

# TSMO IMPLEMENTATIONS ON I-25 AND I-70 WORK ZONES

By Colorado Department of Transportation

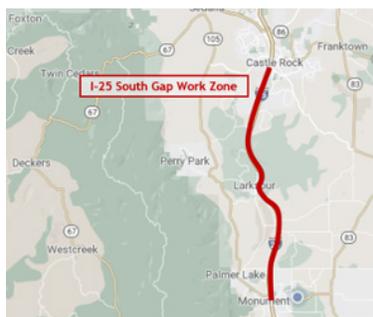
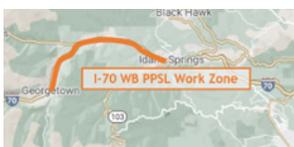
## IN THIS CASE STUDY YOU WILL LEARN:

- 1 How Colorado used permanent and portable ITS systems to implement Smart Work Zone technology on two high profile construction projects.
- 2 The process for developing guidelines and specifications for use of the SWZ technology.
- 3 How communication across law enforcement and operations centers helped to make the work zone safety efforts a success.

Shoulder Lane (PPSL)) under construction using such technology. Permanent ITS technology has proven to be an effective strategy in helping CDOT enhance safety and better manage the transportation network. The same ITS systems are deployed on portable platforms appropriate for work zones with the purpose of improving safety and mobility.

There were several challenges in these corridors. The I-25 Gap corridor represents a crucial north-south travel artery. Alternative routes to the corridor represent significant travel time delays. Consistent population growth in Colorado has steadily increased travel demand which correlates to increased congestion and total crashes along the corridor. As in most construction areas, traffic flow can be interrupted by construction vehicles entering and exiting the work zone, traffic incidents, and recurring commuter congestion potentially resulting in long queues, delays, increased crash frequency or a complete highway shutdown. Travel through construction work zones presents significant challenges to both travelers and work crews, especially considering that construction work is adjacent to the highway open to traffic carrying high traffic volumes and/or high-speed traffic.

CDOT started the I-70 PPSL project to respond to peak-hour traffic congestion which erodes travel time reliability, increases traffic on local roads, decreases motorist safety and compromises the ability of emergency responders. The road goes through the Rocky Mountains making traffic management and incident respond a difficult task and a safety concern.



## BACKGROUND

The Colorado Department of Transportation (CDOT) has been implementing Smart Work Zones (SWZ) since 2018. Currently we have two high profile projects (I-25 Gap Express Toll Lanes (ETL) and West Bound I-70 Peak Period

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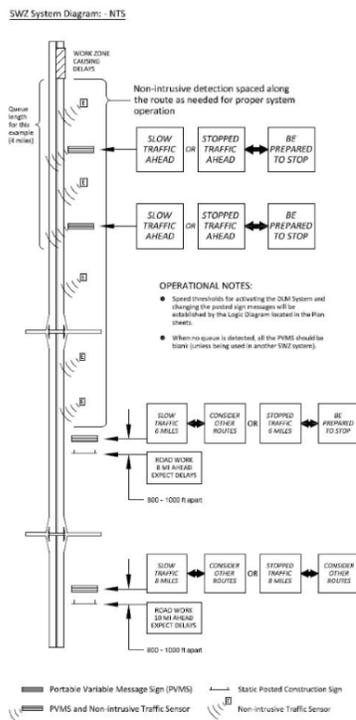
## TSMO PLANNING, STRATEGIES AND DEPLOYMENT

CDOT Region 1 team started to lay the groundwork for planning and deploying TSMO solutions in work zones.

### A) Developing the CDOT Region 1's SWZ guidelines.

In support of the projects teams, CDOT Region 1 created the SWZ guidelines. The purposes of the guidelines are:

- Identifying expected traffic and safety characteristics during construction.
- Selecting beneficial SWZ strategies by linking each strategy to an existing problem for the public.
- Identifying funding needs and sources.



### B) Creating specifications and technical implementation drawings for the project team to support them in the project bidding process and implementation.

Developing project specific SWZ details and specifications that can be altered to the projects specific needs can help with minimizing the cost and saving time needed to implement SWZ.

### C) Proving traffic and ITS engineering support from the Region 1 headquarter office to each individual construction project for I-70 WB PPSL and I-25 GAP Project.

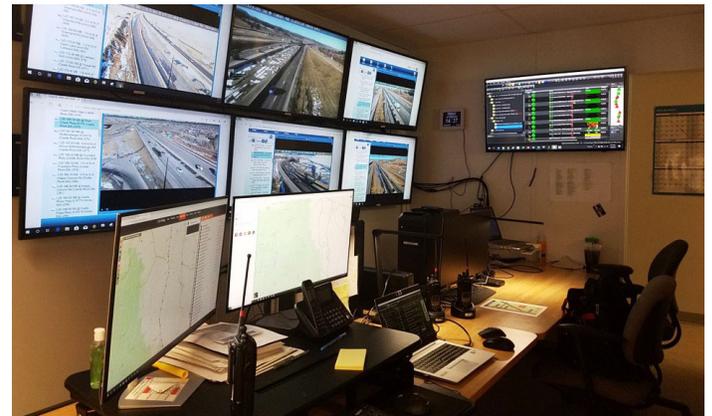
In order to avoid hiring a subject matter expert for each project, Region 1 team provided that staff support in part time capacity. The supporting staff provided training to project engineers and traffic inspectors.

### D) Establishing Extra Enforcement Support to increase compliance.

The law enforcement officers in the road worked closely with the project team and operators to identify problematic areas. Also, their data was used to shape the project action items to improve safety and operation. As an example, a speed feedback sign was deployed where the data suggested it's need.

### E) Setting up Project Traffic Operation Centers (TOC).

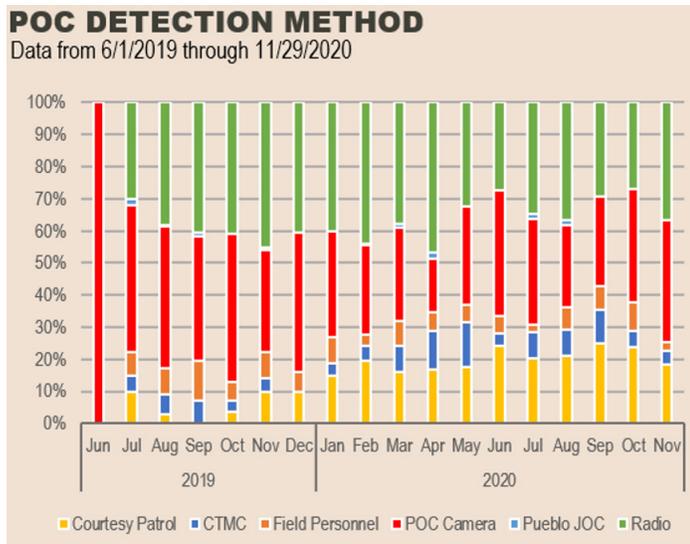
Region 1 chose two different approaches for each project Operation Centers. I-25 project was an 18 miles long project and a standalone specific Project Operation Center (POC) responding to identified incidents through cameras, change postings on SWZ devices using a central software, and inform incident responders using radios. The I-70 project was supported by two of CDOT existing operation centers (Golden and the Eisenhower tunnel).



## COMMUNICATIONS PLANNING AND EXECUTION

Both projects deployed numerous SWZ devices. After deploying these SWZ devices the team was able to harmonize travel speeds and decrease the number of abrupt speed reductions occurred along the corridor. This resulted in smoother travel conditions for the public.

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- A management plan to enforce the specification(s) of the equipment
- A manned satellite traffic center (16 hours on weekdays and 10 hours on weekends) to monitor traffic
- Courtesy patrol support/dispatching
- Data collection and analysis (volumes, speeds, incidents, response times, etc.), used in daily decision making on how to enhance safety
- SWZ meetings to review data and address safety hotspots
- Safety follow up meetings
- Colorado State Patrol Data Review, including types of the tickets wrote on the project
- Communication protocols

The innovative SWZ system included a variable speed limit zone partnered with a comprehensive safety coordination structure including:

- Launching POC
- On-site courtesy patrol support
- First responder safety meetings
- Method of handling traffic control coordination
- Data collection and analysis
- An emergency responder task force for all the local stakeholders
- Public information and social media

Together with the SWZ technology and coordinated safety infrastructure, the project teams could work in real time to reduce delays in incident response times and improve safety for workers and the public. SWZ strategies used include:

- Travel Time Information (TTI)
- Queue Warning System (QWS)
- Variable Speed Limit (VSL)
- Truck Entry Systems (TES)
- Incident Detection / Project Surveillance (Portable cameras)
- Speed and Volume Monitoring

The SWZ innovative elements initiated by the project team included the following:

- A SWZ comprehensive live mobile plan
- Specification(s)
- Daily SWZ field inspection plan

## OUTCOME, LEARNINGS AND PUBLIC BENEFIT

The project team has published a number of documents to measure the outcomes and specify the benefits. There were documented benefits in many areas. Operators identified more incidents, maximizing the incident management efficiency. The communication between the local agencies, operators, law enforcement and the project team using SWZ central software was an essential piece that made real time response possible. The SWZ technologies of QWS, VSL, and speed and volume monitoring were an essential piece that made communication with the public possible. QWS was proven to slow down traffic ahead of the project and VSL speed drops had considerable compliance. The TES system, had benefits but was proven to be a system requiring a lot of mobilization and manpower as the project work zone geometry kept changing and effected its optimal efficiency.

The stable traffic volumes are likely an indication that mitigation such as quick identification and clearance of crashes aided by the POC, SWZ and speed harmonization have resulted in maintaining acceptable travel times. The travel time indices evaluation revealed small increases to the TTI in both directions during most days and periods indicating that construction has had little impact to mobility during average travel conditions which as in improvement to the past construction projects.