District of Columbia Work Zone Safety and Mobility Policy

October 2007

d.
District Department of Transportation

Cover Letter by Director, DDOT

The District of Columbia Work Zone Safety and Mobility Policy

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In cooperation with:
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And
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ABBREVIATIONS

ADA	Americans with Disabilities Act of 1990
ATSSA	American Traffic Safety Services Association
DCBIA	District of Columbia Building Industry Association
DCPS	District of Columbia Public Schools
DDOT	District Department of Transportation
FEMS	Fire and Emergency Medical Services
FHWA	Federal Highway Administration
IMSA	International Municipal Signal Association
IPMA	Infrastructure Project Management Administration
IPMA, DPMD	Design and Project Management Division
IPMA, SSQCD	Office of Safety Standards and Quality Control Division
ITS	Intelligent Transportation Systems
MOTAA	Maintenance of Traffic Alternative Analysis
MPD	Metropolitan Police Department
MWCOG	Metropolitan Washington Council of Governments
NUCA	National Utility Contractors Association
OD	Office of Director
PE	Project Engineer
PI	Public Information
PI & O	Public Information and Outreach
PM	Project Manager
SAFETEA-LU	Safe Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users
SHSP	Strategic Highway Safety Plan
TCP	Traffic Control Plan
TMA	Transportation Management Area
TMP	Transportation Management Plan
TO	Traffic Operations
TOA	Transportation Operations Administration
TOA, TOD	Transportation Operations Division
TSO	Traffic Safety Officer
TTC	Temporary Traffic Control
WASA	DC Water and Sewer Authority
WMATA	Washington Metropolitan Area Transit Authority

I. POLICY STATEMENT

The District Department of Transportation (DDOT) is committed to reducing congestion in and around work zones without compromising the safety of workers and the public. This policy provides guidance for assessing work zone impacts related to mobility and safety issues on the traveling public across the various stages of all Federal-Aid Highway-funded projects and to develop proper management strategies to reduce these impacts.

II. SCOPE

This policy applies to all Federal-Aid Highway-funded projects performed on:

- Interstates
- Other Freeways and Expressways
- Principal Arterials

III. BACKGROUND

The Federal Register, September 9, 2004, published the Work Zone Safety and Mobility Rule. All State and local governments that receive Federal-Aid funding are required to comply with the provisions of the rule no later than October 12, 2007. The Rule updates and broadens the former regulation 23 CFR 630, Subpart J. Changes to the regulation will encourage broader consideration of safety and mobility impacts of work zones across project development and implementation of strategies that help manage these impacts during project delivery.

The DDOT recently developed its own *Guidelines and Standards for Temporary Traffic Control*, which, when combined with Federal policy, will significantly improve the safety of road users and workers. This policy must be linked to other SAFETEA-LU requirements such as the District-based Strategic Highway Safety Plan (SHSP).

IV. TARGET AUDIENCE

The target audience(s) for this document includes anyone involved in planning, designing, constructing, and monitoring all Federal-Aid Highway Projects in the District of Columbia, such as:

- DDOT
- Utilities
    - PEPCO
    - Verizon
    - Washington Gas
- DC Water and Sewer Authority (WASA)
- US Park Police
- Metropolitan Police Department (MPD)
- Fire and Emergency Medical Services (FEMS)
- Consultants
- Contractors

V. POLICY PROVISIONS

- Implement a policy for the systematic consideration and management of work zone impacts for all Federal-Aid Highway-funded projects.
- Address work zone impacts throughout the various stages of the project development and implementation process.
- Identify upcoming projects expected to be significant. For significant projects, develop a Transportation Management Plan (TMP) that consists of a Temporary Traffic Control Plan (TTC) and addresses both Traffic Operations (TO) and Public Information (PI) components.
- Use field observations, available work zone crash data and operational data to manage work zone impacts for specific projects during implementation.
- Continually pursue improvement of work zone safety and mobility by analyzing work zone crash and operation data from multiple projects to improve processes and procedures.
- Develop a training program for personnel involved in the development, design, implementation, operation, inspection and enforcement of work zone-related transportation management and traffic control.
- Assess the effectiveness of work zone safety and mobility procedures by conducting a process review every two years.

VI. DISTRICT-LEVEL PROCESSES AND PROCEDURES

The following section details the various agency-level processes and procedures that should be performed to support the new work zone policy implementation during the project life cycle, as wells as post life cycle.

A. Project Life Cycle
    1. Planning/Design/Pre-Construction
    2. Construction Stage
    3. Post Construction Stage
B. Process Review
C. Training

Figure 1.1 (page 5) illustrates the development of District-level process and procedures for implementing the policy. *IPMA Project Manger will be the team lead unless otherwise determined by the DDOT Chief Engineer.*

A. Project Life Cycle

1. Planning/Design/Pre-Construction

1.1. Compile Project Material

The Project Manager responsible for each stage of the project compiles project material such as:

- Project scope and limits.
- Roadway and traffic characteristics (including non-motorized issues).

- Local community issues.
- Preliminary cost estimates for strategy implementation (when available).
- Information from other projects in the corridor to evaluate the combined or cumulative impact of the projects.
- Information on existing geometric and traffic characteristics and crash trends.
- Existing cultural resources and right-of-way maps.
- Public outreach and community information.
- Construction phasing/staging approaches and plans.
- Environmental impact study.

Outcome: Information for impact assessment.

1.2. Identify Significant Project and Determine TMP Needs

A significant project is one that alone or in combination with other concurrent projects nearby is anticipated to cause sustained work zone impacts that are greater than what is considered tolerable based on DDOT policy and/or engineering judgment. Work zone impacts refer to work zone-induced deviations from the normal range of transportation system safety and mobility conditions. The District shall identify upcoming projects that are expected to be significant. Significant projects should be identified as early as possible in the project delivery and development process, and in cooperation with the FHWA.

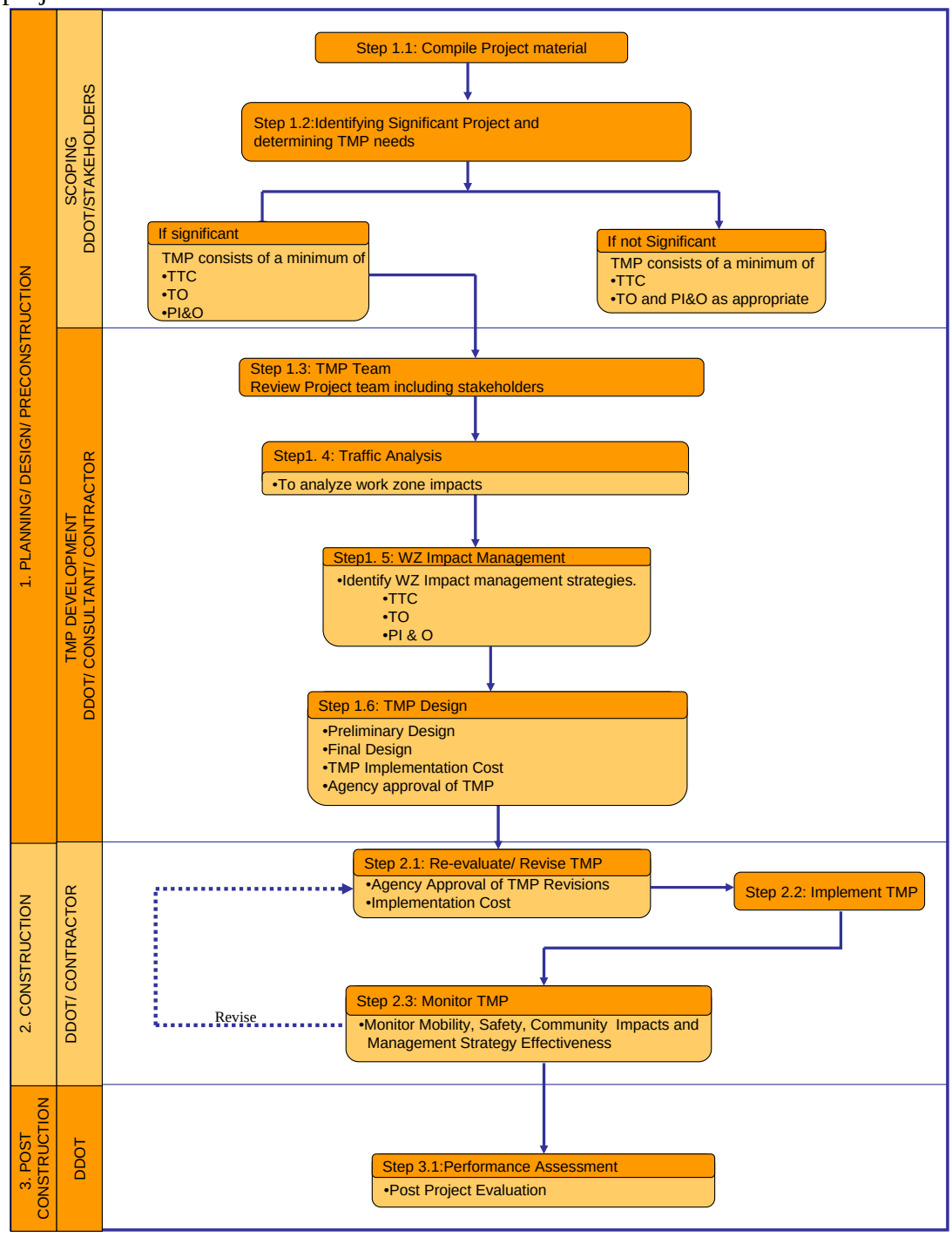
DDOT, in consultation with the project partners, should determine significant projects during the planning stage. The following projects are considered to be significant:

A. All projects on Interstates, Freeways, and Expressways that occupy a location for more than three days with either intermittent or continuous lane closures.
B. Federal-Aid Highway-funded reconstruction projects (refer to appendix H for definition of reconstruction projects) on all Principal Arterial roads.

Appendix A provides additional information on significant projects.

A TMP is required when the project is significant. This consists of a Temporary Traffic Control Plan (TTC), as well as Transportation Operations (TO) and Public Information and Outreach (PI&O) Strategies. The extent of TO and PI&O depends on the level of work zone impact. When multiple projects are planned in the same corridor or on corridors within the same traffic area, it may be possible to develop a single corridor or regional TMP.

Figure 1.1: Development of District Level Processes and Procedures for significant projects



*Note: For projects not undergoing the Planning/Design stage, develop and get approval of the TMP, which consists of a TTC and appropriate TO and PI&O strategies, prior to the start of construction.

If a TMP is required, then funds must be allocated in the cost estimate for developing the TMP at this stage of the project. The design budget should be increased to reflect efforts

required to develop the TMP. If a consultant develops the TMP, then the consultant scope of work and budget should reflect these efforts.

Identify Significant projects and Determine TMP needs	**IPMA**	**TPPA**	**TOA**	**OD(PI)**
Who is responsible?	✓			
When should it be completed?	During the early planning stage.			
Documentation	Present finding of the significant project type at the scoping meetings and include in meeting minutes.			

Outcome: Determining the significant project status and TMP needs.

1.3. TMP Team

The DDOT Project Manager is responsible for revising the TMP Team to include additional stakeholders based on project needs. Finalizing the list of stakeholders depends on the project type, extent and duration of construction, and length of the work zone. Always consider the work zone's geography, business, and residential environment. Identify and consult stakeholders throughout the design and construction process, and add members to the team as required. Stakeholders provide project input by identifying project elements, events, or safety/mobility concerns that should be evaluated in the TMP. Refer to Section C, page 14, for minimum training requirement of key TMP personnel.

The stakeholders may include:

- DDOT Personnel
- Other District Agencies (e.g., FEMS, MPD, DCPS)
- Washington Metropolitan Area Transit Authority (WMATA)
- Railroad Agencies/Operators
- Freight Operators
- Metropolitan Washington Council of Governments (MWCOG)
- National Utility Contractors Association (NUCA, local representative)
- District of Columbia Building Industry Association (DCBIA, local representative)
- Utility Providers
- Metropolitan Police (and other emergency service providers as deemed necessary)
- Business Representatives
- School Representatives
- Community Groups
- Citizens' Interest Groups

It is incumbent on the Project Manager to include all necessary stakeholders from the project scoping stage.

Outcome: TMP Team.

1.4. Traffic Analysis

Conduct a queue/delay analysis for significant projects to minimize the work zone severity and duration of mobility impacts on the traveling public. Use mainline queue length as the criteria to determine the impact of proposed work zones. The District may use Quickzone, Quewz-92, Synchro/Simtraffic, Corsim, or similar programs to model the expected queues to be generated.

Factors to be considered:

- Analyze multiple phasing of construction separately.
- Use the posted legal construction zone speed limit in the computer models.
- Input traffic volume data no older than three years, and current regional traffic patterns into the computer model and account for seasonal traffic variations that may occur during construction.
- Use growth factors provided by DDOT to expand traffic volumes to construction year levels.
- Include the effect of significant ramp merges on queues in the model.
- Include non-motorized data (pedestrian/bicyclist) in any modeling.
- Consider pedestrian-accessibility requirements (ADA, Title II Regulations).

Refer to appendix B for guidance on traffic analysis.

Outcome: Analyzing the work zone impact.

Traffic analysis	**IPMA**	**TPPA**	**TOA**	**OD(PI)**
Who is responsible?	✓			
When should it be completed?	Prior to selecting preferred construction phasing			
Documentation	A report documenting the traffic analysis.			

1.5. Work Zone-Impact Management Strategies

This step involves identifying potential work zone management strategies based on impact assessments conducted in the previous steps. Use work zone-impact management strategies to minimize traffic delays, improve mobility, maintain or improve motorist and worker safety, complete roadwork in a timely manner, and maintain access for businesses and residents. Develop strategies in such a way that they are suited to the scale of the work zone impacts. As the project progresses through the various developmental stages, and as more project-specific information becomes available, review and revise the type of traffic control selected and impact management strategies as necessary.

For the TMP, identify work zone impact management strategies for both the mainline and detour routes for the selected construction phasing/staging approaches. Where appropriate, document the management strategies on plan sheets. Agencies may elect to

develop separate sections or plans specific to the PI and/or TO strategies to distinguish them from the TTC strategies.

Group the various work zone management strategies according to the following three categories:

- Temporary traffic control (TTC):
  - Control strategies.
  - Traffic control devices.
  - Project coordination, contracting, and innovative construction strategies.
- Transportation operations (TO):
  - Demand-management strategies.
  - Corridor/network management (traffic operations) strategies.
  - Work zone safety management strategies.
  - Traffic/incident management and enforcement strategies.
- Public information (PI):
  - Public awareness strategies.
  - Motorist information strategies.

Refer to appendix C for an overview of work zone impact management strategies and appendix D for work zone design checklist, which provides a summary of Work Zone Impact Management Strategies.

Outcome: Identifying work zone impact management strategies.

Work Zone-Impact Management Strategies	**IPMA**	**TPPA**	**TOA**	**PI**
Who is responsible?	✓	✓	✓*	✓
When should it be completed?	Refer Section 1.6.1 and 1.6.2			
Documentation	Refer Section 1.6.1 and 1.6.2			

* If ITS involved

1.6. TMP Design/Development

1.6.1. Preliminary Design

Refine initially identified TMP elements at this stage. This is particularly important for elements requiring long lead times needing to be established prior to the start of construction. This may include consultant contracts for public information and outreach campaigns and other improvements requiring completion prior to construction. The TMP Team should work with technical specialists, including construction, traffic, engineering, and public information officers, to jointly identify/confirm the work zone impacts that must be accounted for, as well as any proposed strategies. Address construction equipment and material access to the site, storage, and staging areas at this time, as well as potential infrastructure improvements to accommodate future projects. If the design has changed, perform additional analysis to address these changes. The TMP developer will provide all required data for DDOT.

At a minimum, the concept/draft TMP submittal should include:

- Introductory material
- Executive Summary
- TMP Roles and Responsibilities
- Project Description
- Existing and Future Conditions
- Work Zone Impacts Assessment Report
- TMP Monitoring
- Public Information and Outreach Plan
- Incident Management
- TMP Implementation Costs
- Special Considerations (as needed)
- Attachments (as needed)

Outcome: Draft Report.

TMP Draft Report	**IPMA**	**TPPA**	**TOA**	**OD(PI)**
Who is responsible?	✓		✓*	
When should it be completed?	Submitted along with 30% and 60% of PS&E.			
Documentation	Draft TMP Report			

* If ITS involved

1.6.2. Final Design

During this stage, finalize the TMP and develop detailed plans, specifications, and estimates. The designer is responsible to implement recommendations set forth in the draft TMP document. The designer may be required to collect more data and conduct additional analyses to reflect changes in the project design. Consult the TMP Team when design and TTC decisions dictate a revision to the Draft TMP work zone impact mitigation strategies. Show the work zone impact management strategies on the plans, where applicable. Appendix E provides a detailed outline of TMP Report.

Outcome: Final TMP report.

TMP Draft Report	**IPMA**	**TPPA**	**TOA**	**OD(PI)**
Who is responsible?	✓		✓*	
When should it be completed?	Submitted along with 90% of PS&E.			
Documentation	Final TMP Report			

* If ITS involved

1.6.3. TMP Implementation Cost

It is crucial to estimate the TMP implementation cost within the overall project cost, as it may be difficult to obtain additional funding at a later time. It can potentially avoid under-allocation of funds. Where feasible, itemize and document cost estimates for the

various strategies in the TMP with cost responsibilities, opportunities for sharing, any coordination with other projects, and funding sources. Increase the construction budget to reflect efforts required to implement the TMP, including any data collection required for monitoring/evaluation of TMP implementation (see Section 2 and 3). Determine pay items to be included in the PS&E during design. (Refer to DDOT *Standard Specifications for Highways and Structures for Measurement and Payment of Items*). At the latest, by 60% design, develop a detailed estimate for implementing elements of the TMP. Individual projects may have varying pay items depending on size, complexity, and location. TMP components can be funded as part of the construction contract and/or in separate agreements. Also, the costs of TMP development and implementation can be estimated as a percentage of the construction project costs.

Outcome: Overall cost for implementing the TMP.

TMP Implementation cost	**IPMA**	**TPPA**	**TOA**	**OD(PI)**
Who is responsible?	✓		✓*	✓
When should it be completed?	Submitted at or before 60% of PS&E.			
Documentation	Refer Section 1.6.1 and 1.6.2.			

* If ITS involved

1.6.4. Agency Approval of TMP

The designated DDOT Chief Engineer/Deputy Chief Engineer should approve the final TMP design document before implementation.

Outcome: TMP approval.

2. Construction Stage

2.1. Reevaluate/Revise TMP

Review and modification of construction alternatives and traffic plans may occur before and during the course of projects. The Project Engineer will maintain current documentation regarding the changes and/or deficiencies noted in implementing the TMP and how and when they were corrected. Identify any major changes or notable items at the monthly partnering meetings during construction. Provide this information to the TMP Team upon completion of construction in a post-construction meeting for the purposes of relaying successes and failures back to the designers (refer Section 3.1 - Performance Assessment).

The Contractor shall submit all proposed TMP changes to DDOT Project Engineer for review and approval. Changes may include:

- Work activities that alter traffic control requirements.
- Scheduling of work activities.
- Project initiation or completion dates.
- Work zone impact management strategies.

When alternative construction phasing/staging plans or other management strategies have been suggested, DDOT technical specialists will review the revised TMP. The DDOT Project Engineer must approve all TMPs developed or revised during contracting or construction prior to implementation.

2.2. Implement TMP

Implement the TMP during construction (some elements may need to be implemented prior to construction, such as public information and outreach efforts or improvements to detour routes). Both DDOT and the Contractor must designate a trained person at the project level to implement the TMP and other safety and mobility aspects of the project. For DDOT, this person will most likely be the Construction Project Engineer (PE), refer Section C, page 14, for minimum training requirements. For the Contractor, this person will be the Traffic Safety Officer (TSO), as specified in the DDOT *Standard Specifications for Highways and Structures*, 2005 or later, Section 616.02(B1). These persons are responsible for efficiently and appropriately implementing the TMP. They are also responsible for reviewing traffic operations throughout the project limits on a regular basis, including the condition of all traffic control devices.

2.3. TMP Monitoring

Monitoring the performance of the work zone and TMP during the construction phase is important to establish whether the predicted impacts closely resemble the actual conditions in the field, and if the strategies in the TMP are effective in managing the impacts.

It is important for many reasons to monitor the project-traffic data is often stale, closures may be sloppy or non-conforming, and enforcement strategies may need to be modified for unanticipated events. The DDOT will monitor the TMP for both oversight and evaluation purposes.

Monitoring for oversight includes:
Determining how strategies are being implemented and verifying that specified TMP elements will occur on schedule and in the manner planned.

- Ensure Changeable Message Signs, Highway Advisory Radio, and other media tools provide accurate and timely information to motorists, bicyclists and pedestrians regarding lane closure times and other project information.
- Ensure contractor compliance with lane closure pickup times.

Monitoring for evaluation is important to:

- Assess and fine-tune performance of all TMP strategies and overall performance of the project corridor and alternative routes.
- Track public acceptance and ensure continuation of the project.
- Determine cost-effectiveness of individual TMP strategies and shift resources from the least to most cost-effective strategies.
- Determine whether additional TMP elements are needed or particular elements refined.

Examples of possible performance measures for TMP monitoring include volume, travel time, queue length, delay, number of incidents, incident response and clearance times, contractor incidents, community complaints, user costs, and cumulative impacts from adjacent construction activities. Base performance-monitoring requirements and performance measures, as stated above, on agency policies, standards, and procedures, are included in the project contract documents. Provide all data to DDOT for its analysis with respect to TMP monitoring.

Appendix F contains a sample of a Field Inspection Report.

Outcome: TMP implementation.

TMP Monitoring	**IPMA**	**TPPA**	**TOA**	**OD(PI)**
Who is responsible?	✓	✓	✓	✓
Documentation	Field Inspection Report (Appendix F). TMP Performance/Monitoring Report			

3. Post-Construction Stage

3.1. Performance Assessment

Evaluations of work zone TMP policies, processes, and procedures aid in addressing and managing the safety and mobility impacts of work zones, particularly for significant projects and when using performance-based contracting. Focus TMP evaluation on overall TMP process and the actual field performance of the work zone and TMP. Various measures of effectiveness and measuring techniques are appropriate to corridor and strategy evaluation.

3.1.1. Post-Project Evaluation

The TMP should include references to the development of a short evaluation report upon completion of construction and identify the persons responsible for developing this report. The report should document lessons learned and provide recommendations on how to improve the TMP process and/or modify guidelines. Elements to consider for inclusion in the post-project evaluation are:

- Overall statement reflecting the usefulness of the TMP.
- Successes and failures.
- Areas of the TMP successfully implemented.
- Changes to the original TMP and results of those changes.
- Public reaction to the TMP.
- Frequency of legitimate complaints and nature of complaints (or compliments).
- Actual measures of conditions versus what was predicted (for example, predicted and encountered delay time).
- Cost for implementing the strategies.
- Types of crashes during construction.

- Suggested improvements or changes for similar future projects.

Outcome: Provide recommendations on how to improve the TMP process.

Post Project Evaluation	**IPMA**	**TPPA**	**TOA**	**OD(PI)**
Who is responsible?	✓	✓	✓	✓
When should it be completed?	Upon project completion			
Documentation	Post-Project Evaluation Report			

B. Process Review

Conduct a process review at least every two years. This review may include evaluation of work zone crash data and operational data for randomly selected projects. The DDOT will maintain the data and information resources needed to support the use of work zone data for the above activities. The results of TMP evaluations can be useful in the process reviews, and vice versa. Collecting, analyzing, and synthesizing findings from multiple projects can help to develop and implement future TMPs. The process review should include an annual work zone traffic control inspection ratings report and an annual work zone crash report. The work zone traffic control inspection rating report should consist of a summary of inspection ratings from the field inspection report of selected significant projects. The annual work zone crash report should present a crash trend analysis and comparison of work zone crashes District-wide. Additionally, the process review should include a review of randomly selected post-evaluation reports of significant projects to assess TMP process and strategies. Appropriate personnel, who represent the project development stages and different offices within the agency, FHWA, and non-agency stakeholders, should participate in the process reviews. The DDOT, IPMA will lead this process.

Outcome: Provide recommendations on how to improve/modify the TMP process and guidelines including the definition of significant project and traffic analysis criteria.

C. Training

All DDOT personnel, consultants, and contractors involved in the development, design, implementation, operation, inspection and enforcement of work zone-related transportation management and traffic control must be trained commensurate with their level of responsibility. Individuals may gain this training through DDOT-provided courses or outside sources. The initial training would be done over the next two years and include, at minimum, the following:

- Advanced Work Zone and Design Course (FHWA)
  - Team Leaders
  - Project Manager
  - Project Engineer
  - Traffic Engineer
- Design and Operation of Work Zone Traffic Control (FHWA)
  - Inspectors
  - Key Team Members
- Short Interactive Presentation (to be developed)
  - Enforcement Personnel
- Nighttime work zones (ATSSA)
  - Inspectors
  - Key Team Members
- Traffic Control and/or Work Zone training (ATSSA, IMSA)
  - Inspectors
  - Key Team Members
  - Flagger Training (ATSSA, IMSA)
  - Inspectors

Provide a refresher course to all the above-mentioned personnel every five years, which will reflect changing industry practices and new agency processes and procedures. DDOT, IPMA (SSQCD) will implement the minimum work zone training requirements as indicated above for their personnel. The DDOT is not responsible for training non-agency staff. For additional training requirements, refer to the DDOT *Temporary Traffic Control Manual*, 2006 or later.

Appendix A

A. Overview of Significant Projects

Given the variety and differing complexity of roadway projects, some projects are likely to have much greater effects on traffic conditions than others. Recognizing that not all road projects cause the same level of work zone impacts, it is reasonable to identify those that will have greater impacts such that the appropriate resources can be allocated to these projects. The Work Zone Safety and Mobility Rule ("The Rule," 23 CFR 630 Subpart J) establishes a category of "significant projects." A significant project is defined as one that, alone or in combination with other concurrent projects nearby, is anticipated to cause sustained work zone impacts that are greater than what is considered tolerable based on DDOT policy and/or engineering judgment.

What is the purpose of identifying significant projects?
Considering work zone impacts at the systems-planning level (either on a network-wide basis or corridor basis) can have several positive effects. For example, in cost estimation and budgeting for projects, an understanding of the expected level of work zone impacts of the road project will help in deciding what transportation management strategies are likely and to what extent a public information campaign is required. This understanding can then serve as the basis for developing reasonable cost estimates that are commensurate with the impacts of the project. Further, the analysis of the cumulative impacts of concurrent road projects will help better schedule construction, thereby minimizing the impacts on road users, businesses, and other affected parties.

When should significant projects be identified?
Identify significant projects during the planning phase of project delivery, prior to selecting preferred construction phasing. Confirm the significant project status during subsequent project development stages. As more information becomes available for making project-specific decisions, certain projects once thought to be significant may no longer be significant as a result of change in certain circumstances, and vice versa.

What happens when a project is identified as a significant project?
Develop a Transportation Management Plan (TMP) for all significant projects. The TMP will include the temporary traffic control plan, as well as transportation operations and public information strategies to manage work zone impacts. In addition to work zone impacts management strategies, the TMP may also include contingency plans, incident management plans, detailed roles and responsibilities, and implementation costs.

Who is responsible for identifying significant projects?
Refer to section 1.2

Exceptions
The Rule specifies significant projects at a minimum as all Interstate system projects within the boundaries of a designated Transportation Management Area (TMA) that occupy a location for more than three days with either intermittent or continuous lane closures. DDOT may request an exception to the requirements from the FHWA Division Office for projects classified as significant, but in the judgment of DDOT do not cause sustained work zone impacts. Use qualitative or quantitative criteria and methods (or a

combination of both) to illustrate that the specific project or categories of projects will not cause sustained work zone impacts. For Federal-Aid projects, approval of exceptions from the FHWA Area Engineer is recommended no later than at the 30% PS&E's point.

Examples of Significant Projects include:

- Frederick Douglas Memorial Bridge
- Woodrow Wilson Bridge – New Bridge
- Benning Road and H Street NE revitalization
- Georgia Avenue revitalization

Appendix B

B. Traffic Analysis

To minimize the severity and duration of mobility impacts on the traveling public, evaluate all significant projects according to the following guidelines for queue/delay analysis.

1. FREEWAYS

If the most recent traffic data (that falls within the proposed work schedule) exceeds the numbers presented in the following chart, then perform a queue or delay analysis to determine average delays that could result based on the proposed construction staging.

NUMBER OF LANES		WORK ZONE CAPACITY	
NORMAL (existing)	OPEN (to traffic)	VPH	VPHPL
3	1	1170	1170
2	1	1340	1340
5	2	2740	1370
4	2	2960	1480
3	2	1980	1490
4	3	4560	1520

Reference: Transportation Research Board, National Research Council, **Highway Capacity Manual**

Use the following thresholds to evaluate project queue lengths, as determined by the computer model. When the resulting queue exceeds the following thresholds, develop alternatives for construction or employ additional work zone impact management strategies.

1. For queues less than 1.0 miles, the work zone impacts are acceptable.
2. For queues longer than 1.0 miles for any period of time, the work zone impacts are unacceptable. Consider alternate strategies according to the provisions of this policy.

Consider a vehicle as a part of a queue if its average operating speed is approximately 10 mph or less. Discretion is required by the District personnel during both the analysis portion and field evaluation of the implemented work zone in determining what constitutes a queue. In general, consider a queue as a condition that causes driver frustration as a result of stop-and-go operations.

2. ARTERIALS

Unacceptable travel delays are those longer than 15 minutes or a traffic queue extending more than 1500 feet on the mainline, beyond what are considered normal for the affected roadway segment.

Procedure
Analysis should generally occur during the planning or early design stages of the project development process. For routine district maintenance projects, if significant, this analysis should occur prior to implementing any lane restrictions.

A. ***Projected impacts are less than thresholds***. When the traffic analysis indicates projected impacts will be below allowable thresholds, the proposed TMP (TTC, TO, PI&O) development process may commence.

B. ***Projected impacts exceed thresholds***. Other design construction phasing, work zone options, or allowable work hours may be considered to reduce the impacts.

The TMP developer/designer responsibility (consultant/contractor) will provide DDOT with all software files and other traffic data. The TOA in the signal center has much of the signalized street network in a Synchro database, which would preclude consultants developing new models from scratch.

Guidance for Analysis
Use QuickZone, Quewz-98, Synchro/Simtraffic, Corsim or similar programs to model the expected impacts to be generated. Analyze work zone mobility impacts no later than the PI stage (30%) for each of the maintenance or construction phases. DDOT should use current volume data for input into the models (not older than three years), and should account for seasonal traffic surges that may occur during construction, reflect current regional traffic patterns, and be adjusted to account for heavy vehicles. Expand traffic volumes to construction year levels through the use of growth factors. If the project will involve lane closures on the weekend, then develop separate analysis for the weekday and weekend traffic. Where congestion occurs under normal unrestricted conditions, consider the recurring queue length in the analysis.

Include impacts of other projects in the area of the work zone in the analysis. Also coordinate construction phasing between projects.

For simple freeway analysis, use QuickZone or Quewz-98. For simple arterial analysis, the use of Synchro is suggested. Use microscopic models, such as SimTraffic, Corsim, Vissim, etc., to model complex work zones.

Complete an MOTAA, if multiple work zone options exist. In such a case, the option with the least impact is recommended.

Documentation
Documentation of the analysis in a written report includes the following:

1. Project Location and Description – Include project background, purpose, type of work, description of project area and surrounding roadway network, project goals and constraints, and the general schedule and timeline. Provide general

information on lane width and configuration, grade, pedestrian and bike facilities, heavy vehicle impacts, etc.

2. Data Collection and Modeling Approach – Discuss how existing traffic data and information was obtained, including source, location, and date of volume data. Include a brief summary and justification of the analysis tool(s) chosen.
3. Existing and Future Conditions – Provide information on existing and future (i.e., during construction) conditions. Describe the approach used to estimate traffic conditions during construction, including truck percentages, growth factors, seasonal adjustments, day of week factors, work zone capacity, etc. While the level of detail will vary based on the project, it should consider existing roadway characteristics, existing/historical traffic data, traffic operations, accident history, and mobility issues.
4. Results of Traffic Analysis – Discuss results of traffic analysis, including mobility impacts (maximum queue length, delay, etc.), recommendations for lane/ramp restrictions and/or closures, work hour restrictions, and potential detours. Include information for holidays, weekend restrictions and/or special events. Analysis should consider impacts on network operations. Changes to the project throughout the design process may require additional analysis to be performed.

Appendix C

C. Overview of Work Zone Impact Management Strategies

This section briefly describes various work zone management strategies, grouped according to the following three categories:

1. TEMPORARY TRAFFIC CONTROL (TTC):

- 1.1 Control strategies
- 1.2 Traffic control devices
- 1.3 Project coordination, contracting and innovative construction strategies

2. TRANSPORTATION OPERATIONS (TO):

- 2.1 Demand management strategies
- 2.2 Corridor/network management (traffic operations) strategies
- 2.3 Work zone safety management strategies.
- 2.4 Traffic/incident management and enforcement strategies

3. PUBLIC INFORMATION AND OUTREACH (PI&O):

- 3.1 Public Information and Outreach Campaign
- 3.2 Communication Strategies

This set of strategies is not meant to be all-inclusive; rather, it offers a large number to consider, as appropriate, in developing transportation management plans (TMPs). Individual strategies may fit into multiple categories. For example, changeable message signs (CMS) are a traffic control device defined in the *Manual on Uniform Traffic Control Devices* (MUTCD), and thus are included in this category. However, they are also frequently used for motorist information and are included in that category as well.

Note: Maintain preexisting roadside hardware at an equivalent or better level than existed prior to project implementation.

1. TEMPORARY TRAFFIC CONTROL (TTC)

Temporary traffic control strategies, devices, and contracting/construction techniques and coordination are used to facilitate traffic flow and safety through and around work zones. Standards, guidance, and other information defining the proper use of the traffic control strategies and devices are provided in:

- District of Columbia *Temporary Traffic Control Manual Guidelines and Standards*.
- District of Columbia *Standard Specifications for Highways and Structures*, 2006 or latest
- *Manual on Uniform Traffic Control Devices* Part 6, 2003 or latest
- Chapter 9 of American Association of State Highway and Transportation Officials, 2004 or latest
- National Highway Cooperative Research Program 350 Report, 1993 or latest
- DDOT *Context Sensitive Design Guidelines* 2005 or latest

In developing and implementing TTC plans for projects, maintain preexisting roadside hardware at an equivalent or better level than existed prior to project implementation. TTC strategies include:

1.1 Control Strategies
1.2 Traffic Control Devices
1.3 Project Coordination, Contracting, And Innovative Construction Strategies

1.1 Control Strategies

This category includes various traffic control approaches used to accommodate road users within the work zone or the adjoining corridor in an efficient and safe manner, while providing adequate access to the roadway for the required construction, maintenance, or utility work to be performed.

- **Construction phasing/staging.** Staging typically refers to how the contractor will position the equipment and materials. Phasing refers to the sequencing of the aspects of a project, completing portions of the project one part at a time. Minimize the impacts of a work zone on traffic by using operationally sensitive phasing and staging throughout the life of the project.
- **Full roadway closures.** This strategy involves complete closure of the roadway for various time periods to minimize the duration of the project and improve worker safety by reducing traffic conflicts. Full closures may be brief (e.g., intermittent, off -peak), short term (e.g., night, weekend), or long term (e.g., continuous for the duration of the project).
- **Lane shifts or closures.** Lane shifts or closures last for varying durations of time. They may be intermittent, off-peak, night, weekend, for a single project phase, or continuous for the duration of the project. This strategy involves multiple approaches, including:
  - ***Reduced lane widths to maintain number of lanes (constriction).***
  - ***Lane closures to provide worker safety.***
  - ***Reduced shoulder width to maintain number of lanes.***
  - ***Shoulder closures to provide worker safety.***
  - ***Lane shift to shoulder/median/parking lane to maintain number of lanes.***
- **One-lane, two-way controlled 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 facility.** This strategy involves closing one side of a 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.** Also known as variable lanes or contra-flow 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 week.
- **Ramp closures/relocation.** Ramp closure involves closing one or more ramps in or near the work zone for specific time periods or construction phases to allow work access or 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 period of time.
- **Night work.** Work is performed at night (end of evening peak period to beginning or morning peak period) to minimize work zone impacts on traffic and adjacent businesses.
- **Weekend work.** Construction work (all or individual phases) is restricted to weekend periods from the end of the Friday afternoon peak period to the beginning of the Monday morning peak period.
- **Work hour restrictions for peak travel.** This involves restricting work hours such that work impacting traffic does not occur during periods of peak travel demand and congestion (e.g., peak hours, holidays, special events).
- **Pedestrian/bicycle access improvements.** This strategy provides for alternate facilities for bicyclists and pedestrians (including those with disabilities, in accordance with the Americans with Disabilities Act of 1990) in places where the work zone impacts their accessibility.
- **Business access improvements.** Some projects will directly impact businesses, particularly accessibility. Accessibility improvements for businesses may include signage or information directing motorists to the business(es) and/or relocating access locations.
- **Off-site detours/use of alternate routes.** This strategy involves rerouting some or all traffic off of the roadway under construction and to other existing roadways.

1.2 Traffic Control Devices

The MUTCD provides standards, guidelines, and other information pertaining to installing, maintaining, and operating traffic control devices on streets and highways. Part 6 of the MUTCD, "Temporary Traffic Control," addresses safety, mobility, and constructability issues in work zones. It applies to all types of highway work from major construction on high-volume freeways to minor maintenance on residential streets, and everything in-between. Traffic control devices and other safety devices used for work zones include:

- **Temporary signs.** Several types of temporary signs provide information to road users to enable safe and efficient travel through the work zone or a detour. Temporary signs are an essential and integral part of temporary traffic control and are used in nearly all work zones. Temporary signs typically include the following types:
  - ***Warning*.** These signs give notice to road users of a situation that may not be readily apparent (e.g., speed reductions and road or lane narrows).
  - ***Regulatory*.** These signs provide notice to road users of traffic laws or regulations through the work zone (e.g., speed limits, fine notices, parking restrictions, or road closed).
  - ***Guide/information*.** Advance signing and signing in and around the work zone area 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. Detour signs direct motorists onto detour routes, through the detour, and back to the route from which they were

diverted. Advance notice is required so that motorists have time to choose an alternate route.

- **Changeable message signs (CMS).** Both fixed and portable CMSs are highly effective in conveying work zone information to drivers, especially when that information is subject to frequent change or addresses a short-term or current situation or condition within the work zone. These signs provide real-time information to drivers concerning specific work operations, traffic patterns, and other conditions in the work zone. These devices help drivers avoid conflicts and potential crashes as they travel through the work zone.
- **Arrow panels.** Also referred to as arrow boards, arrow panels operating in flashing or sequential mode are intended to aid motorists as they navigate and merge through and around the work zone.
- **Channelizing devices.** These devices include traffic cones, drums, barricades, or tubular markers and provide traffic control through the work zone. The purpose is to define the intended travel path through the work zone and delineate potential work zone hazards.
- **Temporary pavement markings.** Various types of temporary markings on the pavement are available to define travel lanes and provide guidance and information for the road user through the work zone.
- **Flaggers and uniformed traffic control officers.** Flaggers, and to a lesser extent police or traffic control officers, direct and control road user and pedestrian traffic in work zones.
- **Temporary traffic signals.** Fixed or portable temporary traffic signals can improve traffic flow through and near the work zone and/or address safety concerns.
- **Lighting devices.** A wide range of lighting devices, listed in Part 6 of the MUTCD are available for use in work zones. Lighting strategies offer enhancement to other work zone strategies by attracting attention to the devices and improving delineation, particularly for adverse conditions. They can also be used to improve worker safety and to guide road users through a work zone, particularly during night work.

1.3 Project Coordination, Contracting, and Innovative Construction Strategies

- **Project coordination.** Project coordination strategies having the potential to reduce mobility and safety impacts of work zone activities include:
  - ***Coordination with other projects*.** Coordinating, sequencing, and scheduling projects can minimize motorist delay and impacts on potentially affected businesses and communities.
  - ***Utilities coordination*.** Coordinating and scheduling utility work both within the impacted work zone area and near the project can minimize potential work disruptions or interruptions resulting from utility work, and reduce overall construction duration. Coordination can also reduce the recurrence of work zones by doing two jobs together. For example, the installation of a communications conduit (for traffic management, ITS, etc.), a new water main or power along a highway corridor may coincide with a pavement reconstruction project on that highway.

  - ***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 other intermodal facilities can help minimize traffic disruptions.
- **Contracting strategies.** These strategies typically involve contractual agreements to reduce the project duration or traffic impacts including:
  - ***Design-build*.** This strategy involves using a single contract to design and build the project, thus reducing project duration by allowing construction to begin prior to design completion.
  - ***A+B bidding*.** A+B bidding encourages contractors to minimize construction impacts by reducing construction time. Part A refers to the contractor's bid for the actual items of work, and Part B is the total number of days bid to complete the project multiplied by the daily road user cost stipulated in the contract. The combined values of the A and B portions determine the winning bid. The contractor's payment is based on both Part A and the actual number of days used under Part B.
  - ***Incentive/disincentive clauses*.** This strategy involves using incentives and/or disincentives in the construction contract to minimize construction duration.
  - ***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 (pre-cast members, rapid cure materials).** These strategies employ special materials such as quick-curing concrete or pre-cast items (e.g., culverts, bridge deck slabs, and pavement slabs) to lessen the duration of construction or maintenance activities where traffic restrictions need to be minimized (e.g., roadways with high volumes). They are also used when work activities must be completed during night or weekend periods to allow reopening travel lanes for normal weekday travel.

2. TRANSPORTATION OPERATIONS (TO)

Transportation operations strategies can mitigate work zone impacts by using improved transportation operations and management of the transportation system. TO strategies typically include:

2.1 Demand Management
2.2 Corridor/Network Management
2.3 Work Zone Safety Management Strategies
2.3 Work Zone Intelligent Transportation Systems
2.4 Traffic/Incident Management and Enforcement Strategies

2.1 Demand Management Strategies

Demand management strategies include a wide range of techniques intended to reduce the volume of traffic traveling through the work zone by such means as diverting travelers to alternate modes, shifting trips to off-peak hours, or shifting vehicles to alternate routes. These strategies include:

- **Transit service improvements.** Where appropriate, transit service improvements may include modifying transit schedules and/or routes, increasing frequency, or establishing transit service in the corridor.
- **Transit incentives.** Transit incentives include employer and/or traveler transit subsidies and guaranteed ride home programs.
- **Shuttle services.** Shuttles and charter buses can reduce traffic volumes through a work zone if a sufficient number of users along the corridor are anticipated to use the service.
- **Parking supply management.** This strategy involves reducing traffic demand by managing the parking supply, typically through cost strategies.
- **Variable work hours.** This strategy encourages 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.** Telecommuting allows motorists to work at home, or at a telecommuting center near home, either full or part time. Encouraging motorists who normally travel through the work zone to telecommute for the duration of the project can reduce the demand.
- **Ridesharing/carpooling incentives.** Rideshare/carpool incentives can 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, providing vanpool vehicles, etc.
- **Park-and-ride promotion.** Creating, expanding, and/or promoting (advertising) park-and-ride lots to encourage ridesharing or transit use can reduce the number of vehicles traveling through the work zone.

2.2 Corridor/Network Management Strategies

This category includes using various traffic operations techniques and technologies to optimize traffic flow through the work zone corridor and adjacent roadways:

- **Signal timing/coordination improvements.** Retiming traffic signals can increase throughput of the roadway(s), improve traffic flow, and optimize intersection capacity in and around the work zone.
- **Temporary traffic signals.** Installing temporary traffic signals can improve traffic flow through and near the work zone. At a corridor or network level, using temporary traffic signals is more effective than STOP signs or flaggers for providing mobility through the work zone area. These temporary traffic signals may also be coordinated with existing signals.
- **Street/intersection improvements.** Improvements on streets and intersections for the roadway and/or alternate routes may be necessary to provide increased capacity to handle the traffic through the work zone or within the adjacent corridor. This may involve improvements to the mainline and intersections,

including roadway and/or shoulder widening, additional through and/or turn lanes and removing parking.

- **Bus turnouts.** Constructing bus stop areas that are recessed from the travel lanes may be helpful in work zones or on detour routes with a high occurrence of bus traffic and stops.
- **Turn restrictions.** Restricting turn movements for driveways and/or intersections can increase roadway capacity, reduce potential congestion and delays, and improve safety. Restrictions may be applied during peak periods or all day.
- **Parking restrictions.** Eliminating parking in all or part of the work zone and/or alternate routes, or parking restrictions during work hours or peak traffic periods 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.** Imposing 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, follow the requirements of 23 CFR Part 658.11 (d) (1) and (g).
- **Reversible lanes.** Also known as variable lanes or contra-flow 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.** Also called dynamic lane merge system, the system uses dynamic electronic signs and other special devices to control vehicle merging at the approach to lane closures.
- **Ramp closures.** This strategy involves closing one or more ramps in or around the work zone. Closures may be necessary to provide work access within the work space or used to improve traffic flow on the mainline.
- **Coordination with adjacent construction site(s).** Combining or coordinating projects within a specific corridor can minimize the combined impacts on the motoring public and community. Coordination typically involves scheduling projects within a corridor to ensure that adequate capacity remains available to accommodate the anticipated travel demand within the corridor by not implementing work zones on adjacent or parallel highways at the same time. This may entail communicating about the timing of lane closures and occurrence of incidents, and coordinating diversion routes. It may also involve completing needed capacity and safety improvements on a highway prior to its use to carry traffic diverted or detoured from another project.

2.3 Work Zone Safety Management Strategies

Use this category of devices, features, and management procedures to address traffic safety concerns in work zones. Work zone safety management strategies include:

- **Speed Limit Reduction/Variable Speed Limit.** Reduced work zone speed limits may improve traffic safety and protect workers. Reduced sped limits may also be appropriate on detours with increased traffic volumes and conflicts.
- **Temporary Traffic Signals.** In some work zones, temporary traffic signals can be used in place of traffic control officers or flaggers, which may increase safety by removing these personnel from the roadway.

- **Temporary traffic barrier.** Temporary traffic barriers provide positive physical separation between travel lanes and the adjacent work space, or between opposing travel lanes. Screens may be mounted on the top of temporary traffic barriers to reduce headlight glare.
- **Movable traffic barrier systems.** This system involves a mechanical transfer machine, which quickly shifts temporary barrier laterally to the full width of a travel lane while protecting both the transfer operation and traffic in the work zone. This system permits rapid and safe reconfiguration of the 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 cushions.** Also known as an impact attenuator, a crash cushion is a fixed or mobile barrier used to protect a temporary hazard or prevent vehicle intrusion into the workspace or other hazardous area. It works by gradually decelerating the vehicle to a stop or by redirecting the vehicle away from the hazard.
- **Temporary rumble strips.** Rumble strips are grooves or raised strips placed across or adjacent to a travel lane to alert motorists to a change in roadway conditions or that they have strayed out of the travel lane.
- **Intrusion alarms.** Various types of sensors can detect vehicles that stray out of the travel lane approaching or adjacent to the workspace and into the work area. When an intrusion is detected, a loud siren and/or flashing lights provide a warning to workers.
- **Warning lights.** Various types of warning lights, as described in the MUTCD, are available to alert drivers and pedestrians and draw attention to critical signs, channelizing devices, and other work zone features.
- **Automated Flagger Assistance Devices (AFADs).** AFADs are portable traffic control systems that assist a flagger operation for short-term lane closures, on two-lane highways. For a typical flagging operation with AFADs, one or both flaggers can be positioned a short distance away from the roadway and moving traffic. A flagger(s) can use a radio control unit or an attached cable to operate an AFAD(s).
- **Project task force/committee.** This strategy creates a project task force or committee to address safety and/or traffic control within the work zone and adjacent corridor.
- **Construction safety supervisor/inspectors.** Daily inspection and supervision of safety and/or traffic control operations is an integral part of project management, and can be provided by various contractor and/or agency personnel, as appropriate to their specific project responsibilities.
- **Road safety audits.** Road safety audits involve analyzing a future or existing roadway by an independent expert on safety issues. It is a proactive way to reduce crashes and identify potential safety hazards. Audits may be performed during any stage of a road project, including planning, preliminary design, detailed design, traffic control planning, construction, pre-opening, and on existing roads.
- **TMP monitor/inspection team.** This strategy involves establishing a team (or person) to monitor and inspect implementation and monitoring of the work zone transportation management strategies.

- **Team meetings.** The project team meets on a regular basis to discuss TMP strategies, implementation, and monitoring, particularly related to safety concerns.
- **Project on-site safety training.** Ongoing safety training to ensures workers are familiar with safety procedures and specific risks associated with the project and maintains a high level of safety awareness.
- **Safety awards/incentives.** Strategy uses awards or incentives for innovations that reduce the safety impacts associated with the work zone.
- **Windshield surveys.** This strategy involves a designated DOT employee and/or contractor driving through the work zone area to conduct a firsthand assessment of safety and/or traffic flow. This strategy provides periodic assessments of the effectiveness of project safety features.

2.4 Work Zone Intelligent Transportation Systems (WZ-ITS)

Using intelligent transportation systems (ITS) in work zones has the potential to make traffic flow through and around the work zone safer and more efficient. WZ ITS electronics, computers, and communications equipment can be used to collect information, process it, and take appropriate action. ITS technology can be applied in work zones to monitor and manage traffic, provide traveler information, or track and evaluate contract incentives/disincentives (performance-based contracting). WZ-ITS technology may also be applied to enhance the safety of both the road user and worker or increase capacity.

- **Late lane merge concept.** This strategy instructs motorists to use both lanes until the merge point and then take turns merging as they approach a single lane closure situation. The late lane merge concept can be accomplished using static sign or a dynamic system.
- **PCMS with speed display.** Portable Changeable Message Signs (PCMS) with Speed Display is a WZ-ITS system that can be effectively used to reduce the speed of vehicles traveling through work zones and to increase speed limit compliance in work zones. Speed-detection devices are connected to the PCMS units and provide vehicle speed information to the PCMS. The vehicle speeds are then displayed to passing motorists.
- **Travel time estimation system.** Travel time estimation is a WZ-ITS system that obtains real-time traffic data and uses computer software to predict the current travel time on a section of roadway. The information can then be displayed to the motorist on a PCMS, displayed on the Internet, or sent to a pager/cell phone/PDA.
- **Advanced speed information system.** An advanced speed information system is a WZ-ITS system that uses microwave traffic sensors and PCMSs to alert motorists of upcoming traffic conditions. This information can also be displayed on the Internet or sent to a pager/cell phone/PDA.
- **Advanced congestion warning system.** This WZ-ITS system is designed to detect congestion (or slowed traffic) in a work zone and alert travelers farther upstream via PCMSs that the congestion is occurring. This information can also be displayed on the Internet or sent to a pager/cell phone/PDA.
- **Conflict warning system.** This WZ-ITS system is designed to detect potentially hazardous conditions and warn travelers of the condition in time for evasive

action. Typical conflict warning systems include runaway truck warning, excessive speed warning, and restricted clearance warning.

- **Travel time monitor system.** This WZ-ITS system obtains real-time traffic data and uses computer software to monitor the current travel time on a section of roadway. This information can be used in combination with a maximum travel-time-oriented performance-based specification to verify contractor compliance with the spec and/or to determine the incentive/disincentive to be awarded to the contractor.
- **Freeway queue monitor system.** This WZ-ITS system is designed to assess current traffic conditions and report the queue length in real-time over specified intervals. This information can be used in combination with a maximum queue length-oriented performance-based specification to verify contractor compliance with the spec and/or to determine the incentive/disincentive to be awarded to the contractor.

2.5 Traffic/Incident Management and Enforcement Strategies

This category includes various strategies to manage work zone traffic operations. Work zone traffic management strategies involve monitoring traffic conditions and making adjustments to traffic operations based on changing conditions. Because some of those changing conditions involve traffic incidents, this category also looks at management strategies with specific applicability to traffic incidents. These strategies involve improved crash detection, verification, response, and clearance, mechanical failures, and other incidents in work zones and on detour routes. This category also includes strategies to provide adequate enforcement of traffic regulations in work zones.

- **ITS for traffic monitoring/management.** Use ITS in work zones to identify areas where traffic flow is impeded so as to provide traveler information and/or make adjustments to the work zone. A work zone ITS deployment uses sensors to detect traffic conditions and can automatically feed this information to motorist information outlets such as CMS and Websites, or to a TMC. Monitoring traffic cameras can help detect places where drivers are having difficulty negotiating a work zone and can then adjust the layout.
- **Transportation management center (TMC).** A TMC can coordinate and manage traffic and incident management activities in and around the work zone. The existing TMC for the District can be used and may be staffed by either contract staff and/or agency personnel. If the project is large and of long duration, establish and operate a project-specific TMC to help manage incidents and maintain traffic flow.
- **Surveillance [Closed-Circuit Television (CCTV), loop detectors, lasers, probe vehicles].** Surveillance equipment, such as detector stations or cameras, can help identify traffic problems and detect, verify, and respond to incidents in the work zone.
- **Helicopter for aerial surveillance.** Use aerial surveillance to identify and verify traffic problems and incidents.
- **Traffic screens.** These screens reduce driver distractions in work zones, which can help to keep traffic moving and enhance safety. Mount screens on the top of temporary traffic barriers to discourage gawking and reduce headlight glare.

- **Call boxes.** Installing temporary or permanent call boxes through the work zone provides motorists with a means to contact incident response personnel, thus expediting the response and clearance times for crashes and breakdowns.
- **Milepost markers.** Milepost markers are signs located in the median off the edge of the road, which list location information (direction, route, mile, and tenths of a mile). Some areas may refer to these as location reference markers because they can be used to mark direction; route, bridge or overpass names; intersection names, etc. in addition to mileage information.
- **Tow/freeway service patrol.** This strategy uses dedicated or on-site (or near site) towing services to reduce the time required to remove vehicles involved in an incident (breakdown or crash). Towing service is almost always contracted, while freeway service patrols might be contracted but are more likely to be publicly operated. This is similar to District's ROPE program.
- **Total station units.** This involves using survey equipment to document/map major incidents (e.g., fatal crashes or HAZMAT conditions) in order to reduce clearance time. In some locations, laser measuring units are replacing total station units.
- **Photogrammetry.** Photogrammetry uses photos taken in the field and computer software to document and measure incident-related data (e.g., skid marks and vehicle location), which may reduce incident clearance times.
- **Media coordination.** This strategy involves working with local news media to publicize traffic delays, incidents, and incident management. Working with media contacts in advance to establish procedures to be followed in the event of a major delay or incident can facilitate the dissemination of specific information upon the occurrence of a major delay or incident.
- **Local detour routes.** Advance identification and approval/authorization of local detour routes is an especially useful strategy to address major traffic delays and incidents, 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 what is 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 type of 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, overseeing implementation and monitoring of the work zone management strategies, and overall management of incidents or emergencies.
- **Incident/emergency response plan.** Developing a plan with information needed to respond to an incident typically includes roles and responsibilities, response agencies, processes/procedures, actions to take for various incident types and levels, contact information, alternate routes, personnel and equipment information, staging area locations, and other information appropriate to the individual project.

- **Dedicated (paid) police enforcement.** This strategy provides police patrols in the work zone under a contractual arrangement with the agency or contractor.
- **Cooperative police enforcement.** Cooperative enforcement is similar to dedicated enforcement, except it is implemented through a cooperative agreement between the police and agency.
- **Automated enforcement.** Automated enforcement involves using various technologies such as radar, cameras, video, and sensors to detect and record vehicle speed or traffic signal violations. When a vehicle speed exceeds a specified threshold or a red signal violation occurs, the vehicle's license plate and/or driver are photographed. The citation with the photo(s) is then mailed to the vehicle's registered owner.
- **Increased penalties for work zone violations.** This strategy imposes increased penalties for speeding or other violations in work zones. Such penalties include increased fines, increased points, license suspension, and even mandatory prison terms for serious violations.

3. PUBLIC INFORMATION AND OUTREACH (PI&O)

Including a public information component in the TMP has the potential to reduce work zone impacts by providing road users and the community with specific information concerning road projects and alerting them to potential impacts and available means to avoid them. Additionally, the strategy can provide more general information concerning appropriate driving and travel behavior and travel options associated with the work zone. Early public involvement, particularly by the affected communities and businesses, in the developing the TMP and keeping them informed throughout the project, is essential both to identify potential impacts and to ensure effective mitigation strategies are developed and implemented. Coordination with DDOT's public information office will help to ensure success, particularly for significant projects. This section deals with:

3.1 Public Information and Outreach Campaign
3.2 Communication Strategies
3.3 Funding/Budgeting for Public Information and Outreach efforts

3.1 Public Information and Outreach Campaign

A work zone public information and outreach campaign involves several strategies for communicating with road users, the general public, area residences and businesses, and appropriate public entities regarding road construction projects. Develop public information and outreach campaigns for work zones, particularly those identified as significant. This section describes the steps in developing a campaign.

3.1.1 Determine the Appropriate Size and Nature of the Campaign

Determine the size and nature of the public information and outreach effort by the anticipated impacts of the road construction project. For a short-lived, small project causing minor traffic disruption, public information and outreach may be limited to routine publication of a press release on the DDOT website and in local newspapers. A longer, more disruptive work zone warrants a more elaborate public information and outreach campaign. Consider a range of elements when determining the size and nature

of a public information and outreach campaign. These include the effects of the project on:

- Traffic delay and safety at both corridor and network levels, including the effects on parallel corridors and alternate routes.
- Traffic delay and safety at nearby intersections, interchanges, and railroad crossings.
- Special traffic and safety conditions such as heavy truck traffic and poor weather.
- Disruptions of other transportation modes, including public transportation, pedestrian, and bicycle access.
- Evacuation routes.
- Hazardous material transportation routes.
- Emergency responders.
- Other public and private entities (such as schools and universities).
- Planned special events (holiday parades, concerts, etc).
- Tourist attractions.
- Businesses and residences.

3.1.2 Identify Resources

To be successful, a public information and outreach campaign must be supported with sufficient resources and therefore should be considered when developing project budgets. Both internal DDOT resources and external resources can play a role in developing and implementing a public information and outreach campaign. Internal resources include DDOT staff, facilities, and equipment (websites, dynamic message signs). External resources may involve paying for public relations expertise (possibly including graphic design and Web design); radio, TV, and newspaper advertising; printing or a public information center or kiosk. Low cost or free external resources may include radio and TV traffic broadcasts, newspaper articles, and help from project partners. The budget for a work zone public information and outreach campaign depend on several factors, including the size and nature of the campaign; the communication strategies selected; whether the selected strategies are already established by DDOT and can readily be used; and the role of partners.

3.1.3 Identify Partners

Consider working with a range of partners in both the planning and implementation stages of public information and outreach campaigns. Partners in the public information and outreach process may include:

- State and local agencies.
- Elected and appointed public officials.
- Major employers and service providers (e.g. Federal and local agencies, hospitals etc) in the affected area.
- Other groups such as neighborhood associations, business associations, etc.
- Chambers of Commerce, etc.
- Traveler information providers, including radio, TV, and newspapers.

Major reasons for including these partners are to:

- **Establish lines of communication.** These connections are particularly important during major periods of disruption and when changes occur.
- **Distribute information.** Involving outside groups in planning an outreach campaign is in itself a way to distribute information. Holding a meeting with the aim of soliciting community input, for example, is also a way to inform the public of disruptions and plans to deal with them.
- **Improve the product.** Partners in developing outreach strategies bring unique perspectives about successful types of messages and methods of communication. This may be particularly important in areas with diverse population groups (e.g. non-English speaking communities, truck drivers, and the elderly).
- **Share the costs.** Partners may be willing to share the cost of producing materials or to provide free forms of advertising. For example, major employers are often willing to incorporate messages in company communications, and on their websites.

One way to obtain input from affected parties is through a Working Group of stakeholders from the community affected by the work zone. Ideally developed during the planning stage of the project, the objective of creating such a group is to obtain input and review/comment on the development and implementation of construction and transportation management strategies to minimize the impacts of the project on the community. Both DDOT and the contractor may meet with the Working Group to obtain input and recommendations at various stages of the project delivery process starting during planning and extending through design, construction, and project assessment. While meeting with all stakeholders is important, meeting with local businesses and business organizations specifically is often a very important element of a public information and outreach effort. Businesses are a conduit for providing project information because they have a vested interest in communicating what they know with customers and suppliers. In addition, these meetings provide businesses the opportunity to suggest ways to manage a project that can minimize any negative effects. Below is a list of Possible Stakeholders and Interested Parties. The list is not inclusive and will vary depending on project complexity.

- **DDOT Internal Partners**
  - Internal partners
  - Communications Section
  - Region Public Information Representative(s)
- **DDOT Jurisdictional Partners**
  - City/county agencies
  - Federal lands agencies
  - Other
- **Shipping/Freight Industry; Commodity Haulers**
  - Trucking industry
  - Ports
  - Railroads
- **Special Interest Groups**
  - AAA Mid-Atlantic

  - Associations
  - Other
- **Property Owners and Property Residents**
  - Directly affected by project (top priority)
  - Adjacent to project
  - Other property owners on right of way
- **Community Residents**
  - People living in the neighborhood
  - People living in the vicinity
  - People living in the highway corridor
  - Commuters traveling the highway corridor
- **Elected Officials/Other**
  - Mayor/City Council
  - Council of Governments
- **Other Affected Community Agencies/Emergency services providers**
  - Capitol Police
  - Emergency operations managers
  - Schools and school bus managers
  - Parks
  - Area attractions/entertainment venues/fairgrounds/festival organizers
  - Other
- **Local business community**
  - Businesses affected by the project (top priority)
  - Businesses in the neighborhood
  - Businesses in the vicinity
  - Businesses in the highway corridor
- **Environmental Justice**
  - Low-income communities
  - Minority communities
  - Spanish translations needed
  - Other
- **Highway Users**
  - Local drivers/local deliveries
  - Commuters/regional and through trips
  - Trucking industry
  - Heavy-haul trucking companies
  - Annual permit holders
  - Local Bus Companies (WMATA, Connector etc.)
  - Charter/Tour bus companies
  - School districts (school buses)
- **Civic Organizations**
  - Chamber of Commerce/city club/visitor association
  - Local community service clubs
  - Local neighborhood associations
  - Visitor Bureau
  - Other

3.1.4 Identify Target Audiences

A key to any public information and outreach campaign is to identify the target audience(s). This will help to determine the types of messages to be conveyed and the best methods of communicating those messages. Identify audiences through three categories, as shown in the table below. An outreach campaign must also consider the different types of people affected by a work zone. Certain groups may need special information or information provided in a different way. Residents who live near an upcoming work zone are often a primary audience as they may be affected by the work zone on a daily basis. A common situation is a large group or groups of limited English-speaking residents. Other segments of the population warranting special consideration are the elderly, children, and the disabled.

Public Information and Outreach Campaign Audiences

- **Types of Travelers**
  - Pre-trip
  - En route
  - Personal – local, commute
  - Personal – local, non-commute
  - Personal – non-local (e.g., tourists)
  - Commercial – local
  - Commercial – non-local (long distance)
- **Types of Trip Generators**
  - Major employers
  - Shopping districts/malls
  - Recreation and tourist facilities (e.g., parks, museums)
  - Organizers of planned special events
  - Emergency responders/hospitals
  - Business associations
  - Associations
  - Intermodal passenger terminals (e.g., Union Station)
  - Intermodal freight terminals
- **Types of People**
  - Residents (and neighborhood associations)
  - Minorities (particularly groups with limited English-speaking capability)
  - Special demographics (particularly elderly, children, disabled)
  - Business owners

3.1.5 Develop Campaign Message(s)

The three messages generally incorporated into successful work zone public information and outreach campaigns are:

i. **Safety First -** The most important message to convey to drivers is to encourage motorists to take safety precautions to protect themselves and highway workers. Continuously remind drivers to adhere to posted speed limits and stay alert to

prevent crashes. Reinforce this message with warnings about increased traffic fines and enforcement activity, if appropriate.

ii. **Work zone** disruptions can be reduced when travelers plan ahead. Additionally, travelers who know what to expect will be less frustrated about delays. Another general message that should be conveyed to the public is to think ahead about the timing of travel, the route, the mode, and the destination.

a. **Work zone details.** Employ a variety of public information and outreach strategies to provide current details of a work zone, including the Web, project hotline, newspaper articles, changeable message signs (CMS), and others. At a minimum, details of a work zone should include the dates and times of work zone activity and the routes, lanes, and ramps affected. If these details are changing, then it is important to provide the most current information. Incorrect and out-of-date information compromise the effectiveness of public information and outreach campaign.

b. **Travel times, average speed and delays.** Public information on travel times and delays can range from very general (e.g., "Expect delays") to very specific (e.g., "Travel time through work zone is 20 minutes"). Color code average speed by segments and display them on the Website. More specific information is usually more useful to travelers and preferable when it is available.

c. **Alternate methods and modes of transportation.** Reducing the amount of traffic through a work zone is one way to reduce congestion and travel delay. This may involve providing detailed information on carpooling/ridesharing, transit, park and ride, and telecommuting options. Target messages regarding telecommuting to major employers as well as commuters.

d. **Alternate routes.** In many cases, alternate routes must be devised and communicated to travelers. These routes may differ, depending on the type of driver (local, long distance, commercial drivers) and timing. Alternate route messages are essential when construction involves shutting down an entire route. Locate alternate route messages that may involve CMS l at decision points for drivers.

iii. **DDOT Cares -** Motorists are more willing to cope with disruptions and cooperate with directions when they feel that all necessary steps are being taken to make things easier. Accepting inconvenience related to the work performed is more likely with a genuine message from those involved.

3.1.6 Determine Communication Strategies

After identifying the appropriate audience and messages for the work zone project the next step is to determine the strategies to be used to get the messages to the target

audiences. While there are wide range of ways to communicate with the public about work zones, tailor strategies to the project context, the message being conveyed, and funding limitations.

Modify communication strategies to fit the needs of each project. A combination of several of strategies may make sense for some projects, while only one or two strategies may be necessary for other projects. Typically, there will significant interaction between different means of communication. For example, informational materials such as brochures and fact sheets are often posted to project Websites, which makes them more widely accessible. Similarly, media may use information posted to project Websites or gained from project materials to provide information through newspapers, the radio, and television news. Ensure consistent messages across all communication strategies to achieve credibility.

3.1.7 Determine When to Communicate

Avoid providing information to the public only when a work zone is up and running. A public information and outreach campaign must develop and implement strategies before construction begins and after the project is complete. In the before phase, concentrate the campaign on general information about the project, the problems it may cause, and where to find more information. Near the commencement date of a work zone, it may be appropriate to add other methods such as free media coverage and paid advertising, a telephone hotline, and using CMS. After the completion of the project, debrief effectiveness of strategies to determine what worked and what did not.

3.1.8 Evaluate Effectiveness

During a long-term construction project, periodically evaluate the effectiveness of the public information and outreach campaign with the aim of redirecting resources if necessary. An evaluation might:

- Document and report the impacts of the work zone, such as the number of crashes and traffic delay.
- Document and report questions, comments, compliments, and complaints received via hotline, Website, letter, etc.
- Assess perceptions of successes and failures among the project partners.
- Survey public, businesses, or commercial truck drivers affected by the work zone.
- Survey tourism bureaus or other major facilities near the work zone.

A list of evaluation tools includes:

- **Pre-project Baseline Survey**
  - Postcard survey
  - Telephone survey
  - Other
- **Public Meeting Survey**
  - Ballot survey
  - "Bean-jar" survey
  - Other
- **Mid-Construction Survey**

  - Postcard survey
  - Telephone survey
  - Other
- **End-of-Project Survey**
  - Postcard survey
  - Telephone survey
  - Other

3.2 Communication Strategies

This section describes a number of commonly used communication strategies.

3.2.1 Public Awareness Strategies

Public awareness strategies include various methods to educate and reach out to the public, businesses, and the community concerning the road project and work zone:

- **Branding**. Using distinctive project names and trademark graphics, logos and catchphrases, otherwise known as branding, can be an effective method of getting the target audience(s) to easily recognize any information related or pertaining to the work zone.
- **Press kit.** A press kit containing information the media needs to get the word out about the project allows consistent messages to be provided to the media and helps develop positive relationships with the media.
- **Brochures and mailers.** Brochures and mailers are printed materials containing project-related information, such as advanced notice of the project's start date, schedules, pictures/graphics of the project, a description of the need for the project, alternative routes, etc. These may be distributed to motorists at key locations (e.g., large employers in the project area, rest stops, travel information centers), via automobile associations, or mailed to affected businesses or communities.
- **Press releases/media alerts.** This strategy provides project-related information to the news media, affected businesses, and other affected or interested parties using print and/or electronic media.
- **Mass media**. Outreach to radio, television, and newspapers should be a cornerstone of any public information campaign. It is important to establish a working relationship with reporters to encourage positive publicity and accurate information.
  - *Earned Media* – Use earned media, or free media, such as news stories and traffic information, to the maximum extent. Large projects are typically considered newsworthy by local media outlets, so it can be relatively easy to get news coverage.
  - *Paid Media* – Paid announcements of an upcoming major project may use newspaper, radio, or television ads. Paid advertisements can also be used for progress updates, or to provide information regarding major changes to the work zone configuration. Paid advertising can be expensive, but may be a cost-effective way of reaching a wide audience.
- **Paid advertisements (PSA).** Paid announcements of an upcoming major project may use newspaper, radio, and television ads, as well as billboards. Paid

advertisements can also be used for progress updates or to provide information regarding major changes to the work zone configuration and management approach.

- **Project information center.** Typically located on or near the project site, the facility contains materials such as scale model displays, maps, brochures, videos, etc., describing the project, its potential impacts, and available alternatives to minimize the impacts.
- **Telephone hotline.** This traveler information system provides traffic or travel information for the work zone using a toll-free telephone number. It can include prerecorded messages and/or real-time interactive request and response information.
- **Planned lane closure website.** This strategy is typically not for one specific project, but is usually implemented for an entire geographic region/jurisdiction. The Webpage summarizes planned lane closures for public information, lists routes involved as well as the closure start and end dates, presents both in text and graphical formats as part of a much larger website.
- **Project website.** This traveler information system provides traffic or travel information for the work zone via the web/Internet. It can include both long term static information and/or real-time interactive information and be part of a much larger work zone website.
- **Public meetings/hearings.** This strategy involves public relations staff presenting project information to the public, community, and/or businesses, and soliciting input concerning potential concerns, impacts, and management strategies.
- **Community task forces.** Develop community task force(s), which includes various stakeholders from the community likely to be affected by the work zone (businesses, neighborhood groups, interested individuals, public officials, or other representatives). Task forces can be a means of providing information and receiving input related to a road project.
- **Coordinate with media/schools/businesses/emergency services.** Coordinate with various community, business, and media groups likely to be affected by the work zone, or that can disseminate needed information. Examples of these groups include local/cable TV newsrooms, schools and school districts, local major employers/businesses, and local emergency services (fire, police, and ambulance). Establish various mechanisms such as fax, e mail, phone message, mailings, etc., to communicate project-related information, including start dates, project schedules, significant traffic pattern changes, and traffic crashes and incidents within the work zone.
- **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), videos, etc.
- **Work zone safety highway signs.** This strategy involves the use of signs placed strategically at work zone approaches to increase driver awareness to work zone safety concerns.

- **Rideshare promotions.** This strategy involves the marketing of an existing rideshare program or creation of a new program through signage, advertisements, brochures, and events.
- **Visual information (videos, slides, presentations) for meetings or for web-based dissemination.** This involves the use of videos, slides, and presentations to supplement public meetings, public information center displays, or press releases.

3.2.2 Motorist Information Strategies

These strategies provide current and/or real-time information to road users regarding the project work zone. Motorist information strategies include:

- **Radio traffic news.** Disseminate project-related information is through regularly scheduled traffic reports on commercial radio stations.
- **Changeable Message Signs (CMS).** Place these fixed or portable message boards along roadways or at key locations to notify road users of lane and road closures, work activities, incidents, potential work zone hazards, queues and slowed or stopped traffic ahead, and travel time or delay information, as well as alternate routes in or around the work zone. Place CMS at key locations before potential diversion points to give motorists an opportunity to divert to an alternate route or take other appropriate measures based on the information provided. As an enforcement tool, these signs can also be used to inform drivers of work zone speed limit reductions and enforcement activities.
- **Temporary motorist-information signs.** Temporary conventional signs mounted in the ground, overhead, or on vehicles to provide traveler information to guide motorists through the work zone and warn of potential hazards.
- **Dynamic speed message sign.** This portable system can be mounted as a fixed sign or located on a portable trailer. Radar measures the speed of approaching vehicles, which is displayed on the sign along with or near the work zone speed limit. The objective of this system is to enhance safety by reducing speeding and minimizing speed variations throughout the work zone.
- **Highway Advisory Radio (HAR).** Use HAR when longer, more detailed messages than can be provided using signage may be necessary for some work zone situations. HAR involves disseminating information to motorists while en route over wide-area wireless communications directly to in-vehicle radios. Signs inform motorists of the radio frequency where the information is available.
- **Extinguishable signs.** These signs are typically associated with highway advisory radio (HAR) systems where the sign indicates how to obtain information on roadway conditions (e.g., tune in to 1610 AM). These signs turn on and off, depending on when the HAR has a message available.
- **Highway Information Network (Web-Based).** A highway information network is a website where multiple stakeholder groups can place information related to the roadway. The website is shared among the various stakeholder groups, each with its own data storage areas (including control of functionality, security, data quality, etc.).
- **Traveler information systems (wireless, handhelds).** Using such technology as cell phones, pagers, in-vehicle systems, and e-mail notifications, this strategy

provides motorists with work zone-related information and static (e.g., project dates) and/or real time (e.g., potential delays).

- **Freight travel information.** This is an appropriate strategy when there is a moderate-to-high percentage of freight movement through the work zone. It involves coordinating with the freight community (trucking companies, truck drivers, etc.) to identify work zone information considered useful (e.g., truck restrictions, occurrences of incidents, and planned closures) and developing a mechanism to disseminate that information to freight stakeholders. Information dissemination can be 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 such as the CB Wizard Alert System).
- **Transportation Management Center (TMC).** Use TMCs to coordinate and manage road user information dissemination activities. The TMC may be staffed by either contract staff and/or agency personnel. For large projects of long duration, establish and operate a project-specific TMC to help manage incidents and maintain traffic flow.
- **Live traffic cameras on the web.** Real-time live traffic cameras on the web allow users to view real-time traffic conditions.
- **Project information hotline.** Use a toll-free telephone number to provide prerecorded messages and/or real-time traffic or travel information for the work zone.
- **E-mail alerts.** E-mail alerts provide travelers with timely information on work zone activity and traffic delays. Lane closures, delays, and incident/crash information are distributed to travelers who have signed up to receive the information via computer, cell phone or hand-held device.

3.3 Funding/Budgeting

Public information and outreach efforts can be time consuming and resource intensive. However, when citizens feel their concerns have not been adequately addressed, costly project delays, lawsuits, and even project cancellations can occur.

As stated, the budget for a work zone public information and outreach campaign will depend on several factors, including the size and nature of the campaign, the communication strategies selected, whether the selected strategies are already established in DDOT and can be readily used, and the role of partners.

Unit costs for various public information and outreach efforts will vary based on the region, strategy chosen and size of the effort. Consult with the Office of Communications and/or the District Community Liaison for assistance in determining potential costs for these efforts.

3.3.1 Sample Costs

The following are sample unit costs for various TMP strategies in the Washington Metropolitan area.

- Hiring consultant to do TMP ($250,000+)
- Billboards ($3500/Month)

- Radio ad ($800/Minute)
- Newspaper Ad (1/2 page, color - $14,000/day)
- Open House ($3,000)
- TV Commercial (Local - $4,000+)
- Portable CMS ($10,000)
- Portable Highway Advisory Radio ($60,000/unit)
- Ground-mounted signs ($300/each)

In general, each project Public Information and Outreach Plan should include:

- Brief summary of report
- Goals and Objectives
- Roles and Staffing
- List of affected stakeholders to be targeted
- Communication plan and timeline for each element
- Project Cost and funding source breakdown
- Schedule of communication with DDOT
- Means of evaluation of communications plan
- Review and submittals

Appendix D

D. Work Zone Design Checklist

(For use on all significant projects, can also be a good guide for non-significant projects)

Project: _____ Date: _____
Completed by (or contract person): _____
Organization: _____

Overview of WZ Design Checklist	Completed?
Step 1- Identify Traffic Control Options	
General	☐
Work Zone Setup	☐
Project Timing	☐
Detour	☐
Roadside Safety	☐
Step 2 - Identify Work Zone Impacts	
Data Collection	☐
Work Zone Analysis	☐
Mobility Impacts	☐
Construction Related Impacts	☐
Step 3 - Identify Impact Management Strategies	
Temporary Traffic Control	☐
Transportation Operations	☐
Public Information and Outreach	☐

STEP 1 - IDENTIFY TRAFFIC CONTROL OPTIONS			
Work Zone Setup	**YES**	**NO**	**N/A**
1. Have all applicable work zone types been adequately considered?			
a. Work outside of roadway	☐	☐	☐
b. Full roadway closure	☐	☐	☐
c. Permanent lane/shoulder/ramp closures	☐	☐	☐
d. Crossovers/contraflow	☐	☐	☐
e. Detour	☐	☐	☐
f. Intermittent road closures	☐	☐	☐
g. Reduced lane widths	☐	☐	☐
h. Reduced shoulder widths	☐	☐	☐
i. Lane shifts	☐	☐	☐
j. Daily lane/shoulder closures	☐	☐	☐
k. Use of shoulder or median	☐	☐	☐
l. Runaround	☐	☐	☐
m. One-lane, two-way operation	☐	☐	☐
n. Temporary Signal	☐	☐	☐
o. Flagger	☐	☐	☐
p. Reversible lane	☐	☐	☐
q. Use of temporary structures	☐	☐	☐
r. Use of temporary pavement	☐	☐	☐
s. Widening	☐	☐	☐
t. Night work	☐	☐	☐
u. Weekend work	☐	☐	☐

Work Zone Continued	YES	NO	N/A
2. Have different staging options been considered?	☐	☐	☐
3. Are bypasses or temporary widening needed?	☐	☐	☐
4. Does pedestrian/bicycle traffic or ADA access need to be maintained?	☐	☐	☐
5. Is this roadway/intersection a high accident location?	☐	☐	☐
6. What is the minimum allowable lane width?	☐	☐	☐
7. Will oversized load permits be affected?	☐	☐	☐
8. Is a reduced work zone speed limit required?	☐	☐	☐
9. Should certain types of vehicles be prohibited from entering the work zone (over-height, weight restrictions)?	☐	☐	☐
10. Will the work zone be adequate in terms of:			
a. Traffic control devices?	☐	☐	☐
b. Railroad crossing and controls?	☐	☐	☐
c. Geometrics (turning radii, ramp merge/diverge areas, etc.)?	☐	☐	☐
d. Bridge restrictions and other structures?	☐	☐	☐
Project Timing	**YES**	**NO**	**N/A**
1. Can the contractor restrict the roadway during			
a. AM or PM rush hours?			
One direction?	☐	☐	☐
Both directions?	☐	☐	☐
b. Overnight?	☐	☐	☐
c. Local celebrations?	☐	☐	☐
d. Holidays or weekends?	☐	☐	☐
e. Sporting events?	☐	☐	☐
f. Other special events?	☐	☐	☐
2. Will project timing (for example, start or end date) be restricted by			
a. School closings or openings?	☐	☐	☐
b. Holidays?	☐	☐	☐
c. Sporting events?	☐	☐	☐
d. Other projects in the area?	☐	☐	☐
e. Other?	☐	☐	☐
3. Is there present or future roadwork in the immediate area that may affect traffic or the Contractor's operations?	☐	☐	☐
Roadside Safety	**YES**	**NO**	**N/A**
1. Are temporary barriers required?	☐	☐	☐
2. Will temporary impact attenuators be required?	☐	☐	☐
3. Will extra protection be required for			
a. Pedestrians/Bicyclists?	☐	☐	☐
b. School areas and crossings?	☐	☐	☐
c. Playgrounds and parks?	☐	☐	☐
4. Have areas been designated for the contractor to store			
a. Equipment?	☐	☐	☐
b. Construction materials?	☐	☐	☐
c. Waste materials?	☐	☐	☐
5. Have areas been designated for contractor's employees to park			
a. On-site?	☐	☐	☐
b. Off-site?	☐	☐	☐
Detour	**YES**	**NO**	**N/A**
1. Will traffic be detoured?	☐	☐	☐
2. If yes, is the detour adequate in terms of			
a. Weight restrictions	☐	☐	☐
b. Height-width	☐	☐	☐
c. Wide loads	☐	☐	☐
d. Capacity	☐	☐	☐
e. Adequate traffic control devices	☐	☐	☐
f. Railroad crossing and controls	☐	☐	☐
g. Geometrics (turning radii, ADA requirements, etc.)	☐	☐	☐
h. Bridge restrictions and other structures	☐	☐	☐
i. Truck restrictions	☐	☐	☐

Detour Continued	YES	NO	N/A
3. Will there be other construction along the detour that might influence traffic?	☐	☐	☐
4. Have affected Cities, Districts, Counties, or States been notified of the proposed detour?	☐	☐	☐
5. Will all fronting businesses have acceptable ingress and egress?	☐	☐	☐
6. Can the detour be continued during winter (snow removal concerns)?	☐	☐	☐
7. Are alternate routes available to local motorists?	☐	☐	☐
8. Should any of the following be contacted?			
a. Public school system	☐	☐	☐
b. Public transit system	☐	☐	☐
c. Police, fire, and ambulance services	☐	☐	☐
d. Postal mail route services	☐	☐	☐
e. Others	☐	☐	☐
9. Is a public information meeting required?	☐	☐	☐

STEP 2 - IDENTIFY WORK ZONE IMPACTS			
Data Collection	**YES**	**NO**	**N/A**
1. Has the appropriate data been collected?			
a. Traffic Volumes	☐	☐	☐
b. Signal Timing	☐	☐	☐
c. Origin-Destination	☐	☐	☐
d. Travel Time	☐	☐	☐
e. Crash History	☐	☐	☐
f. Speed	☐	☐	☐
g. Delay	☐	☐	☐
h. Other	☐	☐	☐
Work Zone Analysis	**YES**	**NO**	**N/A**
1. Has the work zone traffic analysis been completed?	☐	☐	☐
a. Have work zone and ramp/other capacities been identified?	☐	☐	☐
Work Zone Capacity =	☐	☐	☐
Ramp/other Capacity =	☐	☐	☐
b. Have required number of maintained lanes and allowable lane closure hours been identified?	☐	☐	☐
c. Have the appropriate analysis tools been identified/used?	☐	☐	☐
d. QuickZone	☐	☐	☐
e. QUEWZ-98	☐	☐	☐
f. HCS	☐	☐	☐
g. Synchro/SimTraffic	☐	☐	☐
h. Corsim	☐	☐	☐
i. Vissim	☐	☐	☐
j. Other	☐	☐	☐
k. Have the appropriate traffic analyses been conducted?	☐	☐	☐
l. Queuing analysis	☐	☐	☐
m. Signal timing optimization	☐	☐	☐
n. Ramp meter analysis	☐	☐	☐
o. Travel time analysis	☐	☐	☐
p. Delay analysis	☐	☐	☐
q. Other	☐	☐	☐

Mobility Impacts.	YES	NO	N/A
1. Has the work zone traffic analysis identified impacts on any of the following?			
a. Ability to maintain all accesses (business, community, etc.)	☐	☐	☐
b. Pedestrian, bicycle, and ADA facilities	☐	☐	☐
c. Public safety (workers and traveling public)	☐	☐	☐
d. Emergency vehicle access	☐	☐	☐
e. Construction equipment access & movement through the work zone	☐	☐	☐
f. Specific user groups (businesses, communities)	☐	☐	☐
g. Over-height, over-weight vehicles	☐	☐	☐
h. Transit services	☐	☐	☐
i. Traffic operations in and around the work zone (freeway queues, network operations, effect on local roads and detour routes)	☐	☐	☐
j. Ramp capacity	☐	☐	☐
k. Intersection traffic control (signal timing, adequate signage, etc.)	☐	☐	☐
l. Existing special traffic operations (HOV lanes, contraflow, drawbridges,etc.)	☐	☐	☐
m. User Costs (delay)	☐	☐	☐
Construction Related Impacts	**YES**	**NO**	**N/A**
1. Has the Maintenance of Traffic identified impacts on any of the following?			
a. Ability to provide required decision sight distance and merge/diverge areas at ramps	☐	☐	☐
b. Right-of-way	☐	☐	☐
c. Environment	☐	☐	☐
d. Required bridge widths	☐	☐	☐
e. Earthwork, retaining walls, pier clearances, profile differences, etc.	☐	☐	☐
f. Ability to maintain existing drainage, utility and lighting systems	☐	☐	☐
g. Construction duration	☐	☐	☐
h. Construction costs	☐	☐	☐
i. Constructability	☐	☐	☐
j. Noise levels	☐	☐	☐
k. Roadway surface conditions	☐	☐	☐
l. Storage of equipment or materials	☐	☐	☐
m. Service life (bridges, pavements, etc.)	☐	☐	☐

STEP 3 - IDENTIFY IMPACT MANAGEMENT STRATEGIES			
Temporary Traffic Control	**YES**	**NO**	**N/A**
Traffic Control Devices			
1. Traffic control signing and striping will be located:			
a. In the plans	☐	☐	☐
b. Reference to standard drawings	☐	☐	☐
2. Will sign message modifications be required on permanent signage for MOT?	☐	☐	☐
3. Are temporary signals required?	☐	☐	☐
4. Will existing signals need to be kept operational?	☐	☐	☐
5. Will temporary roadway lighting be required?	☐	☐	☐
6. Will striping removal be required?	☐	☐	☐
a. Has the work zone been set up to minimize striping removal?	☐	☐	☐
7. Will Portable Changeable Message Signs (PCMS) be required?	☐	☐	☐
Project Coordination, Contracting and Innovative Construction Strategies			
1. Has the project been coordinated with:			
a. Other projects in the area	☐	☐	☐
b. Utilities	☐	☐	☐
c. Right-of-Way	☐	☐	☐
d. Other transportation infrastructure	☐	☐	☐
2. Have innovative contracting strategies been considered?			
a. Design-build	☐	☐	☐
b. A+B Bidding	☐	☐	☐
c. Incentive/Disincentive clauses	☐	☐	☐
d. Lane Rental	☐	☐	☐
e. Performance specifications	☐	☐	☐
3. Have innovative or accelerated construction techniques been considered?			
a. Prefabricated/precast elements	☐	☐	☐
b. Rapid cure materials	☐	☐	☐
Transportation Operations	**YES**	**NO**	**N/A**
1. Have the following demand management strategies been considered?			
a. Transit service improvements	☐	☐	☐
b. Transit incentives	☐	☐	☐
c. Shuttle services	☐	☐	☐
d. Parking supply management	☐	☐	☐
e. Variable work hours	☐	☐	☐
f. Telecommuting	☐	☐	☐
g. Ridesharing/carpooling incentives	☐	☐	☐
h. Park-and-ride promotion	☐	☐	☐
2. Have the following corridor/network management strategies been considered?			
a. Signal timing/coordination improvements	☐	☐	☐
b. Temporary traffic signals	☐	☐	☐
c. Street/intersection improvements	☐	☐	☐
d. Bus turnouts	☐	☐	☐
e. Turn restrictions	☐	☐	☐
f. Parking restrictions	☐	☐	☐
g. Truck/heavy vehicle restrictions	☐	☐	☐
h. Reversible lanes	☐	☐	☐
i. Dynamic lane closure system	☐	☐	☐
k. Ramp closures	☐	☐	☐
l. Railroad crossing controls	☐	☐	☐
m. Coordination with adjacent construction site(s)	☐	☐	☐

Transportation Operations (Continued)	YES	NO	N/A
3. Have the following work zone safety management strategies been considered?			
a. Speed limit reduction/variable speed limits	☐	☐	☐
b. Temporary traffic signals	☐	☐	☐
c. Temporary traffic barrier	☐	☐	☐
d. Movable traffic barrier systems	☐	☐	☐
e. Crash-cushions	☐	☐	☐
f. Temporary rumble strips	☐	☐	☐
g. Warning lights	☐	☐	☐
h. Automated flagger assisstance devices	☐	☐	☐
i. Project task force/committee	☐	☐	☐
j. Construction safety supervisors/inspectors	☐	☐	☐
k. Road safety audits	☐	☐	☐
l. TMP monitor/inspection team	☐	☐	☐
4. Have the following Work Zone ITS strategies been considered for traffic monitoring/management?			
a. Late Lane Merge Concept	☐	☐	☐
b. PCMS with speed display	☐	☐	☐
c. Travel Time Estimation System	☐	☐	☐
d. Advanced Speed Information	☐	☐	☐
e. Advanced Congestion Warning	☐	☐	☐
f. Conflict Warning	☐	☐	☐
g. Travel Time Monitoring	☐	☐	☐
h. Freeway Queue Monitoring	☐	☐	☐
i. CCTV Monitoring	☐	☐	☐
j. Real-time Detour (or other traffic diversion strategies)	☐	☐	☐
k. Team meetings	☐	☐	☐
l. Project on-site safety training	☐	☐	☐
m. Safety awards/incentives	☐	☐	☐
n. Wind shield Survey	☐	☐	☐
5. Have the following traffic/incident management and enforcement strategies been considered?			
a. ITS for traffic monitoring/management.	☐	☐	☐
b. Transportation management center (TMC).	☐	☐	☐
c. Surveillance [Closed-Circuit Television (CCTV), loop detectors, lasers, probe vehicles].	☐	☐	☐
d. Helicopter for aerial surveillance.	☐	☐	☐
e. Traffic screens	☐	☐	☐
f. Call boxes			
g. Mile-post markers	☐	☐	☐
h. Tow/freeway service patrol	☐	☐	☐
i. Total station units	☐	☐	☐
j. Photogrammetry	☐	☐	☐
k. Coordination with media	☐	☐	☐
l. Local detour routes	☐	☐	☐
l. Contract support for incident management	☐	☐	☐
m. Incident/emergency management coordinato	☐	☐	☐
n. Incident/emergency response plan	☐	☐	☐
o. Dedicated (paid) police enforcement	☐	☐	☐
p. Cooperative police enforcement	☐	☐	☐
q. Automated enforcement	☐	☐	☐
r. Increased penalties for work zone violations	☐	☐	☐

Public Information and Outreach	YES	NO	N/A
1. Have the following public awareness strategies been considered?			
a. Branding	☐	☐	☐
b. Press kits	☐	☐	☐
c. Brochures and mailers	☐	☐	☐
d. Press releases/Media alerts	☐	☐	☐
e. Mass media (earned and/or paid)	☐	☐	☐
f. Paid Advertisements	☐	☐	☐
g. Project information center	☐	☐	☐
h. Telephone hotline	☐	☐	☐
i. Planned lane closure website	☐	☐	☐
j. Project website	☐	☐	☐
k. Public meetings/hearings, workshops and community events	☐	☐	☐
l. Community task forces	☐	☐	☐
m. Coordination with media, schools, businesses, and emergency services	☐	☐	☐
n. Work zone education and safety campaigns	☐	☐	☐
o. Work zone safety highway signs	☐	☐	☐
p. Rideshare promotions	☐	☐	☐
q. Visual information (videos, slides, presentations) for meetings and web based dissemination	☐	☐	☐
2. Have the following motorist information strategies been considered?			
a. Radio traffic news	☐	☐	☐
b. Changeable message signs	☐	☐	☐
c. Temporary motorist information signs	☐	☐	☐
d. Dynamic speed message sign	☐	☐	☐
e. Highway Advisory Radio (HAR)	☐	☐	☐
f. Extinguishable Signs	☐	☐	☐
g. Highway information network (web-based)	☐	☐	☐
h. Traveler information systems(wireless, handheld)	☐	☐	☐
i. Transportation management Center (TMC)	☐	☐	☐
j. Live traffic camera on web	☐	☐	☐
k. Project information hotline	☐	☐	☐
l. Email alerts	☐	☐	☐

Appendix E

E. TMP Report Outline

This section contains a comprehensive list of the components that could be included in a Transportation Management Plan (TMP) report. The order, terminology and inclusion of components may vary from project to project. The level of detail of the TMP will reflect the level of potential work zone impacts of the project.

The components discussed in this section include elements of the TMP document itself, as well as elements for TMP implementation and evaluation. The following table summarizes the TMP components. Individual TMP components are described in more detail in the subsections that follow the table.

1. **INTRODUCTORY MATERIAL**
   - Cover Page
   - Licensed Engineer Stamp
   - Table of Contents
   - List of figures
   - List of tables
   - List of abbreviations and symbols
   - Terminology
2. **EXECUTIVE SUMMARY**
3. **TMP ROLES AND RESPONSIBILITIES**
   - TMP Coordinator
   - TMP Team
   - TMP Implementation Task Leaders
   - Approval Contact(s)
   - Emergency Contacts
4. **PROJECT DESCRIPTION**
   - Project background
   - Project type
   - Project area/corridor
   - Project goals and constraints
   - Proposed construction phasing/staging
   - General schedule and timeline
   - Need for detours
   - Related projects
5. **EXISTING AND FUTURE CONDITIONS**
   - Data collection and modeling approach
   - Existing roadway characteristics (roadway classification, number lanes, geometry, etc.)
   - Existing and historical traffic data (volumes, speed, capacity, v/c ratio, truck percentages, congestion, peak traffic hours)
   - Existing traffic operations (signal timing, traffic controls)
   - Crash data

- Stakeholder concerns/issues
- Traffic predictions during construction (volume, delay, queues)

6. WORK ZONE-IMPACTS ASSESSMENT REPORT

- Qualitative summary of anticipated work zone impacts
- Impacts assessment of alternative project design and management strategies
  - Construction approach/phasing/staging strategies
  - Work zone impacts management strategies
- Traffic analysis results
  - Traffic analysis strategies
  - Measures of effectiveness
  - Analysis tool selection methodology and justification
  - Analysis results
- Selected Construction Phasing
  - Construction approach/phasing/staging strategy selected
  - Work zone impacts management strategies selected

7. TMP MONITORING

- Monitoring requirements
- Evaluation report

8. PUBLIC INFORMATION AND OUTREACH PLAN

9. INCIDENT MANAGEMENT

- Trigger points
- Decision and phone tree
- Contractor's contingency plan
- Standby equipment or personnel

10. TMP IMPLEMENTATION COSTS

- Itemized costs
- Cost responsibilities/share opportunities
- Funding source(s)

11. SPECIAL CONSIDERATIONS (AS NEEDED)

12. ATTACHMENTS (AS NEEDED)

1. INTRODUCTORY MATERIAL

This section contains introductory material for the report. Components may include:

- **Cover Page** – Present title/project name, date, and agency name and/or person responsible for the report, with contact information.
- **Licensed Engineer Stamp Page** – Include project name, statement that the TMP was developed under the direction of a licensed engineer, and signature, printed name and license stamp of the engineer responsible for developing the TMP. Engineering for the TMP must be performed under the direction of a licensed engineer.
- **Table of Contents** –Lists sections and subsections of the report with their

page numbers.

- **List of Figures** – Lists figures and associated page numbers.
- **List of Tables** – Lists tables and associated page numbers List of abbreviations and symbols
- **Abbreviations and Symbols** – Lists repeated abbreviations and mathematical symbols in alphabetical order.
- **Terminology** – Describes/defines key technical terms found in the report.

2. EXECUTIVE SUMMARY

The Executive Summary presents a brief overview and summary of the project, general approach, selected construction phasing and staging approach(es), anticipated work zone impacts of the project, chosen TMP strategies, cost estimate for implementing the TMP, and project conclusions/recommendations.

3. TMP ROLES AND RESPONSIBILITIES

This section documents the roles and responsibilities for developing, implementing, monitoring and evaluating the TMP. These may include, but are not limited to:

- **TMP Coordinator** – DDOT person responsible for the overall TMP development.
- **TMP Team** – Identify stakeholders and other TMP Team members involved in the TMP development and review.
- **TMP Implementation Task Leaders** – Identify project personnel responsible for implementing specific tasks recommended by the TMP.
- **Approval Contact(s)** – The person or persons who must give final approval to the TMP.
- **Emergency Contacts** – List of known contact persons for each emergency service agency, including police, fire, ambulance, and utilities.

4. PROJECT DESCRIPTION

The project description component of the TMP presents the project scope and definition. Much of this information will have already been gathered as part of Project Planning and Preliminary Engineering. It may include:

- **Project Background** –Includes a brief description of the project, its purpose, and its developmental history. It may also include additional information related to the project, roadway, or study area.
- **Project Type** – Identifies the nature of the project, which may range from capital projects, new construction, rehabilitation, major maintenance, to routine maintenance.
- **Project Area/Corridor** –Describes physical extents of the construction or maintenance work, as well as the estimated region(s) and corridor(s) that the project may affect. Use a map to illustrate how this information is recommended
- **Project Goals and Constraints** – A brief listing of the goals, benefits, and

challenges that are expected by this project.

- **Proposed Construction Phasing/Staging** – Include project phasing, land and/or facility closure strategies, whether temporary lanes will be used for general traffic, ramp/interchange closures, construction strategies, lane closure hours, duration, etc. Also identify holiday, event, seasonal and/or nighttime restrictions. Provide the Sequence of Construction and Traffic Control Plans separately.
- **General Schedule and Timeline** – Specify project start and finish dates and phasing schedule (if appropriate), including all major milestones and planned shut down times for events for winter, environmental windows, etc.
- **Need for Detours** – Include where detours are identified for staging purposes or for alternate routes. Provide detour plans separately.
- **Related Projects** – Identify other ongoing or planned projects in the vicinity of the project area that may cause cumulative impacts to the project area and/or corridor(s).

5. EXISTING AND FUTURE CONDITIONS FOR PROJECT AREA

This TMP component provides information on existing and anticipated future conditions in the study area, including traffic, safety, and business and community access. While the level of detail will vary based on the project, it should consider:

- **Data Collection and Modeling Approach** – A brief discussion on how existing traffic data and information was obtained and what approach was used to estimate conditions during construction. Include a brief discussion on the growth rates used for analysis, including the source and any assumptions.
- **Existing Roadway Characteristics –** Presents a history of roadways in the study area, roadway classification(s), number of lanes, geometrics, and urban/suburban/rural.
- **Existing and Historical Traffic Data –**Includes measures such as volumes (traffic, pedestrian etc) speed, capacity, volume to capacity ratio, truck percentage, queue length, peak traffic hours, through versus local traffic, etc. Historical traffic data should be no more than three (3) years old.
- **Existing Traffic Operations –**Includes signal timing, delay, and traffic control types.
- **Accident History –** Where feasible, document an accident history, including number and type of crashes.
- **Stakeholder Concerns/Issues –** Provides a list of project stakeholders and others potentially impacted by the project. Include input from the community and business representatives and other stakeholders and prioritize to address local concerns.
- **Traffic Mobility Issues –** List major events with the potential to impact mobility during the project.
- **Traffic Predictions during Construction (Volume, Delay, Queues) -** Based on existing and historical data and traffic growth rates, develop and document estimates of traffic and safety during construction. Compare future estimates to the existing data.

6. WORK ZONE IMPACTS ASSESSMENT

A work zone impacts assessment involves a brief discussion on how the project is expected to impact its vicinity. Include major corridors, local streets, how traffic patterns are expected to change, and an estimate on how traffic demand might change because of the project.

- **Traffic Analysis –**
  - **Traffic Analysis Strategies** – If not previously discussed, include a brief description of how the expected future (construction) traffic conditions were determined. Document any traffic reduction factors or other parameters assumed for the calculations.
  - **Identify Measures of Effectiveness** – List the measure of effectiveness used for the analysis, such as capacity, volume queue, speed, travel time, diversion, safety, noise, environmental, adequacy of detour routes, cost effectiveness, etc.
  - **Analysis Tool Selection Methodology and Justification** – List the traffic analysis tools used. Include a brief summary on how the tool was selected and criteria used to select the most appropriate tool.
  - **Analysis Results** – Compare existing and construction traffic conditions and operations, with and without the TMP impact management strategies. Traffic analysis should also address, in more quantitative manner than the staging impacts assessment, the impacts on:
    - Access to residences and businesses
    - Access for pedestrians, bicyclists, and persons with disabilities
    - Emergency service impacts (fire, ambulance, police, hospitals)
    - Safety
    - Adequacy of detour routes
    - School bus operations
    - Bus operations and stops
    - Other transit services
    - Tourist facilities
    - Seasonal impacts (beach traffic, etc.)
    - Cost-effectiveness
- **Selected Construction Phasing –** Develop plans, specs, and estimates for the selected alternative. Describe the selected construction approach, including the selected construction phasing/staging strategy and selected work zone-impact management strategies.
  - Document any work hour restrictions for each stage (e.g., night work, peak hour restrictions, etc.)
  - Develop the following documents while the TMP is being prepared and referenced them in the TMP:
    - Construction phasing/staging plans - Provide the construction approach/phasing/staging strategy on plan sheets.
    - Temporary Traffic Control Plans (TCPs) - Provide detailed TCPs for each stage and phase of construction. Document

work zone impact management strategies on plan sheet, where possible (e.g., geometric improvements and control devices). If not on the plans, list strategies with text describing any restrictions, usage (duration, stage/phase, etc), or other considerations in the contract documents (possibly in a special provision).

- Detour Plans (if required).
- Temporary Traffic Signal Plans, including any timing modifications (if required).
- Temporary Lighting Plans (if required).
- Public Information and Outreach Plan (Refer to appendix D, section 3).
- Necessary Special Provisions covering other TMP elements

7. TMP MONITORING/EVALUATION CRITERIA

Develop project specific criteria and methods for measuring and evaluating the TMP and determine how it will be modified if improvements are needed.

- **Monitoring Requirements –** Include the TMP monitoring requirements in the TMP report and make them part of the contract documents. The evaluation should consider both the performance of individual TMP strategies as well as overall performance of the work zone and work zone impact area. This may include, but is not limited to:
  - Identification and process for monitoring TMP performance (e.g. volume counts, queue length verification of work zone set-up crashes, complaints and feedback, surveys, etc.).
  - Tracking TMP implementation costs and comparing them to the budgeted costs.
  - Approach for corrective action when TMP performance requirements are not met.
  - Submission of revised/alternative TMPs and the approval process.
  - Person(s) responsible for each component of the TMP monitoring.
- **Evaluation Report for the TMP –** The TMP should include reference to development of an evaluation report upon completion of construction to document lessons learned and provide recommendations on how to improve the TMP process and/or modify guidelines. The TMP document should specify the persons responsible for completing the Evaluation Report.

8. PUBLIC INFORMATION AND OUTREACH PLAN

The public information and outreach plan serves two main purposes. First, it informs the public about the overall purpose of the project to generate and maintain public support. Second, it encourages changes in travel behavior during the project to minimize congestion. Include public awareness and motorist information strategies in the public information and outreach plan. The DDOT Office of Communications may require

separate documentation for public information and outreach efforts. Refer to appendix C, section 3 for information on how to develop public information and outreach plans as part of the TMP effort.

9. INCIDENT MANAGEMENT

Incident management is a planned and coordinated program that detects and removes incidents from the highway and restores traffic capacity as safely and quickly as possible. Discuss emergency communications at the preconstruction meeting. Important elements to discuss include:

- Roles and responsibilities of those involved in incident management.
- Key contacts and their contact information.
- Emergency and essential services contacts.

10. TMP IMPLEMENTATION COSTS

Estimating the work zone management strategy implementation costs and including these costs within the overall project cost is critical as it may be difficult to obtain additional funding at a later time. The earlier TMP costs are incorporated into the budget, the more likely the under-allocation of funds can be avoided. Where feasible, itemize and document the cost estimates for the work zone impact management strategies in the TMP. Specify cost responsibilities, opportunities for sharing or coordinating with other projects, and funding sources. TMP components can be funded as part of the construction contract and/or in separate agreements.

11. SPECIAL CONSIDERATIONS

Identify any special considerations related to the TMP not included in a previous section. This may include reiterating special provisions, highlighting considerations that may need to be included in contracting documents, identifying work zone management strategies that require implementation prior to construction, etc.

12. ATTACHMENTS (AS NEEDED)

Appendices in the TMP document should include information that may be relevant or of interest to the TMP reviewer, implementer, DDOT, or other stakeholders. This could include, but is not limited to:

- Observed, historical, and/or estimated traffic volumes, speeds travel times, level-of service, delay, and crashes.
- Maps.
- Plans (Sequence of Construction, TTC, TO, Detour Plans).
- Detailed analysis methodology, assumptions and parameters used.
- Special provision text.

Appendix F

F. FIELD INSPECTION REPORT

(For use on all significant projects; can also be a good guide for non-significant projects)

***Rating/Grade of Project:** ☐

Inspected By: _____

Date: _____ Time: _____ Weather: _____

Worksite Location: _____

Public Space Job: _____ IPMA Job: _____

Ward Number: _____ Quadrant of the City: _____

Type of Work Performed: _____

In Travel Lane: _____

General Contractor: _____ Subcontractor: _____

Contact Person: _____ Contact Person: _____

Permit Number: _____ Citation: _____ Code: _____ Photos attached: **Yes / No**

SIGNS

- ☐ DDOT typical or TTC Plan (for the current phase of job) not followed
- ☐ Non-standard type (material, size, color)
- ☐ Poor reflectivity
- ☐ Conflicting permanent & temporary signing
- ☐ Sign legend problem
- ☐ Duct tape, obstructed, damaged, dirty, overlay plate, non-standard
- ☐ Wrong message
- ☐ Inappropriate/ contradictory signs not covered/removed
- ☐ Sign support problem
- ☐ Sign missing or down
- ☐ Horizontal and vertical clearances

ARROW PANEL

- ☐ None or Non-standard
- ☐ Malfunction (bulb-out, etc)
- ☐ Incorrect placement
- ☐ Incorrectly aimed (or misaligned bulbs)
- ☐ Not dimmed at night
- ☐ Not protected as in DDOT standard
- ☐ Inadequate sight distance
- ☐ Wrong indication/display

PORTABLE VARIABLE MESSAGE SIGNS

- ☐ Application does not meet DDOT guidelines
- ☐ Incorrect or unapproved message
- ☐ Non-standard or unapproved VMS equipment
- ☐ Not protected as in DDOT standard
- ☐ Improper placement
- ☐ Inadequate sight distance
- ☐ Too many messages

CHANNELIZING DEVICES (CONES, DRUMS, ETC.)

- ☐ Non-standard device (shape, density)
- ☐ Non-standard single or multilane taper
- ☐ Incorrect spacing
- ☐ Placed too far away from traffic (> 2 ft)
- ☐ Damaged, dirty or non-reflective
- ☐ Improper alignment
- ☐ No CDs placed preceding barrier end sections
- ☐ Improperly weighted
- ☐ Missing or poor reflectivity

PAVEMENT MARKINGS

- ☐ None or non-standard markings
- ☐ Less than full complement of pavement markings/ delineation
- ☐ Unnecessary or conflicting markings not obliterated completely
- ☐ Failing of temporary markings/RPMs
- ☐ Less than required number of RPMs
- ☐ Improper alignment
- ☐ Incorrect skip size/space

TEMPORARY BARRIER/CRASH CUSHIONS

- ☐ Improper barrier wall flare
- ☐ Improper barrier end treatment
- ☐ Improper temporary barrier end transition with existing W-Beam or concrete barrier
- ☐ Non-standard or no object marker/vertical panel
- ☐ Reflector maintenance needed
- ☐ Reflector on barrier flare not allowed
- ☐ Damaged or dirty barrier wall
- ☐ Improper barrier delineation
- ☐ Inadequate or no crash cushion
- ☐ Improper installation of crash cushions
- ☐ Damaged or dirty crash cushions

FLAGGERS

- ☐ Non-certified flagger
- ☐ Non-standard STOP/SLOW paddle
- ☐ Incorrect signaling device (flag)
- ☐ Incorrect flagging
- ☐ Wearing improper clothing
- ☐ No flaggers present (signs displayed)
- ☐ Improper distance from advanced warning sign to flagger

GENERAL

- ☐ Traffic Control Device is not NCHRP-350 approved
- ☐ Lane closures do not have ongoing operations/work
- ☐ Less than minimum lane/shoulder widths as per TCP
- ☐ Improper stopping or detouring of traffic
- ☐ Unprotected hazards on or adjacent (< 30 feet) to travel roadway
- ☐ Nighttime portable lighting improperly installed and causing glare
- ☐ Pavement drop-off not in compliance with DDOT standards
- ☐ Pavement not clean
- ☐ Contractor crossing equipment improperly
- ☐ Did not utilize available TARs and/or PVMS

☐ Did not notify DDOT Project Engineer

PREEXISTING ROADWAY SAFETY HARDWARE MAINTENANCE

SIGNS

☐ Missing/Down
☐ Conflicting
☐ Poor Reflectivity
☐ Other

ROAD MARKINGS

☐ Worn
☐ Conflicting
☐ Other

OTHER TCDs

_____
_____
_____
_____
_____
_____

GENERAL COMMENTS & RECOMMENDATIONS

_____
_____
_____
_____
_____
_____

Corrective actions by: Immediate _____ Urgent (24 hrs) _____
5 Days _____ Other _____

***Note: Rating / Grade: 1- Very Poor, 2-Poor, 3-Good, 4-Very Good, 5-Excellent**

c.c.

☐ DDOT Project Engineer
☐ Contractor Project Engineer/Traffic Safety Officer
☐ Other
- _____
- _____

Appendix G

G. Organization and Responsibilities

The following guidance is provided to ensure that each project team member understands his/her expected contributions toward the overall consideration of work zone safety and mobility in the development, review or implementation of the TMP. By working together as a multi-disciplinary team, each team member's expertise can be drawn upon to help make decisions on how to best design and build projects and manage the impacts of the work zone. Team members from the offices listed below will have direct responsibilities for the identification of significant projects and the development of TMPs. These team members will hold meetings with and solicit comments from other offices, as appropriate, to confirm that all safety and mobility concerns are addressed. Provide all team members the opportunity to review the TMP at each stage of their development. Note that the intent of this guidance is not to provide a comprehensive list of roles and responsibilities, but rather provide an overview of what can be expected from each office. The lead office for the project will take the lead in developing the TMP.

TMP Team Responsibilities

The anticipated traffic impacts will dictate the extent and nature of the TMP Team's responsibilities. Throughout TMP development, implementation, and assessment, TMP Team responsibilities may include all or part of the following functions. These responsibilities are not limited to one Office or person, but should be taken on by the Team as a whole.

- Collect data.
- Conduct analyses.
- Review design alternates.
- Review traffic control alternates.
- Review the adequacy of alternate routes (e.g., geometrics, capacity, safety, structural integrity).
- Review onsite and off-site traffic operational improvements (e.g., signal improvements, parking restrictions).
- Review construction phasing and scheduling alternatives.
- Determine cost and cost-effectiveness of various options and improvements.
- Coordinate with local officials and businesses.
- Coordinate funding and timing with other projects within the corridor.
- Coordinate the design with other projects and TMP plans in the region.
- Review design and TMP changes made by the designer to ensure they meet the TMP objectives.
- Review proposed changes made by the contractor or project engineer during construction.
- Evaluate and prepare a report on the successes and failures of the TMP after construction.

IPMA, Design and Project Management Division (Ward Based Teams)

The Design and Project Management Division (Ward Based Teams) will ensure:

i. Proper consideration of work zone safety and mobility impacts during planning by providing:
   a. Preliminary identification of work zone impacts and consideration of these impacts in choosing the preferred alternative.
   b. Potential work zone-impact management strategies.
   c. Project budget that reflects the expected efforts for developing and implementing the TMP.

ii. The proper design and presentation of all aspects of the Transportation Management Plan. Responsibilities include:
   a. Coordinate development of the TMP, including organizing TMP team meetings, managing TMP documentation efforts, and ensuring compliance with DDOT work zone policies and guidelines.
   b. Develop Temporary Traffic Control Plans (TCPs).
   c. Develop a consultant scope of work (as needed) that reflects efforts to develop a TMP.
   d. Provide input to the TMP in areas of expertise, such as bridge or highway design-related construction staging options.

iii. The project can be constructed according to the plans. Responsibilities include:
   a. Play an integral part in project development and on the TMP Team.
   b. Provide input and/or reviewing each project regarding:
      - Access to the work area and storage for construction equipment and materials.
      - Time frame for completion of construction
      - Sequence of construction.
      - Innovative, accelerated or unusual construction methods.
      - Constructability.

iv. The safe movement of traffic through the project's work zone by:
   a. Providing input on work zone design and operation, including lane widths, number of required through and turning lanes, traffic volumes and truck percentages, available detour routes, time restrictions, temporary reduced speed limits, and access requirements.
   b. Providing traffic input/support/review/comment on all TMP Team activities, identifying significant projects and developing the transportation management plan.
   c. Coordinating with Public Information Officers to provide necessary information for the public information and outreach efforts on a project.
   d. Ensuring all proposed lane closures comply with DDOT standards and specifications for highways and structures and delay/ queue threshold analysis.
   e. Coordinating and monitoring all projects that may affect traffic flow on state roadways within the District or neighboring districts.
   f. Reviewing and getting approval of the Chief Engineer for any modifications to the TCP/TMP during construction.

v. Inspection of work zones.

vi. Adequate monitoring of TMP for both oversight and evaluation purposes.
vii. Complete Post-Project TMP evaluation.
viii. Process review every two years.

IPMA, Office of Safety Standards and Quality Control Division (SSQCD)

The Office of Safety Standards and Quality Control Division (SSQCD) is responsible for setting work zone policies and guidelines, identifying and communicating issues related to the condition, design and usage of temporary traffic control devices, as well as the set-up, maintenance, general appearance and functionality of work zones. SSQCD will ensure the proper design and presentation of all aspects of the Transportation Management Plan by:

- Providing accident history.
- Support and guidance for major projects, as requested.
- Input to TMP Team, when requested.
- Guidance on work zone analysis procedures.

TOA, Transportation Operations Division (TOD)

Transportation Operations Division (TOD) will ensure the safe movement of traffic through the project's work zone by:

- Providing guidance on work zone ITS, signal retiming if appropriate.
- Providing input, review, comment, and approval on the ITS elements (if applicable) of Temporary Traffic Control Plans.

TPPA, Plan Review and Compliance Division (PRCD)

Plan Review and Compliance Division (PRCD) will be responsible for reviewing the TMP at all stages and ensuring it is compliant with all related standards, ordinances and other appropriate legislation. In addition, PRCD will also be involved in TMP monitoring and Post-Project evaluation.

Office of Director (PI)

The Office of Director, PI section will ensure that the proper information is communicated to the appropriate individuals, emergency and public safety departments, businesses and organization by providing:

- Need for and type of public information campaigns.
- Process for disseminating incident management information.
- Need and types of public meetings to inform the public on various aspects of the construction project.
- Review and comment on the Public Information and Outreach component of the TMP.

In addition, the PI section will also be involved in TMP monitoring and Post-Project evaluation.

Project Manager/Construction Project Engineer

The Project Manager (PM)/ Construction Project Engineer (PE) will assess and manage

projects during construction to ensure appropriate action is taken to reduce work zone impacts. Responsibilities of the PM/PE are to:

- Implement the TMP and other safety and mobility aspects of the project.
- Verify all contractor personnel are trained in traffic control to a level commensurate with their responsibilities.
- Work with the contractor to ensure lane closures are as planned.
- Ensure work zones are neat, orderly and effective for the safety of highway workers and motorists.
- Perform quality control and assurance of work zone to promote consistency and ensure compliance with contract documents, policies and guidelines.
- Recommend traffic control improvements to address field conditions pertaining to traffic flow, visibility and worker and motorist safety.
- Provide the Office of Communications with updates on all major project changes (traffic shifts, closures, etc.).

Contractor

Contractor responsibilities include:

- Designate a trained person at the project level (most likely the Traffic Safety Officer) who has the primary responsibility, with sufficient authority, for implementing the TMP and other safety and mobility aspects of the project.
- Submit lane-closure requests and reporting active lane closures with supporting information.
- Ensure work zones are neat, orderly and effective for the safety of highway workers and motorists.
- Perform quality control of work zone to promote consistence and ensure compliance with contract documents, policies and guidelines.
- Recommend traffic control improvements to the project engineer to address field conditions pertaining to traffic flow, visibility and worker and motorist safety.
- Collect data as required by DDOT for TMP evaluation.

Law Enforcement

Law enforcement responsibilities are to:

- Provide active and passive enforcement of law, as requested and needed, to promote safety and mobility in the work zone.
- Be knowledgeable of work zone components and operations
- Identify unsafe conditions.
- Take appropriate measures to clear work zone incidents as quickly as possible.
- Document work zone incidents.

TTC Inspectors

Temporary Traffic Control (TTC) Inspectors responsibilities include:

- Inspect designated work zones (either by random assessment or as determined by the Project Engineer).

- Take appropriate measures to identify and facilitate the correction of work zone deficiencies.
- Be knowledgeable of work zone standards, specifications, and policies.
- Coordinate inspections and follow-up issues with appropriate DDOT staff and contractors.
- Participate in bi-monthly meetings and semi-annual group inspections to review and communicate inspection issues and experiences to other inspectors, for the purpose of developing and encouraging statewide uniformity of inspection ratings.
- Compile inspection report results on a quarterly basis and submitting them to IPMA for inclusion in DDOT's Key assessments.

Approval Contacts

The DDOT Chief Engineer is responsible for the final approval of TMP. Provide representatives from other offices the opportunity to review and comment on the document. The PE and TE will be responsible for making sure these comments have been sufficiently addressed before approving the TMP.

Appendix H

Definitions

Significant Project – Generally speaking, a significant project is one that, alone or in combination with other concurrent projects nearby, is anticipated to cause sustained work zone impacts greater than what is considered tolerable.

Transportation Management Plan (TMP) – A Transportation Management Plan details work zone impact management strategies and how they will be implemented. For all projects, the Rule requires that the TMP include a Temporary Traffic Control (TTC) plan that addresses traffic safety and control through the work zone. If a project is expected to be *significant*, then the TMP for that project must also contain both transportation operations and public information components. These elements are integrated into a single document that demonstrates an understanding of site specific issues and project requirements.

Temporary Traffic Control Plan (TTC)/Traffic Control Plan (TCP) – A TCP is a plan that addresses traffic safety and control through the work zone. The TCP will follow DDOT and Federal Standards and Guidance for layout and placement of traffic control devices, signs, and related equipment for the project. The degree of detail in the TCP will depend on the project complexity and traffic interface with the construction activity.

Transportation Operations (TO) Strategies – The TO component of a TMP consists of strategies that address sustained operations and management of the work zone impact area. This component my include travel demand management strategies, traffic signal timing changes, ITS strategies, safety strategies, enforcement strategies, etc. These strategies are incorporated in the TCP and in the contract documents.

Public Information and Outreach (PI&O) Strategies – The PI&O component of a TMP consists of strategies that address communication with the public and concerned stakeholders, before and during the project. This component may include public awareness strategies and motorist information strategies, such as brochures, websites, radio, VMS messages, pre-trip and in-route information, etc.

Maintenance of Traffic Alternative Analysis (MOTAA) – The intent of a MOTAA is to identify and compare benefits as well as potential functional faults of work zone alternatives. The analysis is performed for each detailed design alternative. It should address the benefits and problems of work zone options and include the design team's recommendation on the preferred type of MOT for each detailed design alternative.

Reconstruction Project – Any project to remove/replace deck or pavement (and is usually done behind jersey barrier including rush hour periods).