

Maryland State Highway Administration

**TRANSPORTATION MANAGEMENT PLANS:
GUIDELINES FOR DEVELOPMENT,
IMPLEMENTATION AND EVALUATION**



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APPENDIX A - MOT Red Flag Summary

<http://www.roads.maryland.gov/OOTS/07MOTRedFlagSummary.pdf>

APPENDIX B - Guidance on Identifying Significant Projects

<http://www.roads.maryland.gov/OOTS/03GuidanceonIdentifyingSignificantProjectsRev5.pdf>

APPENDIX C - Traffic Management Plan Approval Form

http://www.roads.maryland.gov/OOTS/SHA_TMP_Approval_Form.pdf

APPENDIX D - Guidance on Work Zone Analysis

https://www.roads.maryland.gov/OOTS/WorkZoneAnalysisGuide_Sept08.pdf

APPENDIX E - Work Zone Design Checklist

<http://www.sha.maryland.gov/OOTS/08WZ%20DesignChecklist.pdf>

APPENDIX F - Summary of Work Zone Impact Management Strategies

<http://www.roads.maryland.gov/OOTS/09SummaryofWorkZoneManagementStrategies.pdf>

APPENDIX G - FHWA Work Zone Management Strategies Matrix

<http://www.roads.maryland.gov/OOTS/10FHWAStrategyMatrix.pdf>

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<http://www.roads.maryland.gov/OOTS/11PIOforTMPRev1.pdf>

APPENDIX I - Incident Management Brochure (Under Development)

1. INTRODUCTION

1.1. PURPOSE

For all roadway projects, attention must be given to traffic control from the early stages of development through the completion of construction. Work zone impacts and issues vary; therefore, it is important to develop project specific transportation management plans (TMPs) that best serve the mobility and safety needs of the road users, highway workers, businesses and the community.

Traditionally, traffic control plans (TCPs) have been developed for every project. For a new class of projects called “significant projects”, TMPs must be developed. The major difference between a TMP and a TCP is that the TCP focuses on the maintenance and protection of traffic within the work zone; the TMP addresses project-related impacts throughout the project corridor and sometimes beyond. The TMP will include the TCP, as well as transportation operations and public information and outreach strategies. A TMP will:

- Address alternative traffic control applications, the cost effectiveness of those alternatives and recommend a proposed **traffic control plan** that accommodates project and site specific considerations.
- Evaluate work zone impacts and develop strategies to mitigate those impacts through the use of improved **transportation operations** and management of the transportation system.
- Include strategies to communicate with the public and concerned stakeholders, before and during the project through the development of a **public information and outreach** plan.

The scope, content, and level of detail of a TMP may vary based on the anticipated work zone impacts.

1.2. SCOPE

These procedures shall be implemented on all federal and non-federal aid construction and maintenance projects anticipated to have significant work zone impacts, known as significant projects. They should also be implemented on non-significant construction and maintenance projects and utility operations to the extent practical and feasible. Generally, for maintenance and utility operations, the provisions in the Book of Standards will be sufficient. However, there may be times when the concepts presented in these guidelines will be appropriate to include during the development of non-significant projects.

1.3. TARGET AUDIENCE

The purpose of these guidelines is to provide information and guidance to SHA staff, consultants and contractors who are involved in the planning, design, construction and

maintenance of SHA facilities on how to develop, implement and evaluate Transportation Management Plans.

1.4. STANDARDS AND REFERENCES

The following standards shall be used when developing TMPs:

<u>Author/Agency</u>	<u>Title</u>
MdSHA	Work Zone Lane Closure Analysis Guidelines
MdSHA	Temporary Traffic Barrier Policy (Dated January 6, 2006)
MdSHA	Guidelines for the Deployment of the Late Lane Merge Concept (Dated March 8, 2006)
MdSHA	Flagger Policy at Signalized Intersections
MdSHA	Functional Guidelines for Portable Changeable Message Signs
MdSHA	Memorandum on Bicycle and Pedestrian Access through Work Zones (dated June 2002)
MdSHA	Book of Standards for Highways and Incidental Structures
MdSHA	Standard Sign Book
MdSHA	Standard Specifications for Construction and Materials
MdSHA	Interagency Work Zone Service Agreement between SHA and Maryland State Police, including <ul style="list-style-type: none">• Maryland State Police Criteria for Use in Work Zones• Standard Operating Procedures for Requesting Maryland State Police in Work Zones
MdSHA	Maryland Manual on Uniform Traffic Control Devices (Maryland MUTCD)
AASHTO	Roadside Design Guide
AASHTO	A Policy on Geometric Design of Highways and Streets
ADA	American's with Disabilities Act Accessibility Guidelines

The following references may be used when developing TMPs:

<u>Author/Agency</u>	<u>Title</u>
MdSHA	Work Zone Safety Toolbox
MdSHA	Office of Planning and Preliminary Engineering's (OPPE) Project Planning Manual
MdSHA	Office of Highway Development's (OHD) Major Highway Project Development Process Manual

MdSHA	Office of Bridge Development's (OBD) Project Management Steps for Bridge Lead Projects
MdSHA	Traffic Development and Support Division's (TDSD) Candidate Safety Improvement Locations (CSIL) List
MdSHA	Highway Construction Cost Estimating Manual
MdSHA	Highway Location Reference

1.5. TERMINOLOGY AND CONCEPTS

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 that are greater than what is considered tolerable. Refer to “Guidance on Identifying Significant Projects” for a more detailed definition.

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. It serves as the basis for scoping the project's work zone design and Transportation Management Plan. Conformance to the thresholds in the Work Zone Lane Closure Analysis Guidelines is reviewed. 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. Refer to “Guidance on Maintenance of Traffic Alternative Analysis” for information on how to perform a MOTAA.

Transportation Management Plan (TMP) – A transportation management plan details work zone impact management strategies and how they will be implemented. Minimally, it is comprised of the Traffic Control Plan (TCP), Transportation Operations (TO) strategies and Public Information and Outreach (PI&O) strategies. These elements are integrated into a single document that demonstrates an understanding of site specific issues and project requirements. A TMP shall make provision for updates and revisions throughout the project lifecycle to address issues as they occur.

Traffic Control Plan (TCP) – A TCP is a plan that addresses traffic safety and control through the work zone. The TCP will follow SHA and Federal Standards and Guidance for the layout and placement of traffic control devices, signs, and related equipment for the project. The scope may range from a very detailed TCP designed solely for a specific project, to a reference of a Typical Temporary Traffic Application from the Book of Standards. It may be a combination of text and drawings that define specifically what traffic control measures will be provided for the project, how they will be implemented, and on what schedule. 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 may 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.

Public Information and Outreach (PI&O) Plan – A PI&O Plan identifies actions and procedures based on identified PI&O strategies to inform the traveling public and project stakeholders of current traffic operations and planned changes to traffic operations. A PI&O plan shall be modified throughout the project life cycle to address issues as they arise.

Incident Management Plan – An incident management plan is intended to address unplanned events or incidents for large, complex projects to ensure incident response operations within the work site are managed effectively. It identifies priorities and procedures for detection and response to incidents with the goal of safeguarding the public and restoring traffic flow as quickly as possible. The plan should define a process of regular review and analysis to identify actions that will reduce incident frequency and severity.

2. PROCESS FOR TMP DEVELOPMENT, IMPLEMENTATION, AND ASSESSMENT

This section provides guidance on how and where a transportation management plan (TMP) fits into the processes and procedures that are part of the typical project delivery process. TMP development should begin during systems planning and progress through the design phase of a project. Existing project development activities/events can provide valuable information to guide TMP development. For example, the National Environmental Policy Act (NEPA) processes during project planning may be a key source of inputs and constraints for the project.

It is important to note that the TMP development process is iterative and evolves through project design and implementation. As the TMP evolves, it is important to reassess the management strategies to confirm that the work zone impacts are addressed and the necessary funding is available. The TMP may be reevaluated and revised prior to and during implementation and monitoring.

2.1. TMP DEVELOPMENT DURING PLANNING, PRELIMINARY INVESTIGATION AND DESIGN

A major consideration in developing and implementing a TMP is its interaction with the planning, design, construction and funding phases of a project. The earlier in the process TMP components can be specified and associated costs can be estimated, the better, for two reasons:

- Some TMP elements require extended lead times (in some cases, even longer than the actual project) and should be identified early; and
- Having TMP elements identified as an integral component of the total project is very helpful in the overall budgeting and approval processes.

Although a full TMP document is not developed until design, conducting some TMP analyses during system planning and preliminary engineering will help ensure that the TMP development and implementation costs are included in the project budget. At an early stage in project development, more alternatives for addressing work zone impacts are available, so a broader range of strategies can be chosen. Work zone impacts can be considered during the evaluation and selection of design alternatives. For some projects, it may be possible to choose a design alternative that alleviates many work zone impacts. This is why significant projects are initially identified during the scoping phase, and a Maintenance of Traffic Alternative Analysis (MOTAA) is conducted during planning and/or preliminary investigation. Early TMP development will also help with scheduling and coordinating projects to minimize the cumulative work zone impacts of multiple projects along a corridor or in a region.

The steps towards TMP development that occur during planning, preliminary engineering, and design are described in this section.

Step 1 – Create TMP Team

A well balanced TMP team consisting of a variety of disciplines and stakeholders is important for developing a successful TMP. It is essential that personnel from all Offices and the District(s) be involved to provide their specialty input. The team composition may vary from project to project. The Project Engineer will assess the needs of the project and determine the team’s composition. For example, CHART may not need to be involved until the project reaches design. Members of the team may be responsible for developing components of the TMP, providing input to designers, and/or reviewing the TMP. The TMP Team should include at a minimum representatives from the following:

<u>Projects in Planning</u>	<u>Projects in Design</u>
<ul style="list-style-type: none"> • Office of Planning and Preliminary Engineering (lead) • District Traffic (ADE-T) • Office of Construction • District Construction • Highway Design Division (as needed) • Bridge Design Division (as needed) • Office of Traffic and Safety (as needed) • Other Stakeholders (as needed) 	<ul style="list-style-type: none"> • Office of Highway Development (lead on OHD projects) • Office of Bridge Development (lead on OBD projects) • District Traffic (ADE-T) • Office of Construction • District Construction • Office of CHART • Office of Communications • Office of Planning and Preliminary Engineering (liaison from project planning) • Office of Traffic and Safety • Other Stakeholders (as needed)

Ideally, members from each of these offices will already be on the project team and involved in the project development. Team members can attend meetings on an as needed basis if the meeting topic does not pertain to their expertise. However, they are encouraged to attend all meetings if possible to provide input on issues that may otherwise be overlooked.

For some projects, it may suffice to have one TMP Team to develop, provide expert input, and review the TMP. For other more complex projects, it might be beneficial to develop more than one TMP Team with differing roles and responsibilities. It is up to the Project Engineer to decide what will work best for each project.

TMP Coordinator – Identify the contact/coordination person for developing the TMP. Typically, the project engineer will function in this position or designate a staff member to function in this role. For projects that originate in OPPE, a new TMP team and coordinator should be developed when the project moves to the design office (refer to Step 7).

If a Consultant is used to develop or review the any part of the TMP process, roles and responsibilities of SHA and the Consultant should be stated in the Consultant’s scope of work.

Create TMP Team	For projects originating in...		
	OPPE	OHD	OBD
<i>Who is responsible?</i>	The Project Manager	The Project Engineer	The Project Engineer
<i>When should it be completed?</i>	Concurrently with A/E #105, Organize Project Team and Initiate Partnering Activities	Concurrently with A/E #10020, Assemble Project Team/Initiate Design	During the Information Gathering Stage

Step 2 – Compile Project Material

Persons on the TMP Team responsible for each stage of the project (planning, preliminary engineering, design, construction) compile available project materials, such as:

- Project scope & limits
- Roadway and traffic characteristics
- Local community issues
- Existing or required data, such as mapping, traffic data, accident data, environmental maps, cultural resources, right-of-way maps
- Preliminary public involvement strategy

Much of this data will have already been gathered for, or prior to, the Project Scoping meeting or Purpose and Need Statement.

Step 3 – Maintenance of Traffic Red Flag Summary

The goal of the Maintenance of Traffic (MOT) Red Flag Summary is to identify any existing barriers that may affect safety and mobility during construction or that may pose significant construction issues. Red flags are meant to identify locations that may entail additional study coordination; creative management, design or construction approaches; or increased right-of-way or construction costs. Identifying any major construction issues at this stage is important so that costly and complex conflicts can be avoided, or at a minimum identified, during the development of preliminary alternates. Uncovering problem areas prior to developing engineering alternates may help reduce project costs and eliminate project delays. The summary includes a checklist of possible issues as well as an area for comments regarding potential work zone impacts. Refer to Appendix A for the MOT Red Flag Summary.

MOT Red Flag Summary	For projects originating in...		
	OPPE	OHD*	OBD*
<i>Who is responsible?</i>	The Project Manager, in consultation with the TMP Team and appropriate representatives from other offices	The Project Engineer, in consultation with the TMP Team and appropriate representatives from other offices	The Project Engineer, in consultation with the TMP Team and appropriate representatives from other offices
<i>When should it be completed?</i>	Concurrently with A/E #155, Preliminary Engineering Assessment	Concurrently with A/E #10100, Request Preliminary Information	During the Information Gathering Stage
<i>Documentation</i>	Retain MOT Red Flag Summary Form in project files (hard copy and electronic).		
	Present Red Flags at the Scoping meeting and include in meeting minutes.	Present Red Flags at next Team Meeting and include in meeting minutes.	Present Red Flags at next Team Meeting and include in meeting minutes.

* For OHD and OBD projects that originated in OPPE, the OHD or OBD Project Engineer should request a copy of the MOT Red Flag Summary from the OPPE Project Manager.

Step 4 – Identify Significant Projects

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. As such, FHWA requires the identification of significant projects (projects that are likely to have a significant impact on safety and/or mobility). Immediately following the completion of the MOT Red Flag Summary, anticipated work zone impacts should be assessed to determine if the project may be a “Significant Project”. Refer to Appendix B for guidance on identifying significant projects.

If the project is considered a significant project, funding should be included in the next revision of the CTP estimate for development and implementation of a Transportation Management Plan (TMP).

Significant Project Identification	For projects originating in...		
	OPPE	OHD*	OBD*
<i>Who is responsible?</i>	The Project Manager, in consultation with the TMP Team and appropriate representatives from other offices	The Project Engineer, in consultation with the TMP Team and appropriate representatives from other offices	The Project Engineer, in consultation with the TMP Team and appropriate representatives from other offices
<i>When should it be completed?</i>	Immediately following completion of Red Flag Summary		
	Concurrently with A/E #155, Preliminary Engineering Assessment	Concurrently with A/E #10100, Request Preliminary Information	During the Information Gathering Stage
<i>Documentation</i>	Document finding of “Significant Project” or “Not a Significant Project” in project files (hard copy and electronic).		
	Present finding of the project as Significant or Not Significant at the Scoping meeting and include in meeting minutes.	Present finding of the project as Significant or Not Significant at the next Team Meeting and include in meeting minutes.	Present finding of the project as Significant or Not Significant at the next Team Meeting and include in meeting minutes.

* For OHD and OBD projects that originated in OPPE, the OHD or OBD Project Engineer should request the Significant Project status from the OPPE Project Manager.

Step 5 – Maintenance of Traffic Alternative Analysis

For projects identified as potentially having significant work zone impacts on safety and mobility (i.e., “Significant Projects”), a Maintenance of Traffic Alternative Analysis (MOTAA) should be performed for each detailed design alternative. The intent of the MOTAA is to identify and compare benefits as well as potential function faults of work zone options for each design alternative. It is not the intent of the MOTAA to require a detailed design of each design alternative’s work zone. The MOTAA may be a factor in choosing the preferred design alternative and will serve as the basis for scoping the project’s work zone design and Transportation Management Plan.

The Project Manager and/or Consultant Project Manager should arrange a meeting with the TMP Team to obtain project information and help identify potential issues or concerns. The TMP Team for the MOTAA should include the ADE-T, ADE-C, design team representatives and other relevant technical specialists (such as right-of-way experts, pavement engineers, environmental specialists, etc.). This collaboration helps to develop the best combination of design, construction phasing/staging, and work zone management strategies.

At the meeting, the following information should be discussed:

- Potential construction phasing/staging approaches and plans.
- Preliminary work zone management strategies, including potential public information and outreach strategies.
- 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.

Developing and evaluating the best alternative combination of construction phasing/staging, project design options, temporary traffic control, transportation operations strategies and public information and outreach strategies hand-in-hand with each other may help reduce work zone impacts, and will yield a more comprehensive TMP.

The alternatives analysis should compare work zone options, including staging/phasing options as well as temporary traffic control options, for each project design alternate and document maintenance of traffic constraints for each option. Conformance to the thresholds in the Work Zone Lane Closure Analysis Guidelines should also be reviewed as part of the MOTAA. The analysis should address the benefits and problems for each option, and should include the design team’s recommendation on the preferred type of MOT for each detailed design alternative. Before a final recommendation is made, the TMP Team and appropriate representatives from other offices should have the opportunity to review and comment on the MOTAA.

Refer to “Guidance on Maintenance of Traffic Alternative Analyses” for more details on performing a MOTAA. For projects in OPPE, the MOTAA may be limited to a more conceptual analysis, including big picture items such as constructability, environmental impacts, and right-of-way impacts. When the project moves to the design stages, a more detailed MOTAA for the chosen alternative may be required.

MOTAA	For projects originating in...		
	OPPE	OHD*	OBD*
<i>Who is responsible? **</i>	The Project Manager, in consultation with the TMP Team and appropriate representatives from other offices	The Project Engineer, in consultation with the TMP Team and appropriate representatives from other offices	The Project Engineer, in consultation with the TMP Team and appropriate representatives from other offices
<i>When should it be completed?</i>	Prior to the selection of the preferred design alternative.		
	Concurrently with A/E #265, Develop Detailed Alternatives	Concurrently with A/E #10180, Preliminary District Traffic/OOTS Coordination	During the Information Gathering Stage
<i>Documentation</i>	A report documenting the MOTAA and preferred work zone option should be retained in the project file (hard copy and electronic).		

* For OHD and OBD projects that originated in OPPE and were classified as Significant Projects by OPPE, the OHD or OBD Project Engineer should request the MOTAA and preferred work zone option from the OPPE Project Manager. The Significant Project status and preferred work zone option should be reviewed at this stage.

** If a consultant is used to perform the MOTAA, the persons listed shall be responsible for reviewing the document.

After the preferred design alternative is selected, the preferred MOT option for that design alternative should be chosen based on the results of the MOTAA. The project's significant project status should be reviewed at this time. It is possible that through the MOTAA process, work zone impacts were minimized or eliminated, allowing the project to no longer be classified as a significant project.

Step 6 – Determine TMP Needs

After reviewing the significant project status, if the chosen design alternative and work zone option will still have significant work zone impacts, a Transportation Management Plan (TMP) is required. For all significant projects, the TMP must consist of the Traffic Control Plan, as well as Transportation Operations (TO) and Public Information and Outreach (PI&O) Strategies. The extent to which TO and PI&O strategies are used should be comparable to the level of work zone impacts.

CTP Estimate – To be successful, a TMP must be supported with sufficient resources. If a TMP is required, and funds have not already been included for a TMP in the CTP estimate, now is the time to do so. The design budget should be increased to reflect efforts required to develop the TMP. Similarly, the construction budget should be increased to reflect efforts required to implement the TMP. If a consultant will be performing efforts to develop the TMP, the consultant scope of work and budget should reflect these efforts. Refer to the most recent SHA Highway Construction Cost Estimating Manual.

Public information and outreach (PI&O) should be a significant consideration when developing design and construction budgets. While they can be expensive, experience has shown that benefits of a public information and outreach campaign are likely to outweigh the costs. The Office of Communications will provide insight into the size and nature of the anticipated PI&O efforts, as well as anticipated costs for development and implementation of the PI&O campaign.

Corridor/Regional TMP – When multiple or consecutive projects are within the same general corridor, the cumulative impact can result in excessive traffic delays and detour conflicts. These may be multiple capital projects, the involvement of more than one district, or a combination of capital projects and/or maintenance activities. Corridor or regional coordination will minimize or eliminate these impacts and reduce inconvenience to the traveling public.

When multiple projects are in the same corridor or on corridors within the same traffic area, it may be possible to develop a single corridor or regional TMP. In other cases, individual TMPs can be developed and funded from their own sources and a bare-bones corridor or regional TMP is developed to address the cumulative impact. Each project covered by corridor and regional TMP contributes resources in proportion to its traffic impact.

The corridor/regional TMP may need elements in addition to those provided by the individual TMP for each project. Those elements may include changeable message signs at key locations outside individual project limits, the establishment of an information hot line and web-sites for all projects involved.

Step 7 – Identify Stakeholders and Revise TMP Team

The TMP Team may include other stakeholders based on project needs. Developing a list of stakeholders is dependent on the type of construction, extent of construction, length of work zone, and duration of construction. The work zone's geography, and business and residential environment should also be considered.

Before the design process begins, the TMP team should be revised to include appropriate stakeholders. Stakeholders should be identified and coordinated with throughout the design and construction process, and added to the team as required. Stakeholders provide input for the project by identifying project elements, events, or mobility concerns that should be evaluated in the TMP. The stakeholders may include:

- FHWA
- SHA's Pedestrian/Bicycle Coordinator
- Maryland Highway Contractors Association (MHCA)
- Regional and/or Metropolitan Planning Organizations
- Public Transportation Providers (MTA)
- Other State Transportation Agencies (MdTA, MVA, MPA, MAA)
- City and/or County Public Works/Traffic Engineering Departments
- Railroad Agencies/Operators
- Freight Operators
- State Automobile Associations (AAA)
- Utility Providers
- Local Government
- State Police (and other emergency service providers as deemed necessary)
- Business Representatives
- School Representatives
- Community Groups
- Citizen's Interest Groups
- Others as deemed necessary

Additionally, if the project originated in OPPE, the TMP team should be re-developed to include the participants in the design projects. Identify the design stage TMP Coordinator and Task Leaders.

TMP Coordinator – Identify the contact and coordination person for developing the TMP. Typically, the project engineer will function in this position or designate a staff member to function in this role.

TMP Task Leaders – It may be useful to designate persons to be in charge of development or review of particular sections of the TMP. For example, different persons may be responsible for review of the TCP, traffic management strategies, and public information portions of the TMP.

Consultant Involvement – If there is not already a consultant onboard to develop the TMP or help with particular elements of the TMP, now is the time to identify consultant needs and get a consultant on board if required.

Step 8 – Preliminary Design (DRAFT TMP)

During this stage, three important factors affect the TMP:

- The project is getting better defined
- Environmental mitigation elements (which usually include traffic) are being explored
- There is increased interaction with the local jurisdictions and communities as part of the environmental process.

This then becomes an ideal time to refine the TMP elements that were initially identified in the MOTAA. This is particularly important for elements requiring long lead times that need to be established prior to the start of construction, such as consultant contracts for a public information and outreach campaign, and alternate route and other improvements requiring completion prior to construction. If the design has changed since the MOTAA, additional analysis should be performed to address these changes.

The TMP Team should work with technical specialists, including construction, traffic, engineering, and public information officers to jointly identify/confirm the work zone impacts issues that need to be accounted for and the proposed work zone impact management strategies. This may be a good time to invite additional stakeholders to join the TMP Team.

When developing construction phasing and staging plans, the designers should consult and appropriately involve safety experts, traffic engineers, and other technical specialist as construction phasing and staging can greatly affect the safety and mobility of the work zone. Construction equipment and material access to the site, storage, and staging areas should be addressed at this time, as well as potential infrastructure improvements to accommodate future projects.

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

- Project summary
- Anticipated work zone impacts
- Stakeholders and others impacted by the project
- Goals and objectives of the TMP
- SHA and local agency projects in the vicinity that will require coordination

- Narrative of the recommended construction phasing/staging strategies
- Preliminary TCP with proposed construction phasing/staging
- Traffic analysis and results
- Proposed work zone impact management strategies with expected costs

Draft TMP	OHD	OBD
<i>Who is responsible?*</i>	The TMP Coordinator (PE), in consultation with the project team, ADE-T, ADE-C, Public Information Officer, and appropriate representatives from other offices	The TMP Coordinator (PE), in consultation with the project team, ADE-T, ADE-C, Public Information Officer, and appropriate representatives from other offices
<i>When should it be completed?</i>	Concurrently with A/E #10460, Preliminary TCP Design	Concurrently with Preliminary Investigation (or TS&L Review) Stage
<i>Documentation</i>	<ul style="list-style-type: none"> • Concept Traffic Control Plans • Draft TMP report containing TO and PI&O Strategies • TMP cost estimate 	

* If a consultant is used to develop the TMP, the persons listed shall be responsible for reviewing the document.

Step 9 – Detailed Design (Final TMP)

During this stage, the TMP is finalized and detailed plans, specs and estimates are developed. It is the designer’s responsibility to implement the recommendations set forth in the Draft TMP document. The designer may be required to collect additional data and conduct additional analysis, as necessary, to reflect any changes in the project design. The TMP team should be consulted when design and TCP decisions dictate a revision to the Draft TMP work zone impact mitigation strategies.

Pay items to be included in the PS&E must be determined during design. By Semi-final design at the latest, a detailed estimate for implementing elements of the TMP should be developed. Individual projects may have varying pay items depending on size, complexity and location. Work zone impact management strategies should be shown on the plans where applicable. Special provisions for non-standard items should also be developed at this time.

On some projects, such as design-build projects, it may be appropriate to provide broad TMP parameters in the bid book, and allow the successful bidder to develop a detailed TCP and TMP, subject to the approval of SHA.

TMP submittals shall follow each office’s standard timeline for submittal and review of the TCP. The ADE-T will have final approval of the TCP and transportation operations elements of the TMP. Refer to Appendix C for a copy of the TMP Approval Form. The PR Manager (or Media Manager) will have final approval of the PI&O elements. However, appropriate offices should be given the opportunity to review elements of the TMP that relate

to their expertise. The ADE-T and PR Manager will be responsible for verifying that all comments related to their respective disciplines have been addressed sufficiently.

Final TMP		OHD	OBD
<i>Who is responsible?*</i>		The TMP Coordinator (PE), in consultation with the project team, ADE-T, ADE-C, Public Information Officer, and appropriate representatives from other offices	The TMP Coordinator (PE), in consultation with the project team, ADE-T, ADE-C, Public Information Officer, and appropriate representatives from other offices
<i>When should it be completed?</i>	<i>Semi-final Draft TMP</i>	Concurrently with A/E #10840, Secondary Design Activities for Semi-Final Review (Finalize Traffic Control Plan Phases and Detail Plan)	Intermediate submission of TMP for review upon the request of OHD.
	<i>Final TMP</i>	Concurrently with A/E #11060, Prepare Design for Final Review (Request Final TCP Approval)	Concurrently with the Traffic Control Plan Review Stage (or at Final Review Stage if there is not a separate TCP review)
<i>Who will approve?</i>		ADE-T approves TCP and TO elements; PR Manager approves PI&O elements; other offices should review and provide comments as required	ADE-T approves TCP and TO elements; PR Manager approves PI&O elements; other offices should review and provide comments as required
<i>Documentation</i>		<ul style="list-style-type: none"> • Traffic Control Plans • Signed TMP Approval Plan • Final TMP report (refer to Section 4 - TMP Documentation) 	<ul style="list-style-type: none"> • TMP elements included in plans, specifications, and estimates • Comments appropriately documented and addressed (final review letter/report)

2.2. TMP IMPLEMENTATION, MONITORING AND REVISIONS DURING CONSTRUCTION

Step 10 – Implement TMP

The TMP will be implemented 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 SHA 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 SHA, this person will most likely be the construction Project Engineer (PE). For the Contractor, this person will most likely be the Traffic Manager. These persons are responsible for efficiently and appropriately implementing the TMP. They are also responsible for reviewing traffic operations throughout the project limits, including the condition of all traffic control devices, on a regular basis.

Step 11 – Monitor TMP

Monitoring the performance of the work zone and of the TMP during construction is important to see if the predicted impacts closely resemble the actual conditions in the field and if the strategies in the TMP are effectively managing the impacts. Monitoring a project is particularly important, for many reasons – traffic data is often stale, closures may be sloppy or non-conforming, and enforcement strategies may need to be modified for

unanticipated events. The TMP should be monitored for both oversight and evaluation purposes.

Monitoring for oversight includes:

- Determining how strategies are being implemented and verifying that specified TMP elements are happening on schedule and in the manner planned.
- Assuring that 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.
- Ensuring 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 if additional TMP elements are needed or if particular elements need refinement.

Any special requirements for TMP monitoring and assessment, such as the use of work zone ITS, should be written into the TMP during TMP development and included in the Contract Documents.

Step 12 – Update/Revise TMP

Review and modification of construction alternatives and traffic plans may occur before and during the course of minor and major projects. Usually the two interact, as when unexpected traffic volumes make night work necessary or weather changes cure times or any of many other situational variables change. It is at this stage that cooperation among all involved becomes important, and safety and cost considerations get hammered out in daily actions.

The SHA construction PE and Traffic Manager are responsible for maintaining current documentation regarding when deficiencies were noted in the implementation of the TMP and how and when they were corrected. Any major changes or notable items should be identified at the monthly partnering meetings during construction. This information shall be provided 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 (see Step 13).

The Contractor shall submit all proposed TMP changes to the ADE-T (or the ADE-T's appointed designee) for review and approval. Changes may include:

- Changes to work activities that alter traffic control requirements
- Changes to scheduling of work activities
- Changes to project initiation or completion dates
- Changes to any work zone impact strategies

2.3. TMP PERFORMANCE ASSESSMENT

Step 13 – Evaluation

TMP evaluation should focus on the performance of both individual TMP strategies and overall performance of the TMP. Various measures of effectiveness and measuring techniques are appropriate to corridor and strategy evaluation.

The TMP should include reference 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 that were successfully implemented
- Changes made 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 implementation of the strategies
- Types of crashes that occurred during construction
- Suggested improvements or changes for similar future projects

2.4. ROLES AND RESPONSIBILITIES

The following guidance is provided to ensure that each project team member understands his/her expected contributions towards the overall consideration of work zone safety and mobility in the development, review or implementation of the TMP. Working together as a multi-disciplinary team, each team member's expertise can be drawn from 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. All team members should be provided the opportunity to review the Maintenance of Traffic Alternative Analysis and 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 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.

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

Office of Planning and Preliminary Engineering

The Office of Planning and Preliminary Engineering will ensure the proper consideration of work zone safety and mobility impacts during planning by providing the following:

- Preliminary identification of work zone impacts and consideration of these impacts in choosing the preferred alternative
- Potential work zone impact management strategies (through the MOTAA)
- A project budget that reflects the expected efforts for developing and implementing the TMP

Office of Highway Development and Office of Bridge Development

The Office of Highway Development and Office of Bridge Development will ensure the proper design and presentation of all aspects of the Transportation Management Plan. Responsibilities of the Design offices include:

- Review/identification of significant projects.
- Coordinating the development of the TMP, including organizing TMP team meetings, managing TMP documentation efforts, and ensuring compliance with SHA work zone policies and guidelines.
- Developing Temporary Traffic Control Plans (TCPs).
- Developing a consultant scope of work (as needed) that reflects efforts to develop a TMP.
- Providing input to the TMP in areas of expertise, such as bridge or highway design related construction staging options.

District Traffic

District Traffic will ensure the safe movement of traffic through the project's work zone by providing the following:

- Providing input to SHA staff 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.
- Providing traffic input/support/review/comment on all TMP Team Activities, including the Red Flag Summary, identification of significant projects, maintenance of traffic alternatives analysis, and development of the transportation management plan.
- Developing and approving the Transportation Operations (TO) strategies portion of the TMP.
- Providing input, review, comment and approval on Temporary Traffic Control Plans.
- Coordinating with Public Information Officers to provide necessary information for the public information and outreach efforts on a project.
- Ensuring that all proposed lane closures are compliant with the Work Zone Lane Closure Analysis Guidelines.
- Coordinating and monitoring all projects that may affect traffic flow on state roadways within the District or neighboring districts.
- Reviewing and getting approval of the District Engineer for any modifications to the TCP/TMP during construction.

Office of Construction/District Construction

The Office of Construction and District Construction will ensure that the project can be constructed according to the plans. Responsibilities of OOC and District Construction include:

- Playing an integral part in project development and on the TMP Team.
- Providing 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

Office of Communications

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

- Need for and type of public information campaigns
- Process for the dissemination of 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

Office of Traffic and Safety

The Office of Traffic and Safety (OOTS) 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. OOTS will ensure the proper design and presentation of all aspects of the Transportation Management Plan by providing the following:

- Temporary signals and lighting (TEDD)
- Provide accident history (MHSO)
- Support and guidance for major projects, as requested
- Input to TMP Team, when requested
- Guidance on work zone intelligent transportation systems
- Guidance on work zone analysis procedures (See Appendix D)

Office of CHART

The Office of CHART will ensure the proper information is communicated to the appropriate individuals and will assist in incident management by providing the following:

- Real-time information on the CHART website, highway message signs, and highway advisory radio
- Input and expertise on emergency response and incident management
- Emergency Traffic Patrols to provide emergency motorist assistance
- Emergency Response Units to set up traffic control at crash scenes
- Review and comment on the Incident Management component of the TMP
- Proposed and active lane closures on the CHART website.

Construction Project Engineer

The 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 PE include:

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

Contractor

Responsibilities of the contractor include:

- Designating a trained person at the project level (most likely the Traffic Manager) who has the primary responsibility, with sufficient authority, for implementing the TMP and other safety and mobility aspects of the project
- Submitting lane closure requests and reporting active lane closures as required.
- Ensuring work zones are neat, orderly and effective for the safety of highway workers and motorists
- Performing quality control of work zone to promote consistence and ensure compliance with contract documents, policies and guidelines
- Recommending traffic control improvements to the project engineer to address field conditions pertaining to traffic flow, visibility and worker and motorist safety

Law Enforcement

Responsibilities for law enforcement include:

- Providing active and passive enforcement of law, as requested and needed, to promote safety and mobility in the work zone
- Being knowledgeable of work zone components and operations
- Identifying unsafe conditions
- Taking appropriate measures to clear work zone incidents as quickly as possible
- Documenting work zone incidents

TTC Inspectors

Responsibilities of the Temporary Traffic Control (TTC) Inspectors include:

- Inspection of designated work zones (either by random assessment or as determined by the District Engineer).
- Taking appropriate measures to identify and facilitate the correction of work zone deficiencies.
- Being knowledgeable of work zone standards, specifications, and policies.
- Coordinating inspections and follow up issues with appropriate SHA staff and contractors.
- Participating 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.
- Compiling inspection results on a quarterly basis and submitting them to the OOTS for inclusion in SHA's Key Performance Area assessments.

In addition to the aforementioned roles and responsibilities for each office, persons should be designated for the following roles:

TMP Coordinator

The TMP Coordinator will be responsible for the overall development of the TMP. In general, the Project Engineer will function in this position or will appoint someone to be the TMP Coordinator. This person is responsible for the following:

- Organizing the TMP Team by inviting the appropriate persons to be a part of the Team and setting up meetings when necessary
- Designating Design Task Leaders to develop specific components of the TMP

- Reviewing the TMP document
- Ensuring that the proper items and specifications have been added to the contract documents.

Design Task Leaders

These are the persons responsible for designing specific components of the TMP. Consultants may function in this position, or the TMP Manager may delegate specific TMP tasks to persons with an expertise in that task area. A Design Task Leader should be designated to compile the sections of the TMP into one comprehensive document.

Approval Contacts

The Assistant District Engineer – Traffic (ADE-T) and PR Manager (or Media Manager) are responsible for the final approval of TMP. Representatives from other offices should be provided the opportunity to review and comment on the document. The ADE-T and PR Manager will be responsible for making sure these comments have been sufficiently addressed before approving the TMP.

3. DEVELOPING TMP STRATEGIES

3.1. WORK ZONE IMPACTS MANAGEMENT OVERVIEW

Roadwork can range from simple maintenance tasks to complex construction and rehabilitation activities. Given the variety and complexity of projects, the challenge is to develop a TMP with strategies suited to the scale of the work zone impacts. There are three major steps in the development of traffic management strategies:

- Identify the type of traffic control required for the work.
- Identify potential work zone impacts.
- Identify work zone impact management strategies.

Note that these steps are part of a cyclical process. As the project progresses through various developmental stages and as more project-specific information becomes available, the type of traffic control selected, work zone impacts and impact management strategies should be reviewed and revised as necessary. Also during this process, worker safety should be considered.

The Work Zone Design Checklist in Appendix E is a useful tool for developing traffic control options, identifying potential impacts, and selecting work zone impact management strategies.

3.1.1. Identify Type of Traffic Control

Selection of the appropriate work zone type represents one of the most significant elements of a traffic control strategy. Other elements of a traffic control strategy that should be considered include length of the work zone, time of work, number of lanes, lane width, traffic speeds and right-of-way. Considering these and other factors, reasonable alternates can be narrowed to a selected few for further review. Typically, only a small number of feasible work zone alternates will emerge for a particular project and, in many cases, only one may be practical. Identification of these alternates at an early stage in the planning process can significantly reduce the analysis effort necessary. Identifying the type of traffic control required for a project is fundamental to determining its work zone impacts.

As a work zone planner or designer, when identifying traffic control options, there are several questions to ask regarding the general work zone setup, project timing, available detour routes, and roadside safety. These questions are presented in the Work Zone Design Checklist in Appendix E.

3.1.2. Identify Work Zone Impacts

Based on the type of traffic control, the work zone impacts can be identified. The work zone impacts should be described in brief in the maintenance of traffic alternative analysis (MOTAA). Examples of potential impacts include traffic delays,

environmental impacts, increased construction duration, and restricted emergency vehicle access. By identifying work zone impacts early on, designs can be altered to minimize impacts or funding can be programmed for impact management strategies.

3.1.3. Identify Work Zone Impact Management Strategies

For a given work activity, the work zone impact management strategies will vary depending on anticipated impacts and issues, such as the time of day work is scheduled, roadway configuration and the number of lanes affected. For all significant projects, in addition to traffic control, transportation operations and public information and outreach strategies must be developed. Strategies should be reviewed and adjusted to meet each project location and situation.

3.1.4. Designing for Worker Safety

Worker safety should be appropriately considered and managed as part of the project development process. In general, the following process should be followed for the consideration of worker safety:

1. Consider the application of appropriate positive protective strategies to avoid or minimize worker exposure to motorized traffic. Positive protective strategies include, but are not limited to, full road closures; ramp closures; crossovers; detours; and rolling roadblocks for work zone setup and removal.
2. Where exposure cannot be adequately managed through the application of the above strategies, reduce risk to workers through the use of appropriate positive protective devices (per SHA's Barrier Policy).
3. Where exposure and risk reduction is not adequate, possible or practical, manage risk through the application of appropriate intrusion countermeasures. A wide range of traffic intrusion countermeasures should be considered, in combination as appropriate. The countermeasures may include:
 - Uniformed law enforcement officers (Maryland State Police)
 - Signing and warning flags and lights on signs
 - Variable message signs and arrow boards
 - Longitudinal and lateral buffer space
 - Trained flaggers and spotters, as well as enhanced flagger station setups
 - Intrusion alarms
 - Rumble strips
 - Pace or pilot vehicles
 - Removal of misleading pavement markings
 - Channelizing device spacing reduction

- Work zone speed limit reduction
- Drone radar

3.2. WORK ZONE IMPACTS MANAGEMENT STRATEGIES

A variety of work zone impact management strategies can be used 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. The following sections provide brief summaries of various strategies that may be used during the development of a Transportation Management Plan. These strategies must be reviewed and adjusted to address each project location and situation. Note that the strategies discussed in these sections are not all inclusive, but offer a large number to consider, as appropriate, in developing TMPs. Other options may be applicable for the project under consideration.

Individual strategies may fall into multiple categories. For example, Variable Message Signs are a traffic control device as defined by the MUTCD; however, they can be used for motorist information and work zone ITS applications as well.

This section is intended to be a reference for selecting work zone management strategies. Refer to Appendix F for a summary of work zone impact management strategies. Appendix G, FHWA's Work Zone Management Strategy Matrix also contains helpful information on determining when the strategies should be considered, pros/cons, and whether the strategies are likely to improve mobility and/or safety.

3.2.1. Temporary Traffic Control

Temporary traffic control strategies and devices are used to facilitate traffic flow and safety through and around work zones. Standards, guidance, and other information regarding the proper use of traffic control strategies and devices are provided in Part 6, Temporary Traffic Control, of the MUTCD. Traffic control plans should be developed to construct the corridor improvements using a construction sequencing scheme that completes the project in the shortest possible time frame, focuses early efforts on areas that currently exhibit the highest levels of congestion, and provides safe, quality construction operations.

- Temporary Traffic Control Strategies - Traffic control strategies can be used to accommodate road users within the work zone or the adjoining corridor in an efficient and safe manner. They are also used to provide adequate access to the roadway for the required construction, maintenance, or utility work and to provide safety for the worker.
- Temporary 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.

3.2.2. Project Coordination, Contracting, and Accelerated Construction Methods

Project coordination, contracting, and accelerated construction strategies have the potential to reduce traffic impacts and project duration.

- Project Coordination - Project coordination, done early in the planning and design process, has the potential to reduce safety and mobility impacts, as well as project delays and duration.
- Contracting Strategies - Contracting strategies typically involve contractual agreements to reduce the project duration or traffic impacts.
- Accelerated Construction Techniques - These techniques involve the use of special materials or precast items to minimize the duration of construction or maintenance activities where traffic restrictions need to be minimized and when work activities need to be completed during night or weekend periods to allow reopening of travel lanes for normal weekday travel.

3.2.3. Transportation Operations Strategies

Transportation operations (TO) strategies are used to mitigate work zone impacts through the use of improved transportation operations and management of the transportation system. TO strategies include demand management, corridor/network management, work zone safety management, and enforcement strategies:

- Demand Management Strategies - The objective of demand management strategies is to increase the normal person movement capacity of a freeway corridor.
- Corridor/Network Management Strategies - Corridor/network management strategies optimize traffic flow through the work zone corridor and adjacent roadways by using various traffic operations techniques and technologies.
- Work Zone Safety Management Strategies - This category includes devices, features, and management procedures used to address traffic safety concerns in work zones.
- Work Zone Intelligent Transportation Systems (WZ-ITS) - Using intelligent transportation systems in work zones has the potential to make traffic flow through and around the work zone safer and more efficient. WZ-ITS involve the use of electronics, computers, and communications equipment to collect information, process it, and take appropriate actions. 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.
- Police Traffic Services - The use of police traffic services in construction and maintenance work zones has proven to be effective in enhancing the safety of road workers and motorists. The primary reasons to utilize police services in

work zones include speed control, enforcement, traffic incident/accident management, traffic control, and increased work zone visibility.

3.2.4. Public Information and Outreach Strategies

Public information and outreach (PI&O) is an essential and vital component of all TMPs. The goals of the PI&O strategies are to:

1. Improve public awareness/understanding of the project.
2. Modify travel habits to reduce traffic congestion during the project.
3. Promote project support.

The public information campaign may need to start prior to project construction. The purpose of this approach is to make the public aware of the project and potential impacts prior to construction, and to inform the public about the construction status and the available TMP program elements such as alternative travel routes, additional shuttle service, park-and-ride lots, or improved transit services.

Early public involvement, particularly by impacted communities and businesses, in the development of the TMP and keeping them informed throughout construction is essential both to identify potential impacts and to ensure that effective mitigation strategies are developed and implemented.

Public awareness strategies and motorist information strategies are important considerations in any PI&O campaign. Refer to Appendix H for details on specific PI&O strategies.

- Public Awareness Strategies - Public awareness strategies include various methods to educate and reach out to the public, businesses, and the community concerning the project and work zone.
- Motorist Information Strategies - The goal of motorist information strategies is to provide current and/or real-time information to drivers on the road during the construction of the project. These elements are important components of any project where alternate routing is a practical alternative.

3.2.5. Incident Management Strategies

On highways already constricted by construction, further reduction in capacity caused by accidents or vehicular breakdowns can compound adverse impacts to motorists. Provisions can be made to have standby tow trucks or vehicles equipped with push bumpers on site or close at hand to minimize response time and reduce the effect on traffic flow. Incident management strategies need to be incorporated into the work zone design or impact management plan. Refer to Appendix F for how work zone impact management strategies may be used for incident management.

4. TMP DOCUMENTATION

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.

TMP Component	✓
1. Introductory Material	
▪ Cover Page	<input type="checkbox"/>
▪ Licensed Engineer Stamp	<input type="checkbox"/>
▪ Table of Contents	<input type="checkbox"/>
▪ List of figures	<input type="checkbox"/>
▪ List of tables	<input type="checkbox"/>
▪ List of abbreviations and symbols	<input type="checkbox"/>
▪ Terminology	<input type="checkbox"/>
2. Executive Summary	<input type="checkbox"/>
3. TMP Roles and Responsibilities	
▪ TMP Coordinator	<input type="checkbox"/>
▪ TMP Team	<input type="checkbox"/>
▪ TMP Implementation Task Leaders	<input type="checkbox"/>
▪ Approval Contact(s)	<input type="checkbox"/>
▪ Emergency Contacts	<input type="checkbox"/>
4. Project Description	
▪ Project background	<input type="checkbox"/>
▪ Project type	<input type="checkbox"/>
▪ Project area/corridor	<input type="checkbox"/>
▪ Project goals and constraints	<input type="checkbox"/>
▪ Proposed construction phasing/staging	<input type="checkbox"/>
▪ General schedule and timeline	<input type="checkbox"/>
▪ Need for detours	<input type="checkbox"/>
▪ Related projects	<input type="checkbox"/>
5. Existing and Future Conditions	
▪ Data collection and modeling approach	<input type="checkbox"/>
▪ Existing roadway characteristics (roadway classification, # lanes, geometry, etc.)	<input type="checkbox"/>
▪ Existing and historical traffic data (volumes, speed, capacity, v/c ratio, truck percentages, congestion, peak traffic hours)	<input type="checkbox"/>
▪ Existing traffic operations (signal timing, traffic controls)	<input type="checkbox"/>
▪ Crash data	<input type="checkbox"/>
▪ Stakeholder concerns/issues	<input type="checkbox"/>
▪ Traffic predictions during construction (volume, delay, queues)	<input type="checkbox"/>

TMP Component	✓
6. Work Zone Impacts Assessment Report	
▪ Qualitative summary of anticipated work zone impacts	<input type="checkbox"/>
▪ Impacts assessment of alternative project design and management strategies	<input type="checkbox"/>
- Construction approach/phasing/staging strategies	<input type="checkbox"/>
- Work zone impacts management strategies	<input type="checkbox"/>
▪ Traffic analysis results	<input type="checkbox"/>
- Traffic analysis strategies	<input type="checkbox"/>
- Measures of effectiveness	<input type="checkbox"/>
- Analysis tool selection methodology and justification	<input type="checkbox"/>
- Analysis results	<input type="checkbox"/>
▪ Selected Alternative	<input type="checkbox"/>
- Construction approach/phasing/staging strategy selected	<input type="checkbox"/>
- Work zone impacts management strategies selected	<input type="checkbox"/>
7. TMP Monitoring	
▪ Monitoring requirements	<input type="checkbox"/>
▪ Evaluation report	<input type="checkbox"/>
8. Public Information and Outreach Plan	<input type="checkbox"/>
9. Incident Management	
▪ Trigger points	<input type="checkbox"/>
▪ Decision and phone tree	<input type="checkbox"/>
▪ Contractor's contingency plan	<input type="checkbox"/>
▪ Standby equipment or personnel	<input type="checkbox"/>
10. TMP Implementation Costs	
▪ Itemized costs	<input type="checkbox"/>
▪ Cost responsibilities/share opportunities	<input type="checkbox"/>
▪ Funding source(s)	<input type="checkbox"/>
11. Special Considerations (As Needed)	<input type="checkbox"/>
12. Attachments (As Needed)	<input type="checkbox"/>

4.1. INTRODUCTORY MATERIAL

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

- **Cover Page** – The cover page should contain the title/project name, date, and the name of the agency and/or person responsible for the report with contact information.
- **Transportation Management Plan Approvals** – Include the name of the project, a statement that the TMP was developed under the direction of a licensed engineer, and the signature, printed name and license stamp of the engineer responsible for the development of the TMP. Engineering for the TMP and TCP must be performed under the direction of an appropriate professional that is registered in the State of Maryland.
- **Table of Contents** – The table of contents lists the sections and subsections of the report with their page numbers.
- **List of Figures** – List of figures and associated page numbers.

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

4.2. EXECUTIVE SUMMARY

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

4.3. TMP ROLES AND RESPONSIBILITIES

The roles and responsibilities for the development, implementation, monitoring and evaluation of the TMP should be documented. These may include, but are not limited to:

- **TMP Coordinator** – The person/company responsible for the overall development of the TMP.
- **TMP Team** – Identify stakeholders and other TMP Team members who were involved in the development and review of the TMP.
- **TMP Implementation Task Leaders** – These are the project engineers responsible for implementing specific tasks recommended by the TMP. This should include contact information for the person in the Office of Communications who is responsible for PI&O support during construction.
- **Approval Contact(s)** – The person or persons who need to give final approval to the TMP.
- **Emergency Contacts** – List of known contact persons for each emergency service agency, including police, fire, and ambulance.

4.4. PROJECT DESCRIPTION

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

- **Project Background** – The 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** – The nature of the project, which may range from capital projects, new construction, rehabilitation, major maintenance, to routine maintenance, is identified here.

- **Project Area/Corridor** – The component describes physical extents of the construction or maintenance work, as well as the estimated region(s) and corridor(s) that may be affected by the project. Using a map to 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** – This includes the project phasing, land and/or facility closure strategies, whether HOV/temporary lanes/shoulders will be used for general traffic, ramp/interchange closures, construction strategies, lane closure hours, duration, etc. Identify holiday, event, seasonal and/or night time restrictions. The Sequence of Construction and Traffic Control Plans should be provided separately.
- **General Schedule and Timeline** – The start and finish dates for the project 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 for contingencies. Detour plans should be provided separately.
- **Related Projects** – Other on-going or planned projects in the vicinity of the project area that may cause cumulative impacts to the region(s) and corridor(s).

4.5. EXISTING AND FUTURE CONDITIONS

This TMP component provides information on existing and anticipated future (i.e. during construction) 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** – This included a history of roadways in the study area, roadway classification(s), number of lanes, geometrics, and urban/suburban/rural.
- **Existing and Historical Traffic Data** – This includes measures such as volumes, 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** – This includes signal timing, delay, and traffic control types.
- **Accident History** – Where feasible, an accident history including number and type of crashes should be documented.

- **Stakeholder Concerns/Issues** – Include a list of project stakeholders and others potentially impacted by the project. Input from the community and business representatives and other stakeholders should be included and prioritized to address local concerns.
- **Traffic Mobility Issues** – List major events that have the potential to impact mobility during the project.
- **Traffic Predictions During Construction (Volume, Delay, Queues)** - Based on existing and historical data, traffic growth rates, and the modeling/estimating approach used, estimates of traffic and safety during construction should be developed and documented. Future estimates should be compared to the existing data.

4.6. WORK ZONE IMPACTS ASSESSMENT

A work zone impacts assessment may include:

- **Qualitative Summary of Anticipated Work Zone Impacts** – This involves a brief discussion on how the project is expected to impact its vicinity, including major corridors, local streets, how traffic patterns are expected to change, and an estimate on how traffic demand might change due to the project.
- **Summary of Maintenance of Traffic Alternative Analysis (MOTAA)** – Summary of the MOTAA conducted during planning should include:
 - List of staging/phasing and traffic control options investigated for the selected alternative only. MOT options examined for other design alternatives need not be included in the TMP.
 - Summarize constraints of each MOT option, anticipated impacts, and costs.
- **Impacts Assessment of Alternative Project Design and Management Strategies** – This is a discussion on how the project’s work zone design and other mitigation efforts would impact the project area, how they would affect each other, and how they might adversely impact specific areas, if any.
 - **Construction Approach/Phasing/Staging Strategies** – Include any additional staging/phasing/MOT options investigated since the completion of the MOTAA. As the design evolves, there may be a need to revise construction strategies. Impacts should be investigated for new strategies in a similar approach as was taken in the MOTAA. Minimally, the new construction strategies should be investigated for impacts on:
 - Access to communities and businesses
 - Decision sight distance (especially at on-ramps)
 - Ramp capacity
 - Right-of-way

- Environment (wetlands, noise, historical, etc.)
 - Bridge widths
 - Earthwork, retaining walls, pier clearances, profile differences, etc.
 - Ability to maintain existing drainage, utility, and lighting systems
 - Pedestrian and bicycle facilities
 - Construction duration
 - Constructability and construction equipment access
 - Emergency services (fire, ambulance, police, hospitals)
 - Over-height, over-weight vehicles
 - Public safety (workers and traveling public)
 - Traffic and mobility (see Traffic Analysis below)
 - Construction and MOT costs
- **Work Zone Impacts Management Strategies** – List work zone impact management strategies considered (recommended, and considered but rejected) and discuss feasibility and anticipated traffic or safety impacts. Section 3 of this document lists a variety of work zone impact management strategies for consideration. Appendices E and F provide helpful information for determining when the strategies should be considered, pros/cons, and whether the strategies are likely to improve mobility and/or safety. Strategies may include:
 - Temporary traffic control strategies and devices
 - Project coordination, contracting and accelerated construction strategies
 - Demand management strategies
 - Corridor/network management strategies
 - Work zone safety strategies
 - Work zone ITS
 - Police traffic services
 - Public awareness strategies
 - Motorist information strategies
 - Incident management strategies

For cost effectiveness, constructability needs to be balanced with the work zone transportation management strategies in order to best serve the public, construction workers, and agency. There may be more than one option for addressing safety and mobility during construction. In order to decide which option is appropriate, the benefits and costs of the strategies should be estimated and compared. The cost evaluation may consider on-site costs (e.g. strategy implementation, right-of-way,

environmental, delay, safety, accessibility to businesses and community, user costs), and detour costs, both capital and operating. Comparing the cost to implement work zone impact management strategies to the reduction in user delay costs may be an effective measure.

Where appropriate, strategies should be documented on plan sheets, in separate plans (PI&O), in specifications and/or special provisions, and in construction estimates.

- **Traffic Analysis –**
 - **Traffic Analysis Strategies** – If not previously discussed, include a brief description on how the expected future (construction) traffic conditions were determined. Any traffic reduction factors or other parameters assumed for the calculations should be documented.
 - **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
 - Seasonal impacts (beach traffic, etc.)
 - Cost effectiveness
 - **Selected Alternative** – Plans, specs, and estimates should be developed for the selected alternative. Describe the selected construction approach, including the construction phasing/staging strategy selected and the work zone impact management strategies selected.
 - Any work hour restrictions should be documented for each stage (e.g., night work, peak hour restrictions, etc.)

- The following documents will be developed while the TMP is being prepared and should be referenced 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. Work zone impact management strategies should be documented on plan sheets where possible (e.g. geometric improvements, control devices, etc.). If not on the plans, strategies should be listed 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 section 4.8)
 - Necessary Special Provisions covering TMP elements

4.7. 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** – Monitoring requirements for the TMP should be included in the TMP and be made 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:
 - Verification of work zone set-up
 - Identification and process for monitoring TMP performance (e.g. volume counts, queue length, 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 the 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 person(s) responsible for completing the Evaluation Report.

4.8. PUBLIC INFORMATION AND OUTREACH PLAN

The public information and outreach plan serves two main purposes. It informs the public about the overall purpose of the project to generate and maintain public support. And, it encourages changes in travel behavior during the project to minimize congestion. Public awareness and motorist information strategies should be included in the public information and outreach plan. Separate documentation for public information and outreach efforts may be required by the Office of Communications. Refer to Appendix H for information on how to develop public information and outreach plans as part of the TMP effort.

4.9. 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. Emergency communications should be discussed at the pre-construction meeting. Important elements to discuss include:

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

4.10. 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 get in the budget, the more likely the under-allocation of funds can be avoided. Where feasible, the cost estimates for the work zone impact management strategies should be itemized and documented in the TMP, with cost responsibilities, opportunities for sharing or coordinating with other projects, and funding sources specified. TMP components can be funded as part of the construction contract and/or in separate agreements.

4.11. SPECIAL CONSIDERATIONS

Any special considerations related to the TMP that have not been included in a previous section should be identified here. 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.

4.12. ATTACHMENTS (AS NEEDED)

Appendices may be included in the TMP document to include information that may be relevant or of interest to the TMP reviewer, implementer, SHA, 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, Traffic Control Plans, Detour Plans)
- Lane closure charts
- Detailed analysis methodology, assumptions and parameters used
- Special provision text