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450.05.01 General

This Design Policy Memo (DPM) establishes the Work Zone safety and mobility-related requirements and guidelines to be considered during each stage of the design process for all RIDOT Projects. Also established are the requirements for Transportation Management Plan (TMP) preparation and submission. Questions related to this DPM should be directed to RIDOTWorkZones@dot.ri.gov.

450.05.02 References

RIDOT Policy	Work Zone Safety and Mobility Policy
Table B.1 “TMP Strategy Matrix” ¹	FHWA Report No. FHWA-HOP-05-066: Developing and Implementing Transportation Management Plans for Work Zones
Engineering Design Publications	Manual on Uniform Traffic Control Devices, Part 6 (latest edition); AASHTO Roadside Design Guide, Chapter 9 (latest edition); RIDOT Traffic Design Manual (latest revision)

450.05.03 Definitions

Designer	The Consultant or other design professional responsible for the preparation of Project deliverables (e.g., construction plans); the Traffic Engineer for RIDOT Projects that are designed in-house.
Final Design	The stage of Project design following (1) the 10% submission stage or equivalent, for RIDOT construction and maintenance projects and RIDOT maintenance activities or (2) the initial permit application submission, for Significant Encroachments.
Lane Closure	A reduction in the number of travel lanes available for use by motorists and/or bicyclists (or in the number of travel paths available for use by pedestrians) due to a stationary work operation or setup.
Preliminary Design	The stage of Project design up to and including (1) the 10% submission stage or equivalent, for RIDOT construction and maintenance projects and RIDOT maintenance activities or (2) the initial permit application submission, for Significant Encroachments.

¹ Available at http://www.ops.fhwa.dot.gov/wz/resources/publications/trans_mgmt_plans/app_b_t1.htm

Project	Any RIDOT construction or maintenance project, RIDOT maintenance activity, or Significant Encroachment that requires the establishment of one or more Work Zones.
Project Manager	The RIDOT point of contact responsible for (1) managing a Project through the development/design process (for RIDOT construction and maintenance projects and RIDOT maintenance activities) or (2) the overall review and approval of the permit application (for Significant Encroachments).
Significant Encroachment	Work completed under approval of a Temporary Traffic Control Permit that requires one or more Lane Closures on a state highway.
Significant Project	A Project with an assigned Work Zone Impact Level of 1 or 2; an Interstate system Project within the boundaries of a designated Transportation Management Area that will occupy a location for more than three days with either intermittent or continuous Lane Closures.
Traffic Engineer	The RIDOT point of contact from the Design Section, Traffic Unit who provides direction on all traffic matters for the Project.
Transportation Management Plan (TMP)	The document(s) that lays out a set of coordinated Transportation Management Strategies and describes how they will be used to manage the Work Zone impacts of a Project.
Transportation Management Strategies	Strategies used either singly or in conjunction with one another on a Project in order to maintain or improve road user/worker safety and/or minimize road user congestion and delays.
Work Zone	An area of a highway with temporary construction, maintenance, investigative, or utility work activities that is marked by temporary traffic control devices and/or work vehicles, typically extending from the first warning sign or high-intensity rotating, flashing, oscillating, or strobe lights on a work vehicle to the last temporary traffic control device.
Work Zone Impact Level	The numerical ranking (1, 2, 3, or 4) of the level of impact anticipated to be caused by a Project's Work Zone(s) as assigned using criteria regarding work characteristics, traffic demand, public interest, and overall degree of adverse impact to road users.

450.05.04 Policy

The design of all Projects shall be completed in conjunction with a systematic consideration of the safety and mobility impacts of Work Zones on Rhode Island's highways. To the greatest extent practicable, Projects shall be designed with a goal of minimizing the amount and severity of both (1) traffic crashes occurring within and (2) traffic congestion resulting from the Project's Work Zones.

450.05.04.01 Transportation Management Plan

A Transportation Management Plan (TMP) shall be developed for each Project, regardless of the level of impact anticipated to be caused by the Project's Work Zones. All TMPs include general Project information, a listing of the Temporary Traffic Control (TTC) plans to be used to facilitate traffic flow and safety through the Project's Work Zones, any traffic-related work restrictions (as determined based on the criteria included in the RIDOT Traffic Design Manual), and any other Transportation Management Strategies to be used to maintain or improve road user/worker safety and/or minimize road user congestion and delays during the work.

It is the responsibility of the Designer to obtain the appropriate TMP Template from the Project Management Portal (PMP) at <https://www.pmp.dot.ri.gov> and to develop and complete the TMP as the Project design progresses. Guidance for completing TMPs is presented in Section 450.05.05.02 and is provided in comment form on the TMP Templates. TTC plans must either be attached to the TMP or, when included in the Project construction plan set, incorporated by reference.

450.05.04.02 Transportation Management Strategies

Appropriate Transportation Management Strategies (strategies) shall be selected for implementation on each Project in order to minimize the adverse impacts of Work Zones on safety and mobility. The RIDOT recognizes the four categories (and nine sub-categories) of strategies listed below.

1. Traffic Control, Coordination, and Contracting (TCC&C) Strategies

- A. Traffic Control Strategies
- B. Traffic Control Devices
- C. Project Coordination and Contracting Strategies

2. Public Information (PI) Strategies

- A. Public Awareness Strategies
- B. Road User Information Strategies

3. Transportation Operations (TO) Strategies

- A. Demand Management Strategies
- B. Corridor/Network Management Strategies
- C. Work Zone Safety Management Strategies
- D. Traffic/Incident Management and Enforcement Strategies

4. Performance Monitoring (PM) Strategies

TCC&C strategies include tactics that traditionally are incorporated into contract documents, such as traffic control set-ups and devices (shown on the TTC plans) and coordination requirements (included in the contract-specific provisions for the contract). PI strategies include efforts to inform affected road users, the general public, area residences/businesses, and other public entities about the Project, the expected Work Zone impacts, and the changing work conditions. TO strategies include efforts to improve traffic flow and management on the transportation system within the Work Zone

impact areas. Many PI and TO strategies are typically coordinated through or completed by the RIDOT, such as the use of Highway Advisory Radio (coordinated through the RIDOT Transportation Management Center). PM strategies include efforts to assess the impacts of Project Work Zones following implementation of TCC&C, PI, and/or TO strategies.

A broad range of strategies should be considered for possible use on each Project. The proper consideration and ultimate selection of strategies requires the use of engineering judgment and should be based on the following characteristics and factors:

- Roadway characteristics (classification, geometry, etc.)
- Project / Work characteristics (scope, duration, schedule, sequence, etc.)
- Traffic characteristics (speeds, volumes, vehicle classification, etc.)
- Road user / Work Zone relationship (worker exposure to traffic, road user exposure to the work, distance between traffic and work, worker escape paths, etc.)
- Access to and egress from work areas
- Impacts on Project cost and work duration
- Consequences of Work Zone crashes and delays

Specific requirements regarding the selection of strategies for use on Projects are listed below:

- All Projects must use an appropriate set of TCC&C strategies
- All Work Zone Impact Level 1, 2, and 3 Projects must use, at minimum, the following PI strategies:
 - **RIDOT travel advisories news releases**
 - **RIDOT travel advisories web site**
 - **RIDOT 511 traveler information system**
- All Work Zone Impact Level 1, 2, and 3 Projects expected to include Work Zones that extend into the range of one or more RIDOT CCTV surveillance cameras must use the **RIDOT Transportation Management Center TO** strategy
- All Work Zone Impact Level 1 and 2 (Significant) Projects must use an appropriate set of PI and TO strategies
- All Work Zone Impact Level 1 Projects must use the **Team Meetings** PM strategy

A list of specific strategies that can be considered for use on Projects is presented below. While the list is based on a set of strategies compiled by the FHWA (and since some of the strategies could be included in multiple categories), the list is not meant to be all-inclusive nor does it constitute a standard. Other strategies may be proposed/investigated/used where deemed appropriate to mitigate the expected Work Zone impacts of a given Project.

Traffic Control, Coordination, & Contracting (TCC&C) Strategies

TCC&C Strategies Subcategory A: Traffic Control Strategies

Full Roadway Closures	This strategy involves the intermittent, short-term, or long-term complete closure of a roadway to minimize the duration of the Project and improve worker safety by reducing traffic conflicts.
Reduced lane widths to maintain number of lanes	This involves reducing the width of one or more lanes in order to maintain the existing number of lanes on the facility while permitting work access to part of the facility.
Lane Closures for worker safety	This strategy closes one or more existing traffic lanes to accommodate work activities.
Reduced shoulder width to maintain number of lanes	This involves reducing the width of the shoulder(s) to maintain the existing number of lanes on the facility while allowing access for the work activities to take place.
Shoulder closures for worker safety	This strategy closes the shoulder making it available to accommodate work activities.
Lane shift to maintain number of lanes	This strategy involves diverting traffic onto the shoulder, or a portion of the shoulder, for use as a traffic lane.
One-lane, two-way operation	One lane, two-way traffic control involves using one lane for both directions of traffic, allowing work activities to occur in the closed lane.
Two-way traffic on one side of divided facility	This strategy involves closing one side of a divided facility to permit the work to proceed without traffic interference while both directions of traffic are accommodated on the opposing side of the roadway.
Reversible lanes	This strategy involves sharing lane(s) of travel to accommodate peak-period traffic flow. The direction of travel in the shared lane varies by time of day or day of the week.
Ramp closures/relocation	This strategy involves closing or relocating one or more ramps in or around the Work Zone in order to provide work access within the work space or to improve traffic flow on the mainline.
Freeway-to-freeway interchange closures	This strategy involves closing one or more freeway-to-freeway interchange connectors over a specific period of time.

TCC&C Strategies Subcategory A: Traffic Control Strategies (cont.)

Traffic-related work restrictions	This involves restricting the work on or to specific days and/or hours (e.g., peak/off-peak hours, weekends, holidays, special events, etc.) in order to minimize the safety and/or mobility impacts of the work.
Pedestrian/bicycle access improvements	This strategy involves providing alternate facilities for bicyclists and pedestrians (in accordance with the Americans with Disabilities Act of 1990) in places where the Work Zone impacts their accessibility.
Business access improvements	For work having a direct impact on access to businesses, this strategy may include signage or information to direct motorists to the business(es) and/or relocation of access locations.
Off-site detours/use of alternate routes	This strategy involves re-routing some or all traffic from the roadway(s) under construction to other existing roadways.

TCC&C Strategies Subcategory B: Traffic Control Devices

Temporary Warning Signs	These signs give notice to road users of a situation that may not be readily apparent (e.g., speed reductions, road or lane narrows, etc.).
Temporary Regulatory Signs	Regulatory signs provide notice to road users of traffic laws or regulations through the Work Zone (e.g., speed limits, parking restrictions, road closed, etc.). Included in this strategy is the use of RI Std. 27.1.1 signs declaring doubled traffic fines in Work Zones per RI General Laws.
Temporary Guide/Information Signs	Guide and/or informational signs used to notify the motoring public of the Work Zone and/or offer options for alternative routes. Signs may include dates and/or locations of construction and/or closures, including detour-related information.
Arrow panels	Arrow panels operating in flashing or sequential mode aid motorists in navigating and merging through and around the Work Zone.
Channelizing devices	This strategy involves the use of channelizing devices such as traffic cones, drums, barricades, or tubular markers throughout the Work Zone to define the intended travel path and delineate potential hazards.
Temporary pavement markings	This involves the use of temporary markings on pavement to define travel lanes and provide guidance and information for the road user through the Work Zone.

TCC&C Strategies Subcategory B: Traffic Control Devices (cont.)

Flagpersons/ Uniformed Trafficpersons	Flagpersons and/or Uniformed Trafficpersons are used to direct and control road user and pedestrian traffic in Work Zones.
Temporary traffic signals	This strategy involves the use of temporary traffic signals to improve traffic flow and/or address safety concerns through and/or near the Work Zone.
Lighting devices	Lighting strategies offer enhancement to other Work Zone strategies by attracting attention to the devices and improving delineation for road users traveling through a Work Zone at night or during adverse conditions.

TCC&C Strategies Subcategory C: Project Coordination & Contracting Strategies

Construction Sequencing/Staging	Sequencing refers to the phasing of a Project, completing portions of work one part at a time. The impacts of a Work Zone on traffic may be minimized by using operationally-sensitive phasing and staging throughout the life of the Project.
Coordination with other Projects	This involves coordinating Projects, often within a specific corridor, to minimize the combined impacts to the motoring public and community. Coordination typically involves scheduling work to ensure that adequate capacity remains available to accommodate the anticipated travel demand within a corridor by not implementing Work Zones on nearby highways at the same time.
Utilities coordination	This involves coordinating and scheduling utility work both within the impacted Work Zone area and near the Project to minimize potential work disruptions or interruptions due to utility work, and reduce overall construction duration.
Right-of-way coordination	Increased consideration of potential right-of-way needs and issues may help reduce Project delays and duration.
Coordination with other transportation infrastructure	Coordination with non-highway transportation facilities such as transit junctions, railroad crossings, and intermodal facilities in order to minimize traffic disruptions.
Contracting: Design-build	This strategy involves the use of one contract to design and build the Project thus reducing Project duration by allowing construction to begin prior to design completion.
Contracting: A+B bidding	This strategy involves the use of A+B bidding to encourage contractors to minimize construction impacts by reducing construction time.

TCC&C Strategies Subcategory C: Project Coordination & Contracting Strategies (cont.)

Contracting: Incentive / disincentive clauses	This strategy involves the use of incentives and/or disincentives in the contract to minimize work duration.
Contracting: Lane rental	Lane rental involves a charge assessed to the contractor when a portion of the roadway is obstructed and unavailable to traffic. The lane rental charge can vary according to time of day, day of week, number of lanes impacted, and duration. The contractor's bid includes an estimate of the number of hours that closures will be in place, with the actual payment to the contractor based on the actual use of closures.
Innovative construction techniques	These strategies involve the use of special materials such as quick curing concrete or precast items (e.g., culverts, bridge deck slabs, and pavement slabs) to minimize the duration of construction or maintenance activities where traffic restrictions need to be minimized.

Public Information (PI) Strategies**PI Strategies Subcategory A: Public Awareness Strategies**

Brochures and mailers	Printed brochures and mailers containing Project-related information (e.g., advanced notice of the Project's start date, schedules, pictures/graphics, alternative routes, etc.) are passed out to motorists at key locations (e.g., large employers near the Project limits), via automobile associations, or mailed to affected businesses/communities.
RIDOT travel advisories news releases	Weekly RIDOT news releases to the media and other parties that summarize planned Lane Closures and other travel restrictions, listing the routes involved as well as the closure start and end dates/times.
Other press releases/media alerts	This strategy provides Project-related information to the news media, affected businesses, and/or other affected/interested parties that is in addition to RIDOT's weekly travel advisories news releases.
Paid advertisements	Paid announcements of an upcoming or ongoing Project using newspaper, radio, television, or billboard ads.
Public information center	A facility typically located near the Project site that contains such materials as scale model displays, maps, brochures, videos, etc. describing the Project, its potential impacts, and available alternatives to minimize the impacts.

PI Strategies Subcategory A: Public Awareness Strategies (cont.)

Dedicated telephone hotline	This traveler information system provides traffic or travel information for the Project Work Zone(s) using a dedicated Project toll-free telephone number. It can include prerecorded messages and/or real-time interactive request and response information.
RIDOT travel advisories web site	This RIDOT-maintained web page summarizes planned Lane Closures and other travel restrictions for use by the public, listing the routes involved as well as the closure start and end dates/times.
Dedicated Project web site	This strategy provides traffic and/or travel information for the Project Work Zones via a dedicated Project web site. It can include both long term static information and/or real-time interactive information.
Public meetings/hearings	This strategy involves the formal presentation of Project information to the public, communities, and/or businesses by public relations staff, and solicitation of input concerning potential concerns, impacts, and management strategies.
Community task forces	This strategy involves the development of community task force(s), which includes various stakeholders from the community likely to be impacted by the Work Zone (businesses, neighborhood groups, interested individuals, public officials, or other representatives). Task forces can be a means of both providing information and receiving input related to a Project.
Consultation/ coordination with stakeholders during work	This strategy involves consulting and/or coordinating with appropriate stakeholders during the work in order to keep them informed and to (1) seek their input on and knowledge of local/regional issues and/or (2) improve inter-agency coordination and response to Work Zone issues. Examples of such stakeholders include local/regional/ neighboring state government agencies, transportation providers, schools/school districts, freight movers, law enforcement agencies, major employers/businesses, and emergency service providers that are likely to be impacted by the Work Zones. Mechanisms such as fax, e-mail, phone message, mailings, etc. can be established to communicate Project-related information and to facilitate appropriate RIDOT or stakeholder actions.
Work Zone education and safety campaigns	This strategy involves improving the awareness of motorists and/or increasing worker training in order to reduce the number of fatalities and injuries in Work Zones. This can be accomplished through brochures, web sites, media campaigns (radio, television), and videos.

PI Strategies Subcategory A: Public Awareness Strategies (cont.)

Rideshare promotions	This strategy involves the marketing of an existing rideshare program or creation of a new program through signage, advertisements, brochures, and events.
Supplemental visual information	This involves the use of slide presentations, videos, and/or computer animations to supplement public meetings, public information center displays, press releases, or Project web sites.

PI Strategies Subcategory B: Road User Information Strategies

Commercial radio traffic reports	Project-related information is disseminated via the regularly scheduled traffic reports on commercial radio stations.
Changeable message signs (CMS)	This strategy involves using existing RIDOT-owned and/or temporary contractor-provided changeable message signs to provide real time information to drivers concerning specific work operations, traffic patterns, and other conditions in the Work Zone. These devices give motorists an opportunity to take appropriate measures based on the information provided (e.g., divert to an alternate route).
Dynamic driver feedback speed display sign	This portable radar-based system can be mounted as a fixed sign or located on a portable trailer. The objective of this system is to enhance safety by reducing speeding and speed variations.
Highway advisory radio (HAR)	This strategy disseminates information to motorists while en route over wide-area wireless communications directly to in-vehicle radios, using existing RIDOT-owned and/or temporary contractor-provided HAR systems.
Highway information network (web-based)	A highway information network is a web site where multiple stakeholder groups can place information related to the roadway. The web site is shared among various stakeholders, each with their own data storage areas (including control of functionality, security, data quality, etc.).
RIDOT 511 traveler information system	This strategy provides road users with static (e.g., Project dates) and/or real time (e.g., potential delays) Work Zone-related information using the RIDOT 511 system (includes phone and/or web service).
Freight travel information	This strategy involves coordination with the freight community to identify Work Zone information considered useful (e.g., truck restrictions, planned closures, etc.) and development of a mechanism to disseminate that information to freight stakeholders. The information can be disseminated to central locations (e.g., via a fax or email distribution list to trucking companies) or to truckers as they approach the Work Zone (e.g., via CB communications tools).

Transportation Operations (TO) Strategies

TO Strategies Subcategory A: Demand Management Strategies

Transit service improvements	Transit service improvements may include the modification of transit schedules and/or routes, increases in frequency, or the establishment of transit service in the corridor.
Transit incentives	Transit incentives include employer and/or traveler transit subsidies and guaranteed ride home programs.
Shuttle services	Provisions for shuttles and/or charter buses to reduce traffic volumes through a Work Zone if a sufficient number of users along the corridor are anticipated to use the service.
Ridesharing/ carpooling incentives	This strategy involves the use of rideshare/carpool incentives to reduce the number of vehicles traveling through a Work Zone. Incentives may include preferential parking for carpools, the addition of mainline HOV lanes or bypass lanes on ramps, provision of vanpool vehicles, etc.
Park-and-ride promotion	This involves the creation, expansion, and/or promotion (advertising) of park-and-ride lots to encourage ridesharing or transit use, thus reducing the number of vehicles traveling through the Work Zone.
High-occupancy vehicle (HOV) lanes	HOV lanes require two or more persons per vehicle for use (exceptions may include motorcycles and/or low emission vehicles). HOV lanes are intended to provide an incentive for carpooling.
Toll/congestion pricing	Tolls involve fees paid by motorists to drive on a particular roadway. Congestion pricing, or value pricing, is intended to reduce peak-period vehicle trips through the use of higher tolls during congested conditions.
Parking supply management	This strategy involves reducing traffic demand by managing the parking supply, typically through cost strategies.
Variable work hours	This strategy involves encouraging motorists who typically travel through the Work Zone during periods of high demand to work variable hours (off-peak) in order to reduce travel demand during peak periods.
Telecommuting	Motorists who normally travel through the Work Zone are encouraged to telecommute for the duration of the Project to reduce the demand.

TO Strategies Subcategory B: Corridor/Network Management Strategies

Signal timing/coordination improvements	This involves retiming traffic signals to increase throughput of the roadway(s), improve traffic flow, and/or optimize intersection capacity in and around the Work Zone.
Street/intersection improvements	Improvements on streets and intersections for the roadway and/or alternate routes to provide increased capacity to handle the traffic through the Work Zone or within the adjacent corridor.
Bus turnouts	This involves the construction of bus stop areas that are recessed from the travel lanes. This strategy may be helpful in Work Zones or on detour routes with a high occurrence of bus traffic and stops.
Turn restrictions	This involves restricting turn movements for driveways and/or intersections to increase roadway capacity, reduce potential congestion and delays, and improve safety. Restrictions may be applied during peak periods or all day.
Parking restrictions	This strategy involves the elimination of parking in all or part of the Work Zone and/or alternate routes, or parking restrictions during work hours or peak traffic periods. Parking restrictions can be used to increase capacity by converting the parking lane to an additional travel lane, reduce traffic conflicts, or provide improved access to the work area.
Truck/heavy vehicle restrictions	This strategy, which imposes restrictions on truck travel through the Work Zone either during specific periods or at all times, can increase passenger vehicle capacity of the roadway when a facility normally has a high truck volume. When using this strategy, the requirements of 23 CFR Part 658.11 (d) (1) and (g) must be followed.
Separate truck lanes	This strategy involves the provision of a separate truck lane through the restricted use of an existing lane, use of the shoulder or median, or construction of a new lane.
Reversible lanes	This strategy involves sharing lane(s) of travel to accommodate peak period traffic flow. The direction of travel in the shared lane varies by time of day or day of the week.
Dynamic Lane Closure system	This system uses dynamic electronic signs and other special devices to control vehicle merging at the approach to Lane Closures.

TO Strategies Subcategory B: Corridor/Network Management Strategies (cont.)

Ramp metering	This strategy serves both to decrease demand on a facility by controlling the entrance of vehicles and to improve flow by matching entering vehicles to gaps in the traffic stream.
Railroad crossing traffic control	This strategy includes traffic control improvements at a railroad crossing where Work Zone delays and congestion have the potential to force vehicles to stop on the tracks or between the crossing gates.

TO Strategies Subcategory C: Work Zone Safety Management Strategies

Speed limit reduction/variable speed limits	A reduced speed limit may improve traffic safety in a Work Zone and help protect workers. Speed limit reductions may be implemented through an entire Work Zone or only in active work areas or adjacent to workers. Reduced speed limits may also be appropriate on detours where traffic volumes and conflicts are increased.
Temporary traffic barrier	Temporary traffic barriers provide positive physical separation between travel lanes and adjacent work space, or between opposing travel lanes.
Movable traffic barrier systems	This system permits the rapid and safe reconfiguration of a traffic barrier system, allowing daily opening and closing of lanes for reversible lane operations and to provide additional space for the contractor to work during off-peak conditions.
Crash attenuators	Fixed or mobile crashworthy barriers used to protect a temporary hazard or prevent vehicle intrusion into the workspace or other hazardous area.
Temporary rumble strips	Rumble strips are used to alert motorists to a change in roadway conditions, or that they have strayed out of the travel lane.
Intrusion alarms	This strategy involves the use of various types of sensors to detect vehicles that stray out of the travel lane approaching or adjacent to the workspace and into the work area.
Warning lights	Various types of warning lights, as described in the MUTCD, used to alert drivers and pedestrians and draw attention to critical signs, channelizing devices, and other Work Zone features.

TO Strategies Subcategory C: Work Zone Safety Management Strategies (cont.)

Automated Flagger Assistance Devices (AFADs)	Portable traffic control systems used to assist a flagging operation for short-term Lane Closures, on two-lane highways. For a typical flagging operation with AFADs, one or both Flagpersons can be positioned a short distance away from the roadway and moving traffic.
Project safety task force/committee	This strategy creates a Project task force/committee to address safety within the Work Zone and adjacent corridor.
Road safety audits (design)	Safety audits performed during Project design.
Project on-site safety training	This strategy provides on-going safety training to ensure that workers are familiar with safety procedures and specific risks associated with the Project, and to maintain a high level of safety awareness.
Safety awards/incentives	This strategy involves the use of awards or incentives for innovations that reduce the safety impacts associated with the Work Zone.

TO Strategies Subcategory D: Traffic/Incident Management & Enforcement Strategies

Dedicated Project Work Zone ITS	A Project-specific Work Zone ITS deployment (separate from existing RIDOT ITS devices) using sensors to detect traffic conditions. Data can be automatically fed to motorist information outlets such as CMS, the RIDOT TMC, and/or websites.
RIDOT Transportation Management Center (TMC)	This strategy involves the use of the RIDOT TMC for coordinating and managing traffic/incident management activities in and around the Work Zone.
Helicopter for aerial surveillance	This involves the use of aerial surveillance to identify and verify traffic problems and incidents.
Traffic screens	Traffic screens help prevent driver distractions in Work Zones, which can help to keep traffic moving and enhance safety. Screens may be mounted on the top of temporary traffic barriers to discourage gawking and reduce headlight glare.

TO Strategies Subcategory D: Traffic/Incident Mngmnt. & Enforcement Strategies (cont.)

Location reference markers	Markers/signs located in the median or shoulder that list location information (direction, route, mile, etc.) to aid in incident response.
Tow/freeway service patrol	This strategy involves the use of dedicated or on-site (or near site) towing services to reduce the time required to remove vehicles involved in an incident (breakdown or crash).
Survey equipment for major incidents	This involves the use of survey equipment for documenting/mapping major incidents (e.g., fatal crashes, HAZMAT conditions, etc.) in order to reduce clearance times.
Photogrammetry for major incidents	Photogrammetry involves the use of photos taken in the field and computer software for documenting and measuring incident-related data in order to reduce incident clearance times.
Establish available local detour routes	Advance identification and approval/authorization of local detour routes to be used to address major traffic delays and incidents if they occur, particularly for high volume and incident prone Work Zones.
Contract support for incident management	This strategy provides additional contract support for incident management and response beyond that available from the construction contractor or within the agency. Contracts may include entities such as police agencies, towing/recovery providers, engineering consultants, or others, depending on the support needed for a Project.
Incident/emergency management coordinator	This strategy provides a designated individual with overall responsibility for incident and emergency management on a Project. Responsibilities may include developing incident and/or emergency response plans, overall management of incidents/emergencies, etc.
Incident/emergency response plan	This involves the development of a plan with information needed to respond to an incident. This information could include roles and responsibilities, processes/procedures, contact information, alternate routes, personnel and equipment information, staging area locations, etc.
Dedicated (paid) police enforcement	This strategy provides targeted police enforcement in the Work Zone under a contractual arrangement with the Project owner or contractor.
Cooperative police enforcement	This strategy provides targeted police enforcement in the Work Zone under a cooperative agreement with the Project owner.
Automated enforcement	Automated enforcement involves the use of various technologies such as radar, cameras, and video to detect/record vehicle speed/signal violations.

Performance Monitoring (PM) Strategies

Team meetings	This strategy requires Project team meetings on a regular basis during the work to discuss/assess (1) the safety and mobility impacts of the Work Zones and (2) the performance of the transportation management strategies to date.
Windshield surveys	This strategy involves a designated Project official periodically driving through the Work Zone area(s) to conduct a firsthand assessment of safety and/or traffic flow.
Public surveys	This strategy involves conducting surveys of road users, business owners, and/or other stakeholders who may be impacted by the Project in order to gauge the public's satisfaction with the Work Zones.
Surveillance: Traffic counts	This strategy requires that traffic count/classification data be collected at a specified frequency and location(s) (or under a special condition) during the work so that the mobility impacts of a Work Zone(s) can be assessed.
Surveillance: Traffic queues/delays	This strategy requires that traffic queue/delay data be collected at a specified frequency and location(s) (or under a special condition) during the work so that the mobility impacts of a Work Zone(s) can be assessed.
Surveillance: Travel times	This strategy requires that travel time data be collected at a specified frequency and location(s) (or under a special condition) during the work so that the mobility impacts of a Work Zone(s) can be assessed.
Surveillance: Crash data	This strategy requires that Work Zone crash data be collected by a non-RIDOT party during the work so that the safety impacts of a Work Zone(s) can be assessed.
Assessment: Mobility	This strategy requires that the mobility impacts of the Project Work Zone(s) be formally assessed and documented, typically using traffic count data in conjunction with a quantitative method (e.g., a traffic analysis program).
Assessment: Safety	This strategy requires that the safety impacts of the Project Work Zone(s) be formally assessed and documented, typically using before and after crash data collected from within the Project limits.
Road safety audits (construction)	Safety audits performed during Project construction.

450.05.05 Procedures

This section describes the process by which the Work Zone Impact Level is initially assigned during Project planning and the Work Zone-related design and analysis requirements during subsequent stages of Project design. Table 1 summarizes the primary Work Zone-related tasks and responsibilities during the entire Project development process.

450.05.05.01 Work Zone-Related Tasks/Responsibilities during Project Planning

During the initial planning stage of development for all RIDOT construction and maintenance projects and maintenance activities (or, for Significant Encroachments, upon first notification of a permit application), the RIDOT will complete a conceptual screening-level assessment of the expected Work Zone-related impacts and will assign the Work Zone Impact Level (Impact Level) for the Project, all in accordance with the criteria included in Table 2. Conceptually assessing the expected Work Zone impacts at the start of Project development allows the RIDOT to better plan and program appropriate strategies and funds to mitigate the adverse impacts of Work Zones.

The conceptual screening-level assessment of the anticipated level of impact is typically completed using a qualitative process. For Projects introduced at the Transportation Improvement Program (TIP) level, the Capitol Programming Section is responsible for the assessment and assignment of the Impact Level for the Project. For all other Projects, the Project Manager is responsible for the assessment and assignment of the Impact Level. In cases where the appropriate Impact Level is not readily apparent, the lowest number Impact Level being considered shall be assigned.

Where combined and/or inter-relational Work Zone impacts (impacts resulting from multiple concurrent Projects in an area, impacts on other transportation modes, or impacts from special event and/or seasonal traffic) are identified for a Project, action(s) should be taken at the planning level to minimize or eliminate the associated impacts if feasible (e.g., combining work, adjusting Project schedules, or programming transit incentives/improvements). If practical, the costs for the implementation of Transportation Management Strategies (strategies) to mitigate the adverse safety and/or mobility impacts of the Work Zones should be estimated as early as possible during the planning stage of development so that appropriate funds can be budgeted for the Project.

For Projects to be tracked using the Project Management Portal (PMP), the assignment of the Impact Level should be completed prior to or concurrent with the assignment of a Project Tracking System (PTS) identification number. The Project Manager shall enter the assigned Impact Level in the appropriate location of the Project's Design tab in the PMP.

Projects assigned as Impact Level 1 or 2 are considered Significant Projects. Significant Projects are anticipated to cause high or very high levels of sustained impacts to the traveling public unless PI and/or TO strategies are used to help mitigate those impacts. Significant Projects require more extensive analyses of traffic operations/impacts during Design than are required for Impact Level 3 or 4 Projects.

TABLE 1. Primary Work Zone-Related Tasks/Responsibilities during Project Development

	<i>Task Description</i>	<i>Responsible Party (Assisting Party)</i>			
PLANNING¹	Assign Project Work Zone Impact Level	CPS or PM			
	<i>Work Zone Impact Level</i>	1	2	3	4
	<i>Anticipated Degree of Adverse Impact to Road Users without Mitigation</i>	SIGNIFICANT VERY HIGH	SIGNIFICANT HIGH	MODERATE	LOW
PRELIMINARY DESIGN	Identify relevant TMP stakeholders	D (PM)	D (PM)		
	Meet with CM, PA, CS, & other TMP stakeholders to Identify Work Zone safety and mobility concerns	PM (D)	PM (D)		
	Identify potential PI and TO Strategies & Estimate their implementation costs ²	D	D		
	Identify preliminary construction sequence approach(es)	D	D		
	Perform preliminary Work Zone impacts assessment & Reevaluate Work Zone Impact Level	D	D	D	
	Initiate appropriate level TMP	D	D		
FINAL DESIGN	Update relevant TMP stakeholders list & Identify new Work Zone safety and mobility concerns ³	PM (D)	PM (D)		
	Select appropriate PI and TO Strategies	D	D	D	
	Develop (and/or Select RIDOT Typical) TTC Plans	D	D	D	D
	Perform final Work Zone impacts assessment(s) & Reevaluate Work Zone Impact Level	D	D	D	D
	Quantitatively analyze traffic impacts	D	D	D ⁴	
	Select recommended construction sequence approach	D	D		
	Estimate TMP implementation costs ² & Include provisions for TMP implementation in PS&E	D	D	D ⁵	D ⁵
	Develop/Complete appropriate level TMP	D	D	D	D
	Approve TMP ⁶	TMC, STE & CE	TMC, STE & CE	TMC, STE & CE	TMC, STE & CE
PRE-CON.	Assign TMP Implementation Managers	CM ⁷ & C ⁵	CM ⁷ & C ⁵	CM ⁷ & C ⁵	CM ⁷ & C ⁵

LEGEND: C = Contractor; CE = Chief Engineer; CM = Construction Management Section; CPS = Capital Programming Section; CS = Customer Service Office; D = Designer; M = Highway & Bridge Maintenance Division; PA = Public Affairs Office; PI = Public Information; PM = Project Manager; PS&E = Plans, Specifications, & Estimate; STE = State Traffic Engineer; TMC = Traffic Management Chief; TMP = Transportation Management Plan; TO = Transportation Operations; TTC = Temporary Traffic Control

NOTES: 1. For Significant Encroachments, the Planning Stage commences upon first notification of permit application
 2. To be estimated as early as possible in order for appropriate funds to be budgeted for the Project
 3. To be completed at the discretion of the PM where major design changes and/or major Project delays occur
 4. To be completed where directed by the PM and/or the Traffic Engineer
 5. Not required for RIDOT maintenance activities
 6. PM should arrange for approvals just prior to Project advertising or start of work
 7. M replaces CM for RIDOT maintenance activities; Health & Safety Section replaces CM for Temporary Traffic Control Permits

TABLE 2. Project Work Zone Impact Level Assignment Criteria¹

Work Zone Impact Level	Work Anticipated to Include Lane Closures?	Anticipated Duration of Work ²	ADT ³ on Most Heavily Traveled Roadway within Project Limits	Anticipated Level of Public Interest	Anticipated Degree of Adverse Impact to Road Users Without Mitigation ⁴	Possible Examples
1	Yes	Very Long	> 50,000	Very High	Very High	Reconstruction Projects on major freeways
2	Yes	Moderate to Very Long	> 15,000	Moderate to High	High	Major bridge Projects on principal arterials
3	Yes	Short to Very Long	Any	Low to Moderate	Moderate	Resurfacing Projects on minor arterials
4	No	Short to Long	Any	Low	Low	Short-term maintenance activities

NOTES:

- Interstate system Projects within the boundaries of a designated Transportation Management Area that occupy a location for more than three days with either intermittent or continuous Lane Closures shall be assigned as either Work Zone Impact Level 1 or 2.
- Duration of work is defined as the length of time that temporary traffic control setups for the Project will typically be in place, using the following criteria:
 - Short = less than or equal to one day;
 - Moderate = greater than one day but no greater than one week;
 - Long = greater than one week but no greater than one year;
 - Very Long = greater than one year.
- Average Daily Traffic in both directions (existing or anticipated)
- Mitigation is defined as lessening or eliminating the adverse impacts of the Work Zone(s) through the use of one or more PI and/or TO strategies described in Section 450.05.04.02.

Certain Projects that could be assigned as Impact Level 1, 2, or 3 using the criteria presented in Table 2 may be eligible for an exemption from the assignment scheme if it can be demonstrated that the work will not cause sustained impacts and will not be in conflict with Section 450.05.04. In cases where such an exemption is desired or needed to complete the work, an exemption request shall be approved by the Chief Engineer and, if Federal aid is involved, the FHWA Rhode Island Division Office.

As described in the following sections, the Impact Level assigned during the initial stage of Project development can and should be revised if appropriate during Project design as new information and data become available.

450.05.05.02 Work Zone-Related Tasks/Responsibilities during Project Design

The assessment of Work Zone impacts is an important design task that allows the Project design team to determine which Transportation Management Strategies are expected to best serve the safety and mobility needs of a given Project. This section describes responsibilities regarding the completion of these tasks in conjunction with the development of the Project TMP. Each will proceed in an iterative manner since the level of detail progressively increases from Preliminary to Final Design as more Project-specific information becomes available. Refer to Table 1 for a summary of design stage tasks and responsibilities regarding Work Zones.

The task time (number of hours) for traffic analysis included in Project design contracts should be sufficient to allow the Designer to appropriately assess (as described in the remainder of this section) the mobility impacts of the planned Project Work Zones. For Significant Projects, an appropriate number of additional traffic analysis hours should also be included for potential use during the work in order for the Designer to assess the impacts of a reasonable number of proposed significant changes to the TMP or the Project schedule (e.g., an alternate construction sequence or the accelerated closing of a freeway ramp) that are not analyzed during design. Provisions for the collection of vehicle counts at critical locations and times during the work may also be included where deemed appropriate (e.g., a Significant Project in an urban area with a complex but flexible construction sequence). In all cases, the Designer should use experiences with similar Projects and engineering judgment to determine the appropriate number of hours, and shall provide thorough justification for any traffic analysis hours that are proposed for potential use during the work.

450.05.05.02.01 Preliminary Design²

During the Preliminary Design stage of Project development the Designer shall use preliminary Project data to perform a preliminary assessment of the adverse Work Zone impacts that are expected to occur during the work. At minimum, the preliminary Project data to be considered include:

- Existing and expected road user demands near work areas
- Expected capacity reductions during the work (shoulder, lane, or roadway closures)

The preliminary impacts assessment should be completed using a qualitative approach (using appropriate rationale, reasoning, and engineering judgment) in conjunction with the above data, but may also include the use of detailed quantitative analysis where directed by the Project Manager and/or Traffic Engineer.

A broad range of potential Transportation Management Strategies (strategies) that could be used to minimize the adverse impacts of the Project Work Zones should be considered during Preliminary Design as the impacts are preliminarily assessed. The Designer should also consider other ongoing and/or planned Projects that may contribute to or affect the expected Project impacts and, where appropriate and available, collect information from those Projects to be used in evaluating the combined/cumulative impacts of the work. The Designer should work with traffic engineers (and

² Projects assigned as Work Zone Impact Level 4 are exempt from the requirements of this section.

where applicable, other technical specialists such as persons with construction experience) to jointly assess the expected Work Zone impacts.

Before the close of Preliminary Design, the Designer shall compare the results of the preliminary Work Zone impacts assessment with the criteria included in Table 2 to confirm that the Impact Level as originally assigned during the planning stage remains appropriate. If a lesser or greater Impact Level seems more appropriate, the Designer shall coordinate with the Project Manager to determine whether the Impact Level should be changed. The Chief Design Engineer must approve of a change to the Project Impact Level.

450.05.05.02.01.01 Preliminary Design for Significant Projects

Significant Projects require an expanded consideration of Project Work Zone safety and mobility impacts during Preliminary Design, in addition to the activities and procedures described above.

At the start of the Preliminary Design stage, the Designer shall work with the Project Manager to identify relevant “TMP stakeholders” that are expected to be significantly impacted during the Project work and/or that could provide valuable input as to what Transportation Management Strategies (strategies) to use in order to manage the impacts of the work³. Potential RIDOT TMP stakeholders include staff from planning, design, safety, construction, operations, maintenance, public affairs, and other areas of technical expertise. Other potential non-RIDOT TMP stakeholders include government agencies (local, regional, or neighboring state), public transportation providers, contractors, railroad agencies/operators, freight operators, enforcement agencies, utilities, emergency services, businesses, community groups, and schools. The identified relevant TMP stakeholders should provide varying perspectives that will help the RIDOT consider a broad range of Work Zone safety and mobility concerns.

With relevant stakeholders initially identified, the Project Manager will arrange for a meeting(s) of the design team (e.g., the Designer, the Project Manager, and the Traffic Engineer) and other appropriate stakeholders to (1) identify the significant Work Zone safety and/or mobility concerns on the Project and (2) discuss potential strategies that could be used to address those concerns during the work. At minimum, the other appropriate stakeholders should include a representative from the Construction Management Section, the Public Affairs Office, and the Customer Service Office, but may also include other TMP stakeholders where the Project Manager deems that their presence at the meeting(s) will be critical to the process. The following shall be considered at the meeting(s), with the Designer responsible for recording minutes:

- Impacts on local businesses and communities
- Impacts from or on special events and/or seasonal traffic variations
- Whether significant detours/alternate routes will be necessary/feasible/available
- Other safety/mobility concerns identified by the design team and/or stakeholders

³ In cases where stakeholders have already been identified during Project planning, those stakeholders should be included in (or may constitute) the identified list.

Based on the discussions of the completed meeting(s), together with the guidelines provided in Section 450.05.04.02 and Table B.1 “TMP Strategy Matrix” from FHWA Report No. FHWA-HOP-05-066, the Designer shall identify a set of potential Public Information (PI) and Transportation Operations (TO) strategies that could be used to lessen or eliminate the adverse impacts of the Work Zone(s) during the work. Potential Traffic Control, Coordination, and Contracting (TCC&C) and Performance Monitoring (PM) strategies should also be identified if deemed appropriate.

As part of the preliminary impacts assessment for all Significant Projects, the Designer should consider how candidate construction sequence approaches will impact the safety and/or mobility of the Work Zones. The Designer should also consider what the expected implementation costs will be for each of the identified potential strategies. Before the close of Preliminary Design, the Designer shall (1) identify one or more suggested preliminary construction sequence approaches for the work and (2) estimate the costs to implement each of the identified potential strategies on the Project.

450.05.05.02.01.02 Preliminary Design Documentation

Impact Level 4 Projects do not require any Work Zone safety/mobility documentation during Preliminary Design. For all other Projects, the Designer shall include a discussion of the preliminary Work Zone impacts assessment performed during preliminary design (including references to any preliminary Project data and/or information considered/collected) within or as part of the ultimate Preliminary Design deliverable (e.g., the Design Study Report), where such a deliverable is required. If quantitative traffic analyses are completed during Preliminary Design, the analyses should be documented in Project correspondence and/or reports and submitted to the Project Manager and Traffic Engineer for review.

For Significant Projects, the Designer shall also complete the *TMP Roles and Responsibilities*, *Project Information*, *Transportation Management Strategies*, and *TMP Implementation Cost Estimates* sections of the TMP template to the extent feasible, using the Project information collected during Preliminary Design and the results of the preliminary Work Zone impacts assessment. This initially-completed (initiated) TMP shall be submitted as part of the ultimate Preliminary Design submission (e.g., the Design Study Report) and in accordance with Section 450.05.05.03.

450.05.05.02.02 Final Design

The following Project-level actions shall be completed during the Final Design stage of Project development:

- Select appropriate Transportation Management Strategies
- Develop (and/or Select RIDOT Typical) Temporary Traffic Control plans
- Perform final Work Zone impacts assessment(s)
- Develop/Complete Transportation Management Plan (TMP)
- Estimate final costs/Include provisions for TMP implementation (where applicable)

Because the above actions are related to and/or dependent on one another, each may require reevaluation and modification throughout the various iterations of Final Design where new Project information is revealed and/or the Project plans change significantly. Guidance for completing each action is provided below.

450.05.05.02.02.01 Select Appropriate Transportation Management Strategies

Appropriate Work Zone Transportation Management Strategies (strategies) must be selected for implementation on all Projects in order to maintain or improve road user/worker safety and to minimize road user congestion and delays. The Designer shall use the requirements and guidelines provided in Section 450.05.04.02 and the remainder of this section (where applicable) in selecting an appropriate set of strategies for each Project. Table B.1 “TMP Strategy Matrix” from FHWA Report No. FHWA-HOP-05-066 should also be used for guidance during the selection process.

Where potential strategies have already been identified during Preliminary Design (e.g., for Significant Projects), those strategies should be reconsidered during Final Design to determine and/or confirm their expected effectiveness. Additional strategies should also be considered where Final Design activities reveal that they may help to reduce the adverse Work Zone impacts of the Project.

Performance Monitoring (PM) strategies should be used in addition to TCC&C, PI, and TO strategies where the Project Manager or Traffic Engineer judges that it will be worthwhile to assess the actual impacts of the Project Work Zones once they are implemented in the field.

450.05.05.02.02.02 Develop Temporary Traffic Control Plans

Temporary Traffic Control (TTC) plans are required for all Projects and shall provide for a safe driving and work environment in and around Work Zones through the application of appropriate types and layouts of TTC devices. TTC plans shall be based on consideration of the standards and guidance contained in the latest editions of the Manual on Uniform Traffic Control Devices (MUTCD), the AASHTO Roadside Design Guide (RDG), and the RIDOT Traffic Design Manual (TDM), as well as any specific characteristics and factors of the Project.

In developing TTC plans, the Designer shall consider safe worksite access and egress for road workers and equipment. Constructability reviews offer an opportunity to discuss safe worksite access and egress with traffic engineering and construction operations personnel.

To the extent practicable, the Designer shall prepare TTC plans that avoid or minimize both (1) worker exposure to motorized traffic and (2) road user exposure to work activities/hazards. The setup and breakdown times of TTC devices should be considered, as should the possibility for using elaborate measures such as full road/ramp closures with detours, median crossovers, and/or techniques to accelerate construction. Pre-existing roadside safety hardware within the limits of Work Zones shall be maintained at an equivalent or better level than existed prior to start of work. The Designer should also consider visibility and other environmental factors that may affect traffic

safety and operations in and around the Work Zones (e.g., how geometry, sight distance, and/or sign clutter may degrade motorist reaction to or compliance with TTC setups).

Wherever feasible, the existing number of travel lanes should be maintained through the Work Zone(s) on the Project. Where Lane Closures are necessary, consideration shall be given to restricting the work during peak periods of travel, all in accordance with the RIDOT TDM.

Positive protection devices (e.g., temporary concrete barrier) shall be considered in Work Zone situations that place workers at increased risk from motorized traffic, and where positive protection devices offer the highest potential for increased safety for workers and road users. Example situations include:

- Work Zones that provide workers no means of escape from traffic (e.g., bridges)
- Long duration Projects (e.g., greater than one week) resulting in substantial worker exposure to motorized traffic
- Projects with high anticipated operating speeds (e.g., 45 miles per hour or greater), especially when combined with high traffic volumes
- Work operations that place workers close to travel lanes open to traffic
- Roadside hazards (e.g., drop-offs) that will remain in place overnight or longer

Where positive protection devices are proposed to be used, their need shall be based on an engineering study. The engineering study should be based on a consideration of the standards and/or guidance contained in the MUTCD and the RDG, as well as the specific Project characteristics and factors listed in Section 450.05.04.02.

All TTC plans should reflect the appropriate Transportation Management Strategies identified during the concurrent stage of the design process. While all TTC plans show the overall TTC zone(s) with layouts of TTC devices, additional information should be included where atypical setups are called for or where unique situations exist. Notes describing the construction sequence or staging should be included for complex Projects. Temporary traffic regulations and considerations (e.g., reduced speed limits, parking restrictions, details about staging areas and/or turnarounds for police, special times/events when work is not permitted, etc.) should also be noted if these strategies are used on the Project.

A set of RIDOT-developed Typical TTC plans is available on the PMP. Designers should consider using one or more of these RIDOT Typical TTC plans wherever they are applicable to the Project work. Where appropriate, Impact Level 3 and 4 Projects may include only RIDOT Typical TTC plans for use during the work. However, all Significant Projects will require at least some Project-specific TTC plans to be developed by the Designer.

450.05.05.02.02.03 Perform Final Work Zone Impacts Assessment(s)

Assessments of Work Zone safety and mobility impacts on Projects should be conducted throughout the various Final Design iterations in a progressive and comprehensive manner as Transportation Management Strategies (strategies) are considered and TTC plans are developed. For Significant Projects, the Designer shall perform detailed quantitative analyses of expected Work Zone mobility impacts as part of such assessments, as described in Section 450.05.05.02.02.06. For other Projects the Designer may conduct impacts assessments using qualitative techniques, although on Impact Level 3 Projects quantitative analyses shall also be performed where directed by the Project Manager and/or Traffic Engineer. In all cases, prior to the completion of Final Design the Designer shall perform a final overall Work Zone impacts assessment to ensure that an appropriate set of strategies is selected for use on the Project.

In conducting Final Design assessments, the Designer shall use the latest available Project information and data, and should work with traffic engineers and other technical specialists as appropriate. As during Preliminary Design, the Designer should consider whether roadways expected to be impacted by the Project's Work Zones will also be impacted by other ongoing and/or planned Projects during the work (and, where available, should use information from those Projects to assess the combined/cumulative impacts of the work on the Project). Where unacceptable combined/cumulative impacts are expected, the strategies and/or TTC plans for the Project should be revised to avoid conflicts wherever feasible. As part of the final overall assessment, the Designer should confirm that impacts to emergency service providers, communities, businesses, schools, transit operators, and other appropriate stakeholders are not expected to be unacceptable.

Where major Project changes (e.g., significantly revised work locations or planned start dates) occur during Final Design, the Designer shall (1) assess the expected Work Zone impacts of the Project including the major change(s) and (2) compare the results of this assessment with the criteria included in Table 2 to confirm that the Impact Level as previously assigned remains appropriate. Where no major Project changes occur during Final Design, the results of the final overall Work Zone impacts assessment shall be compared with the Table 2 criteria. If an alternate Impact Level seems more appropriate, the Designer shall coordinate with the Project Manager to determine whether the Impact Level should be changed. The Chief Design Engineer must approve of a change to the Project Work Zone Impact Level.

450.05.05.02.02.04 Develop/Complete Transportation Management Plan (TMP)

The TMP for each Project documents the set of selected Transportation Management Strategies (strategies) that are to be used to manage the Work Zone impacts of the Project during the work. See Section 450.05.04.01 for general TMP information and requirements.

The Designer shall obtain the appropriate level TMP Template from the PMP at the start of Final Design⁴, and shall update and revise the Project TMP throughout the remainder of the design process as strategies are selected, TTC plans are developed, and Project changes occur. The Designer should use the notes that are provided in comment form on the TMP Templates for guidance in completing

⁴ For Significant Projects, the Designer shall use the initiated TMP prepared during Preliminary Design.

the Project TMP. Project-specific questions regarding TMP completion or components/attachments should be coordinated through the Project Manager. General questions regarding TMP development or completion should be directed to RIDOTWorkZones@dot.ri.gov.

All Public Information (PI), Transportation Operations (TO), and Performance Monitoring (PM) strategies selected for use on a Project must be identified in the Project TMP. Specific strategy implementation responsibilities, requirements, and/or special considerations should be noted in the appropriate locations of the TMP, unless standard RIDOT procedures/specifications or contract-specific provisions will be used for strategy implementation (in such cases, references should be noted in the TMP). Traffic Control, Coordination, and Contracting (TCC&C) strategies are not required to be explicitly identified in the Project TMP, since the TTC plans and other contract documents illustrate/describe these strategies. However, a list of the TTC plans to be used on the Project must be provided in the TMP in the appropriate location.

For Significant Projects, the Designer shall enter the appropriate information in the *TMP Development Managers* sub-section of the TMP. The Designer shall also complete the *TMP Implementation Task Leaders*, *TMP Stakeholder Contacts*, and *Emergency Service Contacts* sub-sections of the TMP, where applicable and if such parties are identified during Project design. The *TMP Stakeholder Contacts* are those TMP stakeholders that are identified by the Project Manager and Designer as non-RIDOT parties that must be consulted/coordinated with during the work.

The Designer is not responsible for completing the *TMP Approvals* section of the TMP. The Project Manager should arrange to have the Traffic Management Chief, the State Traffic Engineer, and the Chief Engineer approve the final TMP just prior to Project advertising or start of work rather than earlier in the process to help ensure that the strategies included within reflect the latest roadway and traffic conditions.

Following approval of the final TMP, the *TMP Implementation Managers*⁵ shall be identified prior to start of work by the RIDOT, Designer, and/or contractor as appropriate. For RIDOT construction and maintenance projects and maintenance activities, such persons will be identified without the assistance of the Designer (e.g., at the pre-construction meeting). For Significant Encroachments, the Designer is responsible for arranging for the identification of the contractor⁶.

In conjunction with completing the TMP for Projects with work that will be completed by a contractor (e.g., RIDOT construction and maintenance projects), the Designer is responsible for ensuring that the plans, specifications, and estimate (PS&E) includes all of the applicable elements of the TMP, as described in the following section.

⁵ For RIDOT construction and maintenance projects the RIDOT TMP Implementation Manager is typically the Resident Engineer, while for RIDOT maintenance activities the RIDOT TMP Implementation Manager is typically the supervisor or inspector of the work.

⁶ For investigative work carried out by the Designer under approval of a Temporary Traffic Control Permit, the Designer may be the contractor.

450.05.05.02.02.05 Estimate Costs / Include Provisions for TMP Implementation

As Work Zone impact assessments are completed during Final Design, the Designer shall consider the costs of implementing the proposed Transportation Management Strategies (strategies) during the work. Impacts and effectiveness equal, lower cost strategies should be selected over higher cost strategies. However, many strategies cannot be substituted for another, and in cases where experience, engineering judgment, or the results of an analysis suggests that a certain strategy will provide significant safety and/or mobility benefits a high implementation cost may be warranted.

For all Projects with work that will be completed by a contractor (e.g., RIDOT construction and maintenance projects), the contract documents must include appropriate pay item provisions for implementation of the TMP, using either method- or performance-based specifications. Payment for Work Zone Temporary Traffic Control (TTC) features (e.g., temporary warning signs) and operations (e.g., setup and subsequent removal of temporary concrete barrier) shall not be incidental to the contract, and shall not be included in payment for other items of work not related to traffic control and safety. The Engineer's Estimate for a Project must include pay items and cost estimates for all strategies to be implemented by a contractor⁷. Many TCC&C strategies are typically included as line items in RIDOT construction projects (e.g., standard types of TTC devices), and weighted average unit prices are readily available. For strategies requiring contract-specific specifications, the Designer should use engineering judgment with reasonable assumptions and/or, where available, data from reputable or published sources (e.g., a RIDOT weighted-average job-specific unit price database) in estimating the strategy costs.

For RIDOT construction and maintenance projects, beginning with the 90% submission the Designer shall, where necessary or appropriate, include provisions and/or specifications in the contract documents that define details and responsibilities for carrying out the selected strategies. Contract-specific specifications are necessary for all TMP actions and/or responsibilities assigned to a contractor that are not already included in standard specifications. Performance-based management strategy specifications should be considered for use with all Significant Projects.

450.05.05.02.02.06 Final Design for Significant Projects

Where a major design change (e.g., a significantly revised work location) or a major Project delay (e.g., a multi-year postponement of the scheduled work start date) occurs during the Final Design of a Significant Project, the Project Manager should determine whether the previously-identified list of relevant TMP stakeholders should be updated and whether an additional meeting(s) of the design team and other appropriate stakeholders should be held to (1) identify any new significant Work Zone safety and/or mobility concerns on the Project and (2) reconsider potential Transportation Management Strategies (strategies) that could be used to address those concerns during the work. Where deemed appropriate, the Project Manager will update the stakeholder list (with assistance from the Designer) and arrange for such a meeting(s). The Designer shall arrange for the recording of minutes of each meeting, and should consider the approved minutes in selecting the appropriate set of strategies to be used on the Project.

⁷ Pay items for the contractor's general responsibilities for maintenance of traffic and maintenance of public access during the work (as described in Section 104 of the RIDOT Standard Specifications) are not required.

In addition to the requirements for Final Design activities described in preceding sections of this DPM, for Significant Projects the Designer is required to (1) quantitatively analyze the impacts of Lane Closures and (2) select a recommended construction sequence approach for the work. Each action is described in detail below.

450.05.05.02.02.06.01 Quantitative Analysis of Work Zone Traffic Impacts

For Significant Projects the impact of proposed Lane Closures on road user delays must be quantitatively evaluated. The Designer must demonstrate by a delay analysis that unacceptable congestion or delays will not occur during the work. Delays greater than or equal to fifteen (15) minutes beyond typical traffic delays (i.e., the delays experienced by road users on a recurring basis, without any temporary control of traffic) are to be considered unacceptable, unless another delay threshold is approved by the Chief Engineer. In analyzing temporary traffic control design options, the Designer shall consider the default traffic-related work restrictions presented in the RIDOT Traffic Design Manual.

One or more traffic analysis tools shall be used to evaluate the road user delays that are expected to be caused by proposed Lane Closures. Acceptable tools that the Designer may use to conduct these evaluations are listed in Table 3. The tools are listed in sequential order corresponding to the amount of time and effort that is typically needed for their proper use, and in general a tool listed lower in the table should only be used if an analysis using a tool listed higher in the table will not provide the desired level of detail. If a microscopic simulation model is used, it should be properly calibrated and validated. Other tools not listed in Table 3 may be used only with the prior approval of the Project Manager and the Traffic Engineer.

At a minimum, road user delays at bottlenecks (e.g., Lane Closures) and other critical locations (e.g., signalized intersections, access to hospitals, etc.) within and approaching the Work Zone(s) or proposed detour route(s) should be analyzed and documented. Because the presence of trucks and other heavy vehicles can have a significant effect on lane capacity, the Designer should take care in interpreting the results of a traffic analysis if there are significant volumes of heavy vehicles in the traffic stream.

For Significant Projects that are expected to have a sustained effect on multiple freeway segments and interchanges, the use of a properly calibrated and validated microscopic simulation model is recommended unless otherwise directed by the Traffic Engineer. For Impact Level 1 Projects, road user delay costs should be considered in the analyses. Road user delay costs can be considered with the use of QuickZone or microscopic simulation models, and may be used to develop an incentive or disincentive program/specification for the Project work.

TABLE 3. Acceptable Tools for Use in Quantitatively Analyzing Work Zone Traffic Impacts

Tool / Method / Software	Freeways, Expressways, & Ramps	Arterials, Collectors, Local Roadways¹	Intersections²
NHI Course No.13355 Procedure ³	YES	NO	NO
HCM ⁴ -Based Procedure/Software	YES	YES	YES
QuickZone	YES	YES	NO
Microscopic simulation model ⁵	YES	YES	YES

NOTES:

1. If a long-term (duration one week or greater) one lane two-way temporary traffic control setup is proposed, the guidelines and procedures of the Minnesota DOT Report *Traffic Control for One Lane Bridges* should be used
2. Includes signalized, STOP- or YIELD-controlled, and roundabout intersections (for roundabouts, the Designer shall coordinate with the Traffic Engineer regarding which specific tools are acceptable)
3. National Highway Institute Course No. 13355: *Transportation Alternatives During Highway Construction*. The Traffic Engineer will provide procedure documentation/examples if needed/requested.
4. Highway Capacity Manual, Transportation Research Board (latest edition)
5. May only be used if a specific model is approved in advance by Project Manager and Traffic Engineer

Quantitative traffic analyses should be completed at each stage in the Final Design process as significant changes are proposed to the plans to check that unacceptable congestion or delays will not occur during the work. The Designer should consult with and appropriately involve traffic engineers during this process.

450.05.05.02.02.06.02 Select Recommended Construction Sequence Approach

For all Significant Projects, the Designer should develop TTC plans in conjunction with a consideration for how the recommended construction sequence approach will impact Work Zone safety and mobility. Starting with the suggested preliminary construction sequence approach(es) as identified during Preliminary Design and continuing through the iterations of Final Design, the Designer should consider whether changes to the proposed work schedule and phasing would be expected to increase and/or decrease the likelihood that traffic safety and/or operational problems will occur. Special attention should be given to the sequencing of Projects where major roadway intersections will be impacted during the work.

Prior to completion of Final Design, the Designer is responsible for recommending a construction sequence approach for the Project work, by way of documenting the approach in the TMP and detailing the approach in the Project plan set. In all cases, the recommended construction sequence approach should serve to minimize the level of adverse impacts on road user safety and mobility while reflecting a reasonable and efficient work plan for the contractor.

450.05.05.02.02.07 Final Design Documentation

During Final Design the Project TMP shall be completed by the Designer in accordance with Section 450.05.05.02.02.04. Work Zone safety and/or mobility-related calculations/analyses that are completed during Final Design as part of the final impact assessment(s) should be documented in Project correspondence and/or reports and submitted to the Project Manager and Traffic Engineer for review. The TMP documenting the most recently selected set of strategies shall be submitted as part of each major Final Design submission (e.g., for RIDOT construction projects, the 30%, 90%, PS&E, and Contract Award submissions; for RIDOT maintenance activities, the final plan submission or work approval request) and in accordance with Section 450.05.05.03.

For all RIDOT construction and maintenance projects, the approved final TMP shall be included on the Project Advertise and Award CDs in the appropriate format as indicated on the latest CD template from the Contracts and Specifications section, and the contract documents shall include appropriate pay item provisions for implementation of the TMP.

450.05.05.03 Submission and Distribution of TMPs

Unless otherwise directed by the Project Manager, the Designer shall submit four (4) printed copies of the TMP to the Project Manager (five (5) copies if there is FHWA Project oversight) as part of each submission noted in Sections 450.05.05.02.01.02 and 450.05.05.02.02.07. The Designer shall also e-mail the electronic version of the TMP (the Microsoft[®] Excel file) to the Project Manager on the date that each of these submissions is made. Specifics regarding TMP components/attachments should be coordinated through the Project Manager. The Project Manager will distribute for review and comment one (1) copy of the TMP to the Traffic Engineer, the Transportation Management Center, and the Construction Management Section (and, if there is FHWA Project oversight, the FHWA Rhode Island Division Office).