explore and recommend additional center to center communications that benefit Wisconsin and Midwest travelers	▪ Number of intercenter connections identified with other vendors or private information centers	▪ STOC inventory ▪ Current relationships - GLRTOC - Midwest ITS - MnDOT - IDOT - Iowa DOT	▪ Center-to-center contacts	

Develop and distribute freight-specific traveler information/traveler warning products	▪ Frequency of messages disseminated to truckers via traveler information systems (radio, cellular device, etc.) ▪ Number of agency-supported information dissemination products	Freight-specific messages disseminated: ▪ 511 xml feeds ▪ Web site usage ▪ Call usage ▪ Survey data ▪ FHWA HERE database – truck speeds ▪ Current relationships - GLRTOC - Midwest ITS - MnDOT - IDOT - Iowa DOT -MDOT -	▪ Freight-specific survey to determine usage of information sources	▪ Feedback survey data to identify additional methods of disseminating freight-related information
Continue to Work Closely with Partner Agencies, Jurisdictions, States, Stakeholders and Others to Determine Implementation Opportunities Allowing Seamless Connections Between Technology Systems (2030)	▪ Number of technology systems that are supported by the agency and available to the public that also are integrated with each other to any extent		▪ Documentation of these technology systems	
(4) Support Improvement Program				
Proactively provide clear and direct liaison to mega and significant projects affecting the freeway and arterial system	▪ Amount of staff time and resources dedicated to mega- and significant project support	▪ STOC logs of contact with field personnel, freeway service teams and other field personnel ▪ Staff timesheet records ▪ Contract documents		

Packaging and advertising STOC control room support for improvement projects	▪ Number of improvement projects that have received STOC control room support ▪ Amount of staff time and resources dedicated to improvement projects	▪ Staff timesheet records ▪ Contract documents		
Support day to day coordination and communication with mitigation and construction staff	▪ Number of construction/mitigation staff or projects that have access to direct communication with STOC ▪ Amount of staff time and resources dedicated to improvement projects	▪ Staff timesheet records ▪ Contract documents		
Staff and develop the operations manager position (This position is responsible for significant engineering decision-making in the statewide operations environment)	▪ Performance review and time allocation of operations manager	▪ Staff review ▪ Timesheet records		

(5) Support the ITS Maintenance Consolidated Contract				
Provide timely, reliable service request information	▪ MTTR ▪ Average turnaround time for service requests ▪ Percent of requests that were not resolved by the first response (including those that were not accommodated due to insufficient specs from the requestor, because this may indicate that users are not being given specific enough instructions)	▪ ITS maintenance ticketing system	▪ Combine asset management and ITS maintenance ticketing system	▪ Feedback from maintenance to asset management system to refine replacement strategies
Provide support to development of asset management software	▪ MTTF by equipment type	▪ Cartegraph	▪ Combine asset management and ITS maintenance ticketing system	▪ Feedback from maintenance to asset management system to refine replacement strategies
Fully utilize ITS maintenance consolidated contract by engaging program manager appropriately	▪ Cost per maintenance activity	▪ ITS maintenance ticketing system	.	
(6) Support Bureau Development				
Commence Traffic Operations Content Management Program (WP)	▪ Percent completion for the program (e.g., how close it is to being deployed)			

(7) Ensure Proper and Timely System Integration				
Update ITS Device Configuration Management and Notification Process (WP)	▪ Number of pending updates (or unmet needs) compared to the number of implemented updates ▪ Months since last update	▪ ATMS ▪ ITS Maintenance Ticketing System ▪ Cartegraph	▪ Combine asset management and ITS maintenance ticketing system	
Continue system integration management and network engineering support	▪ Time and resources dedicated	▪ Timesheet records ▪ Contract invoices	.	
(8) Implement System Redundancy				
Implement Freeway and Traffic Signal Central System Redundancy	▪ Number/pct of signals with redundant coverage ▪ Number/pct of freeway devices with redundant coverage	▪ Cartegraph		
Implement STOC Server Backups	▪ Frequency of server backups	▪ ATMS ▪ Server documentation		
Create CCTV Network Redundancy	▪ Number of CCTV links/cameras with redundancy (or percentage)	▪ ATMS ▪ INOC ▪ Cartegraph ▪ CCTV System documentation	.	

Traveler Information Strategic Objectives

Objectives (in gray) and Actions (in white)	Measures of Effectiveness	Existing Data Source	New Data Source	Feedback Opportunity
(1) Enhance and Promote Existing Service and Functionality				
Develop Concepts for NextGen 511, including a Traveler Hotline (WP)	▪ Status of NextGen 511 development	▪ Resources expended on development		

Continue to fund operation, planning and maintenance of Traveler Information Program, including 511	▪ Funding level ▪ Mileage covered by 511 ▪ Mileage covered by project sites	▪ 511 system	Combine with traffic volume data to estimate: ▪ VMT covered ▪ Pct of VMT covered	
Launch Phase 2 of 511 Construction Projects and 511 Winter Road System	▪ Usage of 511 ▪ Phone and web site hits on construction and winter road information	▪ 511 system	Combine with RWIS data to estimate: ▪ 511 usage during weather events Bluetooth data to estimate travel time changes due to construction	• Feedback usage data to identify where to expand 511 reporting • Usage of system can provide input to TOIP refinements in certain corridors
Develop NextGen 511 System	▪ Status of NextGen 511 development	▪ Resources expended on development		
Fully integrate upgrades and enhancements to the Department's Lane Closure System	▪ Date of implementation ▪ Number/pct of LCS entries reported through 511	▪ LCS ▪ 511 xml		
Begin to leverage full color matrix technologies for enhanced on-road, real-time traveler information on dynamic message signs	▪ Number of full color matrix DMS deployed ▪ Number and category of messages delivered on full color DMS	▪ ATMS ▪ 511 xml		
Enriching DMS Signing (particularly for adverse weather conditions and unexpected congestion)	▪ Number and category of messages delivered on adverse weather and unexpected congestion	▪ 511 xml	▪ User surveys	▪ Feedback to identify potential improvements in messaging during periods of adverse weather and congestion

Continue development, technical maintenance and enhancement of the 511 Construction Projects Site (provides project-specific content and real-time information at one location)	▪ Use of 511 Construction Projects site ▪ Resources expended on construction project site	▪ 511 system	.	
Continue to explore value of alternative traffic data sources, including local, transit and third party sources	▪ Number of alternative sources identified and analyzed		▪ User surveys on use of third party traffic information sources	▪ Feedback to identify opportunities for linking 511 to third party sites
Define social media role in traveler information	▪ Usage of social media for traveler information	▪ Usage of WisDOT social media sites	▪ User surveys to identify usage of third party social media sites	▪ Feedback to identify opportunities for linking 511 to third party sites
Wisconsin Arterial Travel Time (WATT) Pilot Project	▪ Arterial roadway mileage covered	▪ ATMS	▪ Centrex signal management system ▪ Bluetooth readers	
(2) Expand User Options				
Annual, Monthly, Weekly, and Real-time Communication of Closures to Various Stakeholders	▪ Number of customers for closure information	▪ LCS ▪ 511 xml		
Continue to explore alternative dissemination methods	▪ Number of alternative dissemination methods identified and implemented ▪ Usage of alternative dissemination channels for traveler information	▪ 511 system	▪ User surveys on use of third party traffic information sources	▪ Feedback to identify opportunities for disseminating 511 data through other outlets
Address freight industry-specific needs (Truck Parking Information, Width Restrictions)	▪ Number of freight-specific messages provided ▪ Usage by freight industry	▪ 511 system	▪ User survey of freight industry	

(3) Improve Internal Coordination				
Improved coordination with Maintenance (winter weather, welcome centers/rest areas, emergency repairs, near-term lane closure planning)	▪ Notifications regarding maintenance activities	▪ LCS ▪ Event Manager	▪ ATMS – notification of unexplained speed threshold change	
Clear Organization of Where to Find Different Types of Traveler Information	▪ Usage of 511 system	▪ 511 system	▪ User feedback on organization of system – focus groups, surveys, website feedback	
Promote and consider public Information Tools and Best Practices Documents	▪ Best practices adopted			
Promote 511 Branding and Communication Efforts across the Department	▪ Number of Department outlets for 511 information		.	
Incorporate the use of automation and analysis Tools in Road Weather Assessments, including Maintenance Decision Support System (MDSS), Road Weather Information Systems (RWIS), regional maintenance coordination and advanced forecasting information integration	▪ Number of tools and processes that are integrated with automatic weather information ▪ Number of adjustments made to information disseminated response to MDSS-related information	▪ Labor resources expended on weather-related information	▪ Record of MDSS inputs into traveler information system	▪ Feedback to determine whether labor resources can be saved due to incorporation of automated MDSS data
(4) Enhance Performance Measurement and Policy Creation				
Further integrate efforts with tourism, freight, and multistate regional traffic operations groups	▪ Number of outside parties using or promoting 511 information ▪ Use of 511 system		▪ Survey/ follow-up calls to outside agencies	

Develop Processes to Obtain and Integrate Stakeholder and User Feedback for Future Improvements (ongoing collection of data through surveys, focus groups, user group meetings, etc.)	▪ Number of surveys/focus groups completed ▪ Number of changes made in response to user feedback ▪ Change in user perceptions and ratings over time		▪ User surveys, focus group responses	
Performance Management (integrate reliability and congestion measures into traveler information systems)	▪ Number and frequency of reliability and congestion measures reported ▪ Use of reliability/congestion measures by staff and public ▪ Perceived usefulness of reliability measures	▪ 511 system usage ▪ Number accessing reliability reports	▪ User surveys, focus groups	▪ Feedback to adjust number and format of reliability measures provided
Align traveler information objectives with Department, Division and Bureau performance measures expectations	▪ Percentage of performance measures that currently are being met ▪ Gap size between other performance measures and their targets	▪ 511 system ▪ 511 system usage	▪ User surveys, focus groups	
Develop media Sharing Agreements	▪ Number of resellers/value added providers with agreements ▪ Amount of users taking advantage of media through all outlets	▪ 511 system usage	▪ User surveys to gauge usage of other outlets	

(5) Maximize Funding Mechanisms				
Explore and implement sponsorship funding for traveler information systems	▪ Number of sponsors on-board and pursued ▪ Dollar value of sponsorships	▪ Budget information	.	

Emergency Traffic Operations (ETO) and Traffic Incident Management (TIM) Strategic Objectives

Objectives (in gray) and Actions (in white)	Measures of Effectiveness	Existing Data Source	New Data Source	Feedback Opportunity
(1) Integrate Program Functions with Other BTO Initiatives				
Integrate Emergency Transportation Operations and Traffic Incident Management Programs into a Statewide Initiative (continue to coordinate response efforts and share information quickly with all appropriate partner agencies and organizations)(2030)	▪ Number of incidents reported ▪ Incident response time	Incident information: ▪ InterCAD ▪ Event Manager ▪ Traffic Incident Alert ▪ Safety Data Portal TIME program records	▪ CAD links to additional agencies	
Use ETO program knowledge to influence and enhance the development of both NextGen 511 systems and NextGen ATMS systems	▪ Number of emergency-related activities documented in ATMS ▪ Number of emergency-related messages disseminated by 511	Incident information: ▪ InterCAD ▪ Event Manager ▪ Traffic Incident Alert ▪ Safety Data Portal TIME program records 511 system usage		▪ Feedback of incident information to identify priorities for next gen ATMS and 511
(2) Leverage Technology for ETO Purposes				
Redesign and reorganize the ETO repository for improved content and easier access	▪ User ability to access ETO resources	▪ Current usage of ETO-related records/data	▪ User input on ease of data access	

Continue to investigate mobile technologies and their value to the ETO process	▪ Use of mobile technologies	▪ ATMS (Incident records)	▪ Research project into benefit/cost analysis of increased mobile technology	▪ Feedback on role of mobile technologies in incident response
Explore opportunities for efficiency and increased communication through use of Smart Board technology	▪ Usage of smart boards		▪ User input on usage of smart boards	
Research and select technologies to support the threat and risk assessment process of the ETO program (previously defined)	▪ New technologies investigated and accepted		▪ Documentation of research results	
(3) External Agency Interactions				
Define and document National Guard Capabilities for response to state highway emergencies	▪ Number of emergencies with associated National Guard documented capabilities	▪ ATMS incident records	▪ Add documentation of NG participation to after-action reports	
Begin training and planning for emergencies with counties and Department of Natural Resources	▪ Hours of joint training ▪ Participation of RIM-C staff	▪ Timesheet records		
(4) Formalize and Institutionalize an ETO Training and Exercise Program				
Perform statewide/regional exercise, define WisDOT's functional version of area command	▪ Whether exercise is performed ▪ Frequency of exercise	▪ Timesheet/ personnel records ▪ Exercise review		
Update annual and multi-year training and exercise calendar within the ETO Plan	▪ Number of training activities undertaken ▪ Number of participants	▪ Timesheet/ personnel records ▪ Exercise review		

(5) Cultivate Statewide TIM Relationships				
Initiate and steer the initiatives of the TIME Coalition	▪ Number of initiatives implemented ▪ Effectiveness of initiatives		.	
Work with Partners to Develop Agreements on Responsibilities for Transportation Incident Management and Emergency Transportation Operations (2030)	▪ Number of formal agreements established ▪ Average incident clearance times	Incident information: ▪ InterCAD ▪ Event Manager ▪ Traffic Incident Alert ▪ Safety Data Portal After-action reviews		▪ Feedback of response time data and after-action review to modify agreements as needed
Develop DSP/Division of Transportation System Development (DTSD) MOU (identifies roles and responsibilities pertaining to traffic incident management)	▪ Date of MOU establishment	Incident information: ▪ InterCAD ▪ Event Manager ▪ Traffic Incident Alert ▪ Safety Data Portal After-action reviews		▪ Feedback of response time data and after-action review to modify MOU as needed
(6) Support Bureau Development				
Investigate Freeway Service Patrol Sponsorship (WP)	▪ Value of sponsorship in dollars and/or services	▪ FSP budget	.	
Continue TIM/ETO program financial support	▪ Amount of funding received	▪ Program budget	.	
Maintain Sheriff Freeway Service Team (FST) Program	▪ Number of vehicles deployed as part of Sheriff FST ▪ Amount of funding received ▪ Personnel assigned	▪ Program budget ▪ Vehicle inventory ▪ Timesheet records	.	
Initiate Sheriff FST Programmatic Safety Review Initiative	▪ Review performed			

(7) Evaluate Best TIM practices				
Investigate Application of Traffic Incident Management Techniques Along Key Corridors Around the State (2030)	▪ Criteria and toolbox established ▪ Number of corridors analyzed ▪ Percent of entire network investigated ▪ Priority ranking of corridors for action	Incident information: ▪ InterCAD ▪ Event Manager ▪ Traffic Incident Alert ▪ Safety Data Portal After-action reviews Delay: ▪ FHWA HERE probe data ▪ TranSuite detector data ▪ V-SPOC ▪ Work zone detector data Volume: ▪ TRADAS ▪ V-SPOC Travel times: ▪ FHWA HERE probe data ▪ Wis511XML feed	▪ Bluetooth data where available	▪ Feedback from analysis to establish project objectives and refine strategies as needed
Assess national and Federal practices for TIM outreach toolkits	▪ Actions applicable to WisDOT	Incident information: ▪ InterCAD ▪ Event Manager ▪ Traffic Incident Alert ▪ Safety Data Portal After-action reviews	▪ TIM outreach toolkits ▪ WisDOT Staff and consultants related to TIM outreach	
(8) Improve TIM Performance Measurement				
Develop a first responder database	▪ Completion of database ▪ Database linked to other related DOT databases ▪ Usage of database	Incident information: ▪ InterCAD ▪ Event Manager ▪ Traffic Incident Alert ▪ Safety Data Portal After-action reviews	▪ Incident response times by component (detection, verification, etc.) ▪ Identify useful input from first responders	▪ Feed data back to first responders, STOC and service patrol personnel to identify operational improvements

Institute secondary and strike by incident measurement procedure for the Department	▪ Date the procedure was initiated ▪ Reduction in average incident clearance times for incidents that were addressed by this initiative	Incident information: ▪ InterCAD ▪ Event Manager ▪ Traffic Incident Alert ▪ Safety Data Portal After-action reviews	▪ Measure of secondary incidents	▪ Feedback to identify conditions under which secondary incidents are most likely to occur and mitigation strategies
Develop effective and relevant performance measure for longer-term incidents	▪ Anticipated length of longer-term incidents ▪ Measure of anticipated length versus actual length	Delay: ▪ FHWA HERE probe data ▪ TranSuite detector data ▪ V-SPOC ▪ Work zone detector data Volume: ▪ TRADAS ▪ V-SPOC Lane Closure System Incident information: ▪ InterCAD ▪ Event Manager ▪ Traffic Incident Alert ▪ Safety Data Portal	▪ Travel times on impacted routes and alternate routes ▪ Analysis of incident length by type ▪ Summary of required actions that impact incident removal (fatalities, hazardous clean-up, etc.)	▪ Feedback to identify improved strategies for alternate routing ▪ Feedback to develop strategies for reducing long-term incident response and recovery times
(9) Establish a Known and Practiced Training Curriculum				
Integration of emergency traffic control and scene management guidelines into technical school curriculums	▪ Number of curricula that have integrated guidelines ▪ Number of employees who have training in these guidelines		▪ Certification program enrollment records ▪ Course syllabi or other documentation	
Development and roll out of discipline specific training	▪ Number of training curricula developed/ implemented ▪ Number of employees who have taken the training programs		▪ Training program enrollment records ▪ Training course syllabi and objectives documentation	

Continued Wisconsin TIM training aligned with FHWA national TIM training initiative	▪ Discrepancies between the FHWA and WisDOT training programs	▪ FHWA and WisDOT training materials	.	

Traffic Engineering and Operational Analysis Strategic Objectives

Objectives (in gray) and Actions (in white)	Measures of Effectiveness	Existing Data Source	New Data Source	Feedback Opportunity
(1) Improve Data Management Systems				
Develop a statewide Traffic Impact Analysis GIS database for users to enter or track TIA-related data	▪ Number of registered users ▪ Number of assets in the database	Volume: ▪ TRADAS ▪ V-SPOC Travel times: ▪ FHWA HERE probe data ▪ Wis511XML feed Safety Data Portal	▪ Consolidate information into common GIS data system ▪ Update database after system change to identify before and after comparison	▪ Use database as input to review of TIA
Develop a statewide speed management database	▪ Roadway mileage covered in speed database ▪ Pct of roadway mileage covered in speed database	Delay: ▪ FHWA HERE probe data ▪ TranSuite detector data ▪ V-SPOC ▪ Work zone detector data Travel times: ▪ FHWA HERE probe data ▪ Wis511XML feed	▪ Automated database that links speed declarations with existing speed data	
Collect and establish trip generation data for Wisconsin-specific land-use developments	▪ Completion of trip generation for identified set of land uses	▪ Statewide travel demand model ▪ Traffic Impact Analysis estimates	▪ Research ▪ Dedicated counts for project (driveways)	

Collect signalized intersection capacity data	▪ Number/Percent of intersections in the database	MetaManager: ▪ Roadway characteristics ▪ LOS Centrex signal control Cartegraph inventory	▪ Formatted data available for planning, design, TIA review and other functions	
Contract with consultant to peer review mega/major project micro simulation	▪ Changes made to microsimulation models as result of review ▪ Changes made to project planning/design as result of review	▪ Staff resources dedicated ▪ Contract documents	.	
(2) Develop Traffic Analysis and Data Management Policies				
Develop FDM guidance on traffic data management and analysis	▪ Completion of guidance ▪ Use of document			
Develop FDM guidance for developing, calibrating and reviewing micro simulation models	▪ Completion of guidance ▪ Use of document			
Evaluate other traffic micro simulation modeling software	▪ Evaluation results produced ▪ Process in place for updating as new products are available			
(3) Improve Coordination with Other Bureaus/Regions on Data Integration				
Work with DTIM and regions to establish roles and responsibilities as it relates to collecting, managing, and using various traffic data tools	▪ Data integration plan ▪ Use of data sources by multiple bureaus and sections	▪ Usage statistics for different data sources such MetaManager, WisTransPortal, etc.		

Traffic Safety Engineering and Speed Management Strategic Objectives

Objectives (in gray) and Actions (in white)	Measures of Effectiveness	Existing Data Source	New Data Source	Feedback Opportunity
(1) Improve Design and Operations of Intersections (SHSP Issue Area)				
Complete Phase 2 Roundabout safety analysis	▪ Percent of roundabout intersections analyzed	▪ TIAs ▪ MetaManager: LOS Volume: ▪ TRADAS ▪ V-SPOC	▪ Safety portal for roundabouts	
Co-lead (with BPD) Intersection/Interchange Design and Operations Task Force	▪ Task force participation			
Continue systemic safety improvements at intersections	▪ Percent of intersections improved ▪ Crash reduction	Incident information: ▪ InterCAD ▪ Event Manager ▪ Traffic Incident Alert ▪ Safety Data Portal	▪ Assure that roundabouts are identified in all safety records	
(2) Reduce Head-On and Cross-Median Crashes and Prevent/Mitigate Roadway Departure Crashes (SHSP Issue Area)				
Continue systemic safety improvements (i.e., rumble strips/stripes, signing, and pavement marking)	▪ Percent of highway and freeway miles that do not have departure mitigation measures ▪ Collisions resulting from roadway departures	Incident information: ▪ InterCAD ▪ Event Manager ▪ Traffic Incident Alert ▪ Safety Data Portal Pavement and physical attribute data: MetaManager		
(3) Create Safer Work Zones (SHSP Issue Area)				
See Work Zone Management Policy and Standards Strategic Objectives	▪ Implementation of standards			
(4) Create More Effective Safety Decision Processes and Improve Incident Management in Bad Weather (SHSP Issue Area)				
Begin WISDOT institutionalization of the Highway Safety Manual	▪ Documented institutionalization of HSM			

Implement recommendations from regional safety improvement plans (RSIP)	▪ Number/ Percent of recommendations implemented	Incident information: ▪ InterCAD ▪ Event Manager ▪ Traffic Incident Alert ▪ Safety Data Portal		
Complete 70 MPH freeway speed feasibility study	▪ Completion of study ▪ Change in actual speed on 70 mph roads	Delay: ▪ FHWA HERE probe data ▪ TranSuite detector data ▪ V-SPOC ▪ Work zone detector data Volume: ▪ TRADAS ▪ V-SPOC	▪ Bluetooth Installations	▪ Measure impact of speed change on actual speeds
Complete Crash mapping project phase III	▪ Completion of phase	Safety Data Portal		
Complete Road Safety Audit Guidelines	▪ Completion of guidelines		.	
Establish the safety performance functions (SPF) crash modification factors (CMF) for all the safety engineering improvements applied in Wisconsin	▪ Implementation of program	Safety Data Portal Pavement and physical attribute data: MetaManager		
Participate on Department-wide committee to update the MV4000 crash report form and develop new crash database	▪ Completion of MV4000 revisions ▪ Completion of new crash database	Safety Data Portal	▪ New crash database	
Coordinate with Emergency Traffic Operations (ETO) and Traffic Incident Management (TIM) Strategic Objectives	▪ Revised strategic objectives			

(5) Cooperatively work with DTIM to develop and implement the HSIP.				
Support Development of the HRRRP for local roads	▪ Implementation of HRRRP for local roads ▪ Number of local officials trained			

Work Zone Management and Operations Strategic Objectives

Objectives (in gray) and Actions (in white)	Measures of Effectiveness	Existing Data Source	New Data Source	Feedback Opportunity
(1) Consistently Utilize Traffic Management Tools to Reduce Delay and Promote Safety in Work Zones				
With Local Agencies, Conduct Work Zone Safety and Mobility Analyses, Identify and Coordinate Enforcement Needs, Incorporate Lane Closure Guidelines into Work Zone Plans, Identify Potential Routing Alternatives, and Use Signage to Communicate Relevant Information Such as Expected Time Delays (2030)	▪ Documentation of tools listed	Delay: ▪ FHWA HERE probe data ▪ TranSuite detector data ▪ V-SPOC ▪ Work zone detector data Volume: ▪ TRADAS ▪ V-SPOC Travel times: ▪ FHWA HERE probe data ▪ Wis511XML feed Lane Closure System	▪ Bluetooth data on both work zone routes and alternate routes	
Update and maintain functionality of LCS which includes development and implementation of a web-based lane closure management tool	▪ Functioning web-based lane closure management tool ▪ Number of users	Lane Closure System		

Model, forecast, and balance network delays based on impacts from all WisDOT construction projects; communicate this information to internal and external stakeholders on a regular basis	▪ Aggregate work zone delay ▪ Work zone delay by region and /or corridor ▪ Users of delay information	Delay: ▪ FHWA HERE probe data ▪ TranSuite detector data ▪ V-SPOC ▪ Work zone detector data Volume: ▪ TRADAS ▪ V-SPOC Travel times: ▪ FHWA HERE probe data ▪ Wis511XML feed Lane Closure System	▪ Bluetooth data on both work zone routes and alternate routes	
Develop and implement standardize use of an on-line work zone Transportation Management Plan (TMP) automated system	▪ Completion of system ▪ Use of system			

Collaborate with others in Bureau to develop and implement a traffic operations performance management system; aggregation of many different data points to gauge work zone performance	▪ Progress in development of system ▪ Number of data sources considered in the reporting of a work zone performance metric ▪ Number of system users	Delay: ▪ FHWA HERE probe data ▪ TranSuite detector data ▪ V-SPOC ▪ Work zone detector data Volume: ▪ TRADAS ▪ V-SPOC Travel times: ▪ FHWA HERE probe data ▪ Wis511XML feed Lane Closure System Incident information: ▪ InterCAD ▪ Event Manager ▪ Traffic Incident Alert ▪ Safety Data Portal	▪ Bluetooth speed data ▪ User delay from work zones	
Leverage mitigation funds to increase work zone safety	▪ Total amount of funds applied	▪ Traffic mitigation/work zone costs		
(2) Create Partnerships with Regional and Statewide Bureau Functions to Support Work Zone Management Mission				
Ensure appropriate level of Bureau work zone management perspective in TIME program	▪ TIME program participants			
Continue to define and refine working relationship with Bureau of Project Development (BPD)	▪ Process/ procedure for working with BPD			
Promote standardization of work zone management staff involvement for improvement projects (design and construction)	▪ Documented process/ procedures			

(3) Work with Stakeholders to Monitor and Improve Work Zone Safety				
Develop and implement a statewide work zone safety audit program	▪ Number of audits completed ▪ Percentage of programs passing the audit		▪ Database for safety audit (could be incorporated into Lane Closure System)	
Investigate alternatives to improve work zone speed enforcement	▪ Results of speed zone enforcement evaluations ▪ Speed compliance in work zones	Lane Closure System: ▪ TranSuite detector data ▪ V-SPOC ▪ Work zone detector data	▪ Automated speed declaration database ▪ Bluetooth data from	▪ Feedback speed profiles from work zones to help in review of speed declarations
(4) Continue to Enhance Work Zone Policies				
Develop design guidelines for pedestrian accessibility in work zone	▪ Completion of guidelines ▪ Number of work zone where guidelines are applied		.	
Develop design guidelines for nighttime work zone lighting	▪ Number of work zone where guidelines are applied	Lane Closure System Incident information: ▪ InterCAD ▪ Event Manager ▪ Traffic Incident Alert ▪ Safety Data Portal	▪ Lighting cost database	▪ Feedback of work-zone related incidents and lighting costs to work zone requirements
Establish a working group made up of Bureau of Highway Maintenance (BHM) and Bureau of Traffic Operations (BTO) and utility companies to improve cooperation and coordination of work zones	▪ Formation of working group ▪ Number of working group meetings or accomplishments		▪	

Develop and implement on-line work zone TMP automated system and make enhancements to Lane Closure System (WP)	▪ Completion and implementation of system ▪ Percent of work zone projects using the TMP on-line system ▪ Completion of LCS enhancements	Lane Closure System	.	
Develop guidance for special event documentation effort (WP)	▪ Completion of guidelines ▪ Number of special events for which guidelines have been used			
Develop Design standard and guidance for rolling slowdown/Roadblock for mega freeway/expressway projects	▪ Completion of guidelines ▪ Percent of relevant work zone projects that have used the guidelines for slowdowns and roadblocks	Lane Closure System	.	
Develop standards and guidance for traffic control on roundabout maintenance work	▪ Completion of guidelines			
Enhance guidance on work zone capacity and user delay analysis as part of smart work zones (WP)	▪ Completion of guidance ▪ Application of guidance and delay calculations for work zones	Delay: ▪ FHWA HERE probe data ▪ TranSuite detector data ▪ V-SPOC ▪ Work zone detector data Lane Closure System	▪ Bluetooth data	▪ Use delay data for review and modification of TMIPs

Electrical and Communication Systems Strategic Objectives

Objectives (in gray) and Actions (in white)	Measures of Effectiveness	Existing Data Source	New Data Source	Feedback Opportunity
(1) Manage and Maintain Field Infrastructure				
Integrate ITS as-built and SpatialInfo into regional functions in consideration of 3D XYZ pilot initiative (WP)	▪ Completion of integration			
Complete inventory and assessment of existing signal and electrical systems	▪ Completion of inventory	▪ Cartegraph ▪ Centrex system	▪ Utility cost database integrated with Cartegraph	
Develop specifications related to collection of geographic location data for all newly installed electrical systems	▪ Completion of specifications for geographic-based system		▪ Arterial TOIP	
Evaluate NW Region electrical maintenance outsourced staffing pilot project	▪ Maintenance cost differences resulting from outsourcing	▪ Cartegraph	▪ Interface for region/contractors to enter data in Cartegraph	▪ Feedback experience of NW region to decisions on other outreach opportunities
Develop Statewide Electrical Service Locate Contract (WP)	▪ Completion and execution of contract			
Continually evaluate the impacts of ITS, signals and lighting field infrastructure deployments on operations and maintenance costs	▪ Development of evaluation procedure and database	TOIP Delay and travel time data Incident data Weather data Lane closure Capital costs Operations and maintenance costs	▪ Benefit/cost database ▪ Arterial TOIP	▪ Feedback results of benefit/cost analysis to investment decisions
Complete inventory and assessment of existing lighting systems	▪ Completed inventory of lighting system		▪ Incorporate lighting resources into Cartegraph ▪ Develop database of utility costs	

Complete Highway Improvement Program ITS Field Infrastructure Assessment	▪ Completion of assessment	▪ Cartegraph	▪ Integrate inventory and maintenance components for ITS systems ▪ Arterial TOIP	
(2) Enhance Training Opportunities				
Develop Electrical Certification Curriculum for designers, contractors and inspectors (WP)	▪ Certification program completed and put in place ▪ Number of certified individuals		.	
Develop the lighting component of electrical certification training	▪ Certification program completed and put in place ▪ Number of certified individuals			
(3) Support Communications Systems Operations and Maintenance				
Develop and implement plan for End-of-Life Fiber Lighting (WP)	▪ Plan developed and implemented			
(4) Continue to Implement State of the Art Practices as Budgets Allow				
Implement joint staffing agreement with SE Region Signals group	▪ Staffing agreement implemented	▪ Staffing levels		
Consider Loop Detectors for Bike Lanes and Shared Lanes at Signalized Intersections (2030)	▪ Percent of signalized intersections that have had loops installed for shared lanes and bike lanes		▪ Incorporate into Cartegraph/inventory program	
Coordinate with other WisDOT stakeholders to create a comprehensive data collection program	▪ Establishment and implementation of program ▪ Number of users of data			
Develop performance-based asset management plan	▪ Establishment and implementation of plan		▪ Connections between databases	

(5) Prepare and Manage Life Cycle Device Replacements				
Implement Funding Strategy for Statewide LED Signal Head Replacement (WP)	▪ Budget gap (in dollars) between project costs and available funds ▪ Number of signals replaced ▪ Failure rate	▪ Cartegraph ▪ Centrex Signal Management	▪ Tie together maintenance and asset management programs ▪ Incorporate utility costs into asset management program	
Enhance traffic operations field device asset management tracking tools for life cycle replacement scheduling	▪ Implementation of tracking tools	▪ Cartegraph ▪ Centrex Signal Management	▪ Arterial TOIP	
(6) Improve the Reliability and Efficiency of State Trunk Highway System Operations				
Develop ongoing research and evaluation process for new technologies	▪ Total amount invested in research (in dollars) ▪ Number of new technologies researched or evaluated	▪ Research budget	▪ Research ideas incorporated into operation	▪ Feedback from research activities to operations. Document performance and/or cost improvements
Modernize Traffic Signal System Technologies (which may include replacing and updating traffic signals electronic controllers, and linking traffic signals into the statewide WisDOT's traffic management and public safety communications network) (2030)	▪ Number/pct of upgraded intersections	▪ Cartegraph ▪ Centrex Signal Management ▪ Research budget	▪ Arterial TOIP	
Ensure New Pedestrian Signal Systems Meet Federal Regulations and Bring Existing Signals into Compliance (2030)	▪ Percentage of existing signals that are in compliance	▪ Centrex Signal Management ▪ Cartegraph	▪ Arterial TOIP	

Consider Loop Detectors for Bike Lanes and Shared Lanes at Signalized Intersections (2030)	▪ Number of signalized intersections with loop detectors for bike/shared lanes ▪ Number of signalized intersections considered for loop detectors for bike/shared lanes	▪ Centrex Signal Management ▪ Cartegraph	▪ Arterial TOIP	
Address signal system performance measure improvements in the areas of signal systems communications and retiming	▪ Overall reduction in delay resulting from signal systems communications improvements and signal retimings	Delay: ▪ FHWA HERE probe data ▪ TranSuite detector data ▪ V-SPOC ▪ Work zone detector data Volume: ▪ TRADAS ▪ V-SPOC	▪ Bluetooth data	
Provide communications to all traffic signal systems statewide	▪ Percentage of all signals on the communications network	▪ INOC	.	
Develop guidance for the evaluation and implementation of advanced signal system operations	▪ Development and implementation of guidance		.	
Implement statewide central signal systems management software	▪ Number (or percentage) of state signals connected to the central management software	▪ Centrex Signal Management ▪ Cartegraph	▪ Arterial TOIP	
Develop and update policies related to traffic signal systems	▪ Development and update of policies			
(7) Develop and Maintain Effective Lighting Planning and Policy				
Complete Traffic Guidelines Manual (TGM) Chapter 11 Lighting Policy Revisions	▪ Completion and implementation of guidelines			

Study national policies in relation to lighting safety and evaluate the correlation of lighting systems and crash rates in Wisconsin	▪ Summary of policies with recommendations for implementation ▪ Results of lighting and crash rate study	Incident information: ▪ InterCAD ▪ Event Manager ▪ Traffic Incident Alert ▪ Safety Data Portal Cartegraph	▪ Incorporate lighting fully into asset management system	
Develop policy to implement lighting curfews by time of day	▪ Development of policy ▪ Utility cost savings		▪ Utility cost database	
Develop set of lighting warrants for implementation of new systems	▪ Development and implementation of warrants	Incident information: ▪ InterCAD ▪ Event Manager ▪ Traffic Incident Alert ▪ Safety Data Portal Cartegraph	▪ Utility cost database	
(8) Develop Lighting Asset Management and Life Cycle Replacement Process				
Schedule Lighting Meetings/Workshop with PDS for Lighting Policy Information Exchange	▪ Scheduling of workshops		.	
Complete inventory and assessment of existing lighting systems	▪ Completed lighting inventory	▪ Cartegraph		
Develop implementation options and cost benefit analysis for LED lighting upgrades in SE Region	▪ Number/percentage of lighting upgrades completed ▪ Life cycle cost savings from LED implementation	▪ Cartegraph	▪ Utility cost database ▪ Incorporate lighting into asset management database	
Develop implementation options and life cycle cost plan for statewide LED lighting systems	▪ Number/percentage of lighting upgrades completed ▪ Life cycle cost savings from LED implementation	▪ Cartegraph	▪ Utility cost database ▪ Incorporate lighting into asset management database	
Support the development of NextGen asset management system	▪ Development and implementation of system			

(9) Improve Energy Efficiencies of Lighting System				
Expand implementation of LED lighting for freeway systems	▪ Percent of freeway system with LED lighting ▪ Energy costs used for freeway lighting	▪ Cartegraph	▪ Electrical usage ▪ Utility cost database	
Collect data and evaluate the efficiencies of LED lighting since first deployment	▪ Energy costs and total power usage for portions of system using LED lights, compared to portions of system using conventional lights		▪ Electrical usage ▪ Utility costs	
Maintain Mitchell Interchange Tunnel lighting	▪ Reliability of tunnel lighting system ▪ Operations and maintenance cost of tunnel lighting	▪ Cartegraph	▪ Electrical usage ▪ Utility costs	