Portland Area Mainline Needs Assessment

DRAFT

Transportation Systems Management & Operation: Working Paper #4

HNTB Corporation
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1. Overview

As part of the Portland Area Mainline (PAM) Needs Assessment, current and possible future Transportation System Management (TSM) & Operations strategies were evaluated. TSM strategies improve the efficiency, safety and utility of a roadway network by safely maximizing the use of current and planned transportation infrastructure. In accordance with prudent asset management principles and the Maine Sensible Transportation Policy Act, effective and feasible TSM strategies should be considered to maximize safety and mobility before adding highway capacity.

TSM includes Active Travel Demand Management (ATDM) strategies to monitor and adjust traffic demand and safety dynamically. Strategies listed throughout this document are based on information provided by the Federal Highway Administration[1]. Technology and Intelligent Transportation System (ITS) infrastructure also play an important role in the effectiveness of TSM strategies as they rely heavily on advanced technology and communication. However, robust ITS infrastructure and effective communication are not enough to ensure TSM success; enforcement is also key in achieving traveler compliance and sustainability. Proper enforcement also helps manage non-recurring congestion, such as traffic accidents, that compliment typical TSM strategies.

The purpose of this document is to provide information on available TSM strategies and compare it to the current and proposed TSM practices of the Maine Turnpike Authority (MTA). As will be seen below, current TSM practices of the MTA are consistent with current practices and recommendations of the Federal Highway Administration. The MTA has implemented and currently maintains many TSM systems and provides the enforcement necessary to allow for successful implementation. The MTA is also continually improving technology, ITS, and TSM strategies to adjust to changing traffic conditions and customer expectations. At this time, no additional TSM strategies were identified that should be evaluated and implemented above those already in use or currently under evaluation.

2. Definition of Transportation Systems Management & Operation (TSM)

Transportation Systems Management & Operation (TSM) is a broad concept that focuses on the principles of managing and operating systems in an integrated, active and performance driven manner. TSM strategies include:

- Traffic Incident Management;
- Traffic Signal Coordination;
- Traveler Information;
- Service Patrol;
- Work Zone Management;
- Road Weather Management;
- Freight Management;
- Transit Management; and

[1] Federal Highway Administration (FHWA), "Active Transportation and Demand Management," last modified January 18th, 2018. https://ops.fhwa.dot.gov/atdm/index.htm

- Managed Lanes.

These strategies involve effective communication and coordination with local media, municipalities, government agencies and other entities to provide safe and efficient travel.

3. Active Travel Demand Management (ATDM)

As part of the TSM umbrella, agencies utilize Active Traffic Demand Management (ATDM) strategies to dynamically manage, control and influence traveler behavior to improve traffic operation and safety. Some of these strategies include but are not limited to:

- Adaptive Ramp Metering;
- Adaptive Traffic Signal Control;
- Dynamic Lane Reversal (Reversible Lane);
- Dynamic Lane Use Control;
- Dynamic Shoulder Use;
- Queue Warning System; and
- Dynamic Speed Control.

These ATDM strategies aid and enhance the broader TSM concept. For example: Dynamic Speed Control may be used as part of Road Weather Management to adjust speeds during times of inclement weather. Or, Dynamic Lane Use Control may be used as a part of Traffic Incident Management to inform motorist to shift lanes due to an accident upstream. To put it simply, ATDM focuses on the active management principle of TSM and allows static management systems to operate dynamically. Figure 1 provides a conceptualized graphic of the ATDM cycle. Not all strategies are effective for every road network and thus need to be evaluated on a case to case basis.

Figure 1 – Active Management Cycle

4. Technology and ITS Infrastructure

Technology and ITS infrastructure are the backbone of any TSM strategy. Advanced ITS infrastructure helps establish a dynamic system that assesses performance, evaluates and implements appropriate changes, assesses impacts, and then reassess performance in one continuous cycle. Some of the technologies utilized in ITS infrastructure as part of a TSM strategy are:

- Fiber Optic cable network for faster, more reliable connection and communication;
- Variable Speed Limit (VSL) signs to reduce speeds during inclement weather, traffic incidents or as part of speed harmonization;
- Traffic count stations to monitor speed and traffic volumes;
- Roadway Weather Information Systems (RWIS) to monitor roadway conditions;
- Portable and fixed variable message signs (VMS) to warn and inform motorists of incidents, roadway conditions, weather information, and travel time data;
- Highway Advisory Radio (HAR) to provide motorists information on traffic conditions, weather and construction zones;
- Closed-Circuit Television (CCTV) system to monitor traffic conditions in real time; and
- Queue counters to detect queues forming on off-ramps; and
- Media alerts such as through the agency website, Twitter, Facebook, text updates, etc.

In optimal dynamic system: traffic count stations, RWIS, CCTV and queue counters would continuously monitor roadway conditions; then traffic controllers would communicate conditions and recommend appropriate action to travelers though VSL, VMS, HAR or Media outlet. Ideally these assets would be controlled and operated through a single location to maximize efficiency.

5. Enforcement

Even with TSM & ATDM strategies in place with proper technology and ITS infrastructure, Enforcement is needed to help achieve strategy success. Enforcement, or the threat of enforcement, has shown to reduce speeds, improve traffic flow and provide an overall benefit to the corridor.

The Maine State Police has sole responsibility for enforcement on the Maine Turnpike. Law enforcement services are provided by Troop G and their duties include enforcing speed limits, assisting disabled vehicles, providing traffic control during incidents, detecting and apprehending drivers under the influence, and enforcing other Maine State Laws. Troop G is funded entirely by the MTA and both share a state-of-the-art facility off Exit 46 giving the troop easy and safe access to the turnpike. The number of troops assigned (called the compliment) to the Maine Turnpike is made jointly by the MTA and Maine State Police, which patrols the turnpike, 24-hours a day 365-days a year. The current compliment consists of a lieutenant, five sergeants, three corporals and twenty-five troopers. At full strength, Troop G can have as many as thirty-five Troopers.

The MTA works jointly with the Maine State Police to promote and implement:

- Education;

- Safety;
- Community outreach;
- Effective communication; and
- Quick clearance of the roadway.

Another key role for the Maine State Police is managing congestion that occurs from accidents or breakdowns. This is done through quick and efficient response as well as providing traffic control to help warn motorists. These strategies improve safety and efficiency along the turnpike and help the effectiveness of incident management and other TSM strategies used by the MTA.

6. MTA Current TSM Strategies

The MTA already utilizes many TSM, and by extension ATDM, strategies along the Maine Turnpike including:

- Incident Management
  - Incidents detected by CCTV and traveler 911 calls; communicated to other travelers through VMS signs, HAR and local media outlets including Twitter and Text alerts; VSL signs reduce speeds if necessary; and
  - Maine State Police helps manage incidents by creating awareness, providing traffic control and working cooperatively to quickly and safely clear the roadway.
- Traffic Signal Coordination
  - Traffic Signals at freeway junctions are coordinated to keep queues from spilling onto the mainline; and
  - Queue counters are placed at certain exits to detect if queues could backup onto the mainline and then adjust signal timing accordingly.
- Traveler Information
  - General traveler information such as back-ups, weather events, special events, or safety messages are communicated through VMS, HAR systems and coordination through local media.
- Service Patrols
  - State Farm Sponsored Safety Patrol truck patrols the Maine Turnpike and provides roadside assistance to disabled vehicles;
- Work Zone Management
  - Traffic control plans are designed by consultants and implemented by contractors, sometimes in phases to reduce travel impacts; and
  - Work zones are sometimes aided by Local or State police to create awareness and to enforce speed limit reductions to improve safety.

- Road Weather Management
    - RWIS monitor road conditions; VMS relay weather conditions; and VSL reduce speeds if necessary.
- Freight Management
    - Certain section of the Turnpike does not allow trucks to travel in the left most lane to improve traffic flow and safety.

Other TSM Strategies such as Transit Management and Managed Lanes are being evaluated separately as part of the PAM process. The same goes for ATDM strategies such as Adaptive Ramp Metering, Dynamic Lane Reversal, and Dynamic Shoulder Use.

7. MTA Future TSM Strategies

As Outlined in the previous section, the MTA already has a robust TSM plan. Additionally, the MTA continues to evaluate opportunities to expand and improve TSM strategies and technology to keep up with roadway demand, customer expectations, and ever-changing traffic conditions. Some of these improvements include:

- Expanding the fiber optic cable network to improve communication and reliability;
- Adding more VSL signs;
- Adding more VMS signs;
- Adding Travel Time VMS signs south of Exit 44 heading northbound and north of Exit 53 heading southbound to inform motorists of the delay on I-95 and I-295.
- Upgrading outdated technology and software such as the HAR and CCTV systems; and
- Integrating components to be controlled remotely from the Turnpike Communications Center located at the MTA headquarters off exit 46.

8. Conclusion

TSM is an important traffic management tool that can improve travel safety and efficiency by improving performance dynamically, utilizing existing and future transportation infrastructure. ATDM, Technology, ITS, and Enforcement play key roles in the effectiveness of TSM and should be implemented cooperatively. As part of the Portland Area Mainline Study, current and future TSM strategies utilized by the MTA were evaluated.

Based on this evaluation, it is apparent that strategies implemented by the MTA are consistent with current design practices and recommendations from the Federal Highway Administration. The MTA is also continually improving technology, ITS, and TSM strategies to adjust to changing market demand and traffic conditions. No additional strategies were identified that should be evaluated and implemented above those already in use or currently under evaluation.