

# ***Implementation of Transportation Management Plan (TMP) in Puerto Rico***

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**Abstract** — *The Puerto Rico Department of Transportation is committed to provide an efficient and safe flow of traffic in highway projects. The Transportation Management Plans provide the best strategies to mitigate the work zone impacts in significant projects. Since 2007, Puerto Rico ensures the mitigation of these strategies by implementing the Work Zone Safety and Mobility Policy. The policy establishes the goals, objectives and minimum requirements to develop and implement Transportation Management Plans in Puerto Rico. This report evaluated the policy, past and on-going transportation management plans; and compared the procedures used in Puerto Rico with other states. A policy implementation guideline is recommended to provide uniformity and consistency in future plans.*

**Key Terms** — *Mobility, Safety, Transportation Management Plan (TMP), Work Zones*

## **INTRODUCTION**

Over the years, highways professionals have been trying to maintain a safe traffic flow through work zones implementing strategies and innovative practices. The nationwide records show the reduction of work zone fatalities in the United States by fifty (50) percent in ten years (2002-2012), proving the success of these strategies [1]. However, the effect of aging highway infrastructures, growing traffic volumes and congestion, limited roadway capacities, more than 32,500 crashes in work zones at a national level, and other issues, cause the safety and mobility through work zones a more complicated challenge.

Federal Highway Administration (FHWA) published the Work Zone Safety and Mobility Rule (the Rule) on September 2004 in Title 23 Code of

Federal Regulation Section 630 Subpart J to address work zone issues. The Rule facilitates the consideration of the work zone impacts that may extend beyond the physical location of the work zone itself through a project's life cycle and the adoption of appropriate strategies that help manage these impacts during project implementation. As described in the Rule, the set of these coordinated strategies are developed and implemented on each project by the Transportation Management Plans (TMPs) [2].

The Puerto Rico Department of Transportation and Public Works (PRDTPW) is committed to traffic safety through the highway work zones during new constructions, reconstructions, operation, and maintenance of the highway facilities in Puerto Rico [3]. Therefore, Puerto Rico adopted the Rule in 2007, as part of the Federal-aid highway program requirements, developing an agency-level work zone safety and mobility policy called the Puerto Rico Department of Transportation and Public Works Work Zone Safety and Mobility Policy (PRDTPW Policy) [3].

## **Research Description**

The Transportation Management Plan (TMP) consists of strategies to manage the work zone impacts of projects. The scope, content, and degree of detail may vary based on the expected work zone impacts of the project, however it shall comply with the requirements of the state policy.

Some states have a policy implementation guideline describing the development and implementation procedures of the TMP document. Currently, Puerto Rico does not have a guideline describing their requirements. This guideline could ensure uniformity and consistency. It can promote coordination between all organizations involved in

the work zone development both internal and external parties to Puerto Rico Highway and Transportation Authority (PRHTA).

The purpose of this study is to highlight the importance of developing a policy implementation guideline for design and implementation of Transportation Management Plans (TMPs) in Puerto Rico.

### **Research Objectives**

The main objective of this study is to identify components or recommendations that Puerto Rico can incorporate into a policy implementation guideline.

## **LITERATURE REVIEW**

The main goal of the Rule is to reduce safety and mobility impacts (as crashes, delays, and traffic congestions) in work zones using transportation management. It emphasizes the importance of traffic control, taking into account the issues of transportation operations and public information during the project's life cycle.

The regulation required each agency to implement a work zone policy to consider and manage the work zone impacts across all stages of projects. In order to assist the states in the development of their own policy, the FHWA published multiple guidelines with minimum requirements. For example, the state policy could include: agency goals and objectives, the process reviews, and the training plan. Also, one of the most important sections was their own definition of a significant project. In general, a significant project is known as a project that will cause an sustained impact. Defining this criteria will help the state to determine when, where, how, and what are the level of requirements to be considered in the TMP.

### **Transportation Management Plans**

The Transportation Management Plan (TMP) includes all the work zone strategies that will address the safety and mobility impacts of projects. The strategies will be based on the project

constraints, the type of work zone that is planned, the geographic and demographic area in which the work is located, and the anticipated traffic impacts. Designer can use multiple strategies to mitigate the work zone impacts. The Temporary Traffic Control (TTC) strategies are focus on providing traffic control, project coordination and safety. The Transportation Operations (TO) strategies provide demand management, corridor and network management, work zone safety, and traffic incident management. Lastly, the Public Information (PI) are the public awareness and motorist information strategies [4]. The TMP document will define those strategies, the project scope, the existing conditions and other important information. The level of detail required within the TMP document, will depend on the state requirements.

In general, the TMP process consists of four stages: preliminary engineering, design, construction, and performance assessment. During the preliminary engineering, the state agency determine if the project will cause a significant impact or not. Non significant projects should have at least the TTC strategies, while significant projects requires the TTC, TO and PI strategies. After the design of the TMP document, the state Construction Area and the Contractor start the TMP implementation. Finally, the last stage is the performance assessment, evaluating and measuring the TMPs results by process reviews.

### **The Policy in Puerto Rico**

The Puerto Rico Highway and Transportation Authority (PRHTA) developed the PRDTPW Work Zone Safety and Mobility Policy in 2007. The policy goals and objectives address the safety of workers and road users, the traffic congestions and delays, the mobility and access impacts, the crashes in work zones and the improvement of work zone strategies and procedures.

PRHTA included the agency-level procedure of performance assessments, trainings, and process reviews as part of their policy. This procedure is important in order to evaluate and monitor the implementation of TMPs and identify potential

improvements to the policy. The policy included four reviews: the Work Zone Safety Checklist to be filled for each project, annuals Field Reviews or Field Inspections to be performed to each region in Puerto Rico every other year, the annual FHWA Work Zone Self Assessment and the Process Review every two years by a multidisciplinary team.

The training plan was an important consideration included in the policy to ensure the successful implementation of the new requirements. The policy emphasized the importance of trainings to all personnel that one way or another gets involve during the TMP development and implementation process. A list of minimum trainings for specific audiences was included in Table 3 of the policy [3].

The policy also included the definition of a significant project in Puerto Rico. Reference [3] defined a significant project as a project that “alone or in combination with other concurrent projects nearby, is anticipated to cause sustained work zone impacts to the road users, businesses, or local communities during construction.” The significant project criterion is based on the roadway number and description, as shown in table 1 of the policy. If the project is not within the list of routes, the project can be evaluated to be significant considering the existing or anticipating annual average daily traffic, the duration of project and the estimated project cost (see table 2 of the policy). Lastly, other projects may be considered significant based on engineering judgment. This project classification, will determine the minimum strategies that shall be included as part of the TMP document. As stated in the policy, the significant projects shall include the strategies of Temporary Traffic Control (TTC), Traffic Operation (TO) and Public Information (PI). Otherwise, if the project is not significant, the policy says that the project shall include as a minimum the TTC, but the TO and PI strategies are not required. [3]

The TMP development process occurs during the planning, preliminary engineering and design phases. The identification of significant projects

and the work zone impacts will help to identify the construction phasing, the impact management strategies and determine the associated costs for development and implementation. [3]

The implementation process of TMPs is during construction phase. PRHTA and the Contractor shall provide a trained person that will ensure that all strategies are implemented. All personnel should wear all safety equipment in accordance with the OSHA regulations. During this phase, the annual field inspections will be assigned to a Traffic Control Review Team. [3]

## **METHODOLOGY**

This research will analyze and compare the procedures follow in Puerto Rico with different states in order to determine the best practices in the development and implementation of TMP's.

- The first step will be to study and review the PRDTPW Work Zone Safety & Mobility Policy, the guidelines and procedures used in Puerto Rico.
- Interview PRHTA staff (Traffic & Operations Area, Construction Area, and Design Area) and Consultants involved in the development and implementation of TMP's.
- Review and evaluate four Transportation Management Plans of projects in Puerto Rico.
- Review the guidelines, procedures and processes used in other states to develop and implement TMP's.
- Compare the procedures between Puerto Rico and other states and make recommendation.

## **RESULTS AND DISCUSSION**

During the last 7 years, the PRDTPW Policy has been the only official document that PRHTA have for the development of TMPs in Puerto Rico. According to Juan Carlos Rivera (Supervisor of PRHTA Office of Traffic Engineering Area) the authority does not have an implementation guide. One of the goals of the authority is to develop a guideline that will benefit all professionals involve in the design and construction of highway projects,

providing a uniform and standard process for TMPs.

The policy of Puerto Rico has its own process and requirements. As described before, the process consists of two stages: (1) development and (2) implementation. The development process is divided in planning, preliminary engineering and design. The planning and preliminary engineering phases consist of classifying the project as significant or non-significant. The first criterion is project location. As mention previously, the policy has a list of roadways. If the project is not located within that list of roadways, the second criteria are the existing or anticipated AADT, project duration and estimated project cost. The policy of Puerto Rico does not include exceptions to these criteria. Therefore, there can be projects located in the list of roadways (Table 1 of the policy), which not necessarily need a detailed TMP. For example, some activities as maintenance, installations of barriers, signs, or other low impact works, do not require the implementation of several strategies. Table 1 compares the project classification criteria used in Puerto Rico with California [5], Illinois [6], and North Carolina [7]. PRHTA could evaluate this classification procedures, in order to consider a new alternative for those projects that are located in significant road, but with low work zone impacts.

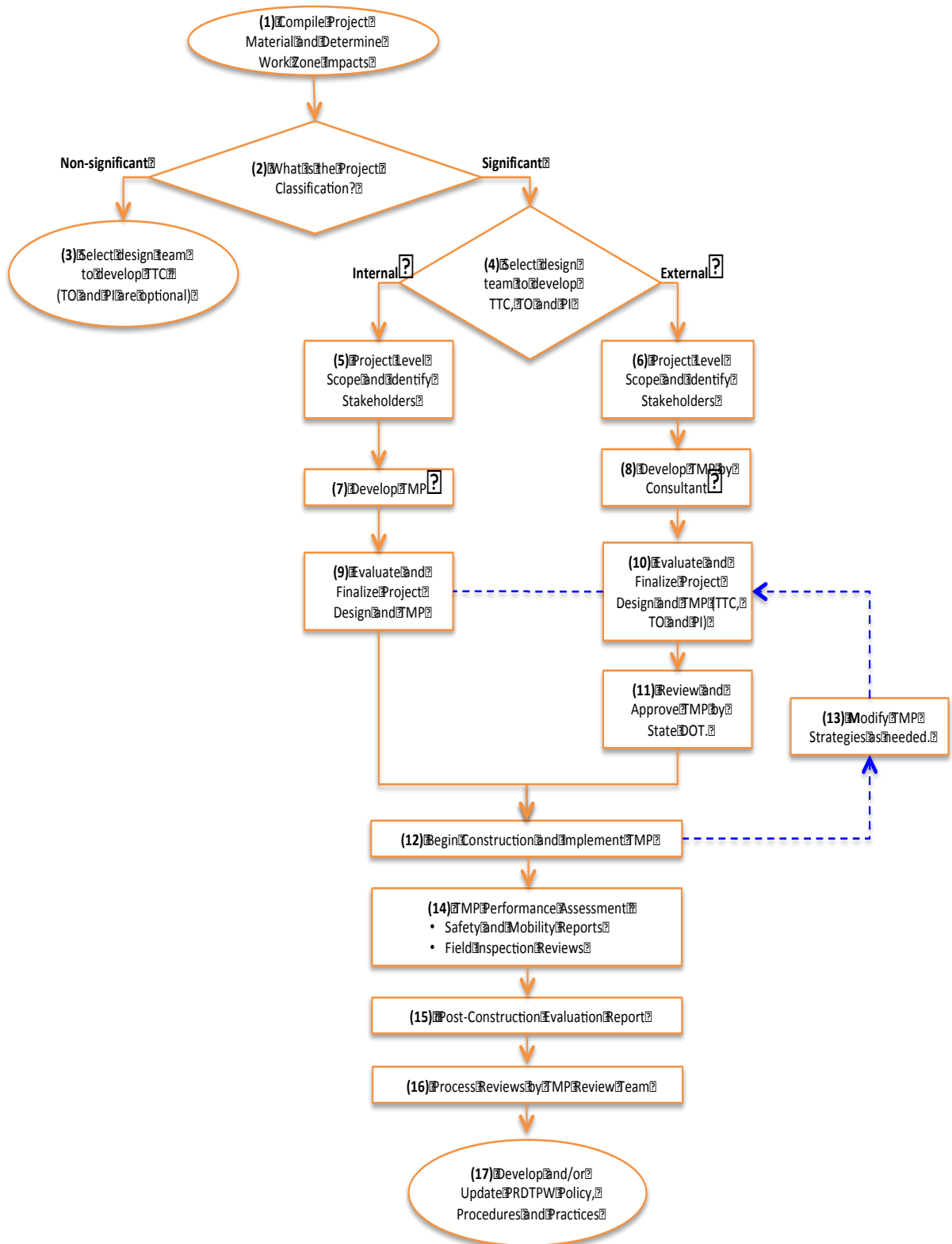
**Table 1**  
**Project Classification Criteria in Puerto Rico and Other States.**

State	Classification	Criteria
Puerto Rico	Significant	1. Project Location 2. AADT, project duration and estimated project cost
	Non Significant	None of the above
California	Major (Significant)	Significant impacts expected, longer duration, multi jurisdictional in scope.
	Minor (Significant)	Minimal impacts expected, lane closure required, require some mitigation measures.
	Blanket (Non Significant)	No expected delays, off-peak work, low volume, moving lane closures.
Illinois	Long Term (Significant)	Project Location and Long Term
	Short Term (Significant)	Project Location and Short Term (Less than 3 days)
	Non Significant	None of the above

North Carolina	Level 1 (Significant)	High Impact, Project Location, and Closure for 3 days or longer
	Level 2 (Significant)	Moderate Impact, Project Location, and Closure for 3 days or longer
	Level 3 (Non Significant)	Low Impact, AADT, Truck Traffic, Travel Time, Duration of Traffic, User Value and/or User Cost
	Level 4 (Non Significant)	No Impact

After the classification of project, the next phase is the TMP design. The design in Puerto Rico could be internally in PRHTA by the Traffic Engineering Area, or externally by private consultants. Designers evaluate the possible work zone impacts and select the best mitigation strategies that will be included in the TMP. The policy included a list of few strategies that shall be considered for significant projects. The new guideline could describe all possible strategies that may be considered where appropriate. For example, the California Department of Transportation (Caltrans) included several strategies in their implementation guide [5].

The selection of strategies during the design process is the same no matter if the design is internal or external to PRHTA. However, external designs include a different step: evaluation and approval by PRHTA. This process is not detailed in the policy, and it can be included in the guideline. This evaluation process could include a cost analysis, as Caltrans Datasheet [5] or using a checklist to ensure that all minimum requirements were followed. A designer from the private sector expressed the following: “The development of TMPs is practically new for the private sector. PRHTA should have a standard procedure with sufficient detail so that someone with a basic understanding of the field can successfully prepare TMPs.” Figure 1 give an example of a flowchart describing the TMP process.



**Figure 1**  
**Example of Puerto Rico TMP Process**

The best mitigation strategies, selected by the Consultants, are described in a TMP document that later becomes part of the project Contract. PRHTA does not have an official format of the TMPs document in place. During the years, in-house designers and Consultants have been free to use their own TMP format. Four TMPs of past and current projects were reviewed to evaluate the TMP content (two prepared by internal designers within PRHTA [8]-[9] and two by Consultants [10]-[11]). Although the documents were very similar, there are some differences described below:

- Reference [8] was the only TMP describing the project as a sensitive zone. This criterion is not defined in the policy.
- Reference [8] was the only document with a list of responsible persons for the implementation of TMP.
- TMPs shall provide strategies emphasizing on safety and mobility. A requirement of the policy is the Work Zone Safety Checklist. All TMPs included this strategy with a standard checklist in the appendices section. The main objective of this checklist is to evaluate the Maintenance of Traffic (MOT) conditions in a daily basis. A second report is the Incident/Crash Report, which has not been incorporated in the policy. Reference [8] was the only project that included this safety strategy, including the form in the appendices. The new guideline should specify this requirement and its procedure. For example, the Incident/Crash Report says that it shall be filled and reported to PRHTA Industrial Office within 24 hours of the event.
- As part of the TTC strategies, all TMPs required two trainings. The first training is the Introduction of the Work Zone Safety and Mobility Policy, and the second is the Flagmen and OSHA trainings. Both trainings are very important to provide the necessary skills and knowledge to all the personnel involved in the project. However, the TMPs should be consistent and include the Contractor as part of TMP discussion. Three TMPs included the

Contractor for the discussion of the TMP at the beginning of the project. This strategy could allow the Contractor to understand the TMP and clarify all questions.

- A Public Information (PI) strategy that was common in all TMPs was the newspaper. The TMPs described that the project engineers need to notify the Traffic Engineering and Operations Area and the Puerto Rico DTWP Communications and Press Office 15 days in advance of a programmed closure. The press announcement should be five (5) days before closing. Also, the TMPs provided a sample of the press announcement in the Appendix section. This procedure and sample could be described in the new guideline.
- Reference [11] was the only TMP that included the Department of Transportation Facebook page [12] as one of the public information strategies. The TMP explained that the Facebook page is updated by PRHTA Technologies of Information Area, communicating all closures, detours and works to more than 35,000 followers. If PRHTA considers the social media as an excellent communicator, they could include this strategy as a minimum requirement.
- Another alternative for public information is developing a project web site. This strategy was implemented in Mejoras Intersección Caparra project to provide real-time information and progress [13]. This strategy could be implemented for special cases.
- None of the TMPs included the requirement of a Post-Construction Evaluation Report. Other departments of transportations request this report that includes a final summary of the TMP strategies with lessons learned. For example, Caltrans include the following sections in their evaluation reports [14]:
  - A summary of changes to scheduled events,
  - Traffic Volumes,
  - Travel Time Delays,
  - Transit Ridership, and

- Operational Impacts caused by Accidents and Lessons Learn.

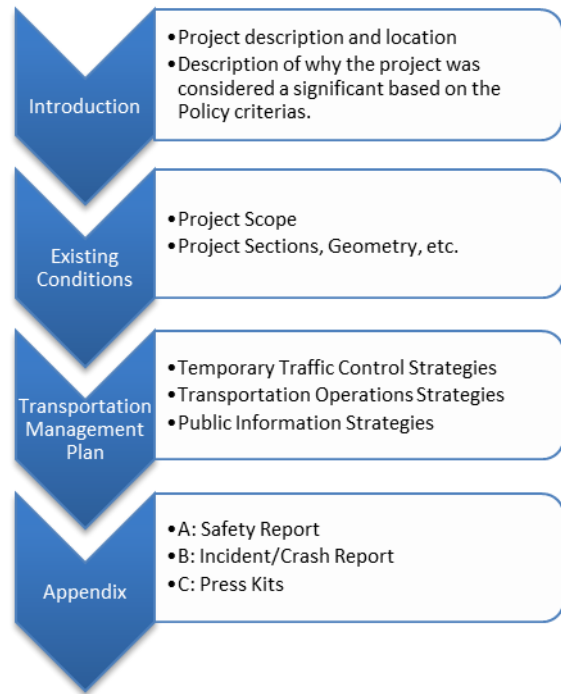
Another example is Wisconsin DOT, that develop evaluation reports including the following sections [15]:

- A statement reflecting the usefulness of the TMP,
- Updates necessary to correct the TMP,
- Modifications made to the original TMP and their success,
- The public reaction to TMP,
- The maximum and average delay time encountered,
- Any peak traffic periods exceeding the predicted,
- Frequency of legitimate complaints and nature of the complaints,
- Types and number of crashed that occurred during construction,
- Types and number of safety patrol incidents,
- The level of success and performance log for each strategy of the TMP implemented, and
- Recommended/suggested improvements or changes to similar future projects.

Finally, Illinois DOT requires the Resident Engineer to develop and submit a Summary Report within 30 days after the completion of the project [6]. They include the list of requirements for the summary report in their policy. The objective of these reports is to compile recommendations that could modify the standards, specifications, policies, and procedures in future process reviews. PRHTA can include this requirement to evaluate the results of the TMPs and use them in their process reviews every two years.

- TMPs are design by internal or external designers, are approve by PRHTA Office of Traffic Engineering Area and FHWA Division Office, and finally implemented by PRHTA Construction Area employees and the Contractor. There are multiple professionals and areas involve in the process. The TMP document should be standarized in order to

avoid confusion and ensure that the minimum requirements are always included. This recommendation could be implemented by developing a boiler plate document including the sections and minimum requirements. For example, figure 2 shows the TMP sections in one of the TMPs [8].



**Figure 2**  
**TMP Sections of PR-26 Project**

## CONCLUSION

The main objective of this study was to identify components or recommendations that Puerto Rico Department of Transportation could incorporate into a policy implementation guideline. The guideline could describe the minimum requirements of PRHTA (e.g. list of responsible persons; requirements to fill the Work Zone Safety Checklist and Incident/Crash Report for all TMPs; the initial TMP discussion with the Contractor; the procedure for press kits, the process flowchart, describe the external designing process, post-construction evaluation report, etc.) to standardize the process and assist everyone that, in one way or another, works during the development and implementation of TMPs.

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