PUBLIC INFORMATION DISSEMINATION FOR RAMP METERING IN THE PITTSBURGH, PENNSYLVANIA AREA

by

Casey Diane Hanner

Bachelor of Civil Engineering, University of Delaware, 2006

Submitted to the Graduate Faculty of

The Swanson School of Engineering in partial fulfillment

of the requirements for the degree of

Master of Science

University of Pittsburgh

2010

UNIVERSITY OF PITTSBURGH

SWANSON SCHOOL OF ENGINEERING

This thesis was presented

by

Casey Diane Hanner

It was defended on

April 28, 2010

and approved by

Amir Koubaa, PhD, Academic Coordinator

Daniel Budny, PhD, Associate Professor

Mark Magalotti, PE, Adjunct Faculty

Thesis Advisor: Amir Koubaa, PhD, Academic Coordinator

PUBLIC INFORMATION DISSEMINATION FOR RAMP METERING IN THE PITTSBURGH, PENNSYLVANIA AREA

Casey Diane Hanner, M.S.

University of Pittsburgh, 2010

Although ramp metering systems have been in use throughout the U.S. for over 40 years, ramp meters are still a foreign concept in many places. Pittsburgh, Pennsylvania is one such place; therefore, successful implementation of ramp meters in the Pittsburgh area would require a comprehensive public education campaign. However, there are currently no standards in Pennsylvania for such a campaign. This lack of information on public education raises the following questions: How important is a public education campaign to the success of a ramp metering project in the Pittsburgh area? What have other states done in the past to educate the public on ramp metering? And what is the most effective way to inform the public about ramp meters?

This study aims to answer these questions through the development, administration, and analysis of a number of surveys. Eleven state departments of transportation were surveyed as a part of this study, and the trends of these states' experiences with ramp metering and public education are discussed. A test group of thirty-one motorists representing the Pittsburgh area general public were also surveyed as part of the study. This survey was conducted in two parts (before and after reviewing informational material on ramp metering), and the results were analyzed both individually and as a comparison. The findings of all surveys are discussed, and recommendations are made for a ramp metering public education campaign in the Pittsburgh area.

TABLE OF CONTENTS

PREFACE X

1.0 INTRODUCTION 1

1.1 BACKGROUND 1

1.2 STATEMENT OF THE PROBLEM 3

1.3 STUDY OBJECTIVES 4

1.4 RESEARCH APPROACH 4

2.0 LITERATURE REVIEW 6

2.1 STANDARDS FOR RAMP METERING PUBLIC EDUCATION CAMPAIGNS 6

2.2 STATES CURRENTLY USING RAMP METERING STRATEGIES 8

2.3 GENERAL PUBLIC INFORMATION DISSEMINATION 13

3.0 DEPARTMENT OF TRANSPORTATION SURVEY 20

3.1 METHODOLOGY 20

3.2 DISTRIBUTION 25

4.0 TEST GROUP SURVEYS 26

4.1 METHODOLOGY 26

4.2 PREPARATION 34

4.3 ADMINISTRATION 37

5.0 RESULTS 40

5.1 DOT SURVEY RESULTS 40

5.2 TEST GROUP SURVEY RESULTS 53

6.0 SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS 69

6.1 SUMMARY 69

6.2 FINDINGS 70

6.3 RECOMMENDATIONS 73

APPENDIX A. PENNDOT GENERAL INFORMATION DISSEMINATION 77

APPENDIX B. DEPARTMENT OF TRANSPORTATION SURVEY 83

APPENDIX C. TEST GROUP SURVEY 256

BIBLIOGRAPHY 468

LIST OF TABLES

Table 1. Summary of Ramp Metering Benefits Experienced by Different States 2

Table 2. Summary of Different States Ramp Metering Information..... 13

Table 3. Summary of the Anticipated Effectiveness of Public Information Dissemination Methods for Ramp Metering in the Pittsburgh Area..... 74

LIST OF FIGURES

Figure 1. Background Information for Public Education and Ramp Metering from DOT Survey 41

Figure 2. Content of Ramp Metering Public Education Campaign from DOT Survey 43

Figure 3. Surveyed DOT's Approaches to Disseminating Information to the Public About Expected Delays Due to Ramp Meters 44

Figure 4. Surveyed DOT's Methods of Information Dissemination on How to Use Ramp Meters 45

Figure 5. Surveyed DOT's Popularity of Methods for Information Dissemination on How to Use Ramp Meters 46

Figure 6. Surveyed DOT's Methods for Information Dissemination on the Benefits of Ramp Meters 47

Figure 7. Surveyed DOT's Popularity of Methods for Information Dissemination on the Benefits of Ramp Meters 48

Figure 8. Surveyed DOT's Reported Problems with Public Education Campaigns for Ramp Meters 50

Figure 9. Background Answers from Part 1 of Test Group Survey 54

Figure 10. Test Group Survey Participants' Preferences for Methods of Information Dissemination 56

Figure 11. Informational Material Reviewed by the Participants of the Test Group Survey 58

Figure 12. Comparison of Correctly/Incorrectly Identified Benefits of Ramp Metering from Part 1 to Part 2 of the Test Group Survey 59

Figure 13. Correctly/Incorrectly Identified Benefits of Ramp Metering from Test Group Part 2 Survey Participants Who Were Previously Unfamiliar with Ramp Metering..... 61

Figure 14. Comparison of Test Group Survey Responses from Part 1 to Part 2..... 62

Figure 15. Changes in the Amount of Time Test Group Survey Participants Said They Would Be Willing to Wait at a Ramp Meter..... 64

Figure 16. Comparison of Responses to Part 2 between Participants Who Were Previously Familiar with Ramp Metering and Those Who Were Not..... 66

PREFACE

Some abbreviations used throughout this document include: DOT (Department of Transportation), DOT's (Departments of Transportation), FWHA (Federal Highway Administration), and TMC (Traffic Management Center). Also, the use of the phrases "public education" and "public outreach" are used interchangeably. Within the context of this document, these phrases refer to a campaign launched by a department of transportation that aims to disseminate information to the general public.

It should also be noted that any reference to "the public" or "the general public" strictly refers to the public users of the ramp meters, and not the public officials that may approve the ramp meters.

1.0 INTRODUCTION

As the city of Pittsburgh, Pennsylvania gets closer to the idea of implementing ramp meters along some of its congested corridors, it is important to incorporate the experiences of other states into future implementation strategies. This project aims to:

- Examine the different methods used by state departments of transportation (DOT's) in educating the general public in ramp metering, and the lessons they have learned.
- Survey test groups in the Pittsburgh, Pennsylvania area to gain a sense of the general public's understanding and perception of ramp meters. (It is expected that most motorists in the Pittsburgh area are not familiar with ramp meters, and will need detailed explanations on how to use them, and the expected benefits).
- Help identify the most effective methods of disseminating this information to the public.

1.1 BACKGROUND

The Federal Highway Administration (FHWA) defines ramp management as "the application of control devices, such as traffic signals, signing, and gates to regulate the number of vehicles entering or leaving the freeway, in order to achieve operational objectives." Ramp management has gained acceptance in many states and urban areas in the country. FHWA and state DOT's have developed ramp management systems that show major benefit to the urban

freeway systems (FHWA, 2006). The years of operational experience attained by different state DOT's should be considered when implementing ramp management strategies for the first time in other locations.

Ramp metering is a strategy used in ramp management and is defined by the FHWA (2006) as "the use of a traffic signal(s) deployed on a ramp to control the rate at which vehicles enter a facility." If deployed correctly, ramp metering can improve the flow of traffic on the mainline, thereby addressing congestion. Safety concerns at specific points along the freeway can also be addressed. A summary of some of these specific benefits, as reported in the FHWA Ramp Management and Control Handbook (2006), is presented in **Error! Reference source not found.** The related considerations for ramp metering include: metering strategy, geographic extent, metering approaches, metering algorithms, queue management, flow control, and signing (FHWA, 2006).

Table 1. Summary of Ramp Metering Benefits Experienced by Different States

Location	Benefit
Portland, Oregon	43% reduction in peak period collisions
Portland, Oregon	173% increase in average travel speed
Denver, Colorado	50% reduction in rear-end and side-swipe collisions
Denver Colorado	52% increase in average peak period travel speed and 37% decrease in average travel time
Seattle, Washington	39% reduction in collision rate
Seattle, Washington	52% reduction in average travel time and 74% increase in traffic volume

Many of the congestion and safety problems exhibited by urban freeways, which can be solved by ramp management, are found in the urban freeway systems of Pennsylvania. These characteristics include insufficient ramp acceleration areas; close spacing of ramps and deficient mainline capacity during peak periods. Ramp metering is a low cost benefit that can help alleviate localized and corridor congestion, improve safety, and improve travel perception and satisfaction. Ramp metering is also a way to improve freeway operations, while preserving the existing infrastructure. Communication among different agencies is a consequential benefit of ramp metering, as communication plays a key role in effectively implementing ramp management strategies (FHWA, 2006).

1.2 STATEMENT OF THE PROBLEM

Pittsburgh, Pennsylvania has never seen a ramp meter on one of its freeways. More and more state DOT's are experiencing the benefits of ramp meters, and Pennsylvania appears to have multiple ramp metering candidate locations. Successful implementation of ramp meters in the Pittsburgh area will require a comprehensive public education campaign. There are currently no standards in Pennsylvania for such a campaign. This lack of information on public education raises the following questions:

- How important is a public education campaign to the success of a ramp metering project in the Pittsburgh area?
- What have other states done in the past to educate the public on ramp metering?
- What is the most effective way to inform the public about ramp meters?

1.3 STUDY OBJECTIVES

This study hopes to clarify the answers to the questions presented in the previous section. The objectives of this study are to:

- Obtain information from more experienced state DOT's in ramp metering. The type of information that will be relevant to this study will include the methods of disseminating information to the public that were used, the effectiveness of those methods, the type of information that was presented, and finally the lessons learned from the campaign.
- Quantify the importance of a public education campaign on ramp metering, specifically in Pittsburgh, PA.
- Determine the most effective methods for disseminating information to the general public on ramp metering.

1.4 RESEARCH APPROACH

In order to accomplish the objectives set forth by this study, a detailed research approach was followed. The first step in the research approach was to perform a literature review. This review examined sources on ramp metering guidelines, such as national and state handbooks. Also included was an overview of which states currently use ramp metering. The review also looked at other non-ramp metering, but still transportation-related, sources on public information dissemination. The intent of examining those sources was to take the information learned from comparable situations within the transportation field and apply that specifically to ramp metering.

The second step in the research approach was to develop a survey to distribute to state DOT's that currently use ramp metering. This survey included questions on basic background information, methods used by the state DOT's in disseminating ramp metering information to the public, the responses of the public, the kind of information that was distributed to the public, and the lessons learned through the process.

The third step in the research approach was to analyze the returned DOT surveys. Once all of the surveys were collected, the responses were analyzed and summarized. Specifically, similar trends were looked for, and special note was made of the lessons learned.

The fourth step in the research approach involved the development of surveys for a test group, as well as the formation of the test group. The test groups were made up of commuters who regularly travel on the parkway (I-376) in Pittsburgh. The test groups were given the first part of the survey to fill out at the beginning of the meeting. This survey consisted of general questions about ramp metering, in order to get a sense of the group's understanding and perception of ramp metering. Then, the test groups were given informational material on ramp metering to review. Once the groups had a chance to review the material, the second part of the survey was administered. This survey asked the same questions as the first survey, and also questioned the individual's preferred method of information dissemination.

Finally, for the fifth step in the research approach, the test group surveys were analyzed and conclusions were drawn. Focus was applied on the differences in the responses before and then after the information was given to the group. This difference helped determine the importance of a public education campaign for ramp metering in Pittsburgh. Also, emphasis on the different ways people prefer to obtain public information was applied.

2.0 LITERATURE REVIEW

The literature review focused on ramp metering sources, such as national and state DOT handbooks. The interest of this study in those sources was in the discussion of public education campaigns. Specific attention was paid to any standards or guidelines in this area. Also, an overview of states that currently use ramp meters was important in determining which DOT's to contact for information. Finally, a review of sources related to the general dissemination of public information, not necessarily ramp metering related, was conducted.

2.1 STANDARDS FOR RAMP METERING PUBLIC EDUCATION CAMPAIGNS

2.1.1 National Standards

The Federal Highway Administration published the *Ramp Management and Control Handbook* in 2006. This handbook features a section on "Public Information and Outreach." This section stresses the importance of a public education campaign to the successfulness of ramp management strategies. According to the handbook, the intended goals of such a campaign are to help the general public understand how to use ramp meters, and to also understand the benefits of ramp meters. The implementation of a ramp metering system will not be effective without the support and understanding of the public (FHWA, 2006).

The FHWA handbook (2006) recommends that "the size and scope of the public outreach effort should be commensurate with the size and scope of the ramp management strategy." The handbook also recommends that the public campaign be started well in advance of the actual implementation (they recommend anywhere from one to five years before the meters are turned on for large projects) and be repeated several times to avoid the "surprise factor" of turning on the meters (FHWA, 2006).

The FHWA handbook (2006) also discusses the "target audience" for the public outreach campaign. Their identified audiences include local leaders, motorists, media, enforcement agencies, and transit. The handbook also recommends targeting any external agency that is expected to be significantly affected by the ramp management strategies (FHWA, 2006).

The tools and techniques discussed in the handbook are not necessarily recommendations. They are more of a description of available options. The handbook stresses that the combination of tools and techniques used for a specific campaign depends on the target audience and the intent. The tools described by the handbook include brochures/flyers/newsletters, websites, open house meetings, inter-agency meetings, media releases, signs, and automated messages. A paragraph or two describing the basic uses and advantages of these options is provided in the handbook for each of these tools (FHWA, 2006).

2.1.2 Individual State Standards

Some individual state DOT's have noted the importance of a public outreach campaign for ramp management by including a short note about it in a DOT handbook. However, this information is usually mentioned briefly and without much detail. The specific strategies and

tools to be used in this process are not mentioned, nor are the evaluations of what strategies have worked best in the past.

The Arizona Department of Transportation (ADOT) has a report that mentions the importance of a public awareness campaign when discussing the enforcement of ramp meters. This report makes note that for the public to abide by the ramp meters, they must be aware of the consequences of ignoring them (ITS Engineers and Constructors, Inc., 2003).

The Wisconsin Department of Transportation (WisDOT) also has a number of publications detailing ramp management strategies in their own state. Wisconsin's *Motorists' Handbook* (2009), which is designed to be a resource for the general public, has a section detailing ramp meters, and how to use them, including concise descriptions and clear diagrams.

2.2 STATES CURRENTLY USING RAMP METERING STRATEGIES

2.2.1 Arizona

The Arizona Department of Transportation (ADOT) operates approximately 121 meters in the Phoenix metropolitan area. The majority of these meters is centrally controlled and operates under fixed timing. However, these meters are capable of adapting to traffic patterns (Kittelson & Associates, Inc., 2007).

2.2.2 California

The California Department of Transportation (Caltrans) developed a systematic and integrated deployment strategy for their transportation management system (TMS) in 2002. This plan incorporates ramp metering into a coordinated operational strategy (FHWA, 2006).

California's system includes over 1,000 ramp meters statewide (to be expanded to over 1,400 locations by 2008), along approximately 70% of urban freeway miles. The goal of this ramp metering system is to improve the safety and capacity in the freeway merge areas (FHWA, 2006).

2.2.3 Georgia

According to a contact at the Georgia Department of Transportation (GDOT), there are eight operating meters in the Atlanta area. These ramp meters are not coordinated with the arterial traffic signals. The local jurisdictions operate and maintain the signals at the entrance and exit ramp intersections. However, when problems arise due to the ramp meter, GDOT assists the local jurisdiction with traffic signal timing around the ramp meter area. The Atlanta traffic management center (TMC) is primarily a freeway management system with less emphasis on the arterial streets (Demidovich, 2008).

2.2.4 Minnesota

The Minnesota Department of Transportation (Mn/DOT) operates one of the nation's most extensive ramp metering systems in the Minneapolis/St. Paul region. This system uses over

430 ramp meters (to be reduced to 350 ramp meters by 2008) to control corridor and regional traffic. The metering algorithms used in this system are some of the nation's most restrictive (FHWA, 2006).

The Minneapolis/St. Paul ramp metering system was turned off for a six-week period in 2000, in order to evaluate the effects of the ramp metering system on the overall transportation system. Certain performance measures were used to compare conditions with the meters turned on versus conditions with the meters turned off. In general, the study revealed that throughput decreased, travel times increased, travel time reliability decreased, and safety decreased when the meters were turned off. A benefit/cost analysis also revealed that the benefits of the ramp metering system outweighed the costs 15 to 1. Finally, survey and focus group efforts revealed that the majority of the Twin Cities' residents supported the use of ramp metering (FHWA, 2006).

2.2.5 Ohio

The Ohio Department of Transportation (ODOT) has recently expanded their ramp metering system, and published a *Ramp Metering Handbook* in 2008. According to a contact at ODOT, there were 25 ramp meters in Columbus and 4 ramp meters in Cincinnati as of 2009. Columbus has been successfully using ramp meters for a number of years, and added 7 more meters in 2005/2006. Cincinnati's ramp metering system was implemented during this past year (Quesnell, 2009).

2.2.6 Oregon

The Oregon Department of Transportation (ODOT) operates more than 140 ramp meters in the Portland area (Kittelson & Associates, Inc., 2007). A study showed that the ramp meters in the Portland area helped reduced the peak period collisions by 43%, as well as increasing the average travel speed by 173% (FHWA, 2006).

2.2.7 Pennsylvania

At the start of this study, the Pennsylvania Department of Transportation (PennDOT) did not operate any ramp meters. In 1998, ramp meters were implemented in the Philadelphia area; however, these meters had since been turned off for the purposes of software upgrades and fiber optic line installation. In March of 2010, these meters were turned back on, and a total of 14 ramp meters are currently operating in the Philadelphia area (Belmonte and Blaum, 2010). Because the implementation of these meters did not occur until the very end of this study, PennDOT was not contacted for the DOT survey.

2.2.8 Texas

The Texas Department of Transportation (TXDOT) installed 106 centralized-computer-controlled ramp meters in Houston in 1996. In 2000, Houston had close to 160 ramp meters (Kittelson & Associates, Inc., 2007).

2.2.9 Virginia

The Virginia Department of Transportation operates 26 meters in the Washington D.C. area, which run from the Smart Traffic Center. It is a centralized, coordinated scheme with meter rates that are updated every one minute (Kittelson & Associates, Inc., 2007).

2.2.10 Washington State

The Washington State Department of Transportation (WSDOT) operates a mid-sized ramp metering system in the Seattle region. As of 2002, there were 120 operating ramp meters. This system focuses on several high-priority corridors, and future plans include expansion of metering to additional locations (160 by 2008). WSDOT used an extensive outreach and public information campaign to relay information about the ramp management system to the public (FHWA, 2006).

2.2.11 Wisconsin

The Wisconsin Department of Transportation (WisDOT) deployed ramp meters at three interchange locations in the Madison region. The purpose of these ramp meters was to mitigate safety and congestion problems in the smaller metropolitan area. The system consists of five total on-ramps along a four-mile section of a beltline corridor (FHWA, 2006).

2.2.12 Other Locations

The following locations have known ramp metering systems: Denver, Colorado; Long Island, New York; Great Britain; and Zoetemeer, Netherlands (Kittelson & Associates, Inc., 2007).

Table 2. Summary of Different States Ramp Metering Information

State	Approximate Number of Ramp Meters	Comments
Arizona	121	Phoenix area
California	1,400+	Statewide, 70% of urban freeway miles
Georgia	8	Atlanta
Minnesota	350	Minneapolis/St. Paul area
Ohio	29	25 in Columbus, 4 in Cincinnati
Oregon	140+	Portland area
Texas	160	Houston area
Virginia	26	D.C. area
Washington	160	Seattle area
Wisconsin	5	Madison area

2.3 GENERAL PUBLIC INFORMATION DISSEMINATION

2.3.1 National Standards – Federal Highway Administration

The government has national standards for disseminating construction and work zone information to the public. The FHWA published a document called *Work Zone Public Information and Outreach Strategies* (2005) that features a set of guidelines for getting important information about future construction to the public and those affected. Although the type of

information (and in some cases the target audience) is different than what would be needed for a ramp metering campaign, the general ideas presented in the guide can still be applied.

The FHWA document (2005) identifies key steps in planning for and implementing the work zone public outreach strategies. The first step identified in the guide is to "determine the appropriate size and nature of the public information and outreach campaign." The guide discusses the factors that go into determining the size of a campaign. Some of these factors include the "characteristics of a project, its location, and the anticipated impacts of a road construction project." The guide also states that some larger projects will require more in-depth data collection to determine the effects of the work zone. Understanding the extent of the effects will help determine the necessary size of the public outreach campaign.

The second step identified in the FHWA work zone guide (2005) is to "identify resources." This step includes a discussion on budgeting the money for the campaign into the construction project, and also discusses taking advantage of free media outlets and existing resources (i.e. websites and hotlines). The internal agency resources that the guide suggests using are a project manager, public relations expert, and graphic design/web specialists. If the public relations and/or design personnel do not exist within the agency, these positions can be temporarily created or outsourced (FHWA, 2005).

The third step in the FHWA work zone guide (2005) is to "identify partners." The public outreach campaign for work zones is important to a number of agencies, which is why working together makes the campaign stronger and can reduce costs. The guide suggests working with "state and local agencies, major employers, and business and neighborhood associations," among others. Including these partners can have a number of positive effects. It establishes lines of communication early on and makes it easier to distribute the information to involved groups.

Having others involved can help improve the product and the presentation of the material. The guide also suggests the use of a community task force. This group can be made up of key stakeholders in the project and should be developed early in the planning process. The purpose of the group would be to get input early on in the process. The group can comment on and improve the strategies, and can help determine ways to minimize the effects on their community (FHWA, 2005).

The fourth step in the FHWA work zone guide (2005) is to "identify target audiences." As with any communication strategy, the key to finding the most effective message and outlet for that message lies in identifying the target audience. The guide identifies three overlapping categories of audiences: types of travelers, types of trip generators, and types of people. The guide notes that not all travelers are the same, and there can be many different types of travelers. Being aware of commuters versus non-commuters and local versus non-local travelers is important in targeting an audience. Also, there are travelers who prefer getting information before their trip, while others prefer getting it en route. Commercial vehicles also cannot be forgotten. All of these types of travelers must be considered when developing the public outreach strategies (FHWA, 2005).

The fifth step in the FHWA work zone guide (2005) is to "develop the message(s)." The guide discusses the both the general and the specific messages that should be conveyed to the public. According to the guide, the general message should incorporate the following three messages: *safety first, plan ahead to minimize delays,* and *we care*. The specific message of the campaign, according to the guide, should include information on dates, times, travel times, delays, and alternate routes.

The sixth step in the FHWA work zone guide (2005) is to "determine communication strategies." This step involves reviewing the different methods and funds available to come up with a communication strategy. Also part of the decision process is examining the target audience and the corresponding message to be conveyed. The guide recommends using as many outlets as necessary for the scope of the project, and also makes a note that it is important to keep the campaign's message consistent. Motorists will often come across the information through multiple outlets, and should not be confused by conflicting information (FHWA, 2005). The guide also makes note that generally, mass media outlets, such as newspaper articles and traffic news, tend to have the largest impact on the public. However, the guide also notes that websites are increasing in popularity for preferred methods of obtaining information (FHWA, 2005); and, as this guide was written five years ago, it can only be assumed that websites have moved higher up the list in effectiveness.

The seventh step in the FHWA work zone guide (2005) is to "determine communication timing." This step discusses the importance of starting the public outreach campaign before the construction starts. The before phase should concentrate on generalities and should establish planning groups. Also, in the before phase, there should be an emphasis placed on how and where to find out more information about the upcoming project. Effective communication after the project is completed is also important. According to the guide, the agency can put out information about the successes of the project, which can improve the agency's image. All websites and online information should also be kept up to date during the project and after its completion, in order to minimize confusion (FHWA, 2005).

The eighth and final step outlined in the FHWA work zone guide (2005) is to "evaluate campaign effectiveness." This step is important, according to the guide, because of the agency's

"long-term effort to improve safety and mobility in and around work zones." The guide also notes that if the duration of the construction, and therefore the duration of the campaign, is long, then all strategies should be evaluated throughout the process. This way the changing or redirection of information can be made. After the completion of the project, the guide suggests a telephone survey for evaluating the effectiveness of the campaign. Some of these measures of effectiveness can include awareness, changes in trip behavior, problems, levels of dissatisfaction, and usefulness of information, among others (FHWA, 2005).

The FHWA work zone guide (2005) also contains a checklist for aiding in the development and implementation of a public outreach campaign. This checklist has a number of different considerations for the campaign, and generally deals with the foundation/framework for the campaign, the outreach strategies, implementing the strategies, and the evaluation of the campaign. This checklist is designed to help the agency with the campaign and to make sure nothing is overlooked (FHWA, 2005).

The FHWA guide (2005) also contains a section devoted to different possible communication strategies. The specific strategies discussed within this section include branding, mass media, websites, email alerts, printed material, hotlines, message signs, highway advisory radio, public meetings, information centers, and videos. This section also contains a useful chart that describes the target audience, benefits, issues, time frame, and relative costs for each communication strategy. Template for different tools, such as the framework of the outreach, the product development, and the action plan, can also be found in Appendix B of the guide (FHWA, 2005).

2.3.2 PennDOT Experience

PennDOT, District 11 has a central press office that handles the dissemination of information to the public in the Pittsburgh region. After contacting the main press officer, Mr. James Struzzi, the following information about PennDOT's information dissemination was obtained: When a major incident in Pittsburgh occurs, the PennDOT press office receives information from the traffic management center (TMC), and then sends out a formal press release with traffic alerts to the media. PennDOT also has an email list of thousands of customers who have signed up to receive updates. Traffic alerts are also sent to these customers on the mailing list via email (Struzzi, 2010).

Planned construction events in Pittsburgh follow a slightly different process. In these cases, contractors are required to fill out a press release form detailing the nature of the restricted access and the time frame of the project. Once the form goes through the approval process, the press office writes up a formal press release and sends it to media outlets and the email list (Struzzi, 2010).

Traffic and construction alerts are also posted on the PennDOT website. In addition, there are hotline numbers that the public can call to get traffic and construction information. There is a fairly recent hotline/website called 511 that provides real-time traffic information to the public. A construction hotline also exists for SR 28, I-79, and the parkways. At this time, the PennDOT press office does not use any social networking sites (Struzzi, 2010).

Automated message boards on the freeways also play a big role in informing the public as to current traffic conditions and future road closures or construction. These boards are not run through the press office. They are solely controlled by the TMC (Struzzi, 2010).

Mr. Struzzi stated that some resources do exist to aid newcomers to the process of releasing information to the media and public. These resources exist in the form of flowcharts, an example of which can be found in Appendix A.1. Also PennDOT website and hotline information can be found in Appendix A.2 (Struzzi, 2010).

It was discovered near the end of this study that PennDOT recently turned on ramp meters in the Philadelphia region. The assistant press secretary for PennDOT, District 6 (Eugene J. Blaum) and the district traffic engineer (Louis Belmonte) were contacted on April 16, 2010 in hopes of obtaining information about the public education/outreach campaign conducted by PennDOT, prior to turning on the ramp meters. After a phone conversation with both gentlemen, it was discovered that for this campaign, PennDOT disseminated information to the public by means of media, signs (portable variable message signs put in place one to two weeks prior to activation), brochures, websites, email, and letters to local officials. Also as part of the ramp meter activation, PennDOT stationed two people at each meter location to help answer questions and ensure smooth operation (Belmonte and Blaum, 2010).

The type of information disseminated by PennDOT for this campaign included educational information on how to use ramp meters and the benefits. Heavy emphasis was placed on previous study results for meters in those locations, in order to show the benefits. The campaign had been started in January 2010 and media releases went out approximately two and a half weeks prior to testing (Belmonte and Blaum, 2010).

3.0 DEPARTMENT OF TRANSPORTATION SURVEY

Many states throughout the U.S. have been using ramp meters on their freeways for years. Also, many states have recently implemented or expanded their ramp metering system. As Pennsylvania nears the idea of implementing ramp meters, it is important to look at other states' experiences and to learn from them. After a literature review was done and the states currently using ramp meters were identified, those states' DOT's became the focus for a survey on the history and experience each DOT has had in implementing a ramp metering system. Specifically, the focus of the survey was on the public education and outreach side of implementing ramp meters.

3.1 METHODOLOGY

The department of transportation survey was designed to be answered by state freeway operations or traffic engineers. A blank copy of the survey can be found in Appendix B.1. It was developed with a few key questions in mind. These questions include:

- Was the concept of *ramp metering* something that was familiar to the public within that area at the time of installation?
- During implementation, what public education/outreach strategy was used?
- What was the initial reaction of the public to the ramp metering system?

- What were the lessons learned from the public education/outreach campaign?
- Do a set of standards exist that should be followed when developing a public education/outreach campaign for a ramp metering system?

3.1.1 Survey Questions 1 and 2

1) When was the first ramp metering system installed in your jurisdiction?

2) Were there any other ramp metering systems operating in the surrounding or nearby areas?

Survey questions 1 and 2 were designed to help answer the inquiry of "Was the concept of *ramp metering* something that was familiar to the public within that area at the time of installation?" Knowing the date of initial installation (question 1) reveals how long the meters have been running and how new the concept of ramp meters were when they were installed. Finding out if there were any ramp meters in operation nearby (question 2) reveals of how familiar the public in that area would have been with the concept. If ramp meters existed in a neighboring state or jurisdiction, there is a greater chance that the general public would be familiar with the meters and may have even experienced them before.

3.1.2 Survey Questions 3, 4, 5, and 6

3) What method(s) were used in explaining how the motorist should use the ramp meters? (Please mark all that apply)

4) What method(s) were used in explaining the potential benefits of the ramp meters to the public? (Please mark all that apply)

5) Was the public informed about alternate routes (to avoid the ramp meters)?

6) Was the public informed about expected delays at the ramps (based upon metering rates)?

Survey questions 3, 4, 5, and 6 were designed to help answer the inquiry of "During implementation, what was the public education/outreach strategy?" Questions 3 and 4 specifically ask about the tools that were used to disseminate information to the public. They also ask which tool was the most effective, in the opinion of the engineer. Knowing the experiences of other states in their campaigns, and what they think worked best, is valuable knowledge for starting a new campaign in a different state, such as Pennsylvania. Survey questions 5 and 6 deal with the specific type of information that was disseminated to the public. A public education and outreach campaign for ramp meters should not necessarily focus solely on how to use the ramp meters and their benefits. Other issues, such as letting the public know about expected delays, or informing the public of alternate routes can also be important in some cases. Questions 5 and 6 were designed to find out if those issues were addressed at all during the campaign.

3.1.3 Survey Questions 8 and 9

8) Was there much public opposition to the system?

9) Did motorists run into any major problems during the initial operating phase, such as confusion or misunderstanding of how to use the meters?

Survey questions 8 and 9 were designed to answer the inquiry of "What was the initial reaction of the public to the ramp metering system?" Knowing if there was much public opposition (question 8) reveals of how important disseminating the benefits of ramp metering to the public was during the campaign. Also, knowing what kind of problems the motorists ran into during the initial phases (question 9) helps give a sense of what information was not clear to the public.

3.1.4 Survey Questions 9 and 10

9) Did motorists run into any major problems during the initial operating phase, such as confusion or misunderstanding of how to use the meters?

10) If implementing ramp meters for the first time today, is there anything that would be done differently to educate the public?

Survey questions 9 and 10 were designed to answer the inquiry of "What were the lessons learned from the public education/outreach campaign?" Although question 9 is a valuable tool in understanding what information was not clear to the public, it can also be seen as a tool in understanding what lessons were learned from the agency during the public education and outreach campaign. Similarly, question 10 asks what would be done differently if implementing ramp meters today. This question also reveals some of the lessons the agency

learned after evaluating the successfulness of their campaign. This question also gives the agencies a chance to discuss more recent technology efforts that they feel would help in developing a campaign today.

3.1.5 Survey Questions 7, 11, and 12

7) Was there a standard set of procedures in place for informing the public?

11) Do you currently have a set of standards for educating the public in using ramp meters?

12) If so, where can this information be found?

Survey questions 7, 11, and 12 were designed to answer the inquiry of "Is there a set of standards in place to follow when developing a public education/outreach campaign for a ramp metering system?" Question 7 asks if standards existed at the time of initial implementation, while questions 11 and 12 ask if there are current standards in place now. If standards were not in place at the initial time of installation, and they are in place now, then these standards can be assumed to be based on experience. If standards on public education/outreach campaigns exist for a number of different states, these standards can be used in developing a set of standards or guidelines for Pennsylvania.

3.1.6 Survey Question 13

13) Please note any additional information or sources that you feel are relevant.

Finally, survey question 13 was developed to allow the engineer to offer an additional or relevant material.

3.2 DISTRIBUTION

The survey was created using a PDF editor, so that it could be filled out on the computer, and sent back over email. It was thought that sending the survey electronically would solicit quicker responses. Every effort was made to make the survey as simple and clear as possible, also with the intention of soliciting quick responses.

States that currently use ramp meters were identified in the literature review. The survey was designed to be filled out by a freeway operations or traffic engineer, and those engineers were identified for each state currently using ramp meters. The surveys were then emailed out to those contacts. The states identified for participation in the survey included: Arizona, California, Colorado, Georgia, Minnesota, New York, Ohio, Oregon, Texas, Washington, Wisconsin, and Virginia.

Once the surveys were sent out, follow-up calls were made the next day. A week before the requested deadline for the surveys to be returned, calls were again made to the contacts who had not yet returned their survey. The only state that was not able to complete the survey was Georgia. Therefore, eleven completed surveys were collected.

4.0 TEST GROUP SURVEYS

Ramp meters have been in use in the U.S. for over forty years. Those who are familiar with the concept of ramp meters may question the necessity of a large public education/outreach campaign or the justification of spending a large amount of money on such a campaign. One of the questions that this study has set out to answer is: *how important is a public education campaign to the success of a ramp metering project?* Specifically, how important would a public education campaign be for implementing ramp meters in the Pittsburgh area? Another question that this study sets out to answer is: *what is the most effective way to get this information to the public?* The test group surveys were designed to help answer these questions.

4.1 METHODOLOGY

The test group surveys were designed to be taken by members of the general public in the Pittsburgh area that frequently travel I-376. This freeway experiences a great deal of recurring congestion during peak hours, and has been identified as a candidate freeway for ramp meters by a study conducted in 2009 through 2010 by the University of Pittsburgh. At this time, the University of Pittsburgh study report is still in its draft stages. There are currently no plans in place by PennDOT to implement ramp meters in Pennsylvania. However, for the purpose of this study, it is assumed that if ramp metering were to be implemented, I-376 would be one of the

first locations chosen for ramp metering. The group of people who frequently travel on I-376 would be target audience for a public education and outreach campaign, as they are the motorists who would be affected by ramp meters on this freeway.

Copies of the test group surveys can be found in Appendix C. They were designed with a number of questions in mind. These questions include:

- How familiar are motorists in the Pittsburgh area with the concept of *ramp metering*?
- Have motorists in the Pittsburgh area ever used a ramp meter before?
- Would motorists in the Pittsburgh area know how to use a ramp meter if one was installed today?
- Do motorists in the Pittsburgh area know the benefits of ramp metering?
- How much public opposition would there be if ramp meters were implemented in the Pittsburgh area today?
- How would motorists in the Pittsburgh area respond to different public education strategies?

4.1.1 Test group Survey Part 1

Part 1 of the test group surveys was designed to get a feel for the amount of prior knowledge each participant had on ramp metering. This part of the survey was designed to act as a baseline for the second part of the survey. It was expected that many of the participants would never have even heard of the concept of ramp metering before.

4.1.1.1 Survey Questions 1 and 2

1) Have you heard of the term ramp metering before?

2) A basic definition of ramp metering is using a signal at the end of a freeway on-ramp to control the rate at which the vehicles enter the freeway. Have you ever heard of this concept before?

Survey questions 1 and 2 were designed to answer the inquiry of "How familiar are motorists in the Pittsburgh area with the concept of *ramp metering*?" If participants answer "no" to both questions 1 and 2, they are asked to skip to the next part of the survey. The participants that answer "no" to both questions 1 and 2 make the case for the importance of public education.

4.1.1.2 Survey Questions 3 and 4

3) Have you ever experienced a ramp meter?

4) If approaching a ramp meter would you feel comfortable in knowing how to proceed?

Survey questions 3 and 4 were designed to answer the inquiries of "Have motorists in the Pittsburgh area ever used a ramp meter before?" and "Would motorists in the Pittsburgh area know how to use a ramp meter if one was installed today?" If participants answer no to these questions, it can be inferred that although they might be familiar with the concept of ramp metering, they are not familiar with actually using ramp meters. The larger percentage of participants that answer "no" to these questions, the higher the importance of a public education campaign becomes.

4.1.1.3 Survey Question 5

5) What are the benefits of ramp metering? (mark all that apply)

Survey question 5 was designed to answer the inquiry of "Do motorists in the Pittsburgh area know the benefits of ramp metering?" Some of the studied benefits of ramp metering were included in the answer options for question 5. Also, some benefits that have not been proven or that are false were also included in the answer options. The participant was asked to select the benefits of ramp metering in this question. Some participants may have said that they understand the concept of ramp metering, but they may not truly understand the benefits. Not understanding the benefits of ramp metering could lead to high public opposition. Therefore, this question helps determine the importance of stressing the benefits of ramp metering as a part of the public education/outreach campaign.

4.1.1.4 Survey Questions 6, 7, and 8

6) If you were approaching an on-ramp to I-376, and you encountered a queue of vehicles stopped on the on-ramp, would you be willing to wait to enter the freeway?

7) Would you be opposed to the idea of installing ramp meters in Pittsburgh (for example on I-376)?

8) If ramp meters were installed in Pittsburgh (for example on I-376) would you try to find alternate routes to avoid the meters?

Survey questions 6, 7, and 8 were designed to answer the inquiry of "How much public opposition would there be if ramp meters were implemented in the Pittsburgh area today?" Question 6 asks if the participant would be willing to wait at a ramp meter, or if they would find an alternate route. If the participants do not fully understand the benefits of ramp metering, they

might be opposed to the idea of waiting in a queue. Question 7 asks if the participant would be opposed to the idea of installing ramp meters in the Pittsburgh area. Again, if the participants do not fully understand the benefits of ramp metering, they might be opposed to this idea. Question 8 asks if the participant would try to find an alternate route to avoid using the meters. The answer to this question reveal whether or not the participant truly understands the benefits of ramp meters, and how much route diversion should be expected.

4.1.2 Test Group Survey – Informational Material

After the participants filled out Part 1 of the survey, they were asked to review some information material on ramp metering. Five types of informational material were made available to the participants. These included a "How to Use Ramp Meters" handout, a "Frequently Asked Questions" handout, a website, an instructional video, and the ability to ask the survey administrator questions. The handouts represented information that could be found on brochures/flyers mailed or handed out to motorists. The flyers also represented information that would be received in an email, in a newspaper article, in an automated message, or on a sign. The website represented information that would be acquired by motorists visiting a project website, or a social networking site. The instructional video represented information that would be received on the local news. Finally, questions asked by the participant to the survey administrator represented the kind of information that would be received at an open house meeting.

Participants were asked to review whichever informational material they felt comfortable with. They were allowed to review the material for as long or as briefly as they chose. The purpose of giving the participants those options was to simulate real world conditions as closely

as possible. During most public education/outreach campaigns, there are a number of ways for the public to receive information. Different people have different preferences, and this became evident as the survey participants were allowed to choose a method of receiving information. Also, in many cases, motorists may only briefly review information presented in a public education campaign. Some motorists might take the time to thoroughly review information, however some may not. For this reason, the survey participants were not given a time frame to look over the informational material. However long they chose to review the material was assumed to be representative of what they would do in the real world.

4.1.3 Test Group Survey Part 2

After the survey participants reviewed the informational material of their choosing for however long they wished, they were asked to fill out Part 2 of the test group survey. Part 2 of the survey contained the same questions as Part 1, plus a few additional questions addressing the inquiry of "How would motorists in the Pittsburgh area respond to different public education strategies?"

4.1.3.1 Survey Question 1

1) Before this survey, had you ever heard of ramp metering before?

Survey question 1 was designed to find out if the participant had ever heard of ramp metering before the survey. It was assumed that participants who answered "no" and who had never heard of ramp metering before the survey would base all of their answers to the rest of the questions in Part 2 solely on the informational material presented as part of the survey. It was

also assumed that for participants who answered "yes" to question 1, any changes in their responses to the questions from Part 1 to Part 2 was due to the informational material presented as part of the survey.

4.1.3.2 Survey Questions 2, 3, 4, 5, and 6

2) If approaching a ramp meter would you feel comfortable in knowing how to proceed?

3) What are the benefits of ramp metering? (mark all that apply)

4)) If you were approaching an on-ramp to I-376, and you encountered a queue of vehicles stopped on the on-ramp, would you be willing to wait to enter the freeway?

5) Would you be opposed to the idea of installing ramp meters in Pittsburgh (for example on I-376)?

6) If ramp meters were installed in Pittsburgh (for example on I-376) would you try to find alternate routes to avoid the meters?

Survey questions 2 through 6 in Part 2 were identical to the questions asked in Part 1. Gauging the changes in responses from Part 1 to Part 2 reveal how much the participants learned from the informational material. Survey question 2 in Part 2 repeat the question of would the participant be comfortable in knowing how to use a ramp meter. If the participant answered "no" or "unsure" in Part 1 and "yes" in Part 2, it can be assumed that the informational material reviewed by the participant was successful in teaching how to use a ramp meter.

Survey question 3 in Part 2 repeat the question of what are the benefits of ramp metering. If the participant selects more correct answers in Part 2 than in Part 1, it can be assumed that the informational material helped in explaining the benefits of ramp metering. However, if the majority of participants do not select the correct benefits, then the informational material might need to be modified to better emphasize the benefits, or in order to more clearly explain them.

Survey question 4 in Part 2 repeats the question of whether or not the participant would be willing to wait to enter the freeway. If the participant is willing to wait longer in Part 2 than in Part 1, it can be assumed that the informational material was successful in explaining the specific benefit of reducing congestion on the freeway.

Survey question 5 in Part 2 repeats the question of whether or not the participant would be opposed to the implementation of ramp meters in the Pittsburgh area. If the participant answers "yes" or "would need more information" in Part 1 and "no" in Part 2, it can be assumed that the informational material reviewed by the participant changed the participant's mind.

Survey question 6 in Part 2 repeats the question of whether or not the participant would try to find alternate routes to avoid ramp meters. If the participant answers "yes" or "would need more information" in Part 1 and "no" in Part 2, it can be assumed that the informational material convinced the participant that waiting at the meter would be a better option than finding an alternate route.

4.1.3.3 Survey Questions 7 and 8

7) Which method(s) would be your preferred method for receiving information on ramp metering?

8) Which method(s) would you be most likely to pay attention to?

Survey question 7 in Part 2 asks the participants which method they would prefer for receiving information about ramp metering. Question 8 in Part 2 asks the participant which method they would be most likely to pay attention to. Some participants may prefer one method; however, they may recognize that another method would grab their attention more easily. The answers to both of these questions should be considered in determining which would be the most

effective method of information dissemination within the test group. It was assumed for this study, that this sample of people was representative of the target audiences for a potential ramp metering public education/outreach campaign in the Pittsburgh area.

4.1.3.4 Survey Question 9

9) Before answering the second part of this survey, which informational materials did you review?

Finally, survey question 9 in Part 2 asks the participants which informational material they reviewed before answering Part 2. Knowing this, with the corresponding answers to Part 2, reveals how effective that particular method of information dissemination was. Also, knowing which method of information dissemination was the most popular within the survey group hints at which method(s) would be most popular in the real world.

The test group surveys were answered anonymously; however ,Part 1 and Part 2 of the survey were stapled together. This allowed each participant's responses to be compared individually, as well as within the context of the entire group.

4.2 PREPARATION

4.2.1 Informational Material

Five types of informational material on ramp metering were needed for the test group surveys. It was desired that a number of options be presented to the participants in order to resemble real word conditions as closely as possible. The five informational material options

included: a "How to Use Ramp Meters" handout, a "Frequently Asked Questions" handout, a website, an instructional video, and the option to ask the survey administrator questions.

The "How to Use Ramp Meters" handout was taken directly from the Wisconsin Department of Transportation's *Motorists' Handbook* (2009). This handout was selected for its simplistic and clear explanation of how to use a ramp meter. The handout is only one page long, and includes a figure describing the parts of a ramp meter, as well as concise explanations. A copy of this handout can be found in Appendix C.

The "Frequently Asked Questions" handout was taken directly from a document found on the Oregon Department of Transportation's website. This handout was selected because of the concise manner in which it addresses the issues surrounding ramp meters. The handout is three pages long and discusses the goals and benefits of ramp metering, while also addressing the potential negatives of ramp metering. A copy of this handout can be found in Appendix C.

The website used in the presentation of the informational material during the survey was Washington State Department of Transportation's website on Ramp Meters. This site was selected for its concise presentation of information and its ease of use. For the administration of the survey, the website was pulled up on a laptop computer, so that participants could freely browse the website if they chose. A link to this site, as well as a copy of the text found on the site can be found in Appendix C.

The instructional video used in the presentation of informational material during the survey was downloaded from the Georgia Department of Transportation's website. The video is entitled *Ramp Meters: Smoothing the Flow* and is approximately three minutes in length. The video presents a clear demonstration of how to use a ramp meter, as well as the benefits. The video also includes video footage of an actual freeway in Georgia and the improvement made on

the freeway by the installation of ramp meters. This video allowed the participant to actually see the effects of a ramp meter on a freeway. The video was available to watch on a second laptop computer. A link to download the video, as well as stills from the video, can be found in Appendix C.

Finally, the survey administrator was available to the survey participants if they wished to ask questions. The administrator presented all of the informational material options to the participants, and then told them that they could also feel free to ask any questions that they might have on ramp metering. The survey administrator was well versed in ramp metering and was prepared to answer common questions that motorists have.

4.2.2 Test Groups

In searching for a test group of people to administer the survey to, the only requirement requested was that they regularly travel on I-376 in Pittsburgh. A variety of people of different ages, education levels, and ramp metering experience ware also desired. In order to obtain this variety and to negate major variances, a large sample size was preferred. Given the time and logistical constraints of the study, thirty-one participants was the largest sample size able to be obtained.

This test group survey was designed to be fairly involved, with the presentation of informational material, and the order in which the surveys were administered. Therefore, simply emailing the survey to participants would not guarantee accurate results. It was determined that the survey must be administered in person. Because of the involvement of the survey, it was also expected to be difficult to solicit random people to take the survey. The best option therefore, was to contact different places of employment and ask to come in to administer the survey

personally. The law firm of Cohen & Grigbsy, P.C., located on Liberty Avenue in downtown Pittsburgh agreed to let a survey administrator come in during the lunch hour. The Carnegie Museum of Natural History, located on Forbes Avenue in the Oakland area of Pittsburgh also agreed to let a survey administrator come in and give the survey to employees in the financial offices, customer service department, and museum café. Finally, a third group of young professionals and students agreed to take the survey and were assembled at a private residence.

4.3 ADMINISTRATION

The survey was administered to a group of employees at Cohen & Grigbsy, P.C. on Liberty Avenue in downtown Pittsburgh on Friday, March 12, 2010. A total of twelve people in the office took the survey. The employees ranged from lawyers, to secretaries, to employees in the IT department. However, it should be noted that the participants were picked at random, and it was not the intention of the survey to seek out a specific number of lawyers, secretaries, or any other profession. The survey was not presented to all twelve participants at once. Participants came in different size groups. The survey was administered a total of four times within that office: the first time to one participant, the second time to one participant, the third time to four participants, and the fourth time to six participants. Many of the participants had never heard of ramp metering before; however, they were assured that it didn't matter and that they could still participate in the survey. Some of the participants indicated that they had remembered seeing ramp meters in other states during travel for work, but could not remember specifically where.

During this day of administering the survey, the website and video options did not seem to be very popular. This could be due to a number of reasons. Possibly, the participants'

background in the law field made them more comfortable reading a sheet of paper. Both of the individuals that took the survey without a group of people requested to watch the video. It is possible that in the larger groups, because no one took the initiative to watch the video or look at the website, the others felt uncomfortable doing so. Or, they simply might not have preferred to receive the information in this way.

Based on the first day of administering the survey, it was determined that administering the survey to smaller groups of people at a time was ideal. That way, the participants felt more comfortable, and were not swayed by which informational material the rest of the group used. However, it should be noted that the size of the group was not thought to have a noticeable effect on the outcome of the results.

The survey was administered at the Carnegie Museum of Natural History on Forbes Avenue in the Oakland neighborhood of Pittsburgh on March 16, 2010. A total of twelve participants took the survey. The participants included customer service representatives, employees in the director's office, employees at the museum café, and museum visitors. The survey was not presented to all twelve participants at once. Because of the lessons learned from administering the survey the first day, participants were given the survey in groups of one to three people at a time. The participants seemed to be more comfortable picking their preferred informational material in this group size, and a larger variety of options were reviewed during this day of survey administration. As with the first day, many of the participants had never heard of ramp metering before; however, they were assured that it didn't matter and that they could still participate in the survey. A few of the participants were familiar with ramp meters from having lived in different states that use them.

The survey was administered at a private residence in the Shadyside neighborhood of Pittsburgh on April 2, 2010. A total of seven young professionals and students took the survey on this date. Again, the survey was administered in smaller groups of one to three people, which allowed the participants to be more comfortable in choosing their preferred informational material. A variety of options were reviewed during this session. As with the first and second days, many of the participants had never heard of ramp metering before, however they were assured that it didn't matter and they could still participate in the survey. A few of the participants were familiar with ramp meters from having traveled through different states that use them.

5.0 RESULTS

The DOT survey results were compiled into a responses portfolio using Adobe Acrobat. This file was then exported to excel, and a spreadsheet was created, comparing the responses of the survey by state. This spreadsheet can be found in Appendix B.3. All of the original returned surveys can also be found in Appendix B.2.

Because the test group surveys were filled out manually, they were inputted into an excel spreadsheet manually. This spreadsheet can be found in Appendix C.4. The original surveys filled out by the survey participants can also be found in Appendix C.3. The following sections describe the results of the surveys in detail.

5.1 DOT SURVEY RESULTS

5.1.1 Breakdown of Background Information

The information obtained from the individual state DOT's was combined into one large spreadsheet so that the data from each state could be easily compared. DOT Survey questions 2, 7, and 11 were asked in order to obtain some background information. The summarized results of these questions can be found in bar chart of Figure 1. The bars represent the percentage of the DOT's that responded "yes" to each question. The rest of the DOT's responded "no."

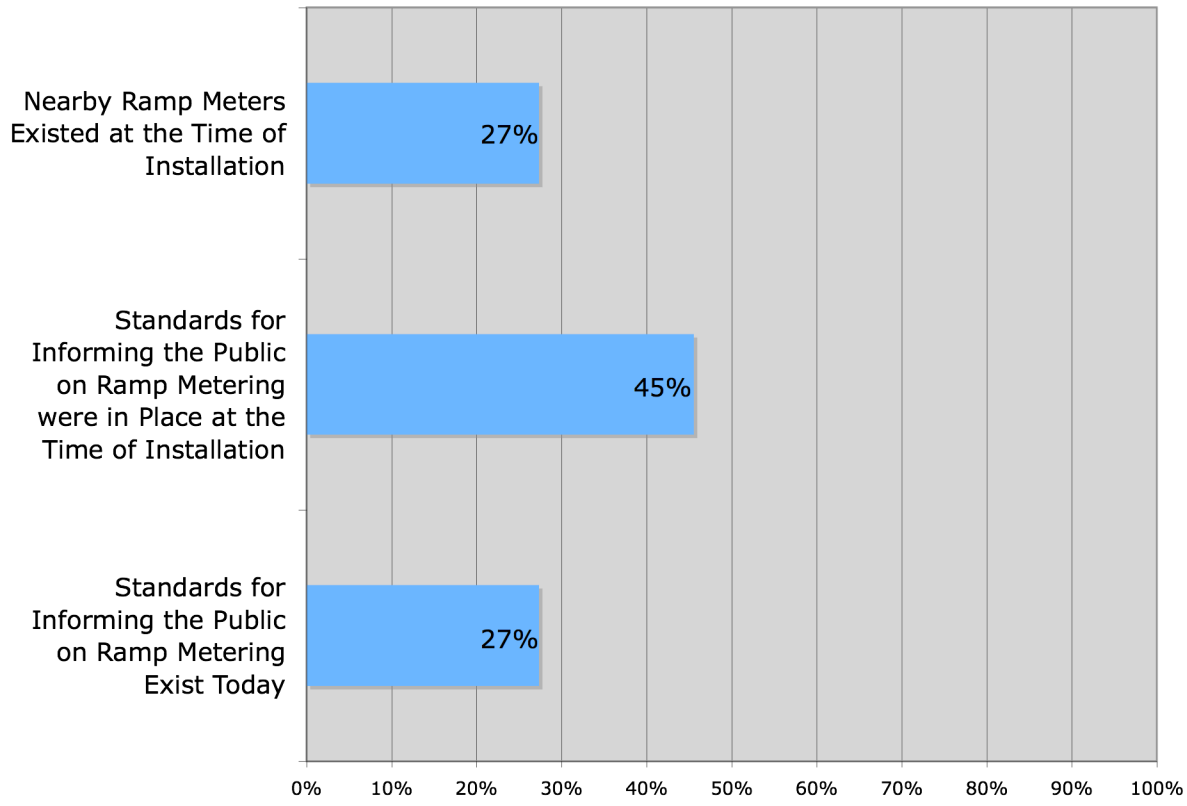


Figure 1. Background Information for Public Education and Ramp Metering from DOT Survey

This information reveals where the DOT's were starting from when they were forming their ramp metering public education campaigns. From the chart, it is evident that less than half of the DOT's that participated in this survey had standards set in place for guiding a public outreach/education campaign when implementing ramp meters for the first time. Only 27% of the DOT's were implementing a ramp metering system in areas where ramp metering was used nearby. It is also evident from the chart that only 27% of the surveyed DOT's have existing standards today for guiding the dissemination of information to the public on ramp metering. It can be discerned then, that the majority of the DOT's surveyed were in a similar position to that

of PennDOT, if PennDOT were to implement ramp meters in Pittsburgh. Therefore, the information obtained from these surveys would be valuable in forming a public outreach and education strategy for Pittsburgh.

5.1.2 Breakdown and Trends of Information Content

The next inquiry of the survey was to determine the content of the information disseminated to the public during public outreach campaigns for ramp metering. The type of information used, and the percentage of surveyed DOT's who reported disseminating this type of information is shown in the Figure 2. The bars represent the percentage of the DOT's that responded "yes" to each question. The rest of the DOT's responded "no."

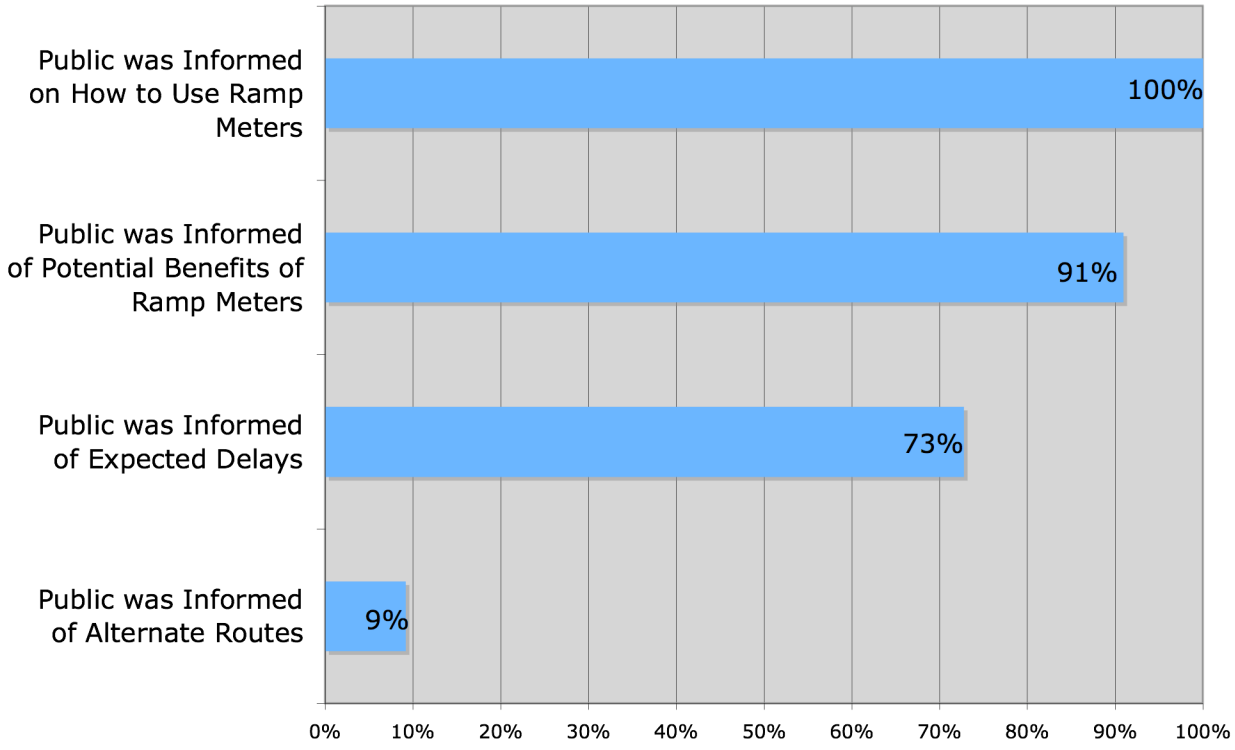


Figure 2. Content of Ramp Metering Public Education Campaign from DOT Survey

Content instructing motorists on how to use ramp meters was reportedly employed by all of the surveyed DOT's in their public outreach campaigns. Also, the majority of the surveyed DOT's reportedly incorporated content relating to the benefits of ramp metering in their public outreach campaigns. It can be discerned from the chart that slightly fewer DOT's incorporated information on expected delays at the meters (73%) and fewer still incorporated information on alternate routes (9%). Therefore, it can be assumed that the focus of the majority of the surveyed DOT's public outreach campaigns was on making sure the public knew how to use the meters

and what the benefits and delays were. Specifically, when disseminating information to the public about expected delays, the breakdown of the different approaches and percentage of surveyed DOT's that used each approach is presented in Figure 3.

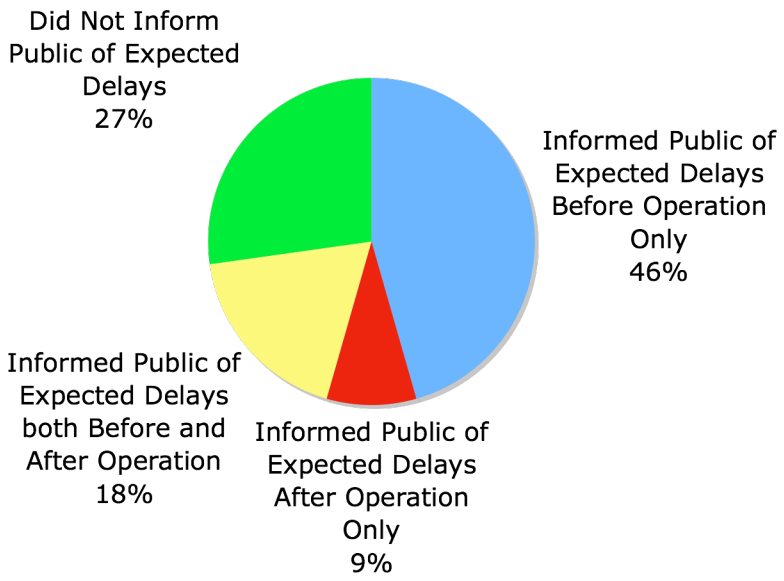


Figure 3. Surveyed DOT's Approaches to Disseminating Information to the Public About Expected Delays Due to Ramp Meters

It can be discerned from the chart that 73% of the surveyed DOT's made informing the public of expected delays a part of their public outreach campaign, however 9% did not make it a priority until after the ramp meters were implemented. Only 18% of the surveyed DOT's made it a priority both before and after the implementation of the meters.

Within the survey, each DOT was asked to identify all of the methods they used for disseminating information to the public on how to use ramp meters. Figure 4 shows different

methods and the percentage of the surveyed DOT's who reported using that method. The bars represent the percentage of the DOT's that reported using each method. The rest of the DOT's did not select that method on the survey. The DOT's were allowed to select as many methods as applied.

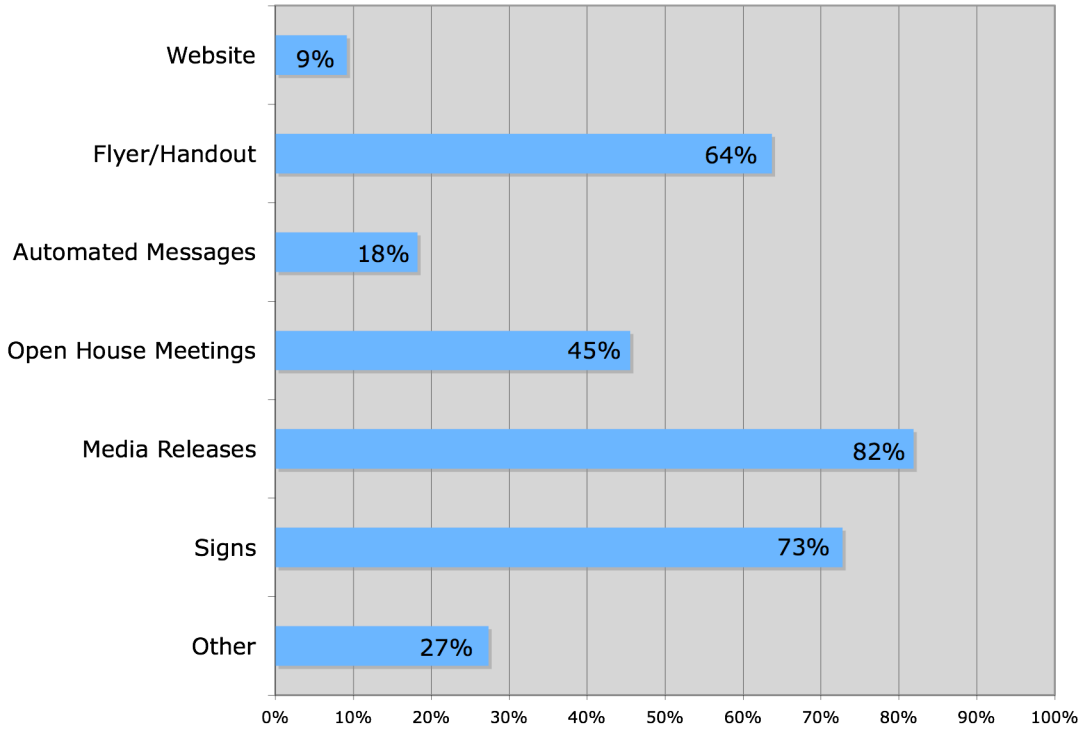


Figure 4. Surveyed DOT's Methods of Information Dissemination on How to Use Ramp Meters

It can be discerned from the chart that the most common method used by the surveyed DOT's was media releases (82%). Other popular methods included signs (73%) and flyers/handouts (64%). The least common method was website. However, it is important to note that most of the DOT's who reportedly did not use websites in their public outreach campaigns were implementing ramp meters before the popularity of the internet. In fact eight of the eleven surveyed DOT's first implemented ramp metering systems before 1990. Many of the DOT's

who did not report using websites, made a note that had they been implementing ramp meters today, they would take full advantage of the internet. Other methods identified by some DOT's included social networking sites, handing out flyers at the ramps with police presence, outreach to schools, and videos.

A representation of the most popular methods for disseminating information to the public on how to use ramp meters, normalized by the total methods reported by all DOT's (thirty-five), is represented in Figure 5.

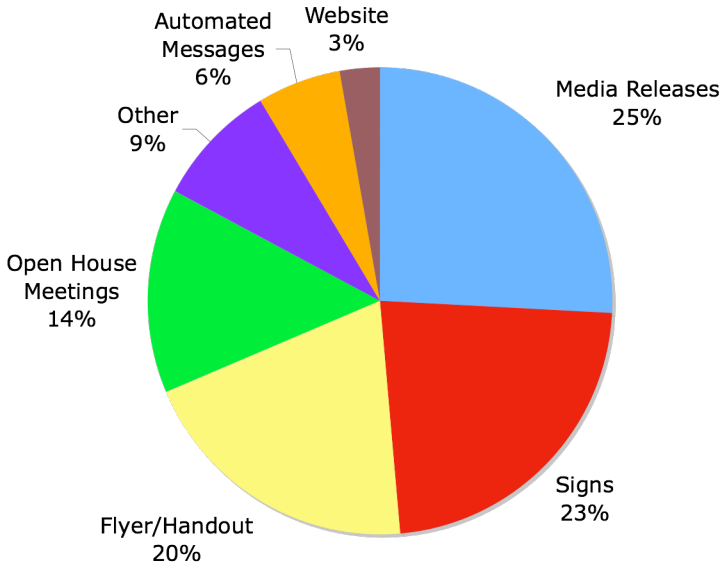


Figure 5. Surveyed DOT's Popularity of Methods for Information Dissemination on How to Use Ramp Meters

Within the survey, each DOT was asked to identify all of the methods they used for disseminating information to the public on the benefits of ramp meters. Figure 6 shows different methods and the percentage of the surveyed DOT's who reported using that method. The bars

represent the percentage of the DOT's that reported using each method. The rest of the DOT's did not select that method on the survey. The DOT's were allowed to select as many methods as applied.

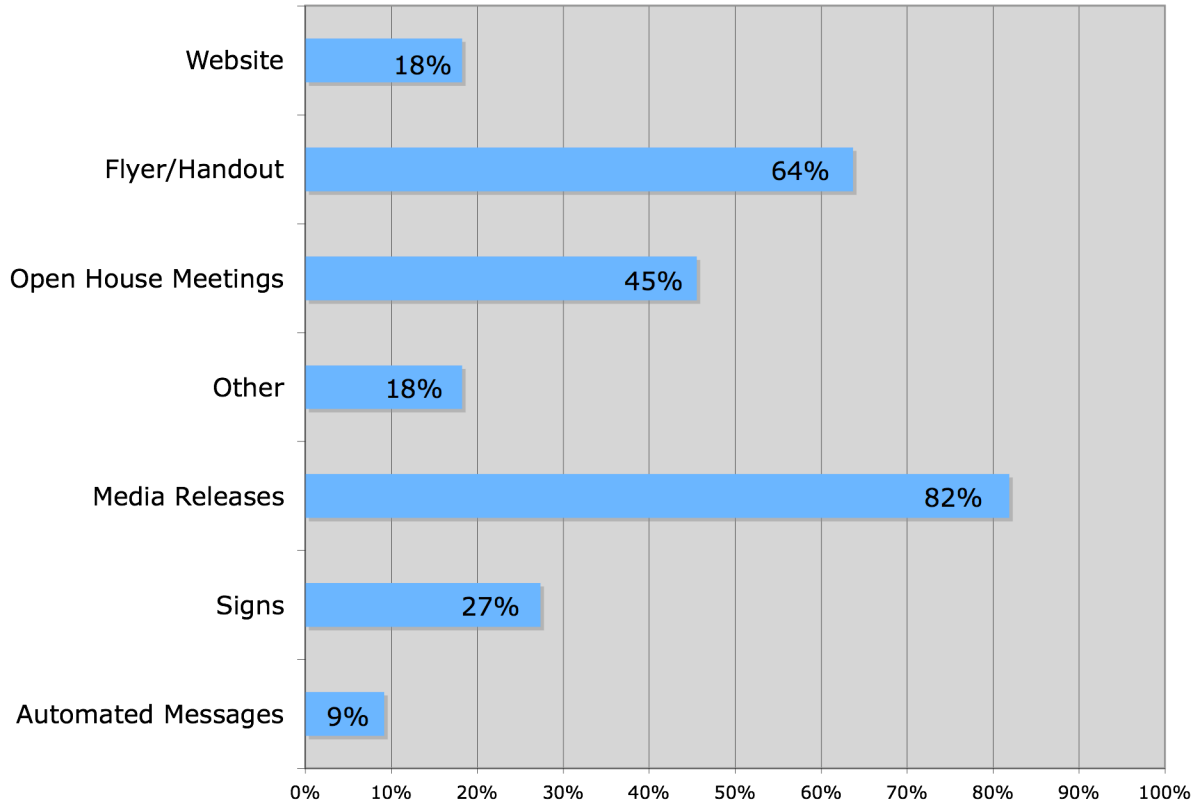


Figure 6. Surveyed DOT's Methods for Information Dissemination on the Benefits of Ramp Meters

It can be discerned from the chart that the most common method used by the surveyed DOT's was media releases (82%). Other popular methods included flyers/handouts (64%) and open house meetings (45%). Aside from automated messages, the least common method was website. However, it is important to note that most of the DOT's who reported not using websites in their public outreach campaign were implementing ramp meters before the popularity of the internet. Many of the DOT's who did not report using websites, made a note that had they

been implementing ramp meters today, they would take full advantage of the internet. Other methods identified by some DOT's included social networking sites, outreach to schools, and videos.

A representation of the most popular methods for disseminating information to the public on the benefits of ramp meters, normalized by the total number of methods reported by all DOT's (twenty-nine), is represented in Figure 7.

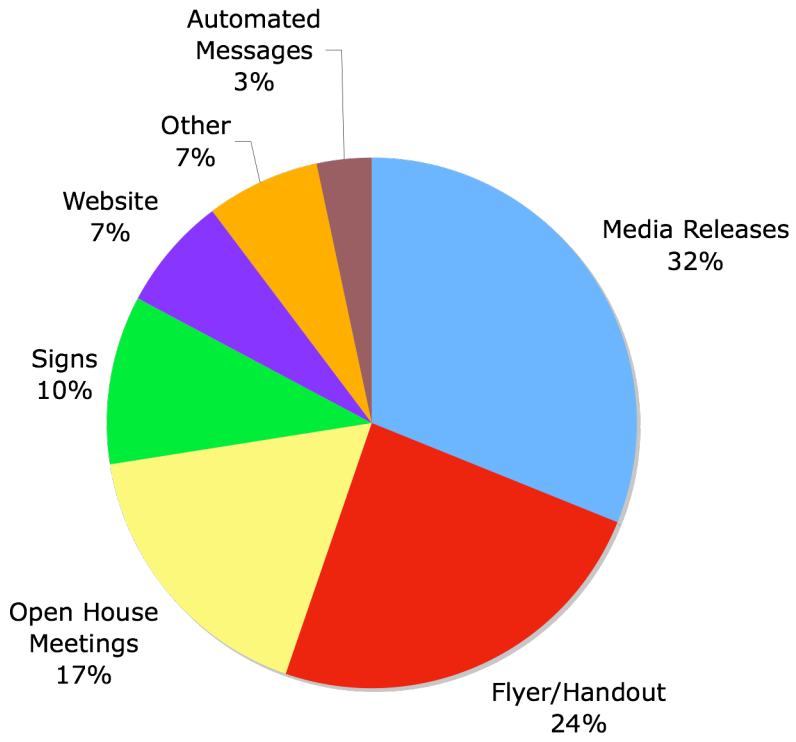


Figure 7. Surveyed DOT's Popularity of Methods for Information Dissemination on the Benefits of Ramp Meters

It should be noted that there is a small difference in the popularity of methods used by the DOT's between disseminating information about how to use ramp meters and the benefits of ramp meters. The popularity of the use of signs for how to use ramp meters is 23%, however the popularity of using signs to disseminate the benefits of ramp meters is only 10%. Also, media

releases are more popular for disseminating information about the benefits as opposed to how to use the meters (32% to 25%, respectively). This could be due to the fact that the benefits of ramp meters are less easily depicted on a sign, and in fact may be more involved than describing to the motorist how to use ramp meters.

5.1.3 Breakdown and Trends of the Lessons Learned

In order to learn from other DOT's and their experiences with public outreach campaigns for new ramp metering systems, it is important to look at some of the problems that were experienced by the surveyed DOT's. Figure 8 shows some of the problems that can be expected during the implementation of ramp meters, and the percentage of the surveyed DOT's that experienced those problems. The bars represent the percentage of the DOT's that responded "yes" to each question. The rest of the DOT's responded "no."

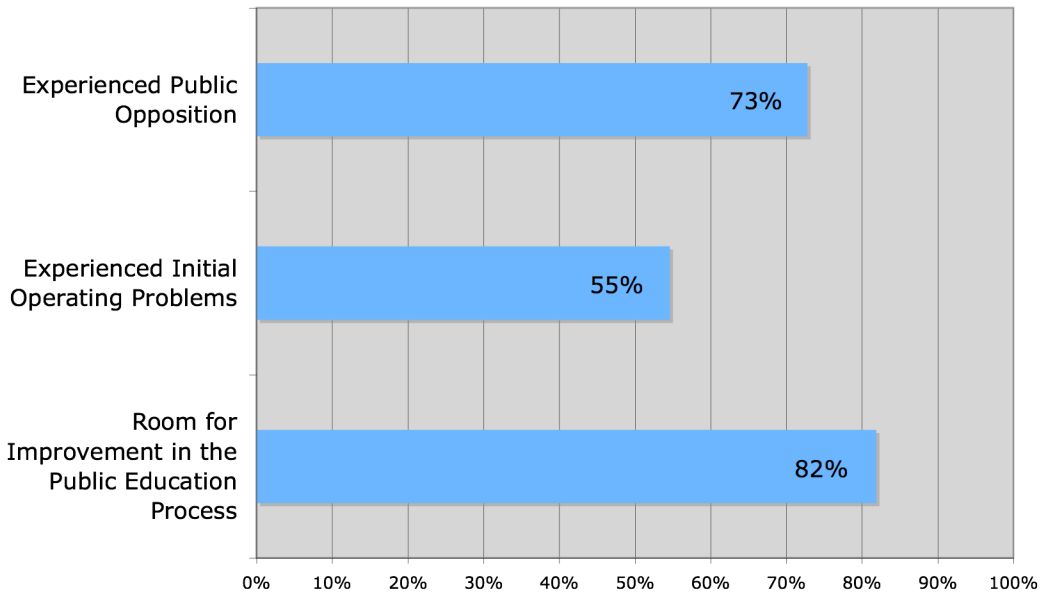


Figure 8. Surveyed DOT's Reported Problems with Public Education Campaigns for Ramp Meters

From the chart, it can be discerned that 82% of the surveyed DOT's reported that if implementing ramp meters for the first time today, they would do some things differently. The lessons these DOT's learned from their first experiences, and specifically what they would have done differently, is valuable information to an area like Pittsburgh, that has never seen ramp meters before.

Also from Figure 8, it can be discerned that 55% of the surveyed DOT's reported that motorists experienced some problems during the initial operation of the ramp meters. Some of the surveyed DOT's reported that some initial confusion about how to use the ramp meters was experienced when the meters were first turned on. These DOT's also reported that after a short amount of time, motorists were able to catch on and there was no longer any confusion. The

Ohio Department of Transportation reported an initial problem with motorists being confused by the use of two lanes on the ramps, as they were not using both lanes equally. However, once word was sent out to the media, and once changeable message signs that displayed "Use Both Lanes" were put into place, the issue cleared up. See Appendix B.2 and B.3 for the exact response of the Ohio DOT. The Virginia Department of Transportation reported a problem with motorists not stopping at the meter signals, thus causing rear-end collisions. The Virginia State Police worked with the DOT to enforce the meter signals during the initial deployment. See Appendix B.2 and B.3 for the exact response of the Virginia DOT.

A higher percentage of the surveyed DOT's (73%) reported problems with public opposition. Many of the surveyed DOT's reported that motorists simply did not understand how the meters worked, and therefore were opposed to having to stop an additional time. Many of these DOT's also noted that once the ramp meters were in operation for some time, the public had a more favorable view of them. If implementing ramp meters for the first time in Pittsburgh, it would be important to learn from these results. A heavy emphasis on the benefits of ramp meters might help reduce some public opposition.

5.1.4 Summary of Trends

When looking at the methods of information dissemination used by the surveyed DOT's, it can be seen that media releases seem to be the most important tool that were used for ramp metering public education campaigns. Signs, flyers/handouts, and open house meetings were also very important tools to the surveyed DOT's. Some of the surveyed DOT's reported that the media releases were the most effective tool in disseminating the information to the public. However, some of DOT's also noted that many of the tools must be used in conjunction with

other tools in order to get the best results. The focus of the information disseminated by the DOT's during the ramp metering public education campaigns was on informing the public on how to use the meters and on the benefits of ramp meters. Many of the DOT's also relayed information to the public about expected delays at the meters. However only 64% of the surveyed DOT's made the information about expected delays available to the public before the actual operation of the meters. Information on alternate routes was not common content within the ramp metering public education campaigns for the surveyed DOT's. However, the Texas Department of Transportation reported that if implementing ramp meters for the first time today, they would use a website to show motorists the locations of less congested ramps and alternate routes. See Appendix B.2 and B.3 for the exact response of the Texas DOT.

Many of the surveyed DOT's noted that had they been implementing ramp meters today, they would make full use of the internet. Therefore, it is important to keep this in mind when developing public education strategies today for places like Pittsburgh. A lesson learned by the Arizona Department of Transportation was the importance of getting the public to understand the "big picture" of ramp meters. The Arizona DOT reported that producing a larger scale public outreach, to explain exactly how meters work and the benefits to the motorists, would have been useful. They also reported that one major lesson learned was the importance of media releases prior to the activation of ramp meters. See Appendix B.2 and B.3 for the exact response of the Arizona DOT. The Minnesota Department of Transportation noted that an important lesson they have learned is to earn the support of local elected officials. See Appendix B.2 and B.3 for the exact response of the Minnesota DOT. In general, many of the DOT's reported the importance

of keeping up with technology and getting as much information out to the public as possible. New methods would include social networking sites (e.g., Facebook and Twitter), video sites (e.g., Youtube), and informational websites (e.g., 511).

5.2 TEST GROUP SURVEY RESULTS

A spreadsheet of the manually complied results can be found in Appendix C.5, and a copy of each returned individual survey can be found in Appendix C.4.

5.2.1 Part 1 Results

Part 1 of the test group survey was designed to find out if the participant was familiar with the concept of ramp metering, and if so, the rest of the questions were designed to act as a baseline for comparison to the second part of the survey. Participants were asked in the first two questions whether or not they had ever heard of the term ramp metering or the concept of ramp metering. If they answered "no" to both of those questions, they were asked to skip the remaining questions in Part 1 (questions 3 through 8). Less than half of the participants (42%) filled out the entire first part of the survey. The rest had never heard of the concept of ramp metering. The background information gathered from all of the participants is summarized in Figure 9.

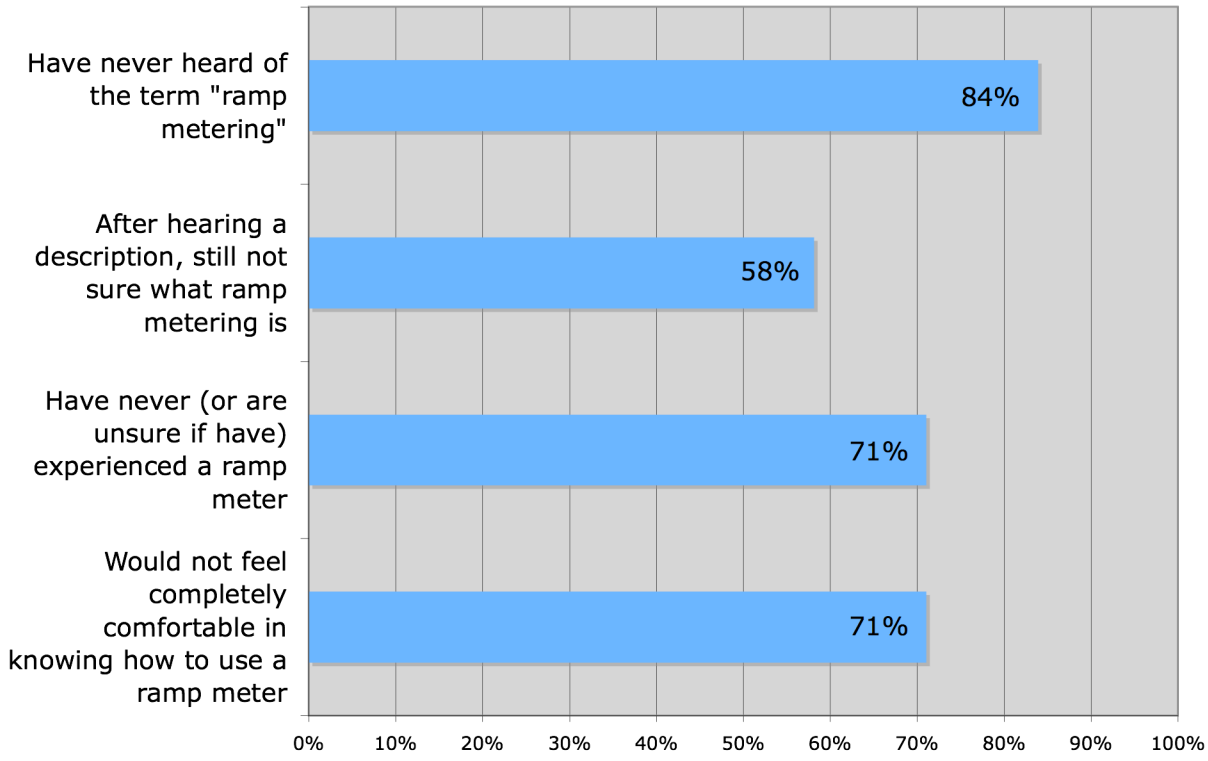


Figure 9. Background Answers from Part 1 of Test Group Survey

The first bar in Figure 9 represents the percentage of the participants indicating they had never heard of the term "ramp metering" before. The rest of the participants responded that they had or that they were unsure. It can be seen from the chart in Figure 9 that 84% of the participants had never heard of the term "ramp metering" before.

The second bar represents the percentage of participants indicating they had never heard of the concept of ramp metering after it was described to them. The rest of the participants responded that they had or that they were unsure. Even after having the concept of ramp metering briefly explained to them, 58% of the participants were still not familiar with it.

If the participants answered "no" to the first two questions and did not fill out the rest of Part 1, it was assumed then, that they had never experienced a ramp meter and also that they would not be entirely comfortable in knowing how to proceed if faced with a ramp meter today. Of the participants who had heard of the concept of ramp metering before, only 29% said they had actually experienced one (the rest responded that they had not or they were unsure), and only 29% said they would feel comfortable in knowing how to use one (the rest said they would or that they were unsure). Therefore, of all the participants surveyed, 71% were unsure if they had, or knew that they had never, experienced a ramp meter before. Similarly, 71% of the participants were not completely comfortable in knowing how to use a ramp meter.

5.2.2 Part 2 Results

Part 2 of the test group survey, when analyzed alone, was designed to find out what types of informational material were preferred by the participants. Participants were asked to identify both their preferred methods of receiving information on ramp meters and also the methods they would be most likely to heed. A total of thirty-one participants answered these questions. Figure 10 shows the average answers to these questions, and how they compare to each other. The bars represent the percentage of participants that selected that particular method. The rest of the participants did not select this method. Participants were allowed to select as many methods as they liked.

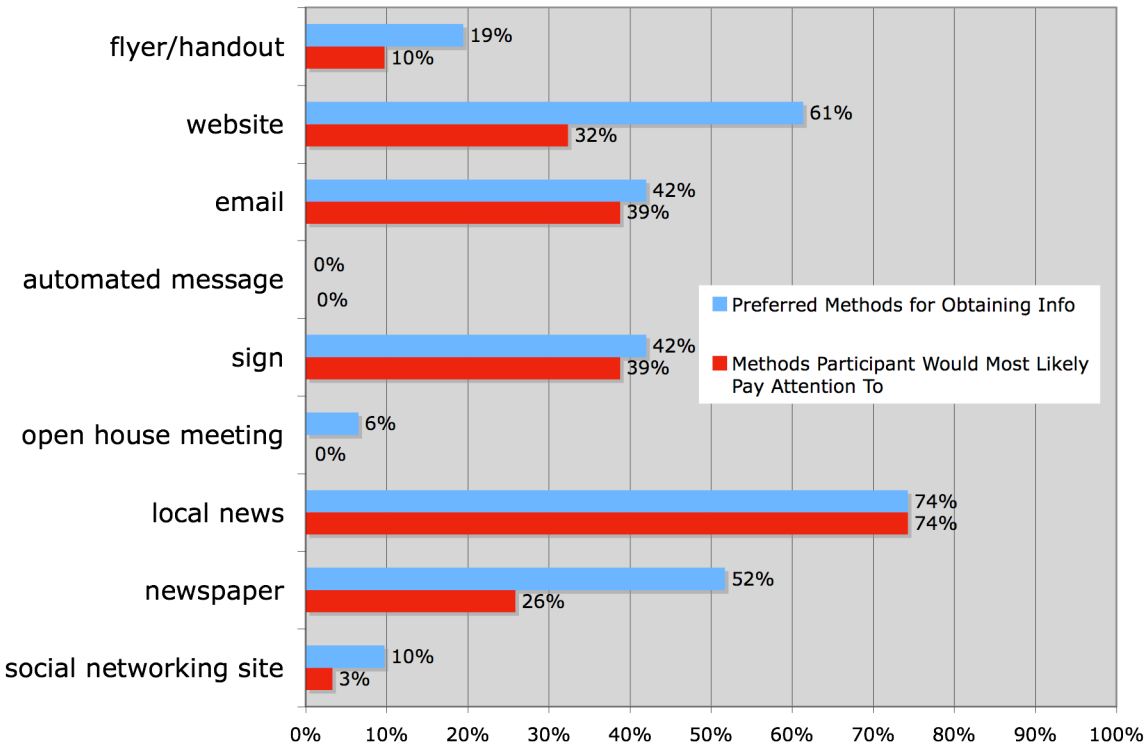


Figure 10. Test Group Survey Participants' Preferences for Methods of Information Dissemination

The chart shows that the most popular method for information dissemination preferred by the survey participants was the local news. This was also the method they would most likely pay attention to, on average. This method was identified by 74% of the participants. On the opposite scale, none of the participants stated that they would use an automated message system to find out information. And although a small percentage of participants (6%) stated that they would prefer to get information from an open house meeting, none identified that as being a method they would pay much attention to. Social networking sites were also low in popularity for both the preferred method and the method that would be heeded. Both the website and newspaper article were picked as methods that would be preferred for receiving information on ramp

metering, however, the percentage of participants that stated they would heed these methods was not as high in either case. A sign at the future location of the ramp meter and the email option were also largely preferred for obtaining information, as well as methods that would be heeded. In general, however, the local news appears to have the greatest chance of getting participants' attention, having a higher percentage than the other methods by a difference of at least 35%.

The participants were asked to identify which informational materials they reviewed before answering Part 2 of the survey. It was assumed that some conclusions would be able to be drawn from the types of materials they chose. A summary of the types of informational material and the percentage of participants who viewed each material is presented in Figure 11. The bars represent the percentage of participants that used each type of informational material. The rest of the participants did not use that material. The participants were allowed to use as many of the materials as they liked.

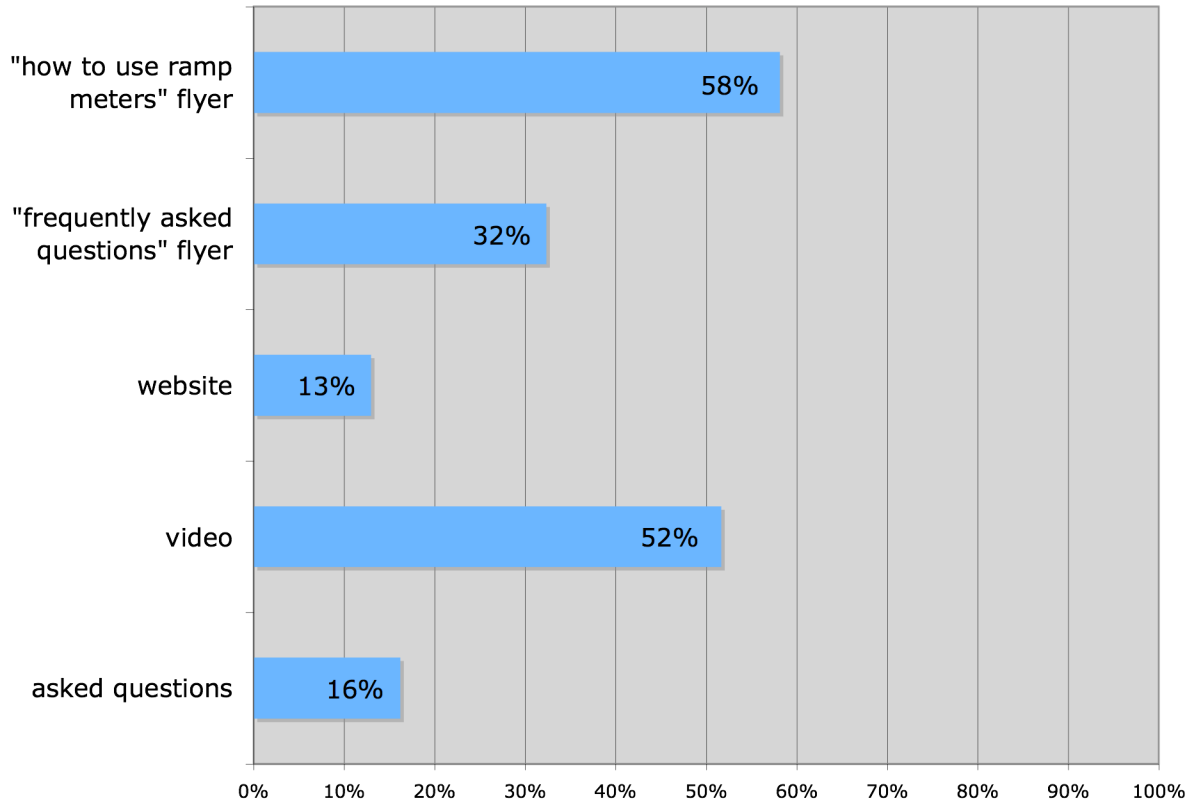


Figure 11. Informational Material Reviewed by the Participants of the Test Group Survey

It can be discerned from the chart that the most popular informational material reviewed by the participants was the "How to Use Ramp Meters" flyer. Also popular was the instructional video. The website was the least popular method among the participants for obtaining information on ramp metering.

5.2.3 Comparison

Part 1 of the survey was used as a base for comparison against Part 2. Of all the participants, 42% of the thirty-one participants filled out the entire Part 1 of the survey. The

responses of this 42% were compared to their corresponding responses to Part 2 of the survey. It can be assumed that the average changes in these responses were due to the informational material reviewed by the participants between Part 1 and Part 2 of the survey. A chart summarizing the changes in responses regarding the question about identifying the benefits of ramp metering can be found in Figure 12. The bars represent the percentage of participants that selected this benefit. The rest of the participants did not select this benefit. Participants were allowed to select as many benefits as they thought applied.

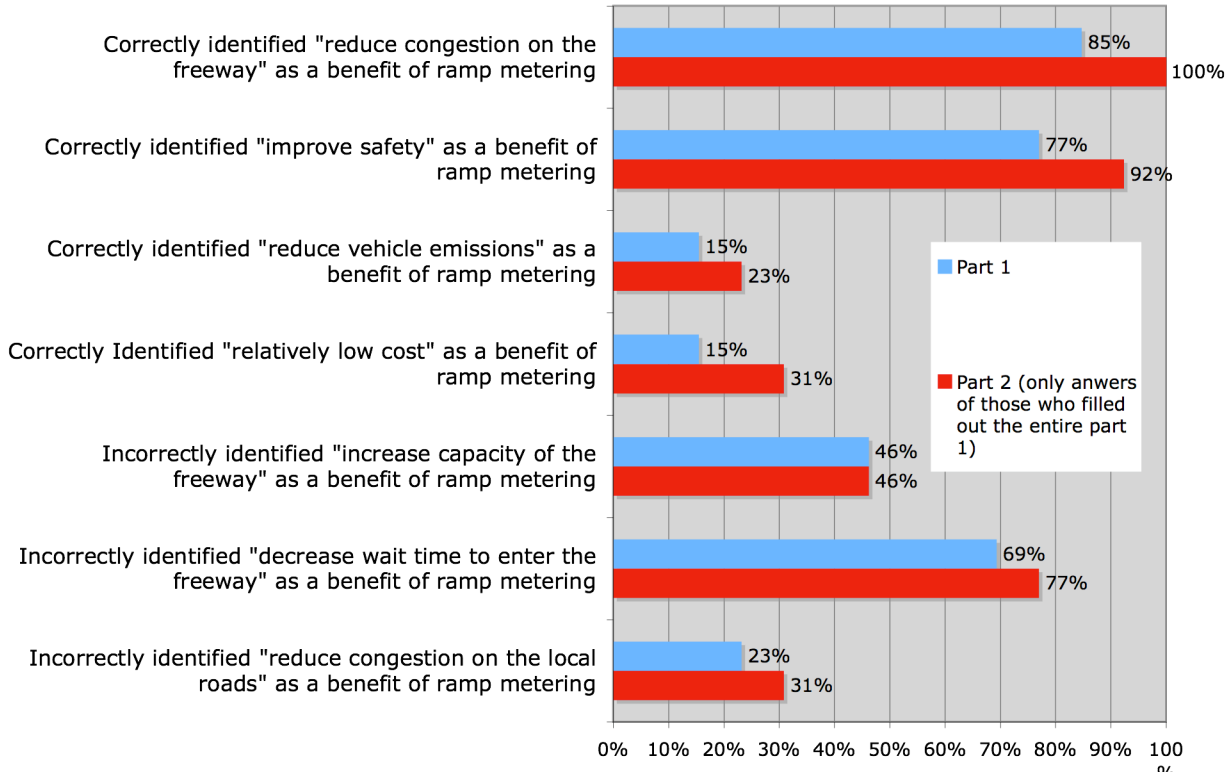


Figure 12. Comparison of Correctly/Incorrectly Identified Benefits of Ramp Metering from Part 1 to Part 2 of the Test Group Survey

It can be discerned from the chart that, after reviewing the informational material, 100% of participants were able to gather that a benefit of ramp metering is to reduce congestion on the

mainline. The informational material also helped participants identify "improve safety" as a benefit of ramp metering. Some participants were able to discern from the informational material that reducing vehicle emissions was a benefit, and that ramp metering is a relatively low cost solution. However, less than 35% of the participants correctly identified these benefits. Also, the informational material on average did not help the participants realize which of the listed benefits were incorrect.

The participants that did not answer the entire first part of the survey (because they had never heard of ramp metering before) filled out the questions regarding benefits in Part 2 only. It can be assumed that the answers to these questions were based only on the knowledge obtained from the informational material. The responses to the benefits question, given only by those participants who had never heard of ramp metering before, are summarized in Figure 13. The bars represent the percentage of participants that selected this benefit. The rest of the participants did not select this benefit. Participants were allowed to select as many benefits as they thought applied.

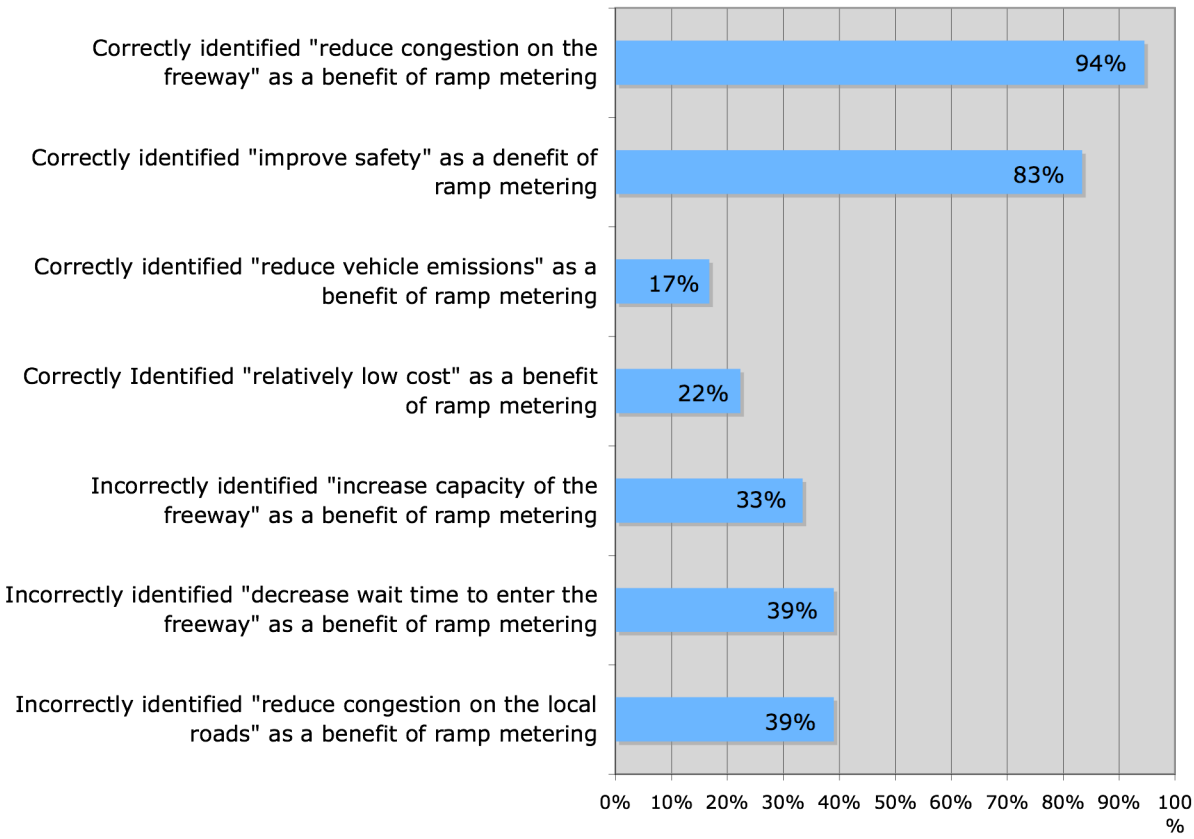


Figure 13. Correctly/Incorrectly Identified Benefits of Ramp Metering from Test Group Part 2 Survey Participants Who Were Previously Unfamiliar with Ramp Metering

It can be discerned from the chart that the majority of the participants who had never heard of ramp metering before understood that reducing congestion on the freeway and improving safety are benefits of ramp metering. It can also be assumed then, that these participants learned this from the informational material. Because more than 65% of the participants who had never heard of ramp metering before were unable to identify "reduce vehicle emissions" and "relatively low cost" as benefits of ramp metering, it can be assumed that the informational material reviewed was not effective in making these benefits clear.

The comparison of the average responses to the rest of the questions from Part 1 to Part 2 can be found in Figure 14. Part 1 responses are the average of the number of participants who had heard of ramp metering before and who answered the question (except for the first question, in which it was assumed that if participants had never heard of the concept of ramp metering, they would not feel comfortable using a ramp meter). Part 2 responses are the average of all participants, both those who had never heard of ramp metering and those who had heard of ramp metering. All questions, aside from the benefits of ramp metering and the specific wait times are compared in this chart. The bars represent the percentage of participants that answered "yes" to the question. The rest of the participants responded "no" or "unsure."

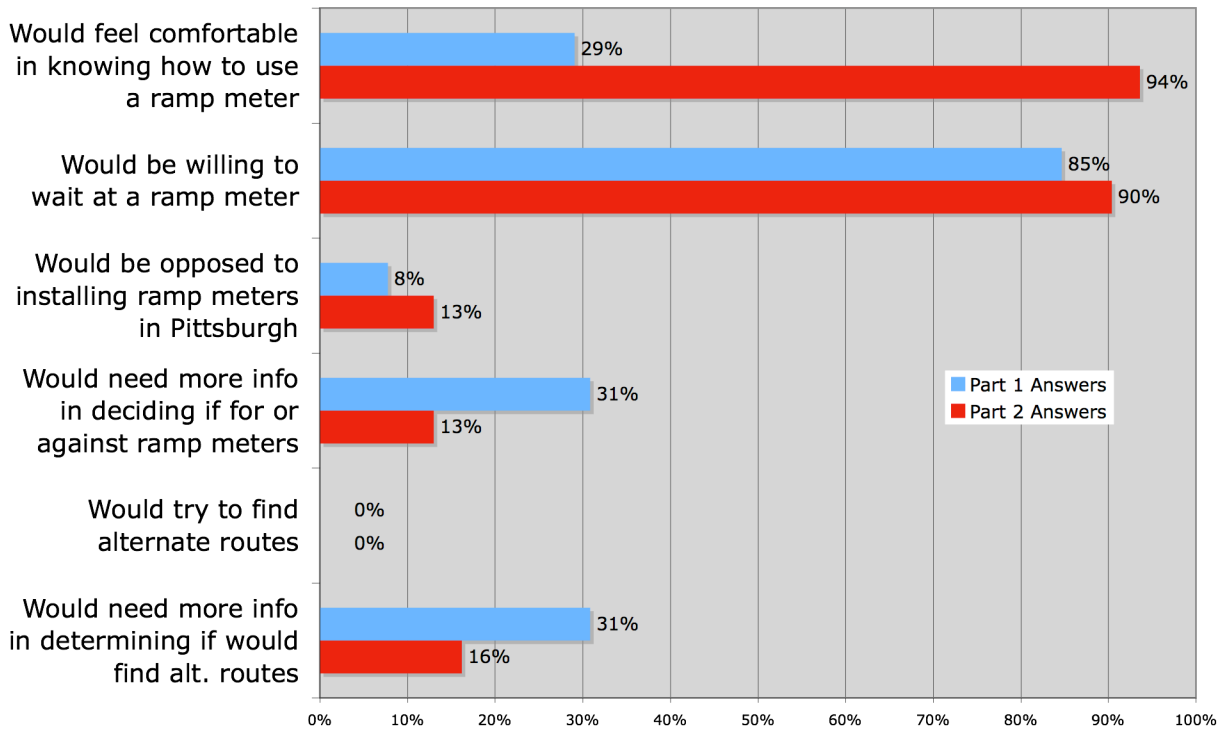


Figure 14. Comparison of Test Group Survey Responses from Part 1 to Part 2

It can be seen from the chart that the change in response from Part 1 to Part 2 for the question of "would you feel comfortable in knowing how to use a ramp meter?" had the most drastic jump. The average went from 29% in Part 1 to 94% in Part 2. It can be assumed then, that the informational material reviewed by the participants did an adequate job in explaining how to use the ramp meters. Part 2 also saw a slight increase in the percentage of participants willing to wait at a meter, from 85% to 90%. This percentage increase corresponds to one participant, out of the thirty-one total, changing his or her answer from not being willing to wait at a meter in Part 1 to willing to wait at a meter in Part 2. The other participants either kept their answer the same, or had not answered the question in Part 1.

It can be assumed that the informational material did not succeed in decreasing public opposition. After reviewing the informational material, the percentage of survey participants who stated they would be opposed to ramp meters in the Pittsburgh area increased from 8% to 13%. However, the informational material was somewhat effective in helping to answer some questions the participants might have had about being opposed to ramp meters and trying to find alternate routes. After reviewing the material, the percentage of participants who said they would need more information before deciding if they were for or against to ramp meters in the Pittsburgh area decreased from 31% to 13%. Similarly, the percentage of participants who said they would need more information before deciding if they would try to find alternate routes to avoid the meters decreased from 31% to 16%. None of the participants in either part indicated that they would try to find alternate routes to avoid the meters.

Changes in the amount of time the participants would be willing to wait at a meter was assumed to be attributed to what they learned from the informational material. A summary of

the percentage of participants who changed the amount of time they would be willing to wait is summarized in Figure 15. The chart compares only those participants who answered the question in both Part 1 and Part 2 of the survey.

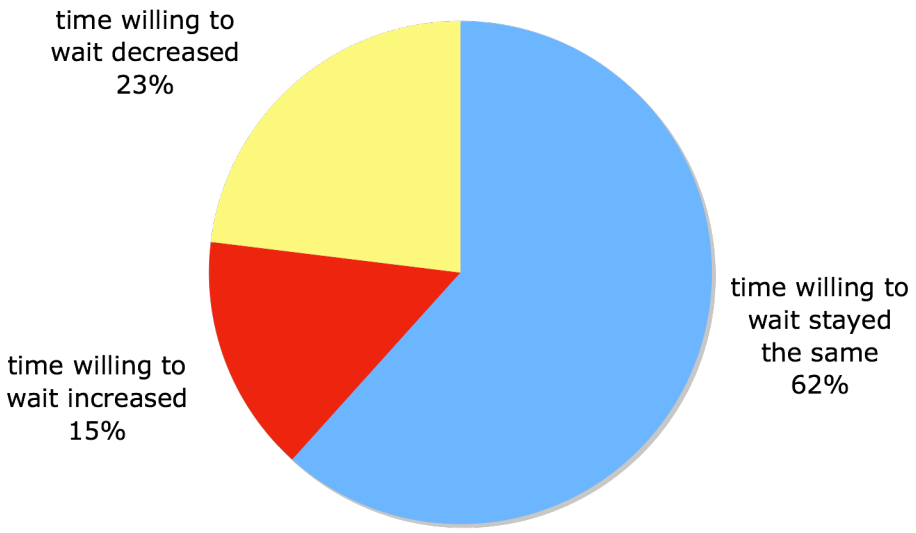


Figure 15. Changes in the Amount of Time Test Group Survey Participants Said They Would Be Willing to Wait at a Ramp Meter

It can be seen from the chart, that the informational material did not seem to have that large of an effect on whether or not the participants changed the time they were willing to wait. 62% of the participants did not change their response, while 23% actually decreased the amount of time they stated they were willing to wait. Only 15% were affected favorably by the informational material and increased the amount of time they stated they were willing to wait.

Finally, a comparison of responses to Part 2 of the survey between participants who indicated that they were previously familiar with the concept of ramp metering versus those that indicated they were *not* previously familiar with the concept of ramp metering is presented in Figure 16. Of the total thirty-one survey participants, thirteen indicated that they had in fact heard of the concept of ramp metering before and completed the entire Part 1 of the survey. The other eighteen participants indicated that they had never heard of the concept of ramp metering and therefore only completed the first two questions of Part 1 of the survey. It was assumed that the thirteen participants who had heard of ramp metering prior to the survey were basing their responses to Part 2 on both their previous knowledge and the informational material. It was also assumed that the eighteen participants who had never heard of the concept of ramp metering prior to the survey were basing their responses to Part 2 solely on the informational material. The results of this comparison can be found in Figure 16. The bars represent the percentage of participants that answered "yes" to the question. The rest of the participants responded "no" or "unsure."

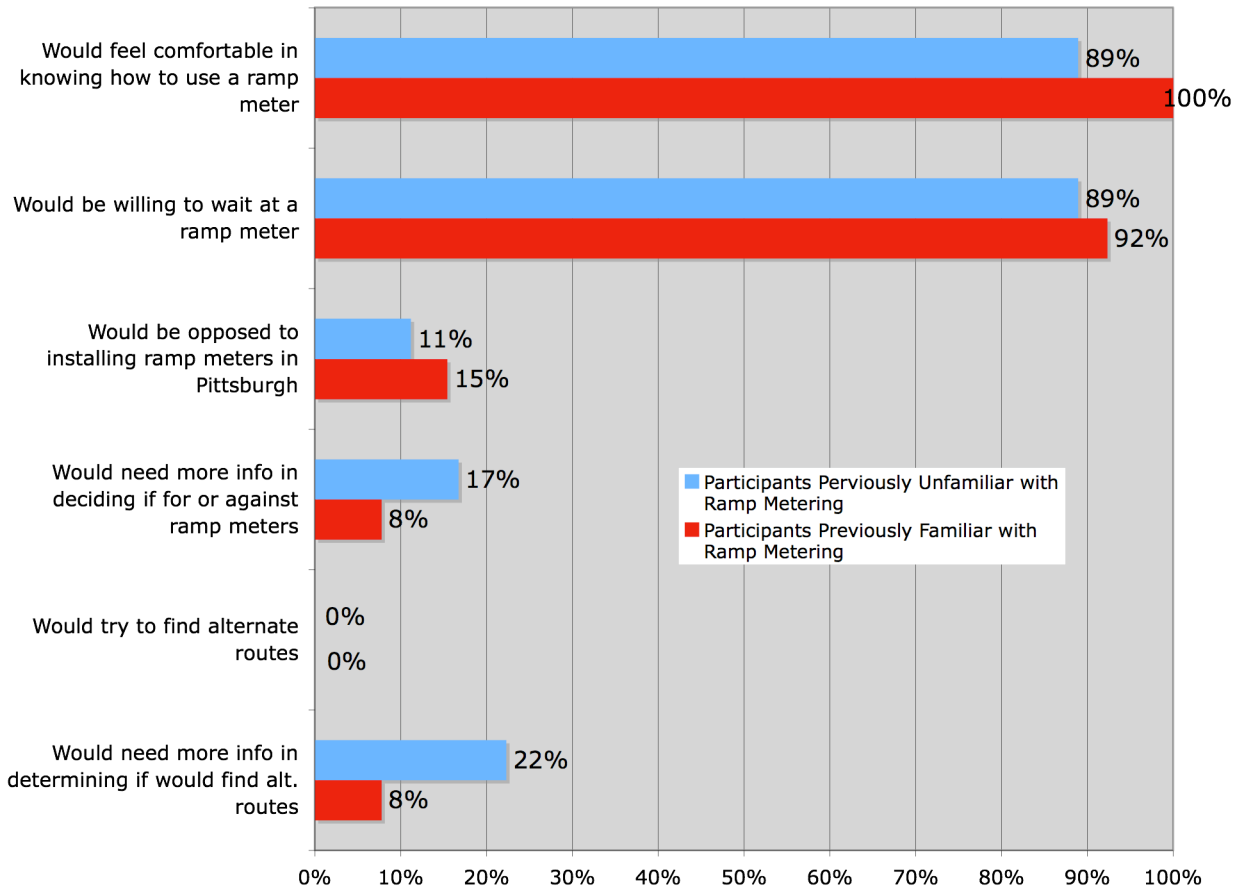


Figure 16. Comparison of Responses to Part 2 between Participants Who Were Previously Familiar with Ramp Metering and Those Who Were Not

It can be seen from the chart that those participants who had previously heard of the concept of ramp metering before were slightly more likely to know how to use ramp meters, on average, than those participants who had not previously heard of ramp metering (100% vs. 89%). It can also be seen from the chart that those participants who had previously heard of the concept of ramp metering before were slightly more likely to be willing to wait at a ramp meter, on average, than those participants who had not previously heard of ramp metering (92% vs. 89%). On average, those participants previously unfamiliar with ramp metering were slightly less opposed to ramp metering than those who had heard of the concept before (11% vs. 15%).

It can also be seen that the participants who had previously heard of ramp metering had more certainty as to whether or not they were opposed to ramp meters and whether or not they would try to find alternate routes. An average of 8% of those participants indicated that they needed more information on both of these issues in order to make a decision. An average of 17% and 22% of the participants who had not previously heard of ramp metering before indicated that they would need more information on decided if they were opposed to ramp metering and if they would try to find alternate routes, respectively. This indicates that the informational material reviewed by these participants was not enough to help them make a decision, and possibly that the participants who had previously heard of ramp metering were relying on some of this previous knowledge to answer the questions.

5.2.4 Summary

In general, the majority of the participants taking the survey had never heard of the term "ramp metering", nor had they heard of the described concept of ramp metering. Over 70% of the participants had never experienced a ramp meter, and would not be completely comfortable in knowing how to proceed if faced with a ramp meter today.

After reviewing the informational material, 94% of the participants responded that they would feel comfortable in knowing how to proceed if faced with a ramp meter today. This is a 65% increase from before reviewing the informational material. By looking at the responses to the questions regarding the benefits of ramp meters, it can be assumed that the informational material provided was helpful to the participants in identifying that reducing congestion on the freeway and improving safety were two benefits of ramp metering. However, the informational

material was less successful in teaching the participants about the other benefits such as reducing vehicle emissions and it being a relatively low cost solution. Also, the informational material did not seem to help the participants pick out the incorrect benefits from the list of choices.

The informational material also did not seem to have much of an effect on changing the participants' responses to the question of how long they would be willing to wait at a ramp meter. 62% of the participants did not change their response from Part 1 to Part 2. However, there was a slight increase from Part 1 to Part 2 in the percentage of participants that stated they would be opposed to ramp metering in the Pittsburgh area (8% to 13%). It can be assumed then, that the informational material reviewed by the participants was not successful in improving public opinion.

The most popular informational material reviewed by the participants were the "How to Use Ramp Meters" flyer and the video. The most popular method that the participants identified as both their preferred method for obtaining information, and the method they would most likely pay attention to was the local news. A newspaper article and a website were also high in popularity for the preferred method for obtaining information on ramp metering.

6.0 SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

6.1 SUMMARY

This study had three main objectives:

- Obtain information from more experienced state DOT's in ramp metering and public education/outreach campaigns.
- Quantify the importance of a public education campaign on ramp metering, specifically in Pittsburgh, PA.
- Determine the most effective methods for disseminating information to the public on ramp metering.

A survey on ramp metering and public education was sent out to state departments of transportation that have experience with ramp meters. They were asked to fill out and return the survey, so that each of these states' methods for educating the public on ramp metering could be examined.

Part 1 and Part 2 of the test group survey, along with the comparison of the two parts was expected to give some insight as to how important a public education campaign would be to the success of a ramp metering project in the Pittsburgh area. The intent was to sample a variety of

types of people, from different ages, backgrounds, and education levels, in order to get a representative sample. This variety was obtained within the thirty-one participants sampled, and is therefore assumed to be representative of the general public in Pittsburgh.

6.2 FINDINGS

Conclusions relating to the study objectives, as proved by the results of the study, are presented in the following three sections.

6.2.1 Other States' History in Educating the Public on Ramp Metering

In general, a trend that emerged from comparing all of the DOT survey results was the use and effectiveness of media releases for disseminating information to the public. It was also noted by many state DOT's that they felt it was necessary to use all of the methods in conjunction with one another for the greatest impact.

Many of the surveyed state DOT's also noted that the internet was not as popular when they were first implementing ramp meters, and if doing so for the first time today, they would take full advantage of the internet in their public education campaign.

A few of the surveyed state DOT's reported that they had a current set of standards for disseminating information on ramp meters to the general public. However, none of these states were able to produce a specific set of guidelines or standards. Some states indicated that they had websites on ramp metering or ramp metering handbooks, however these sources did not

contain information about the public education campaign process or content. Also, many states have been using ramp meters for so many years now, that they indicated there is less of a need for public outreach on this topic today.

6.2.2 Importance of a Public Education Campaign to the Success of a Ramp Metering Project in the Pittsburgh Area

According to the survey, only 29% of the participants felt comfortable in knowing how to use a ramp meter before having reviewed the informational material (see Figure 9). Of the people who had heard of ramp metering before, most did not fully understand the benefits of ramp metering. In fact, not a single participant was able to correctly identify all of the benefits of ramp metering from the list of options in the survey. After reviewing some type of informational material, almost all of the participants were able to correctly identify that reducing congestion on the freeway was a benefit of ramp metering. Also, 94% of the participants reported that they would feel comfortable using a ramp meter after reviewing the informational material (see Figure 14). It can be concluded from these numbers, then, that a campaign to educate the public on ramp meters is essential to an area like Pittsburgh, that has never seen ramp meters before. Without this type of campaign, the majority of people would not know what to do when first approaching the meter. This could cause confusion, disobedience, and dangerous crashes.

Also, without a fully realized public outreach campaign, motorists would not completely understand the benefits to ramp metering, which might lead to more public opposition, as well as a higher number of diversion routes than expected. In order to have a smooth transition into using meters, it is important to have the support local officials, as well as the support of the

public, which is why taking measures to decrease public opposition is important. When first installing ramp meters in an area such as Pittsburgh, diversion routes are expected. In many cases, during the planning phases, improvements will be scheduled for those expected diversion routes in order to handle the extra traffic. If the public is not fully aware of the benefits of ramp metering, a higher number of motorists than expected might divert to other routes. This could lead to unexpected congestion on local streets. Not only is this an undesirable outcome, but it could also lead to higher public opposition of the ramp metering system.

6.2.3 The Most Effective Ways to Get Information on Ramp Metering to the Public

Based on the information from the test group surveys in this study, the method most preferred by the public for obtaining information on ramp metering is through the local news. This also seems to be the method that most people feel they would be apt to pay attention to. Other popular methods include websites, email, newspaper articles, and signs at the future meter location. Not one of the participants indicated that they would use or pay attention to an automated message.

Although the informational material given to the participants in the test group survey was effective in teaching how to use ramp meters and that a benefit of ramp meters is the reduction of congestion on the freeway, the material was not effective in teaching participants other benefits of ramp metering, such as reduction in vehicle emissions and the relatively low cost, compared to capacity added solutions. It was also not very effective in persuading the participants to increase the amount of time they said they would be willing to wait at a meter. The material was also unsuccessful in decreasing public opposition.

It is important to note that under the circumstances of the survey, participants were only exposed to the material once, and for a fairly short duration. Under real-world circumstances, motorists would likely be exposed to information on ramp metering multiple times. However, this fact is not thought to have had a large of an effect on the results.

Also, the survey asked participants to envision ramp meters on I-376 in Pittsburgh. This freeway is currently congested during peak hours, and at many on-ramps, there is already a wait time to enter the freeway. These conditions could have also affected the responses of the participants, however it is not thought to have had a large effect on the results.

6.3 RECOMMENDATIONS

Based on the lack of knowledge the general public in the Pittsburgh area has on ramp metering and its benefits, it is strongly suggested that a large and intensive public education/outreach campaign be set in place months, even years, before the actual opening of any ramp metering system, to ensure a safe and smooth initial operating phase. Media releases, websites, email, and signs at the future meter location should be the focus of any ramp metering public education campaign for the Pittsburgh area. Because not a single test group survey participant indicated that they would use or pay attention to an automated message, this method should not be considered for public education campaigns in the Pittsburgh area. It would also be important to keep up with current technology and use the internet to its full advantage. Emails could be sent out to subscribers to traffic email lists. Informational websites on how to use meters, alternate routes, and expected delay times would be useful. Other websites, such as video sites and social networking sites, could also help get the word out to the public. A

summary of different information dissemination methods and their anticipated effectiveness, based on the findings of the survey, is presented in Table 3.

Table 3. Summary of the Anticipated Effectiveness of Public Information Dissemination Methods for Ramp Metering in the Pittsburgh Area

Most Effective Methods	• Media Releases • Signs at future meter locations • Websites • Emails
Least Effective Methods	• Automated Message Systems (Radio/Telephone) • Public Meetings
Promising Methods for the Future	• Social Networking Sites • Video Sites • Text Messaging

If the goal of the public education campaign is to simply inform motorists on how to use ramp meters, then the informational material provided for the test group survey, which is typical information dissemination material taken from other state DOT's, is the right kind of material. However, in order to minimize public opposition, and to help the general public fully understand the "big picture" of ramp metering, different or additional material would need to be available to the motorists. In an area such as Pittsburgh, where ramp metering is not familiar, the public education campaign would need to focus not only on how to use ramp meters, but also on all of the benefits as well as wait times at meters and total travel time savings.

A stop sign or a traffic signal is a common regulatory device that all motorists in the U.S. should be familiar with. Similarly, the ramp meter is an everyday traffic device used in many states. However, as proved by the test group survey in this study, many areas in the U.S. still have never heard of the concept of ramp metering. In these areas, if ramp meters are to be

installed, it is imperative that a public education campaign crafted, and that it is done in the correct way. It is recommended that a set of guidelines to help direct the public education campaign for ramp meters be developed for the state of Pennsylvania.

The next step of this study, should it be continued, would be to develop this specific set of guidelines on public education campaigns for ramp metering in Pennsylvania. The information gathered from other state DOT's, along with the information obtained from the PennDOT press office for this study would be useful to developing these guidelines. Further research would help determine other information that should be included. The final product would be a document similar in nature to the FHWA's *Work Zone Public Information and Outreach Strategies* (2005). Like this document, the set of ramp metering guidelines should include useful tools such as checklists, charts, and templates to aid in successfully crafting a public education campaign for ramp metering. It is recommended that the content of the message of the public education campaign should focus on teaching motorists how to use ramp meters and teaching motorists about all of the benefits of ramp metering. The campaign should also focus on minimizing public opposition. Further research into how to greater decrease public opposition would be needed, as the information material used in the survey did not have a great enough effect on reducing public opposition.

With the information gathered in this study, it is apparent how important a public education campaign would be to an area like Pittsburgh if installing ramp meters for the first time. This study also began to uncover the most effective methods for disseminating this information to the public, and how the public prefers to receive their information. Larger case studies, and well as larger test group studies might also help in obtaining even more insight into the effectiveness of different methods. Using this study as a starting point, it is recommended

that a set of guidelines be developed to aid the Pennsylvania Department of Transportation in constructing public education campaigns for ramp metering.

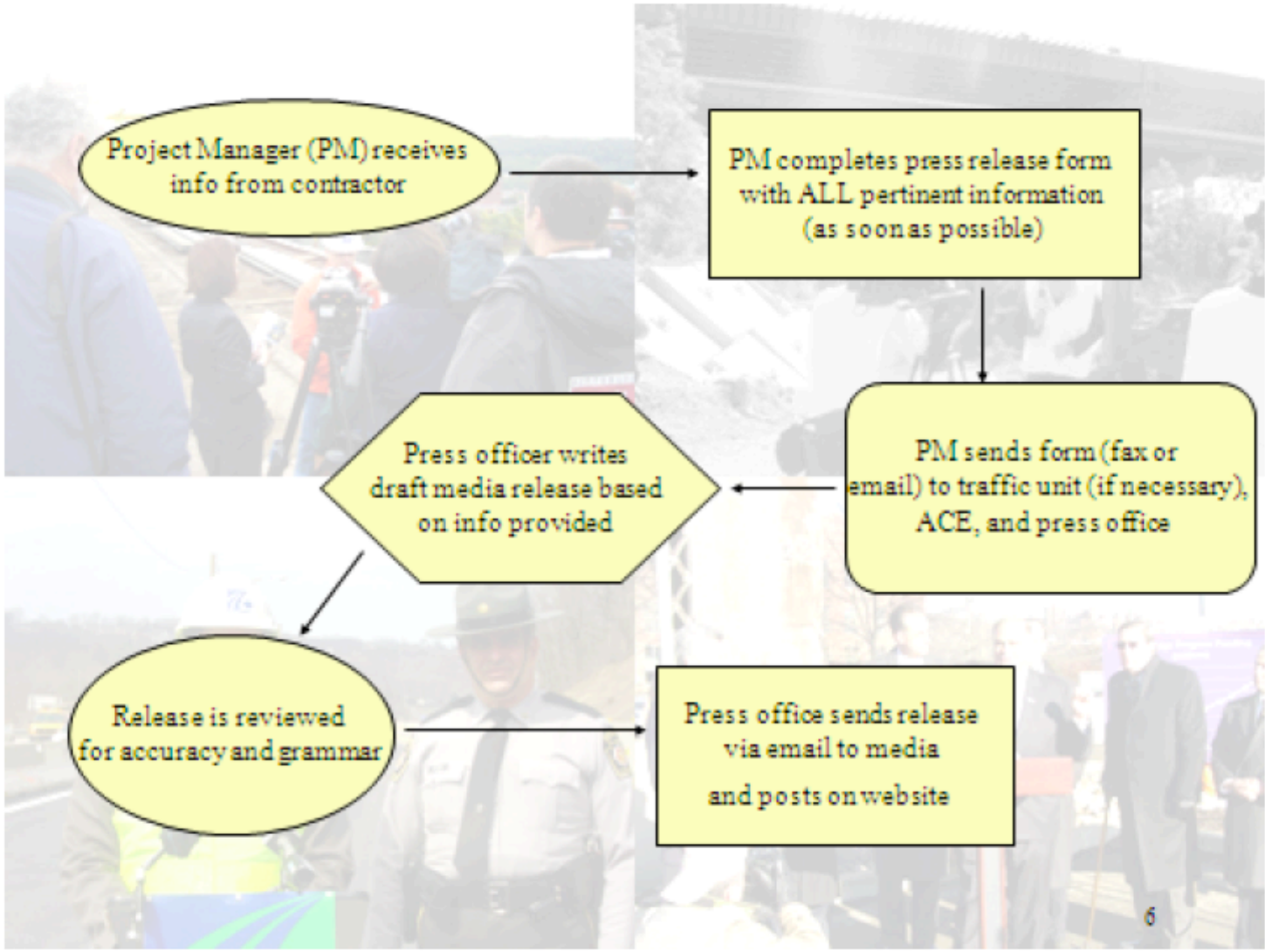
APPENDIX A

PENNDOT GENERAL INFORMATION DISSEMINATION

This Appendix includes supplemental information pertaining to the Pennsylvania Department of Transportation and the organization's specific methods of disseminating information to the public on transportation-related projects.

A.1 FLOWCHART USED BY PENNDOT PRESS OFFICE

This chart was obtained from the PennDOT District 11 central press office.


Project Manager (PM) receives info from contractor
PM completes press release form with ALL pertinent information (as soon as possible)
PM sends form (fax or email) to traffic unit (if necessary), ACE, and press office
Press officer writes draft media release based on info provided
Release is reviewed for accuracy and grammar
Press office sends release via email to media and posts on website
6

A.2 EXISTING PENNDOT INFORMATION DISSEMINATION WEBSITES AND HOTLINES

The following resources are available to residents in the Pittsburgh and surrounding areas:

Traffic Hotline: 511

Construction Hotline: 412-429-6035

Traffic Website: www.511pa.com

PennDOT Website: www.dot.state.pa.us

A.3 RAMP METERING PRESS RELEASE USED BY PENNDOT DISTRICT 6

The following is an actual press release that was distributed prior to turning on a ramp metering system in the Philadelphia area:

News for Immediate Release

Jan. 27, 2010

I-476 Ramp Meters to be Operational in Delaware and Montgomery Counties Starting in February and March to Enhance Travel and Safety
Ramp Metering Activation Follows Installation of Fiber-Optic Communication Lines and New Signal Components

King of Prussia – The Pennsylvania Department of Transportation today announced that it will activate ramp meters at 14 ramps leading to Interstate 476 in Delaware and

Montgomery counties in February and March to enhance travel and safety along the 20-mile long interstate highway.

PennDOT will reactivate ramp meters, which are traffic signals minus the amber caution light, on Feb. 9 at 3 p.m. at the MacDade Boulevard, Baltimore Pike and Route 1 interchanges in Delaware County. Ramp meters operated at these interchanges from 1999 to 2001 and from 2004 to 2008.

In late February, PennDOT will activate ramp meters at the Route 1, Route 3 and Route 30 interchanges in Delaware County, and it will activate ramp meters in mid-to-late March at the Ridge Pike, Chemical Road and Germantown Pike interchanges in Montgomery County.

"We're activating the ramp meters along the entire length of I-476 to provide a corridor-wide system to help move traffic more effectively during morning and afternoon rush hours," PennDOT District Executive Lester C. Toaso said.

"By using the ramp meters to stagger the rate at which vehicles enter I-476, merging vehicles are less likely to slow mainline traffic, thus improving travel times and lessening the potential for crashes at entrance ramps. Ramp meters can help achieve more consistent travel speeds on I-476 by allowing one car to merge at a time rather than having a stream of vehicles force their way onto the highway," Toaso added.

The I-476 ramp meters will initially operate weekdays from 6:30 a.m. to 9 a.m. and from 3 p.m. to 7 p.m. The meters also will be used during emergency situations.

PennDOT will activate I-476 ramp meters in the following three-phase sequence:

<u>Phase 1 – Starting Feb. 9 at 3 p.m.</u>

- MacDade Boulevard ramp to I-476 North in Ridley Township
- Baltimore Pike ramp to I-476 North in Nether Providence Township
- Baltimore Pike ramp to I-476 South in Nether Providence Township
- U.S. Route 1 ramp to I-476 South in Marple Township

<u>Phase 2 – Late February</u>

- Route 1 ramp to I-476 North in Marple Township
- Route 3 East (West Chester Pike) ramp to I-476 South in Marple Township
- Route 3 West (West Chester Pike) ramp to I-476 South in Marple Township
- Route 30 ramp to I-476 North in Radnor Township
- Route 30 ramp to I-476 South in Radnor Township

Phase 3 – Mid-to-Late March

- Ridge Pike East ramp to I-476 North in Plymouth Township
- Ridge Pike East ramp to I-476 South in Plymouth Township
- Ridge Pike West ramp to I-476 South in Plymouth Township
- Chemical Road ramp to I-476 South in Plymouth Township
- Germantown Pike ramp to I-476 South in Plymouth Township

A ramp meter works much like a traffic signal. When the light is red, you stop. When the light turns green, you go. But unlike traffic signals, only one car or truck per lane is allowed to enter I-476 on a green light.

The metering rate for the red and green light at each ramp will be based on I-476 traffic capacity and the number of vehicles on the ramp. Motorists can expect the ramp meter to shine green for 2-to-4 seconds and red for 2-to-8 seconds.

PennDOT advises motorists to remember the following tips when approaching a metered ramp:

- Wait your turn in line;
- Drive slowly up to the stop line marked on the ramp;
- Stop when the signal is red;
- Wait for the light to turn green; and
- Proceed onto I-476 and merge safely into traffic

Toaso said a warning light will flash on each ramp to alert motorists when ramp meters are operating. Message boards also will be posted temporarily on ramps to inform drivers of the date when metering begins.

Motorists are reminded that disregarding a ramp meter is a punishable offense and carries the same penalties as running a red light.

During their previous use on I-476 in Delaware County, ramp meters were shown to benefit mainline traffic flow. A PennDOT ramp metering study in 2005 found I-476's average travel speed increased 10 to 31 miles per hour between MacDade Boulevard and Route 1 during the morning rush hours. In the evening, the highway's average speed increased three to five miles per hour between Route 1 and Baltimore Pike and 35 miles per hour at MacDade Boulevard. In addition, the length of time I-476 traffic moved at a congested pace (10 to 15 miles per hour) also was reduced by metering ramps during rush hours.

PennDOT is activating the ramp meters following the installation of fiber-optic communication lines on I-476 for ramp meters, closed circuit television cameras, dynamic message signs and incident detectors, and the replacement of ramp metering hardware and electronic components. The ramp meter portion of the project cost $1,058,750 while the fiber-optic installation cost $911,902. This work was financed with 90 percent federal and 10 percent state funds.

For more information on I-426, visit www.476blueroute.com

PennDOT reminds motorists they can log on to 511pa.com or call 511 from any phone to check traffic conditions on I-476 and other major highways before heading out. **Media contact**: Gene Blaum, Assistant Press Secretary, 610-205-6800 ###

APPENDIX B

DEPARTMENT OF TRANSPORTATION SURVEY

This Appendix includes all information pertaining to the survey designed for the individual departments of transportation. Copies of the blank survey, along with all returned surveys are included.

B.1 BLANK SURVEY

A blank copy of the survey that was sent out to the different DOT's is provided in this section.

2010

University of Pittsburgh Student Dissertation Survey: Public Education and Outreach for Ramp Metering Systems

Dear Freeway Operations / Traffic Engineer:

I am a graduate student at the University of Pittsburgh in the Transportation Engineering Program, working on my student dissertation. I have been a part of a Ramp Management study conducted by the University of Pittsburgh (in conjunction with PennDOT) that has been ongoing for the past year and a half. Last year, we may have been in contact with you regarding some questions on that specific research.

My thesis is related to that research but is focused more on the public education aspect of ramp meters (i.e. once installed, how do motorists know how to use them). If you have a few minutes to answer the following questions (to the best of your knowledge) I would greatly appreciate it. Also any addition information or material that you might have regarding the subject of public outreach and ramp meters would be very helpful.

Your help in completing and returning this survey by **February 19, 2010** is greatly appreciated. If you have any questions regarding the content of this survey or the purpose of this project, please feel free to contact Casey Hanner by phone or email.

Sincerely,

Casey Hanner, E.I.T.
Graduate Student
University of Pittsburgh
6215 Kentucky Ave
Pittsburgh, PA 15206
(412) 559-5942
cdh20@pitt.edu

Mark J. Magalotti, P.E.
Principal-in-Charge,
Trans Associates
Twin Towers, Suite 400
Pittsburgh, PA 15205
(412) 490-0630
(412) 490-0630 (fax)
MagalottiM@TransAssociates.com

Dr. Amir Koubaa, Ph.D.
Academic Coordinator,
University of Pittsburgh
Department of Civil & Environmental Engineering
949 Benedum Hall
Pittsburgh, PA 15261
(412) 624-9869
(412) 624-0135 (fax)
amk59@pitt.edu

Please return completed surveys to Casey Hanner at the email address above. Thank you.

1) When was the first ramp metering system installed in your jurisdiction?

Year: _____

2) Were there any other ramp metering systems operating in the surrounding or nearby areas?

○ NO

○ YES

State: _____

County: _____

Interstate Number: _____

3) What method(s) were used in explaining how the motorist should use the ramp meters? (Please mark all that apply)

- ☐ Website
- ☐ Flyer
- ☐ Open House Meetings
- ☐ Media Releases
- ☐ Signs
- ☐ Automated Messages
- ☐ Other → Describe: _____

In your opinion, which method was the most effective? _____

4) What method(s) were used in explaining the potential benefits of the ramp meters to the public? (Please mark all that apply)

- ☐ Website
- ☐ Flyer
- ☐ Open House Meetings
- ☐ Media Releases
- ☐ Signs
- ☐ Automated Messages
- ☐ Other → Describe: ____

In your opinion, which method was the most effective? _____

5) Was the public informed about alternate routes (to avoid the ramp meters)?

- ○ NO
- ○ YES
  - ☐ Prior to the meters being put in place?
  - ☐ After the meters were running?

Describe:

6) Was the public informed about expected delays at the ramps (based upon metering rates)?

- ○ NO
- ○ YES
  - ☐ Prior to the meters being put in place?
  - ☐ After the meters were running?

Describe:

7) Was there a standard set of procedures in place for informing the public?

- ○ NO
- ○ YES

8) Was there much public opposition to the system?

- ○ NO
- ○ YES → Describe:

9) Did motorists run into any major problems during the initial operating phase, such as confusion or misunderstanding of how to use the meters?

○ NO

○ YES → Describe:

10) If implementing ramp meters for the first time today, is there anything that would be done differently to educate the public?

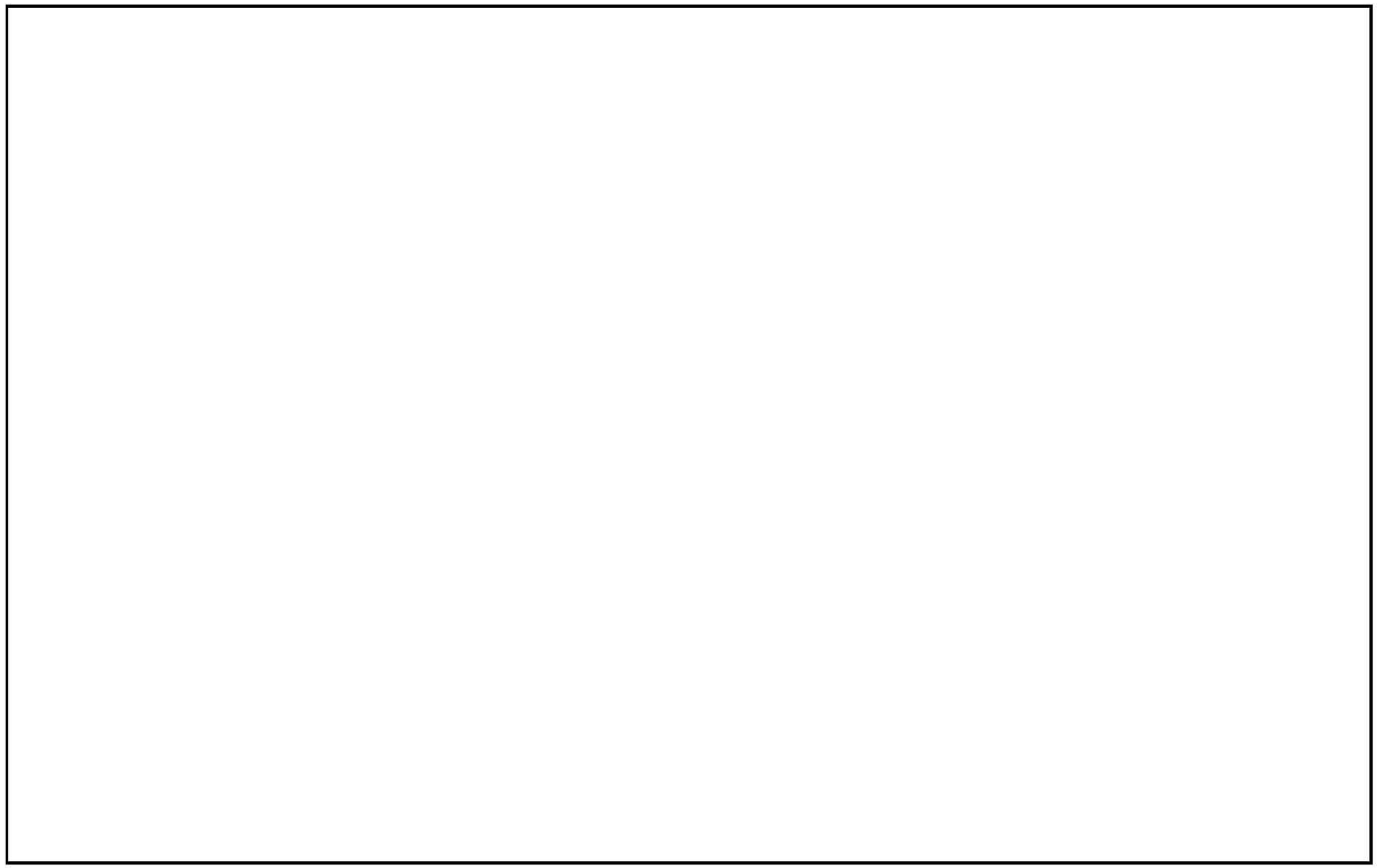
- ○ NO
- ○ YES → Describe:

11) Do you currently have a set of standards for educating the public in using ramp meters?

- ○ NO
- ○ YES

12) If so, where can this information be found?

13) Please note any additional information or sources that you feel are relevant.



This completes the survey. Thank you very much for your time.

If you don't mind, please provide the following contact information, in case of clarification or further questions:

Name: _____

Organization/Position: _____

Phone Number: _____

Email Address: _____

B.2 RETURNED SURVEYS

All eleven returned surveys are provided in this section, unedited.

2010

University of Pittsburgh Student Dissertation Survey: Public Education and Outreach for Ramp Metering Systems

Dear Freeway Operations / Traffic Engineer:

I am a graduate student at the University of Pittsburgh in the Transportation Engineering Program, working on my student dissertation. I have been a part of a Ramp Management study conducted by the University of Pittsburgh (in conjunction with PennDOT) that has been ongoing for the past year and a half. Last year, we may have been in contact with you regarding some questions on that specific research.

My thesis is related to that research but is focused more on the public education aspect of ramp meters (i.e. once installed, how do motorists know how to use them). If you have a few minutes to answer the following questions (to the best of your knowledge) I would greatly appreciate it. Also any addition information or material that you might have regarding the subject of public outreach and ramp meters would be very helpful.

Your help in completing and returning this survey by **February 19, 2010** is greatly appreciated. If you have any questions regarding the content of this survey or the purpose of this project, please feel free to contact Casey Hanner by phone or email.

Sincerely,

Casey Hanner, E.I.T.
Graduate Student
University of Pittsburgh
6215 Kentucky Ave
Pittsburgh, PA 15206
(412) 559-5942
cdh20@pitt.edu

Mark J. Magalotti, P.E.
Principal-in-Charge,
Trans Associates
Twin Towers, Suite 400
Pittsburgh, PA 15205
(412) 490-0630
(412) 490-0630 (fax)
MagalottiM@TransAssociates.com

Dr. Amir Koubaa, Ph.D.
Academic Coordinator,
University of Pittsburgh
Department of Civil & Environmental Engineering
949 Benedum Hall
Pittsburgh, PA 15261
(412) 624-9869
(412) 624-0135 (fax)
amk59@pitt.edu

Please return completed surveys to Casey Hanner at the email address above. Thank you.

1) When was the first ramp metering system installed in your jurisdiction?

Year: 1991

2) Were there any other ramp metering systems operating in the surrounding or nearby areas?

- (●) NO
- ( ) YES

State: _____

County: _____

Interstate Number: _____

3) What method(s) were used in explaining how the motorist should use the ramp meters? (Please mark all that apply)

- ☐ Website
- ☐ Flyer
- ☐ Open House Meetings
- ☑ Media Releases
- ☐ Signs
- ☐ Automated Messages
- ☐ Other → Describe: _____

In your opinion, which method was the most effective? _____

4) What method(s) were used in explaining the potential benefits of the ramp meters to the public? (Please mark all that apply)

- ☐ Website
- ☐ Flyer
- ☐ Open House Meetings
- ☑ Media Releases
- ☐ Signs
- ☐ Automated Messages
- ☐ Other → Describe: _____

In your opinion, which method was the most effective? _____

5) Was the public informed about alternate routes (to avoid the ramp meters)?

- (●) NO
- ( ) YES
  - [ ] Prior to the meters being put in place?
  - [ ] After the meters were running?

Describe:

6) Was the public informed about expected delays at the ramps (based upon metering rates)?

- ○ NO
- ◉ YES
  - ☑ Prior to the meters being put in place?
  - ☐ After the meters were running?

Describe: We submit media releases approx 1-2 weeks prior to activation.

7) Was there a standard set of procedures in place for informing the public?

- ○ NO
- ◉ YES

8) Was there much public opposition to the system?

- ○ NO
- ◉ YES → Describe:

I would probably say, no, but that doesn't give the chance to explain.

We have found that, as each new series of meters are activated, there's a certain level of input received since they slow down access as compared to pre-activation.

Most input is within the first 30 days of installation.

9) Did motorists run into any major problems during the initial operating phase, such as confusion or misunderstanding of how to use the meters?

○ NO

◉ YES → Describe:

I am not aware of any crashes as a result of new activations but there is certainly initial confusion. Strangely enough, most of the observed confusion is after the meters turn off--cars continue to stop for a period of time.

Our morning meters are typically active from 6-9 a.m. (Mon-Fri).

Again, after the first month, motorists seem to adjust to the metering hours and no longer stop following the 9 a.m. deactivation of the meters.

10) If implementing ramp meters for the first time today, is there anything that would be done differently to educate the public?

○ NO

◉ YES → Describe:

Produce a longer series of meter education articles. Explain the national advantages so that drivers understand the "big picture."

Then, precede all activations with the media releases--this was not being done here until the last year. This WAS our lessen learned and it's been a wonderful solution.

11) Do you currently have a set of standards for educating the public in using ramp meters?

- (●) NO
- ( ) YES

12) If so, where can this information be found?

13) Please note any additional information or sources that you feel are relevant.

This completes the survey. Thank you very much for your time.

If you don't mind, please provide the following contact information, in case of clarification or further questions:

Name: Darrell Bingham

Organization/Position: Arizona DOT/TTG Support Manager

Phone Number: 602.712.6439

Email Address: DBingham@azdot.gov

2010

University of Pittsburgh Student Dissertation Survey: Public Education and Outreach for Ramp Metering Systems

Dear Freeway Operations / Traffic Engineer:

I am a graduate student at the University of Pittsburgh in the Transportation Engineering Program, working on my student dissertation. I have been a part of a Ramp Management study conducted by the University of Pittsburgh (in conjunction with PennDOT) that has been ongoing for the past year and a half. Last year, we may have been in contact with you regarding some questions on that specific research.

My thesis is related to that research but is focused more on the public education aspect of ramp meters (i.e. once installed, how do motorists know how to use them). If you have a few minutes to answer the following questions (to the best of your knowledge) I would greatly appreciate it. Also any addition information or material that you might have regarding the subject of public outreach and ramp meters would be very helpful.

Your help in completing and returning this survey by **February 19, 2010** is greatly appreciated. If you have any questions regarding the content of this survey or the purpose of this project, please feel free to contact Casey Hanner by phone or email.

Sincerely,

Casey Hanner, E.I.T.
Graduate Student
University of Pittsburgh
6215 Kentucky Ave
Pittsburgh, PA 15206
(412) 559-5942
cdh20@pitt.edu

Mark J. Magalotti, P.E.
Principal-in-Charge,
Trans Associates
Twin Towers, Suite 400
Pittsburgh, PA 15205
(412) 490-0630
(412) 490-0630 (fax)
MagalottiM@TransAssociates.com

Dr. Amir Koubaa, Ph.D.
Academic Coordinator,
University of Pittsburgh
Department of Civil & Environmental Engineering
949 Benedum Hall
Pittsburgh, PA 15261
(412) 624-9869
(412) 624-0135 (fax)
amk59@pitt.edu

Please return completed surveys to Casey Hanner at the email address above. Thank you.

1) When was the first ramp metering system installed in your jurisdiction?

Year: 1968

2) Were there any other ramp metering systems operating in the surrounding or nearby areas?

○ NO

◉ YES

State: _____

County: _____

Interstate Number: _____

3) What method(s) were used in explaining how the motorist should use the ramp meters? (Please mark all that apply)

- ☐ Website
- ☑ Flyer
- ☐ Open House Meetings
- ☐ Media Releases
- ☐ Signs
- ☐ Automated Messages
- ☐ Other → Describe: [ ]

In your opinion, which method was the most effective? _____

4) What method(s) were used in explaining the potential benefits of the ramp meters to the public? (Please mark all that apply)

- ☐ Website
- ☐ Flyer
- ☐ Open House Meetings
- ☐ Media Releases
- ☐ Signs
- ☐ Automated Messages
- ☐ Other → Describe: ☐

In your opinion, which method was the most effective? _____

5) Was the public informed about alternate routes (to avoid the ramp meters)?

○ NO

◉ YES

☑ Prior to the meters being put in place?

☑ After the meters were running?

Describe:

6) Was the public informed about expected delays at the ramps (based upon metering rates)?

- ○ NO
- ◉ YES
  - ☑ Prior to the meters being put in place?
  - ☑ After the meters were running?

Describe:

7) Was there a standard set of procedures in place for informing the public?

- ○ NO
- ◉ YES

8) Was there much public opposition to the system?

- ○ NO
- ◉ YES → Describe: Typically not, but it depends on the location. It is not uncommon for the public to call us to install ramp meters.

9) Did motorists run into any major problems during the initial operating phase, such as confusion or misunderstanding of how to use the meters?

○ NO

◉ YES → Describe:

10) If implementing ramp meters for the first time today, is there anything that would be done differently to educate the public?

- (●) NO
- ( ) YES → Describe:

11) Do you currently have a set of standards for educating the public in using ramp meters?

- ○ NO
- ◉ YES

12) If so, where can this information be found?

It is online available. Google it.

13) Please note any additional information or sources that you feel are relevant.

Strongly suggested that you google the internet and read the references, and I bet you are going to find a lot more info than this type of survey. Thanks.

This completes the survey. Thank you very much for your time.

If you don't mind, please provide the following contact information, in case of clarification or further questions:

Name: Zhongren WANG

Organization/Position: Caltrans

Phone Number: 916-654-6133

Email Address: zwang@dot.ca.gov

2010

University of Pittsburgh Student Dissertation Survey: Public Education and Outreach for Ramp Metering Systems

Dear Freeway Operations / Traffic Engineer:

I am a graduate student at the University of Pittsburgh in the Transportation Engineering Program, working on my student dissertation. I have been a part of a Ramp Management study conducted by the University of Pittsburgh (in conjunction with PennDOT) that has been ongoing for the past year and a half. Last year, we may have been in contact with you regarding some questions on that specific research.

My thesis is related to that research but is focused more on the public education aspect of ramp meters (i.e. once installed, how do motorists know how to use them). If you have a few minutes to answer the following questions (to the best of your knowledge) I would greatly appreciate it. Also any addition information or material that you might have regarding the subject of public outreach and ramp meters would be very helpful.

Your help in completing and returning this survey by **February 19, 2010** is greatly appreciated. If you have any questions regarding the content of this survey or the purpose of this project, please feel free to contact Casey Hanner by phone or email.

Sincerely,

Casey Hanner, E.I.T.
Graduate Student
University of Pittsburgh
6215 Kentucky Ave
Pittsburgh, PA 15206
(412) 559-5942
cdh20@pitt.edu

Mark J. Magalotti, P.E.
Principal-in-Charge,
Trans Associates
Twin Towers, Suite 400
Pittsburgh, PA 15205
(412) 490-0630
(412) 490-0630 (fax)
MagalottiM@TransAssociates.com

Dr. Amir Koubaa, Ph.D.
Academic Coordinator,
University of Pittsburgh
Department of Civil & Environmental Engineering
949 Benedum Hall
Pittsburgh, PA 15261
(412) 624-9869
(412) 624-0135 (fax)
amk59@pitt.edu

Please return completed surveys to Casey Hanner at the email address above. Thank you.

1) When was the first ramp metering system installed in your jurisdiction?

Year: 1981

2) Were there any other ramp metering systems operating in the surrounding or nearby areas?

- (●) NO
- ( ) YES

State: _____

County: _____

Interstate Number: _____

3) What method(s) were used in explaining how the motorist should use the ramp meters? (Please mark all that apply)

- ☐ Website
- ☑ Flyer
- ☑ Open House Meetings
- ☑ Media Releases
- ☑ Signs
- ☐ Automated Messages
- ☐ Other → Describe:

In your opinion, which method was the most effective? Media Releases

4) What method(s) were used in explaining the potential benefits of the ramp meters to the public? (Please mark all that apply)

- [x] Website
- [x] Flyer
- [x] Open House Meetings
- [x] Media Releases
- [x] Signs
- [ ] Automated Messages
- [ ] Other → Describe: Quoted from a1983 Final Evaluation Report in 1983 written 2 years after initial installation there were 20 meeting held prior to implementation. These included Denver Regional Council of Governments, the Governor, Denver City Council, Denver Police Dept. General Public Meeting, Optimists Club of Southmoor Park, Ellis Community Association, Press Conference, and the Colorado Highway Commision. In addition informational pamphlets were distributed at the affected freeway entrance ramps. Much information was distributed by television, print and radio media as well. The majority of this information as supportive of the project and contributed to a generally positive atmosphere.

In your opinion, which method was the most effective? Media Releases

5) Was the public informed about alternate routes (to avoid the ramp meters)?

- ○ NO
- ○ YES
  - ☐ Prior to the meters being put in place?
  - ☐ After the meters were running?

Describe: No one that was involved with the initial installation in 1981 is available for this information. However in recent years as more ramps were added to the system, CDOT has not advised the public either before nor after installation on alternate routes. It is my personal belief that motorists determine alternate routes on their own. Some of the diversion is probably due to self adjusted time of travel as well as alternate routes.

6) Was the public informed about expected delays at the ramps (based upon metering rates)?

- ○ NO
- ◉ YES
  - ☐ Prior to the meters being put in place?
  - ☑ After the meters were running?

Describe: I would think so prior to system start up during initial installation of the system in 1981, but cannot verify it. In recent years this information has been provided to public most often as a response to individual citizen inquiries, but also as part of media releases explaining the benefits of ramp metering.

7) Was there a standard set of procedures in place for informing the public?

- ○ NO
- ◉ YES

8) Was there much public opposition to the system?

- ○ NO
- ◉ YES → Describe:

According the the aforementioned 1983 Evaluation Report, the majority of the information distributed by television, print and radio media was supportive of the project and contributed to a generally positive atmosphere.
Today when a new meter is installed there continues to be some opposition from those who enter the freeway at the newly metered ramp. However, there is much support from those on the mainline of the freeway. We receive frequent calls from those in support of the system to inform us when a meter is not operational. I believe the majority users of the freeway system realize and appreciate the benefits of ramp metering.

9) Did motorists run into any major problems during the initial operating phase, such as confusion or misunderstanding of how to use the meters?

◉ NO

○ YES → Describe: The aforementioned evaluation report indicated there was an initial varying violation rate from 5 - 10% which settled to 2 - 7% after three months. Violation rates increased again thereafter to about 10%. There continues to be a high percentage of violations to this day. It is my opinion based upon personal observance that these violations are intentional and largely due to lack of enforcement by local authorities, rather than motorists confusion.

10) If implementing ramp meters for the first time today, is there anything that would be done differently to educate the public?

○ NO

◉ YES → Describe: CDOT makes information more readily available as a whole to the public these days through it's various web sites and cooperation with local television news outlets. With the advancements in technology news is disseminated to the public much easier and frequently than ever before.

11) Do you currently have a set of standards for educating the public in using ramp meters?

- (●) NO
- ( ) YES

12) If so, where can this information be found?

Other than the warning and regulatory sings posted at the meters.

13) Please note any additional information or sources that you feel are relevant.

This completes the survey. Thank you very much for your time.

If you don't mind, please provide the following contact information, in case of clarification or further questions:

Name: Johnny Bland

Organization/Position: CDOT/CEPM-I Ramp Metering Administrator

Phone Number: 303.757.9991

Email Address: Johnny.Bland@dot.state.co.us

2010

University of Pittsburgh Student Dissertation Survey: Public Education and Outreach for Ramp Metering Systems

Dear Freeway Operations / Traffic Engineer:

I am a graduate student at the University of Pittsburgh in the Transportation Engineering Program, working on my student dissertation. I have been a part of a Ramp Management study conducted by the University of Pittsburgh (in conjunction with PennDOT) that has been ongoing for the past year and a half. Last year, we may have been in contact with you regarding some questions on that specific research.

My thesis is related to that research but is focused more on the public education aspect of ramp meters (i.e. once installed, how do motorists know how to use them). If you have a few minutes to answer the following questions (to the best of your knowledge) I would greatly appreciate it. Also any addition information or material that you might have regarding the subject of public outreach and ramp meters would be very helpful.

Your help in completing and returning this survey by **February 19, 2010** is greatly appreciated. If you have any questions regarding the content of this survey or the purpose of this project, please feel free to contact Casey Hanner by phone or email.

Sincerely,

Casey Hanner, E.I.T.
Graduate Student
University of Pittsburgh
6215 Kentucky Ave
Pittsburgh, PA 15206
(412) 559-5942
cdh20@pitt.edu

Mark J. Magalotti, P.E.
Principal-in-Charge,
Trans Associates
Twin Towers, Suite 400
Pittsburgh, PA 15205
(412) 490-0630
(412) 490-0630 (fax)
MagalottiM@TransAssociates.com

Dr. Amir Koubaa, Ph.D.
Academic Coordinator,
University of Pittsburgh
Department of Civil & Environmental Engineering
949 Benedum Hall
Pittsburgh, PA 15261
(412) 624-9869
(412) 624-0135 (fax)
amk59@pitt.edu

Please return completed surveys to Casey Hanner at the email address above. Thank you.

1) When was the first ramp metering system installed in your jurisdiction?

Year: 1968

2) Were there any other ramp metering systems operating in the surrounding or nearby areas?

- (●) NO
- ( ) YES

State: _____

County: _____

Interstate Number: _____

3) What method(s) were used in explaining how the motorist should use the ramp meters? (Please mark all that apply)

- ☐ Website
- ☐ Flyer
- ☐ Open House Meetings
- ☐ Media Releases
- ☑ Signs
- ☐ Automated Messages
- ☐ Other → Describe: Unknown for initial deployment. For new deployments on new corridors we have just gone with signing on the ramp. A week prior we put up a sign that says "ramp metering begins (date)". If we were starting from scratch I would say media release and web.

In your opinion, which method was the most effective? _____

4) What method(s) were used in explaining the potential benefits of the ramp meters to the public? (Please mark all that apply)

- [x] Website
- [ ] Flyer
- [ ] Open House Meetings
- [ ] Media Releases
- [ ] Signs
- [ ] Automated Messages
- [ ] Other → Describe: We have a website describing the benefits of metering. http://www.dot.state.mn.us/rampmeter/index.html

In your opinion, which method was the most effective? website

5) Was the public informed about alternate routes (to avoid the ramp meters)?

- (●) NO
- ( ) YES
  - [ ] Prior to the meters being put in place?
  - [ ] After the meters were running?

Describe:

6) Was the public informed about expected delays at the ramps (based upon metering rates)?

- (●) NO
- ( ) YES
  - [ ] Prior to the meters being put in place?
  - [ ] After the meters were running?

Describe: We do have a maximum wait time of 4 minutes for local ramps and 2 minutes for system-to-system ramps. Although this policy has only been in place since 2000.

7) Was there a standard set of procedures in place for informing the public?

- (●) NO
- ( ) YES

8) Was there much public opposition to the system?

- ( ) NO
- (●) YES → Describe:

Unknown for the initial deployment but in 2000 there was public opposition and a legislative mandate to shutdown the ramp meters for a 6 week operational test to determine the effectiveness of metering. Without metering, congestion was worse and travel time reliability was worse. In response to the study, Mn/DOT turned the meters back on but with the wait time restrictions as mentioned in question 6.

When deploying new segments we have gotten some opposition at first but this has been minimal and usual only consists of a few email or phone complaints. Overall the motoring public in the Twin Cities is accustomed to metering.

9) Did motorists run into any major problems during the initial operating phase, such as confusion or misunderstanding of how to use the meters?

◉ NO

○ YES → Describe: Unknown for the initial deployment. I can imagine there was some confusion as we were one of the first in the world to deploy metering. I think only Chicago had them installed first. I've heard the first meters were literally a traffic cop on the ramp allowing one car at a time.

10) If implementing ramp meters for the first time today, is there anything that would be done differently to educate the public?

○ NO

◉ YES → Describe: Today we would probably utilize the media and the website to educate people on the importance of ramp metering. Public open houses and local marketing would also play an important role. Also important to have support and understanding of local elected officials.

11) Do you currently have a set of standards for educating the public in using ramp meters?

- (●) NO
- ( ) YES

12) If so, where can this information be found?

13) Please note any additional information or sources that you feel are relevant.

http://www.dot.state.mn.us/rampmeter/rmstudy.html

This link is for the ramp meter shutdown study that was done in Minnesota in 2000. The results of the study show the benefits of metering in reducing congestion, crashes and improving travel time reliability.

This completes the survey. Thank you very much for your time.

If you don't mind, please provide the following contact information, in case of clarification or further questions:

Name: Brian Kary

Organization/Position: Mn/DOT Freeway Operations Engineer

Phone Number: 651-234-7022

Email Address: brian.kary@state.mn.us

2010

University of Pittsburgh Student Dissertation Survey: Public Education and Outreach for Ramp Metering Systems

Dear Freeway Operations / Traffic Engineer:

I am a graduate student at the University of Pittsburgh in the Transportation Engineering Program, working on my student dissertation. I have been a part of a Ramp Management study conducted by the University of Pittsburgh (in conjunction with PennDOT) that has been ongoing for the past year and a half. Last year, we may have been in contact with you regarding some questions on that specific research.

My thesis is related to that research but is focused more on the public education aspect of ramp meters (i.e. once installed, how do motorists know how to use them). If you have a few minutes to answer the following questions (to the best of your knowledge) I would greatly appreciate it. Also any addition information or material that you might have regarding the subject of public outreach and ramp meters would be very helpful.

Your help in completing and returning this survey by **February 19, 2010** is greatly appreciated. If you have any questions regarding the content of this survey or the purpose of this project, please feel free to contact Casey Hanner by phone or email.

Sincerely,

Casey Hanner, E.I.T.
Graduate Student
University of Pittsburgh
6215 Kentucky Ave
Pittsburgh, PA 15206
(412) 559-5942
cdh20@pitt.edu

Mark J. Magalotti, P.E.
Principal-in-Charge,
Trans Associates
Twin Towers, Suite 400
Pittsburgh, PA 15205
(412) 490-0630
(412) 490-0630 (fax)
MagalottiM@TransAssociates.com

Dr. Amir Koubaa, Ph.D.
Academic Coordinator,
University of Pittsburgh
Department of Civil & Environmental Engineering
949 Benedum Hall
Pittsburgh, PA 15261
(412) 624-9869
(412) 624-0135 (fax)
amk59@pitt.edu

Please return completed surveys to Casey Hanner at the email address above. Thank you.

1) When was the first ramp metering system installed in your jurisdiction?

Year: 1986

2) Were there any other ramp metering systems operating in the surrounding or nearby areas?

○ NO

◉ YES

State: NY

County: Queens

Interstate Number: I 678

3) What method(s) were used in explaining how the motorist should use the ramp meters? (Please mark all that apply)

- ☐ Website
- ☑ Flyer
- ☐ Open House Meetings
- ☑ Media Releases
- ☑ Signs
- ☐ Automated Messages
- ☐ Other → Describe:

In your opinion, which method was the most effective? They all reached people in different ways

4) What method(s) were used in explaining the potential benefits of the ramp meters to the public? (Please mark all that apply)

- ☐ Website
- ☑ Flyer
- ☐ Open House Meetings
- ☑ Media Releases
- ☐ Signs
- ☐ Automated Messages
- ☐ Other → Describe: [ ]

In your opinion, which method was the most effective? Both equally effective capturing an audience

5) Was the public informed about alternate routes (to avoid the ramp meters)?

- (●) NO
- ( ) YES
  - [ ] Prior to the meters being put in place?
  - [ ] After the meters were running?

Describe:

6) Was the public informed about expected delays at the ramps (based upon metering rates)?

- (●) NO
- ( ) YES
  - [ ] Prior to the meters being put in place?
  - [ ] After the meters were running?

Describe:

7) Was there a standard set of procedures in place for informing the public?

- ○ NO
- ◉ YES

8) Was there much public opposition to the system?

- ◉ NO
- ○ YES → Describe:

9) Did motorists run into any major problems during the initial operating phase, such as confusion or misunderstanding of how to use the meters?

○ NO

◉ YES → Describe: As with anything new it takes time to get used to it but after a while it cleared up and has been working fine since

10) If implementing ramp meters for the first time today, is there anything that would be done differently to educate the public?

- ○ NO
- ◉ YES → Describe: Probably add using website or even youtube video to educate the public in their use

11) Do you currently have a set of standards for educating the public in using ramp meters?

- (●) NO
- ( ) YES

12) If so, where can this information be found?

13) Please note any additional information or sources that you feel are relevant.

Sorry, don't have much to add. The following which I recently received in an e-mail may be of help

Evaluation of Renton Ramp Meters on I-405

http://www.wsdot.wa.gov/NR/rdonlyres/D4A44406-D1D3-4AAD-BEFE-033D7E033359/0/I405study.pdf

SR 520 EASTBOUND MORNING RAMP METERING THREE MONTH STUDY

http://www.wsdot.wa.gov/NR/rdonlyres/9FB40ACE-EE17-4B20-BED5-633D38AC8A7B/0/520eb3monthstudy.pdf

SR 520 Westbound Ramp Meter Effects

http://www.wsdot.wa.gov/NR/rdonlyres/6E3FAC2D-E6F9-4AB7-9E7E-274FD13399C6/0/520wb6monthstudy.pdf

Merging Conflict Study for SR 167 at the South 212th St. Interchange

http://www.wsdot.wa.gov/NR/rdonlyres/51C9AF98-BDB0-44F0-892E-4E33A86D8E15/0/SR167ConflictStudy.pdf

EVALUATION OF A FUZZY LOGIC RAMP METERING ALGORITHM:

A COMPARATIVE STUDY BETWEEN THREE RAMP METERING ALGORITHMS USED IN THE GREATER SEATTLE AREA

http://www.wsdot.wa.gov/NR/rdonlyres/A5AD6DCC-B595-4181-978B-F50359E78D71/0/eval_report.pdf

If you look at these studies as well as others you will no doubt be pointed to, I believe you will see that ramp meters have a positive proven track record. However, as with most traffic operations strategies, their effectiveness is tied to the traffic conditions of where they are installed and how they are operated.

Also, the effectiveness of ramp meters is only part of the issue, ramp meter installation, particularly in areas which do not have them, come with lots of potential public and political push back. As you are probably aware they are not without controversy, which can be a larger challenge then justifying their effectiveness. We, as well as other areas with established and proven ramp meter programs, are consistently questioned about their effectiveness.

The best example of this is the Minneapolis ramp meter system evaluation. MNDOT shut off their entire extensive ramp meter system (over 400 meters) to do a with and without evaluation to conclusively determine if the meter benefits outweighed perceived negative impacts and cost. You can find the executive summary of this study here:

http://www.dot.state.mn.us/rampmeterstudy/pdf/execsummary/executivesummary.pdf

This completes the survey. Thank you very much for your time.

If you don't mind, please provide the following contact information, in case of clarification or further questions:

Name: Emilio C. Sosa

Organization/Position: NYSDOT INFORM System/ Director

Phone Number: 631-904-3014

Email Address: esosa@dot.state.ny.us

2010

University of Pittsburgh Student Dissertation Survey: Public Education and Outreach for Ramp Metering Systems

Dear Freeway Operations / Traffic Engineer:

I am a graduate student at the University of Pittsburgh in the Transportation Engineering Program, working on my student dissertation. I have been a part of a Ramp Management study conducted by the University of Pittsburgh (in conjunction with PennDOT) that has been ongoing for the past year and a half. Last year, we may have been in contact with you regarding some questions on that specific research.

My thesis is related to that research but is focused more on the public education aspect of ramp meters (i.e. once installed, how do motorists know how to use them). If you have a few minutes to answer the following questions (to the best of your knowledge) I would greatly appreciate it. Also any addition information or material that you might have regarding the subject of public outreach and ramp meters would be very helpful.

Your help in completing and returning this survey by **February 19, 2010** is greatly appreciated. If you have any questions regarding the content of this survey or the purpose of this project, please feel free to contact Casey Hanner by phone or email.

Sincerely,

Casey Hanner, E.I.T.
Graduate Student
University of Pittsburgh
6215 Kentucky Ave
Pittsburgh, PA 15206
(412) 559-5942
cdh20@pitt.edu

Mark J. Magalotti, P.E.
Principal-in-Charge,
Trans Associates
Twin Towers, Suite 400
Pittsburgh, PA 15205
(412) 490-0630
(412) 490-0630 (fax)
MagalottiM@TransAssociates.com

Dr. Amir Koubaa, Ph.D.
Academic Coordinator,
University of Pittsburgh
Department of Civil & Environmental Engineering
949 Benedum Hall
Pittsburgh, PA 15261
(412) 624-9869
(412) 624-0135 (fax)
amk59@pitt.edu

Please return completed surveys to Casey Hanner at the email address above. Thank you.

1) When was the first ramp metering system installed in your jurisdiction?

Year: November 2009

2) Were there any other ramp metering systems operating in the surrounding or nearby areas?

◉ NO

○ YES

State: _____

County: _____

Interstate Number: _____

3) What method(s) were used in explaining how the motorist should use the ramp meters? (Please mark all that apply)

- ☐ Website
- ☐ Flyer
- ☑ Open House Meetings
- ☑ Media Releases
- ☑ Signs
- ☐ Automated Messages
- ☐ Other → Describe:

In your opinion, which method was the most effective? Media Releases

4) What method(s) were used in explaining the potential benefits of the ramp meters to the public? (Please mark all that apply)

- ☐ Website
- ☑ Flyer
- ☑ Open House Meetings
- ☑ Media Releases
- ☐ Signs
- ☐ Automated Messages
- ☐ Other → Describe:

In your opinion, which method was the most effective? Open House meetings

5) Was the public informed about alternate routes (to avoid the ramp meters)?

- (●) NO
- ( ) YES
  - [ ] Prior to the meters being put in place?
  - [ ] After the meters were running?

Describe:

6) Was the public informed about expected delays at the ramps (based upon metering rates)?

- (●) NO
- ( ) YES
  - [ ] Prior to the meters being put in place?
  - [ ] After the meters were running?

Describe:

7) Was there a standard set of procedures in place for informing the public?

- (●) NO
- ( ) YES

8) Was there much public opposition to the system?

- ( ) NO
- (●) YES → Describe: Mostly due to the fact that they would have to stop another time.

9) Did motorists run into any major problems during the initial operating phase, such as confusion or misunderstanding of how to use the meters?

○ NO

◉ YES → Describe: On the two lane ramps they were not using both lanes equally. We set out a changeable message sign to explain USE BOTH LANES. We also asked the media to get the word out. After they started using both lanes it worked much better, shorter queues.

10) If implementing ramp meters for the first time today, is there anything that would be done differently to educate the public?

- ○ NO
- ◉ YES → Describe: Only to try to highlight to use both lanes of the two lane ramps.

11) Do you currently have a set of standards for educating the public in using ramp meters?

- (●) NO
- ( ) YES

12) If so, where can this information be found?

13) Please note any additional information or sources that you feel are relevant.

This completes the survey. Thank you very much for your time.

If you don't mind, please provide the following contact information, in case of clarification or further questions:

Name: Jay Hamilton

Organization/Position: TE4

Phone Number: 513-933-6584

Email Address: jay.hamilton@dot.state.oh.us

2010

University of Pittsburgh Student Dissertation Survey: Public Education and Outreach for Ramp Metering Systems

Dear Freeway Operations / Traffic Engineer:

I am a graduate student at the University of Pittsburgh in the Transportation Engineering Program, working on my student dissertation. I have been a part of a Ramp Management study conducted by the University of Pittsburgh (in conjunction with PennDOT) that has been ongoing for the past year and a half. Last year, we may have been in contact with you regarding some questions on that specific research.

My thesis is related to that research but is focused more on the public education aspect of ramp meters (i.e. once installed, how do motorists know how to use them). If you have a few minutes to answer the following questions (to the best of your knowledge) I would greatly appreciate it. Also any addition information or material that you might have regarding the subject of public outreach and ramp meters would be very helpful.

Your help in completing and returning this survey by **February 19, 2010** is greatly appreciated. If you have any questions regarding the content of this survey or the purpose of this project, please feel free to contact Casey Hanner by phone or email.

Sincerely,

Casey Hanner, E.I.T.
Graduate Student
University of Pittsburgh
6215 Kentucky Ave
Pittsburgh, PA 15206
(412) 559-5942
cdh20@pitt.edu

Mark J. Magalotti, P.E.
Principal-in-Charge,
Trans Associates
Twin Towers, Suite 400
Pittsburgh, PA 15205
(412) 490-0630
(412) 490-0630 (fax)
MagalottiM@TransAssociates.com

Dr. Amir Koubaa, Ph.D.
Academic Coordinator,
University of Pittsburgh
Department of Civil & Environmental Engineering
949 Benedum Hall
Pittsburgh, PA 15261
(412) 624-9869
(412) 624-0135 (fax)
amk59@pitt.edu

Please return completed surveys to Casey Hanner at the email address above. Thank you.

1) When was the first ramp metering system installed in your jurisdiction?

Year: 1981

2) Were there any other ramp metering systems operating in the surrounding or nearby areas?

- (●) NO
- ( ) YES

State: _____

County: _____

Interstate Number: _____

3) What method(s) were used in explaining how the motorist should use the ramp meters? (Please mark all that apply)

- ☐ Website
- ☑ Flyer
- ☑ Open House Meetings
- ☑ Media Releases
- ☑ Signs
- ☐ Automated Messages
- ☐ Other → Describe:

In your opinion, which method was the most effective? Media Releases

4) What method(s) were used in explaining the potential benefits of the ramp meters to the public? (Please mark all that apply)

- ☐ Website
- ☑ Flyer
- ☑ Open House Meetings
- ☑ Media Releases
- ☐ Signs
- ☐ Automated Messages
- ☐ Other → Describe:

In your opinion, which method was the most effective? Media Releases

5) Was the public informed about alternate routes (to avoid the ramp meters)?

- (●) NO
- ( ) YES
  - [ ] Prior to the meters being put in place?
  - [ ] After the meters were running?

Describe:

6) Was the public informed about expected delays at the ramps (based upon metering rates)?

- ○ NO
- ◉ YES
  - ☑ Prior to the meters being put in place?
  - ☐ After the meters were running?

Describe:

7) Was there a standard set of procedures in place for informing the public?

- (●) NO
- ( ) YES

8) Was there much public opposition to the system?

- (●) NO
- ( ) YES → Describe:

9) Did motorists run into any major problems during the initial operating phase, such as confusion or misunderstanding of how to use the meters?

◉ NO

○ YES → Describe:

10) If implementing ramp meters for the first time today, is there anything that would be done differently to educate the public?

○ NO

◉ YES → Describe: With the internet you can reach a far greater audience and explain in more detail the benefits

11) Do you currently have a set of standards for educating the public in using ramp meters?

- ○ NO
- ◉ YES

12) If so, where can this information be found?

http://www.oregon.gov/ODOT/COMM/docs/RampMeters.pdf

13) Please note any additional information or sources that you feel are relevant.

This completes the survey. Thank you very much for your time.

If you don't mind, please provide the following contact information, in case of clarification or further questions:

Name: Dennis Mitchell

Organization/Position: Oregon DOT / Region Traffic Engineer

Phone Number: 503-731-8218

Email Address: dennis.j.mitchell@state.or.us

2010

University of Pittsburgh Student Dissertation Survey: Public Education and Outreach for Ramp Metering Systems

Dear Freeway Operations / Traffic Engineer:

I am a graduate student at the University of Pittsburgh in the Transportation Engineering Program, working on my student dissertation. I have been a part of a Ramp Management study conducted by the University of Pittsburgh (in conjunction with PennDOT) that has been ongoing for the past year and a half. Last year, we may have been in contact with you regarding some questions on that specific research.

My thesis is related to that research but is focused more on the public education aspect of ramp meters (i.e. once installed, how do motorists know how to use them). If you have a few minutes to answer the following questions (to the best of your knowledge) I would greatly appreciate it. Also any addition information or material that you might have regarding the subject of public outreach and ramp meters would be very helpful.

Your help in completing and returning this survey by **February 19, 2010** is greatly appreciated. If you have any questions regarding the content of this survey or the purpose of this project, please feel free to contact Casey Hanner by phone or email.

Sincerely,

Casey Hanner, E.I.T.
Graduate Student
University of Pittsburgh
6215 Kentucky Ave
Pittsburgh, PA 15206
(412) 559-5942
cdh20@pitt.edu

Mark J. Magalotti, P.E.
Principal-in-Charge,
Trans Associates
Twin Towers, Suite 400
Pittsburgh, PA 15205
(412) 490-0630
(412) 490-0630 (fax)
MagalottiM@TransAssociates.com

Dr. Amir Koubaa, Ph.D.
Academic Coordinator,
University of Pittsburgh
Department of Civil & Environmental Engineering
949 Benedum Hall
Pittsburgh, PA 15261
(412) 624-9869
(412) 624-0135 (fax)
amk59@pitt.edu

Please return completed surveys to Casey Hanner at the email address above. Thank you.

1) When was the first ramp metering system installed in your jurisdiction?

Year: 1968

2) Were there any other ramp metering systems operating in the surrounding or nearby areas?

◉ NO

○ YES

State: _____

County: _____

Interstate Number: _____

3) What method(s) were used in explaining how the motorist should use the ramp meters? (Please mark all that apply)

- ☐ Website
- ☑ Flyer
- ☐ Open House Meetings
- ☑ Media Releases
- ☑ Signs
- ☐ Automated Messages
- ☑ Other → Describe: Hand out flyers at ramp with police presence prior to starting the metering of the ramp

In your opinion, which method was the most effective? hand outs at the ramp

4) What method(s) were used in explaining the potential benefits of the ramp meters to the public? (Please mark all that apply)

- ☐ Website
- ☑ Flyer
- ☐ Open House Meetings
- ☑ Media Releases
- ☑ Signs
- ☐ Automated Messages
- ☐ Other → Describe:

In your opinion, which method was the most effective? Flyer and response to inquiries.

5) Was the public informed about alternate routes (to avoid the ramp meters)?

- (●) NO
- ( ) YES
  - [ ] Prior to the meters being put in place?
  - [ ] After the meters were running?

Describe:

6) Was the public informed about expected delays at the ramps (based upon metering rates)?

- ○ NO
- ◉ YES
  - ☑ Prior to the meters being put in place?
  - ☐ After the meters were running?

Describe: They were informed that in no case would the delay to enter the freeway be over 2 minutes.

7) Was there a standard set of procedures in place for informing the public?

- (●) NO
- ( ) YES

8) Was there much public opposition to the system?

- ( ) NO
- (●) YES → Describe: Prior to the first turn on mainly based on experience from other cities. But one operations began most realized the benefits and were more worried when they were turned off.

9) Did motorists run into any major problems during the initial operating phase, such as confusion or misunderstanding of how to use the meters?

◉ NO

○ YES → Describe: Most said that it ran better than the week before the meters began operation.

10) If implementing ramp meters for the first time today, is there anything that would be done differently to educate the public?

○ NO

◉ YES → Describe: Would have used the website to answer the frequently asked questions. Also show which ramps that were hardly used so they could divert to take an alternate route (usually the frontage road in Houston) to get on the freeway or stay on the frontage road and avoid the more heavily used ramps.

11) Do you currently have a set of standards for educating the public in using ramp meters?

- (●) NO
- ( ) YES

12) If so, where can this information be found?

13) Please note any additional information or sources that you feel are relevant.

This completes the survey. Thank you very much for your time.

If you don't mind, please provide the following contact information, in case of clarification or further questions:

Name: John Gaynor, P.E.

Organization/Position: Director Transportation Management Systems

Phone Number: 713-881-3060

Email Address: jgaynor@houstontranstar.org

2010

University of Pittsburgh Student Dissertation Survey: Public Education and Outreach for Ramp Metering Systems

Dear Freeway Operations / Traffic Engineer:

I am a graduate student at the University of Pittsburgh in the Transportation Engineering Program, working on my student dissertation. I have been a part of a Ramp Management study conducted by the University of Pittsburgh (in conjunction with PennDOT) that has been ongoing for the past year and a half. Last year, we may have been in contact with you regarding some questions on that specific research.

My thesis is related to that research but is focused more on the public education aspect of ramp meters (i.e. once installed, how do motorists know how to use them). If you have a few minutes to answer the following questions (to the best of your knowledge) I would greatly appreciate it. Also any addition information or material that you might have regarding the subject of public outreach and ramp meters would be very helpful.

Your help in completing and returning this survey by **February 19, 2010** is greatly appreciated. If you have any questions regarding the content of this survey or the purpose of this project, please feel free to contact Casey Hanner by phone or email.

Sincerely,

Casey Hanner, E.I.T.
Graduate Student
University of Pittsburgh
6215 Kentucky Ave
Pittsburgh, PA 15206
(412) 559-5942
cdh20@pitt.edu

Mark J. Magalotti, P.E.
Principal-in-Charge,
Trans Associates
Twin Towers, Suite 400
Pittsburgh, PA 15205
(412) 490-0630
(412) 490-0630 (fax)
MagalottiM@TransAssociates.com

Dr. Amir Koubaa, Ph.D.
Academic Coordinator,
University of Pittsburgh
Department of Civil & Environmental Engineering
949 Benedum Hall
Pittsburgh, PA 15261
(412) 624-9869
(412) 624-0135 (fax)
amk59@pitt.edu

Please return completed surveys to Casey Hanner at the email address above. Thank you.

1) When was the first ramp metering system installed in your jurisdiction?

Year: 1985

2) Were there any other ramp metering systems operating in the surrounding or nearby areas?

◉ NO

○ YES

State: _____

County: _____

Interstate Number: _____

3) What method(s) were used in explaining how the motorist should use the ramp meters? (Please mark all that apply)

- ☐ Website
- ☐ Flyer
- ☐ Open House Meetings
- ☑ Media Releases
- ☑ Signs
- ☑ Automated Messages
- ☐ Other → Describe: ____

In your opinion, which method was the most effective? _____

4) What method(s) were used in explaining the potential benefits of the ramp meters to the public? (Please mark all that apply)

- ☐ Website
- ☐ Flyer
- ☐ Open House Meetings
- ☑ Media Releases
- ☐ Signs
- ☐ Automated Messages
- ☐ Other → Describe: _____

In your opinion, which method was the most effective? _____

5) Was the public informed about alternate routes (to avoid the ramp meters)?

- (●) NO
- ( ) YES
  - [ ] Prior to the meters being put in place?
  - [ ] After the meters were running?

Describe: The ramp meters were installed at ramps on Interstates 66 and 395. If motorists need to get onto the interstate, they have to go thru the ramp meter. There were not a lot of options/detour routes, if motorists didn't want to use the meter.

6) Was the public informed about expected delays at the ramps (based upon metering rates)?

- ○ NO
- ◉ YES
  - ☑ Prior to the meters being put in place?
  - ☐ After the meters were running?

Describe:

7) Was there a standard set of procedures in place for informing the public?

- ○ NO
- ◉ YES

8) Was there much public opposition to the system?

- ○ NO
- ◉ YES → Describe: Those 24 ramp meters VDOT installed were the first in the National Capital Region. Most motorists were not familiar with it and didn't understand how they work. Even though, VDOT issued news release, the communication methods were limited in 1985.

9) Did motorists run into any major problems during the initial operating phase, such as confusion or misunderstanding of how to use the meters?

○ NO

◉ YES → Describe: Some people didn't stop at the ramp signal resulting rear-end collision. Virginia State Police (VSP) noticed the problems and provided the enforcement. VDOT worked with VSP closed during the initial operating phase.

10) If implementing ramp meters for the first time today, is there anything that would be done differently to educate the public?

○ NO

◉ YES → Describe: As technology enhances, there are more ways that we can use to educate or inform public about ramp meters - how it operates, benefits, etc. These public outreaches include news release, website, 511, public meetings, flyer, and temporary signs, etc.

11) Do you currently have a set of standards for educating the public in using ramp meters?

- ○ NO
- ◉ YES

12) If so, where can this information be found?

The set of procedure was used during the initial operating period in 1985. As time goes, people get to use the ramp meter signals. The information can be found, but it may not be easy, as most people who involved in the initial installation are not longer with VDOT.

13) Please note any additional information or sources that you feel are relevant.

VDOT is moving towards to upgrade of the existing ramp metering control system from fix-timed to a real-time control. Public education plays a critical role in the successful deployment of the new system. It is expected that an effective public information campaign will be conducted accompanying the implementation of new ramp control system. Various methods, such as news release, 511- traveler information system, open house conferences and distribution of flyers in the neighborhood where people are impacted by the ramp metering system, will be undertaken to disseminate information to the public.

This completes the survey. Thank you very much for your time.

If you don't mind, please provide the following contact information, in case of clarification or further questions:

Name: Xiaoling "Ling" Li, P.E.

Organization/Position: Virginia Department of Transportation

Phone Number: 571-350-2020

Email Address: ling.li@vdot.virginia.gov

2010

University of Pittsburgh Student Dissertation Survey: Public Education and Outreach for Ramp Metering Systems

Dear Freeway Operations / Traffic Engineer:

I am a graduate student at the University of Pittsburgh in the Transportation Engineering Program, working on my student dissertation. I have been a part of a Ramp Management study conducted by the University of Pittsburgh (in conjunction with PennDOT) that has been ongoing for the past year and a half. Last year, we may have been in contact with you regarding some questions on that specific research.

My thesis is related to that research but is focused more on the public education aspect of ramp meters (i.e. once installed, how do motorists know how to use them). If you have a few minutes to answer the following questions (to the best of your knowledge) I would greatly appreciate it. Also any addition information or material that you might have regarding the subject of public outreach and ramp meters would be very helpful.

Your help in completing and returning this survey by **February 19, 2010** is greatly appreciated. If you have any questions regarding the content of this survey or the purpose of this project, please feel free to contact Casey Hanner by phone or email.

Sincerely,

Casey Hanner, E.I.T.
Graduate Student
University of Pittsburgh
6215 Kentucky Ave
Pittsburgh, PA 15206
(412) 559-5942
cdh20@pitt.edu

Mark J. Magalotti, P.E.
Principal-in-Charge,
Trans Associates
Twin Towers, Suite 400
Pittsburgh, PA 15205
(412) 490-0630
(412) 490-0630 (fax)
MagalottiM@TransAssociates.com

Dr. Amir Koubaa, Ph.D.
Academic Coordinator,
University of Pittsburgh
Department of Civil & Environmental Engineering
949 Benedum Hall
Pittsburgh, PA 15261
(412) 624-9869
(412) 624-0135 (fax)
amk59@pitt.edu

Please return completed surveys to Casey Hanner at the email address above. Thank you.

1) When was the first ramp metering system installed in your jurisdiction?

Year: 1968

2) Were there any other ramp metering systems operating in the surrounding or nearby areas?

- (●) NO
- ( ) YES

State: _____

County: _____

Interstate Number: _____

3) What method(s) were used in explaining how the motorist should use the ramp meters? (Please mark all that apply)

- ☑ Website
- ☑ Flyer
- ☑ Open House Meetings
- ☑ Media Releases
- ☑ Signs
- ☑ Automated Messages
- ☑ Other → Describe: Social Media Twitter, Facebook, preformated new broadcasts to give to news stations.

In your opinion, which method was the most effective? You have got to use all of them together. I am sure as you realize in 1968 the Internet wasn't used as it is today so I have chec

4) What method(s) were used in explaining the potential benefits of the ramp meters to the public? (Please mark all that apply)

- ☑ Website
- ☑ Flyer
- ☑ Open House Meetings
- ☑ Media Releases
- ☑ Signs
- ☑ Automated Messages
- ☑ Other → Describe: Social Media Twitter, Facebook, preformated new broadcast to give to news stations.

In your opinion, which method was the most effective? You have got to use all of them together. I am sure as you realize in 1968 the Internet wasn't used as it is today so I have chec

5) Was the public informed about alternate routes (to avoid the ramp meters)?

- (●) NO
- ( ) YES
  - [ ] Prior to the meters being put in place?
  - [ ] After the meters were running?

Describe: I checked the No box and am using this Yes space to discuss the No answer. There is really no reason to inform drivers off alternate routes. Ramp meters make the highway safer and move more traffic.

6) Was the public informed about expected delays at the ramps (based upon metering rates)?

- ○ NO
- ◉ YES
  - ☑ Prior to the meters being put in place?
  - ☑ After the meters were running?

Describe: We do tell people there will be a short wait but then the freeway will run smoother and they will have a easier time getting on the freeway and ultimately a better trip to their destination.

7) Was there a standard set of procedures in place for informing the public?

- (●) NO
- ( ) YES

8) Was there much public opposition to the system?

- (●) NO
- ( ) YES → Describe:

9) Did motorists run into any major problems during the initial operating phase, such as confusion or misunderstanding of how to use the meters?

◉ NO

○ YES → Describe:

10) If implementing ramp meters for the first time today, is there anything that would be done differently to educate the public?

- (●) NO
- ( ) YES → Describe: Just using this space for a comment since there is no way to comment in the No selection. We revisit the public outreach each time we turn on a meter and scale the outreach accordingly. If you follow that approach then you are flexible and can adjust to changing communication needs and abilities.

11) Do you currently have a set of standards for educating the public in using ramp meters?

- (●) NO
- ( ) YES

12) If so, where can this information be found?

We craft public information based on the size of deployment meters and the experience communities in the area have with ramp meters. We take what we have used and what we have learned from the past and modify to the situation. Afterward we discuss its success and begin the process all over. Standards don't apply this is real life.

This question, like most your questions, does not get the heart of the issue. I think you just want an old fashioned answer like hears my web page, so here it is.... You can call it a standard if you want.

http://www.wsdot.wa.gov/Traffic/Congestion/rampmeters/

13) Please note any additional information or sources that you feel are relevant.

Tons of stuff on the web. Ramp meters are an old school technology for improving safety and efficiency of the highway system. We have even used them at an entrance to a roundabout. I imagine in some communities ramp meters seem new and dangerous, just like a first stop sign or a first traffic signal might be a big deal. The important thing is to realize the situation and understand how the impacted public might be viewing the situation. What people think no matter how unrealistic is real to them. Illusion is a reality and a very persistent one. (Spin on an Einstein quote.)

This completes the survey. Thank you very much for your time.

If you don't mind, please provide the following contact information, in case of clarification or further questions:

Name: Morgan Balogh P.E. PTOE

Organization/Position: WSDOT Traffic Engineer Regional Operations

Phone Number: 206-440-4485

Email Address: baloghm@wsdot.wa.gov

2010

University of Pittsburgh Student Dissertation Survey: Public Education and Outreach for Ramp Metering Systems

Dear Freeway Operations / Traffic Engineer:

I am a graduate student at the University of Pittsburgh in the Transportation Engineering Program, working on my student dissertation. I have been a part of a Ramp Management study conducted by the University of Pittsburgh (in conjunction with PennDOT) that has been ongoing for the past year and a half. Last year, we may have been in contact with you regarding some questions on that specific research.

My thesis is related to that research but is focused more on the public education aspect of ramp meters (i.e. once installed, how do motorists know how to use them). If you have a few minutes to answer the following questions (to the best of your knowledge) I would greatly appreciate it. Also any addition information or material that you might have regarding the subject of public outreach and ramp meters would be very helpful.

Your help in completing and returning this survey by **February 19, 2010** is greatly appreciated. If you have any questions regarding the content of this survey or the purpose of this project, please feel free to contact Casey Hanner by phone or email.

Sincerely,

Casey Hanner, E.I.T.
Graduate Student
University of Pittsburgh
6215 Kentucky Ave
Pittsburgh, PA 15206
(412) 559-5942
cdh20@pitt.edu

Mark J. Magalotti, P.E.
Principal-in-Charge,
Trans Associates
Twin Towers, Suite 400
Pittsburgh, PA 15205
(412) 490-0630
(412) 490-0630 (fax)
MagalottiM@TransAssociates.com

Dr. Amir Koubaa, Ph.D.
Academic Coordinator,
University of Pittsburgh
Department of Civil & Environmental Engineering
949 Benedum Hall
Pittsburgh, PA 15261
(412) 624-9869
(412) 624-0135 (fax)
amk59@pitt.edu

Please return completed surveys to Casey Hanner at the email address above. Thank you.

1) When was the first ramp metering system installed in your jurisdiction?

Year: 2003 (US 12/Madison Beltline; Dane County)

2) Were there any other ramp metering systems operating in the surrounding or nearby areas?

○ NO

◉ YES

State: Wisconsin

County: Milwaukee/Waukesha

Interstate Number: I-43/94/794/894 & US 41/45

3) What method(s) were used in explaining how the motorist should use the ramp meters? (Please mark all that apply)

- ☐ Website
- ☑ Flyer
- ☑ Open House Meetings
- ☑ Media Releases
- ☐ Signs
- ☐ Automated Messages
- ☑ Other → Describe: There was a corridor study underway for the corridor the ramp meters were installed on. The personnel implementing the ramp metering piggybacked on this corridor study by jointly participating in public information meetings, public hearings, brochures in the corridor newsletter, outreach to schools, and a video.

In your opinion, which method was the most effective? Public Meetings and Flyers

4) What method(s) were used in explaining the potential benefits of the ramp meters to the public? (Please mark all that apply)

- ☐ Website
- ☑ Flyer
- ☑ Open House Meetings
- ☑ Media Releases
- ☐ Signs
- ☐ Automated Messages
- ☑ Other → Describe: See question #3

In your opinion, which method was the most effective? _____

5) Was the public informed about alternate routes (to avoid the ramp meters)?

- (●) NO
- ( ) YES
  - [ ] Prior to the meters being put in place?
  - [ ] After the meters were running?

Describe: No good alternate route existed, therefore none were provided to the public. However, it was explained that some diversion would be achieved by implementing ramp meters and would ultimately improve operations on the mainline.

6) Was the public informed about expected delays at the ramps (based upon metering rates)?

- ○ NO
- ◉ YES
  - ☑ Prior to the meters being put in place?
  - ☐ After the meters were running?

Describe: The pros and cons of the ramp meters were explained. For example, people were informed that some of the delay on the ramps would be made up with the improved operations on the mainline.

7) Was there a standard set of procedures in place for informing the public?

- (●) NO
- ( ) YES

8) Was there much public opposition to the system?

- ( ) NO
- (●) YES → Describe: Nothing of too much significance. There is always some opposition to change. Most citizens recognized the need to improve operations on the mainline though.

9) Did motorists run into any major problems during the initial operating phase, such as confusion or misunderstanding of how to use the meters?

○ NO

◉ YES → Describe:

1) The controllers were not tested for a long duration. Once they were put into operation, a default setting with the loop detectors in the programming essentially forced the ramp meter to switch from traffic responsive to fixed rate metering, which was not as efficient. Once the problem was found, the issue was resolved.

2) The fuses overheated in the cabinets that had two 2070 controllers in them. This was one of the first uses of 2070 controllers and the first time two were in a cabinets together.

10) If implementing ramp meters for the first time today, is there anything that would be done differently to educate the public?

- ○ NO
- ◉ YES → Describe: Website

11) Do you currently have a set of standards for educating the public in using ramp meters?

- (●) NO
- ( ) YES

12) If so, where can this information be found?

13) Please note any additional information or sources that you feel are relevant.

This completes the survey. Thank you very much for your time.

If you don't mind, please provide the following contact information, in case of clarification or further questions:

Name: Chris Quesnell

Organization/Position: WisDOT Statewide Traffic Operations Center

Phone Number: 414-225-3727

Email Address: chris.quesnell@dot.wi.gov

B.3 SPREADSHEET OF SUMMARIZED RESPONSES

A summary of all eleven returned surveys was created in an excel file and a copy of this worksheet is provided here.

B.3 Spreadsheet of Summarized DOT Survey Responses

State	From	Received Date	Year of 1st Meters	Nearby Meters	State	County	Interstate Number	Q3 Website	Q3 Flyer	Q3 Automated Msgs	Q3 Meetings	Q3 Media Release	Q3 Signs	Q3 Other	Q3 Other Describe	Q3 most effective method
Washington	Morgan Balogh	2/2/10	1968	No				Yes	Yes	Yes	Yes	Yes	Yes	Yes	A1*	B1
California	anonymous user	2/3/10	1968	Yes				Off	Yes	Off	Off	Off	Off	Off		
Oregon	Dennis Mitchell	3/9/10	1981	No				Off	Yes	Off	Yes	Yes	Yes	Off		Media Releases
New York	anonymous user	2/3/10	1986	Yes	NY	Queens	I 678	Off	Yes	Off	Off	Yes	Yes	Off		B2
Texas	John Gaynor	2/4/10	1968	No				Off	Yes	Off	Off	Yes	Yes	Yes	A2	hand outs at the ramp
Ohio	anonymous user	2/5/10	Nov-09	No				Off	Off	Off	Yes	Yes	Yes	Off		Media Releases
Arizona	Darrell Bingham	2/8/10	1991	No				Off	Off	Off	Off	Yes	Off	Off		
Virginia	anonymous user	2/23/10	1985	No				Off	Off	Yes	Off	Yes	Yes	Off		
Colorado	Johnny Bland	2/23/10	1981	No				Off	Yes	Off	Yes	Yes	Yes	Off		Media Releases
Minnesota	anonymous user	2/24/10	1968	No				Off	Off	Off	Off	Off	Yes	Off	A3	
Wisconsin	anonymous user	3/8/10	2003 (US 12/Madison Beltline; Dane County)	Yes	Wisconsin	Milwaukee/ Waukesha	I-43/94/794/894 & US 41/45	Off	Yes	Off	Yes	Yes	Off	Yes	A4	Public Meetings and Flyers
% YES				**27%**												

*See pages B.3.4 through B.3.13 for more information on Letter/Numbered Responses

-

B.3 Spreadsheet of Summarized DOT Survey Responses

State	Q4 Website	Q4 Flyer	Q4 Meetings	Q4 Other	Q4 Media Release	Q4 Signs	Q4 Automated Msgs	Q4 Other Describe	Q4 most effective method	Alternate Routes	Before?	After?	Public Informed of Alternate Routes	Expected Delays	Q6 Before?	Q6 After?	Public Informed of Expected Delays	Standards?
Washington	Yes	Yes	Yes	Yes	Yes	Yes	Yes	C1*	D1	No	Off	Off	E1	Yes	Yes	Yes	F1	No
California	Off	Off	Off	Off	Off	Off	Off			Yes	Yes	Yes		Yes	Yes	Yes		Yes
Oregon	Off	Yes	Yes	Off	Yes	Off	Off		Media Releases	No	Off	Off		Yes	Yes	Off		No
New York	Off	Yes	Off	Off	Yes	Off	Off		D2	No	Off	Off		No	Off	Off		Yes
Texas	Off	Yes	Off	Off	Yes	Yes	Off		D3	No	Off	Off		Yes	Yes	Off	F2	No
Ohio	Off	Yes	Yes	Off	Yes	Off	Off		Open House meetings	No	Off	Off		No	Off	Off		No
Arizona	Off	Off	Off	Off	Yes	Off	Off			No	Off	Off		Yes	Yes	Off	F3	Yes
Virginia	Off	Off	Off	Off	Yes	Off	Off			No	Off	Off	E2	Yes	Yes	Off		Yes
Colorado	Yes	Yes	Yes	Off	Yes	Yes	Off	C2	Media Releases	Off	Off	Off	E3	Yes	Off	Yes	F4	Yes
Minnesota	Yes	Off	Off	Off	Off	Off	Off	C3	website	No	Off	Off		No	Off	Off	F5	No
Wisconsin	Off	Yes	Yes	Yes	Yes	Off	Off	See question #3		No	Off	Off	E4	Yes	Yes	Off	F6	No
% YES										**9%**	**9%**	**9%**		**73%**				**45%**

*See pages B.3.4 through B.3.13 for more information on Letter/Numbered Responses

-

B.3 Spreadsheet of Summarized DOT Survey Responses

State	Public Opposition?	Public Opposition	Operating Problems?	Problems experienced by motorists during	Anything Done Differently	Anything Done Differently?	Current Standards	Where to find current standards	Additional Info	Name	Organization/ Position	Phone Number	Email Address
Washington	No		No		No	J1	No	K1	L1	Morgan Balogh P.E. PTOE	WSDOT Traffic Engineer Regional Operations	206-440-4485	baloghm@wsdot.wa.gov
California	Yes	G1*	Yes		No		Yes	K2	L2	Zhongren WANG	Caltrans	916-654-6133	zwang@dot.ca.gov
Oregon	No		No		Yes	J2	Yes	K3		Dennis Mitchell	Oregon DOT / Region Traffic Engineer	503-731-8218	dennis.j.mitchell@state.or.us
New York	No		Yes	H1	Yes	J3	No		L3	Emilio C. Sosa	NYSDOT INFORM System/ Director	631-904-3014	esosa@dot.state.ny.us
Texas	Yes	G2	No	H2	Yes	J4	No			John Gaynor, P.E.	Director Transportation Management	713-881-3060	jgaynor@houstontranstar.org
Ohio	Yes	G3	Yes	H3	Yes	J5	No			Jay Hamilton	TE4	513-933-6584	jay.hamilton@dot.state.oh.us
Arizona	Yes	G4	Yes	H4	Yes	J6	No			Darrell Bingham	Arizona DOT/TTG Support Manager	602.712.6439	DBingham@azdot.gov
Virginia	Yes	G5	Yes	H5	Yes	J7	Yes	K4	L4	Xiaoling "Ling" Li, P.E.	Virginia Department of Transportation	571-350-2020	ling.li@vdot.virginia.gov
Colorado	Yes	G6	No	H6	Yes	J8	No	K5		Johnny Bland	CDOT/CEPM-I Ramp Metering Administrator	303.757.9991	Johnny.Bland@dot.state.co.us
Minnesota	Yes	G7	No	H7	Yes	J9	No		L5	Brian Kary	Mn/DOT Freeway Operations Engineer	651-234-7022	brian.kary@state.mn.us
Wisconsin	Yes	G8	Yes	H8	Yes	Website	No			Chris Quesnell	WisDOT Statewide Traffic Operations Center	414-225-3727	chris.quesnell@dot.wi.gov
% YES	**73%**		**55%**		**82%**		**27%**						

*See pages B.3.4 through B.3.13 for more information on Letter/Numbered Responses

-

A1
Social Media Twitter, Facebook, preformated new broadcasts to give to news stations.

A2
Hand out flyers at ramp with police presence prior to starting the metering of the ramp

A3
Unknown for initial deployment. For new deployments on new corridors we have just gone with signing on the ramp. A week prior we put up a sign that says "ramp metering begins (date)". If we were starting from scratch I would say media release and web.

A4
There was a corridor study underway for the corridor the ramp meters were installed on. The personnel implementing the ramp metering piggybacked on this corridor study by jointly participating in public information meetings, public hearings, brochures in the corridor newsletter, outreach to schools, and a video.

B1
You have got to use all of them together. I am sure as you realize in 1968 the Internet wasn't used as it is today so I have checked the boxes of what we use today.

B2
They all reached people in different ways

C1
Social Media Twitter, Facebook, preformated new broadcast to give to news stations.

-

C2
Quoted from a1983 Final Evaluation Report in 1983 written 2 years after initial installation there were 20 meeting held prior to implementation. These included Denver Regional Council of Governments, the Governor, Denver City Council, Denver Police Dept. General Public Meeting, Optimists Club of Southmoor Park, Ellis Community Association, Press Conference, and the Colorado Highway Commision. In addition informational pamphlets were distributed at the affected freeway entrance ramps. Much information was distributed by television, print and radio media as well. The majority of this information as supportive of the project and contributed to a generally positive atmosphere.

C3
We have a website describing the benefits of metering. http://www.dot.state.mn.us/rampmeter/index.html

D1
You have got to use all of them together. I am sure as you realize in 1968 the Internet wasn't used as it is today so I have checked the boxes of what we use today.

D2
Both equally effective capturing an audience

D3
Flyer and response to inquiries.

E1
I checked the No box and am using this Yes space to discuss the No answer. There is really no reason to inform drivers off alternate routes. Ramp meters make the highway safer and move more traffic.

-

E2
The ramp meters were installed at ramps on Interstates 66 and 395. If motorists need to get onto the interstate, they have to go thru the ramp meter. There were not a lot of options/detour routes, if motorists didn't want to use the meter.

E3
No one that was involved with the initial installation in 1981 is available for this information. However in recent years as more ramps were added to the system, CDOT has not advised the public either before nor after installation on alternate routes. It is my personal belief that motorists determine alternate routes on their own. Some of the diversion is probably due to self adjusted time of travel as well as alternate routes.

E4
No good alternate route existed, therefore none were provided to the public. However, it was explained that some diversion would be achieved by implementing ramp meters and would ultimately improve operations on the mainline.

F1
We do tell people there will be a short wait but then the freeway will run smoother and they will have a easier time getting on the freeway and ultimately a better trip to their destination.

F2
They were informed that in no case would the delay to enter the freeway be over 2 minutes.

F3
We submit media releases approx 1-2 weeks prior to activation.

F4
I would think so prior to system start up during initial installation of the system in 1981, but cannot verify it. In recent years this information has been provided to public most often as a response to individual citizen inquiries, but also as part of media releases explaining the benefits of ramp metering.

-

F5
We do have a maximum wait time of 4 minutes for local ramps and 2 minutes for system-to-system ramps. Although this policy has only been in place since 2000.

F6
The pros and cons of the ramp meters were explained. For example, people were informed that some of the delay on the ramps would be made up with the improved operations on the mainline.

G1
Typically not, but it depends on the location. It is not uncommon for the public to call us to install ramp meters.

G2
Prior to the first turn on mainly based on experience from other cities. But one operations began most realized the benefits and were more worried when they were turned off.

G3
Mostly due to the fact that they would have to stop another time.

G4
I would probably say, no, but that doesn't give the chance to explain. We have found that, as each new series of meters are activated, there's a certain level of input received since they slow down access as compared to pre-activation. Most input is within the first 30 days of installation.

G5
Those 24 ramp meters VDOT installed were the first in the National Capital Region. Most motorists were not familiar with it and didn't understand how they work. Even though, VDOT issued news release, the communication methods were limited in 1985.

G6
According the the aforementioned 1983 Evaluation Report, the majority of the information distributed by television, print and radio media was supportive of the project and contributed to a generally positive atmosphere. Today when a new meter is installed there continues to be some opposition from those who enter the freeway at the newly metered ramp. However, there is much support from

-

those on the mainline of the freeway. We receive frequent calls from those in support of the system to inform us when a meter is not operational. I believe the majority users of the freeway system realize and appreciate the benefits of ramp metering.

G7
Unknown for the initial deployment but in 2000 there was public opposition and a legislative mandate to shutdown the ramp meters for a 6 week operational test to determine the effectiveness of metering. Without metering, congestion was worse and travel time reliability was worse. In response to the study, Mn/DOT turned the meters back on but with the wait time restrictions as mentioned in question 6. When deploying new segments we have gotten some opposition at first but this has been minimal and usual only consists of a few email or phone complaints. Overall the motoring public in the Twin Cities is accustomed to metering.

G8
Nothing of too much significance. There is always some opposition to change. Most citizens recognized the need to improve operations on the mainline though.

H1
As with anything new it takes time to get used to it but after a while it cleared up and has been working fine since

H2
Most said that it ran better than the week before the meters began operation.

H3
On the two lane ramps they were not using both lanes equally. We set out a changeable message sign to explain USE BOTH LANES. We also asked the media to get the word out. After they started using both lanes it worked much better, shorter queues.

H4
I am not aware of any crashes as a result of new activations but there is certainly initial confusion. Strangely enough, most of the observed confusion is after the meters turn off--cars continue to stop for a period of time. Our morning meters are typically active from 6-9 a.m. (Mon-Fri). Again, after the first month, motorists seem to adjust to the metering hours and no longer stop following the 9 a.m. deactivation of the meters.

-

H5
Some people didn't stop at the ramp signal resulting rear-end collision. Virginia State Police (VSP) noticed the problems and provided the enforcement. VDOT worked with VSP closed during the initial operating phase.

H6
The aforementioned evaluation report indicated there was an initial varying violation rate from 5 - 10% which settled to 2 - 7% after three months. Violation rates increased again thereafter to about 10%. There continues to be a high percentage of violations to this day. It is my opinion based upon personal observance that these violations are intentional and largely due to lack of enforcement by local authorities, rather than motorists confusion.

H7
Unknown for the initial deployment. I can imagine there was some confusion as we were one of the first in the world to deploy metering. I think only Chicago had them installed first. I've heard the first meters were literally a traffic cop on the ramp allowing one car at a time.

H8
1) The controllers were not tested for a long duration. Once they were put into operation, a default setting with the loop detectors in the programming essentially forced the ramp meter to switch from traffic responsive to fixed rate metering, which was not as efficient. Once the problem was found, the issue was resolved.

2) The fuses overheated in the cabinets that had two 2070 controllers in them. This was one of the first uses of 2070 controllers and the first time two were in a cabinets together.

J1
Just using this space for a comment since there is no way to comment in the No selection. We revisit the public outreach each time we turn on a meter and scale the outreach accordingly. If you follow that approach then you are flexible and can adjust to changing communication needs and abilities.

J2
With the internet you can reach a far greater audience and explain in more detail the benefits

-

J3
Probably add using website or even youtube video to educate the public in their use

J4
Would have used the website to answer the frequently asked questions. Also show which ramps that were hardly used so they could divert to take an alternate route (usually the frontage road in Houston) to get on the freeway or stay on the frontage road and avoid the more heavily used ramps.

J5
Only to try to highlight to use both lanes of the two lane ramps.

J6
Produce a longer series of meter education articles. Explain the national advantages so that drivers understand the "big picture." Then, precede all activations with the media releases--this was not being done here until the last year. This WAS our lessen learned and it's been a wonderful solution.

J7
As technology enhances, there are more ways that we can use to educate or inform public about ramp meters - how it operates, benefits, etc. These public outreaches include news release, website, 511, public meetings, flyer, and temporary signs, etc.

J8
CDOT makes information more readily available as a whole to the public these days through it's various web sites and cooperation with local television news outlets. With the advancements in technology news is disseminated to the public much easier and frequently than ever before.

J9
Today we would probably utilize the media and the website to educate people on the importance of ramp metering. Public open houses and local marketing would also play an important role. Also important to have support and understanding of local elected officials.

-

K1
We craft public information based on the size of deployment meters and the experience communities in the area have with ramp meters. We take what we have used and what we have learned from the past and modify to the situation. Afterward we discuss its success and begin the process all over. Standards don't apply this is real life. This question, like most your questions, does not get the heart of the issue. I think you just want an old fashioned answer like hears my web page, so here it is.... You can call it a standard if you want. http://www.wsdot.wa.gov/Traffic/Congestion/rampmeters/

K2
It is online available. Google it.

K3
http://www.oregon.gov/ODOT/COMM/docs/RampMeters.pdf

K4
The set of procedure was used during the initial operating period in 1985. As time goes, people get to use the ramp meter signals. The information can be found, but it may not be easy, as most people who involved in the initial installation are not longer with VDOT.

K5
Other than the warning and regulatory sings posted at the meters.

L1
Tons of stuff on the web. Ramp meters are an old school technology for improving safety and efficiency of the highway system. We have even used them at an entrance to a roundabout. I imagine in some communities ramp meters seem new and dangerous, just like a first stop sign or a first traffic signal might be a big deal. The important thing is to realize the situation and understand how the impacted public might be viewing the situation. What people think no matter how unrealistic is real to them. Illusion is a reality and a very persistent one. (Spin on an Einstein quote.)

L2
Strongly suggested that you google the internet and read the references, and I bet you are going to find a lot more info than this type of survey. Thanks.

-

L3
Sorry, don't have much to add. The following which I recently received in an e-mail may be of help:

Evaluation of Renton Ramp Meters on I-405
http://www.wsdot.wa.gov/NR/rdonlyres/D4A44406-D1D3-4AAD-BEFE-033D7E033359/0/I405study.pdf
SR 520 EASTBOUND MORNING RAMP METERING THREE MONTH STUDY
http://www.wsdot.wa.gov/NR/rdonlyres/9FB40ACE-EE17-4B20-BED5-633D38AC8A7B/0/520eb3monthstudy.pdf
SR 520 Westbound Ramp Meter Effects
http://www.wsdot.wa.gov/NR/rdonlyres/6E3FAC2D-E6F9-4AB7-9E7E-274FD13399C6/0/520wb6monthstudy.pdf
Merging Conflict Study for SR 167 at the South 212th St. Interchange
http://www.wsdot.wa.gov/NR/rdonlyres/51C9AF98-BDB0-44F0-892E-4E33A86D8E15/0/SR167ConflictStudy.pdf
EVALUATION OF A FUZZY LOGIC RAMP METERING ALGORITHM:
A COMPARATIVE STUDY BETWEEN THREE RAMP METERING ALGORITHMS USED IN THE GREATER SEATTLE AREA
http://www.wsdot.wa.gov/NR/rdonlyres/A5AD6DCC-B595-4181-978B-F50359E78D71/0/eval_report.pdf

If you look at these studies as well as others you will no doubt be pointed to, I believe you will see that ramp meters have a positive proven track record. However, as with most traffic operations strategies, their effectiveness is tied to the traffic conditions of where they are installed and how they are operated.

Also, the effectiveness of ramp meters is only part of the issue, ramp meter installation, particularly in areas which do not have them, come with lots of potential public and political push back. As you are probably aware they are not without controversy, which can be a larger challenge then justifying their effectiveness. We, as well as other areas with established and proven ramp meter programs, are consistently questioned about their effectiveness.

-

The best example of this is the Minneapolis ramp meter system evaluation. MNDOT shut off their entire extensive ramp meter system (over 400 meters) to do a with and without evaluation to conclusively determine if the meter benefits outweighed perceived negative impacts and cost. You can find the executive summary of this study here:
http://www.dot.state.mn.us/rampmeterstudy/pdf/execsummary/executivesummary.pdf

L4
VDOT is moving towards to upgrade of the existing ramp metering control system from fix-timed to a real-time control. Public education plays a critical role in the successful deployment of the new system. It is expected that an effective public information campaign will be conducted accompanying the implementation of new ramp control system. Various methods, such as news release, 511- traveler information system, open house conferences and distribution of flyers in the neighborhood where people are impacted by the ramp metering system, will be undertaken to disseminate information to the public.

L5
http://www.dot.state.mn.us/rampmeter/rmstudy.html
This link is for the ramp meter shutdown study that was done in Minnesota in 2000. The results of the study show the benefits of metering in reducing congestion, crashes and improving travel time reliability.

-

B.4 CHART DATA

The data used for each figure was taken directly from the summary sheets. The specific data used to create the figures pertaining to the DOT survey is presented in this section.

FIGURE 1 Data

Background Questions for DOT's	% That Ansered Yes
Nearby Ramp Meters Exisited at the Time of Installation	27%
Standards for Informing the Public on Ramp Metering were in Place at the Time of Installation	45%
Standards for Informing the Public on Ramp Metering Exist Today	27%

FIGURE 2 Data

Conent of DOT's Public Education Message	% That Ansered Yes
Public was Informed on How to Use Ramp Meters	100%
Public was Informed of PotentialBenefits of Ramp Meters	91%
Public was Informed of Expected Delays	73%
Public was Informed of Alternate Routes	9%

FIGURE 3 Data

Approach to Informing Motorists of Expected Delays	Number of States that Answered Yes
Informed Public of Expected Delays Before Operation Only	5
Informed Public of Expected Delays After Operation Only	1
Informed Public of Expected Delays both Before and After Operation	2
Did Not Inform Public of Expected Delays	3

FIGURE 4 and 5 Data

Method for Disseminating Information on How to Use Ramp Meters	Number of States that Answered Yes	Pecentage that Answered Yes
Website	1	9%
Flyer/Handout	7	64%
Automated Messages	2	18%
Open House Meetings	5	45%
Media Releases	9	82%
Signs	8	73%
Other	3	27%

FIGURE 6 and 7 Data

Method for Disseminating Information on the Benefits of Ramp Meters	Number of States that Answered Yes	Pecentage that Answered Yes
Website	2	18%
Flyer/Handout	7	64%
Open House Meetings	5	45%
Other	2	18%
Media Releases	9	82%
Signs	3	27%
Automated Messages	1	9%

FIGURE 8 Data

Potential Problem Questions for DOT's	% That Ansered Yes
Experienced Public Opposition	73%
Experienced Initial Operating Problems	55%
Room for Improvement in the Public Education Process	82%

APPENDIX C

TEST GROUP SURVEY

This Appendix includes all information pertaining to the survey designed for the test groups. Copies of the blank survey, along with scans of all returned surveys are included.

C.1 BLANK SURVEY (PART 1 AND 2)

A copy of the blank survey administered to each test group participant is included in this section.

Survey on Ramp Metering and Public Opinion – Part 1

1) Have you heard of the term *ramp metering* before?

___ Yes

___ No

___ Unsure

2) A basic definition of ramp metering is using a signal at the end of a freeway on-ramp to control the rate at which the vehicles enter the freeway. Have you ever heard of this concept before?

___ Yes

___ No

___ Unsure

IF YOU ANSWERED NO TO QUESTIONS 1 AND 2, YOU DO NOT NEED TO ANSWER THE FOLLOWING QUESTIONS

3) Have you ever experienced a ramp meter?

___ Yes

___ No

___ Unsure

4) If approaching a ramp meter would you feel comfortable in knowing how to proceed?

___ Yes

___ No

___ Unsure

5) What are the benefits of ramp metering? (mark all that apply)

___ Unsure
___ Reduce congestion on the freeway
___ Decrease wait time to enter the freeway
___ Improve safety
___ Reduce vehicle emissions
___ Increase capacity of the freeway
___ Relatively low cost
___ Reduce congestion on the local roads

6) If you were approaching an on-ramp to I-376, and you encountered a queue of vehicles stopped on the on-ramp, would you be willing to wait to enter the freeway?

___ Yes

How long would you be willing to wait?

___ 0-2 minutes
___ 3-5 minutes
___ 6-8 minutes
___ 9-12 minutes
___ 13-15 minutes
___ would need more information

___ No (would find a different route)
___ Would need more information

7) Would you be opposed to the idea of installing ramp meters in Pittsburgh (for example on I-376)?

___ Yes
___ No
___ Would need more information

8) If ramp meters were installed in Pittsburgh (for example on I-376) would you try to find alternate routes to avoid the meters?

___ Yes

___ No

___ Would need more information

PLEASE STOP AND REVIEW THE INFORMATIONAL MATERIAL

Survey on Ramp Metering and Public Opinion – Part 2

1) Before this survey, had you ever heard of ramp metering before?

___ Yes

___ No

___ Unsure

2) If approaching a ramp meter would you feel comfortable in knowing how to proceed?

___ Yes

___ No

___ Unsure

3) What are the benefits of ramp metering? (mark all that apply)

___ Unsure

___ Reduce congestion on the freeway

___ Decrease wait time to enter the freeway

___ Improve safety

___ Reduce vehicle emissions

___ Increase capacity of the freeway

___ Relatively low cost

___ Reduce congestion on the local roads

4)) If you were approaching an on-ramp to I-376, and you encountered a queue of vehicles stopped on the on-ramp, would you be willing to wait to enter the freeway?

___ Yes

How long would you be willing to wait?

___ 0-2 minutes

___ 3-5 minutes

___ 6-8 minutes

___ 9-12 minutes

___ 13-15 minutes

___ would need more information

___ No (would find a different route)

___ Would need more information

5) Would you be opposed to the idea of installing ramp meters in Pittsburgh (for example on I-376)?

___ Yes

___ No

___ Would need more information

6) If ramp meters were installed in Pittsburgh (for example on I-376) would you try to find alternate routes to avoid the meters?

___ Yes

___ No

___ Would need more information

7) Which method(s) would be your preferred method for receiving information on ramp metering?

___ Flyer
___ Website
___ Email
___ Automated message by calling a toll-free number
___ Sign at the future location of the ramp meter
___ Open house meeting
___ Local News
___ Newspaper article
___ Social Networking site (such as Twitter or Facebook)

8) Which method(s) would you be most likely to pay attention to?

___ Flyer
___ Website
___ Email
___ Automated message by calling a toll-free number
___ Sign at the future location of the ramp meter
___ Open house meeting
___ Local News
___ Newspaper article
___ Social Networking site (such as Twitter or Facebook)

9) Before answering the second part of this survey, which informational materials did you review?

___ The “How to Use Ramp Meters” Flyer
___ The “Frequently Asked Questions” Flyer
___ Website
___ Video
___ Asked questions

C.2 INFORMATIONAL MATERIAL USED DURING SURVEY ADMINISTRATION

The different informational material options provided to each test group participant are presented in this section. Included are: A *How to Use Ramp Meters* handout, a *Frequently Asked Questions* handout, information from the Washington state DOT *Ramp Meters* website, and a link to download an instructional video on ramp meters from the Georgia state DOT along with stills from that video.

METERED RAMPS

Metered Ramps

Ramp meters are traffic signals on freeway entrance ramps. They more evenly space the number of vehicles merging with traffic already on the freeway. This helps to reduce congestion and the stop-and-go traffic flow at freeway entrance points.

How to Use a Ramp Meter

A. Ramp Meter Warning Sign

As you enter a metered ramp, you will see a "Ramp Metered When Flashing" sign.

If the sign's yellow light is not flashing, you can merge into traffic without stopping or slowing down.

If the sign's yellow light is flashing, it means the ramp meter is operating. You should follow these steps when the ramp meter is operating.

B. Regular Traffic Lanes

Choose a traffic lane.

C. HOV Lane

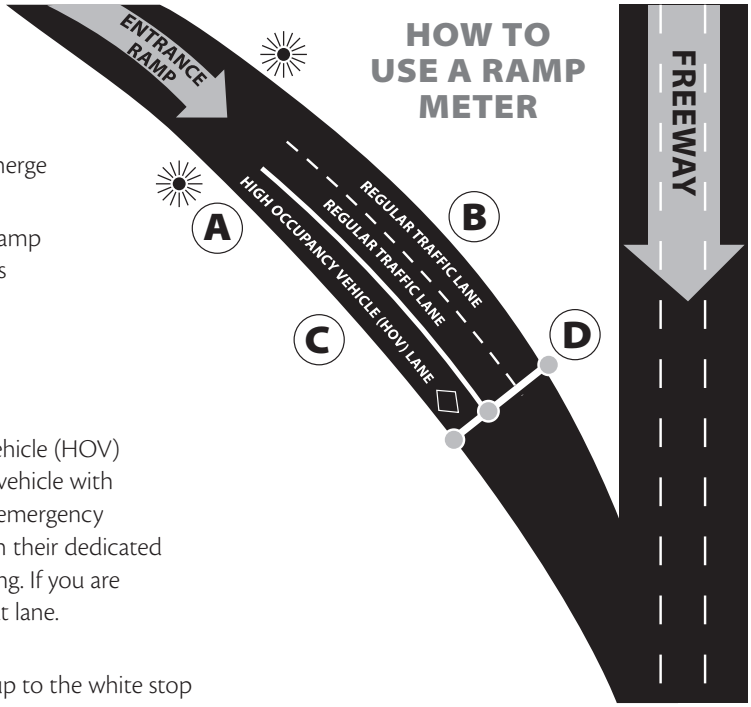
Certain vehicles can use the High Occupancy Vehicle (HOV) bypass lane on the ramp. HOV lanes are for any vehicle with two or more people, or motorcycles, buses and emergency vehicles. HOVs must still obey the traffic signal in their dedicated lane. Generally, HOV lanes have little or no waiting. If you are traveling alone, you can be ticketed for using that lane.

D. Stop Line and Signals

At the ramp signal, you should pull completely up to the white stop line so your tires will trigger the sensors in the pavement to change the light from red to green. Each lane on the ramp has its own traffic signal. The traffic signals will alternate between green and red. They will allow one vehicle to pass through for each green light. You should not try to squeeze through with someone else during one change to green. If you disobey a ramp signal, you can be ticketed.

Other Features

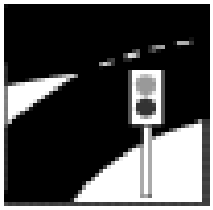
To keep traffic on the ramp from backing up onto local streets, sensors in the pavement will detect if a long line of vehicles is forming on the ramp. The sensor will trigger a computer to speed up the green light. This will shorten the wait time at the ramp meter. Cameras installed on the ramps help to monitor traffic flow or, if needed, to assist emergency personnel in responding to a crash.



Frequently Asked Questions

Ramp Meters

Ramp meters increase freeway speeds and volume as crashes, travel times decrease



Relieving congestion is accomplished by doing much more than just building more travel lanes. The Oregon Department of Transportation uses an array of tools from its Intelligent Transportation Systems unit to reduce bottlenecks and improve safety on the state's highways. One tool: ramp meters.

Ramp meters have come a long way since 1963, when a police officer stood at an on-ramp to the Eisenhower Expressway (I-290) in Chicago and waved his arms to regulate cars merging onto the roadway. There now are more than 4,000 ramp meters in cities across the U.S., according to a 2005 study by the U.S. Department of Transportation's Intelligent Transportation Systems Section.

The goal of ramp meters has remained the same during the past 50 years: reduce bottlenecks and improve the overall flow of traffic. Doing so saves travelers time and improves fuel consumption.

What are ramp meters?
Ramp meters look and operate like traffic signals, only with two phases—green and red—to regulate traffic moving onto highways. They are placed on highway on-ramps. ODOT's can operate around the clock, based on feedback.

Ramp meters allow vehicles to enter the highway one or two at a time. This avoids situations where large groups of vehicles join traffic all at once, causing traffic flow to slow down behind the merge point.

How do ramp meters improve traffic flow?
By regulating the number of cars and trucks that enter a highway at one time, traffic flow is smoother, increasing the total number of vehicles that can make it through a corridor and reducing freeway travel times.

This can only be done by metering flow from on-ramps that are upstream from known bottlenecks (for example, U.S. 26 eastbound on-ramps west of the Vista Ridge Tunnels).

When are ramp meters used?

- Ramp meters are most effective when turned on before congestion begins. (Waiting for congestion to occur before turning on ramp meters is not a solution to traffic backups.)

- As soon as traffic volumes pick up, ramp meters are activated so free-flowing traffic is extended for as long as possible
- The ramp meter system responds to actual traffic conditions. Ramp meters are not turned off the instant highway speeds rise again. Often highway traffic clears precisely because of the benefits provided by ramp meters. Through the use of traffic cameras, ODOT can watch free-flowing traffic become congested minutes after turning off a meter prematurely. Just as meter operators respond to the queues on the ramp, they also respond to highway traffic volumes. As the highway starts to clear, metering rates are increased accordingly to let as many cars as possible onto the roadway without causing congestion

Benefits of ramp meters

Ramp meters decrease congestion and improve the flow of highway traffic by producing higher average speeds and increased capacity. As idling decreases, better air quality and fuel performance also result. Safety is a key benefit of using ramp meters, causing a decline in congestion-related crashes.

A major study of ramp meters was undertaken by the Minnesota Department of Transportation a few years ago. MDOT studied the effects of turning off all its 430 ramp meters in the Twin Cities area for a six-week period. (For more, go to: http://www.dot.state.mn.us/rampmeterstudy/. The results, which were released in 2001, found that ramp meters produced:

- **A 9% increase in freeway volume.**
- **A 7% increase in freeway speeds**
- **A 22% decrease in freeway travel times**
- **A 26% decrease in crashes, including a 14.6% decrease in rear-end crashes, a 200% decrease in side-swipe crashes and a 60% decrease in "run off the road" crashes**

Portland ramp meters

ODOT first installed ramp meters in the Portland metro area in 1981 along a 6-mile section of Interstate 5 between Portland and the Washington state line. Prior to the installation of the northbound I-5 ramp meters, the afternoon peak hour average speed was 16 mph. Fourteen months after installation, the average speed for the same time period was about 40 mph.

In 2001, ODOT turned on ramp meters during the weekend on eastbound U.S. 26 (Sunset Highway) between Helvetia Road and the Highway 217 interchange. Highway congestion significantly decreased. At Cornell Road or Murray Boulevard, for example, the average speed during the weekend peak prior to ramp metering was approximately 30 mph. After ramp metering was implemented, the average speed increased to 55 mph or more during the weekend peak periods. Even where speeds did not increase very

much, volume increased. That means the highway can accommodate more vehicles on the corridor with ramp meters than without.

There now are more than 140 ramp meters in the Portland metro area.

Ramp meter negatives
Motorists must wait in line before getting the “green” light to merge onto highways. In some cases, vehicles waiting in a ramp-meter lineup might back up to local streets.

ODOT balances the need for ramp metering with the impacts to traffic on local streets. Studies have found that time saved in reaching a destination outweighs the additional time spent waiting on the ramp at the meter. For longer trips along a highway corridor, the positive impact of ramp meters is even greater.

##ODOT##

Washington State Department of Transportation

Ramp Meters

What are ramp meters?
Ramp meters are stop-and-go traffic signals that control the frequency with which vehicles enter the flow of traffic on the freeway.

Why does WSDOT install ramp meters?
WSDOT uses ramp meters to reduce accidents and decrease travel times for commuters. Most ramp meters allow only one vehicle through each green light, creating a 4 to 15 second delay between cars entering the highway. This delay helps reduce disruptions to freeway traffic and reduces accidents that occur when vehicles merge onto the highway.

How do I use them?
Drive your vehicle up to the white line, or stop bar, to trigger the ramp meter. If the light is red, stop at the white line. When the light turns green, merge onto the freeway. If there is a high occupancy vehicle (HOV) bypass lane, buses, carpools and vanpools do not have to stop at the ramp meter signal. They have the right of way over vehicles merging into traffic from the metered lane.

Where can I find ramp meters?
The majority of ramp meters are located on our busiest highways – I-5, SR 520, I-90, I-405 and SR 167. Typically, ramps are metered from 6 a.m. to 9 a.m. and from 3 p.m. to 7 p.m. These times may vary depending on the level of traffic congestion.

Ramp Meter Facts

- Ramp meters reduce accidents system-wide by at least 30%.
- On I-405 in Renton, ramp meters provided a travel times savings of 3 to 16 minutes.
- Ramp meters are a proven and cost-effective method of relieving traffic congestion.

Why are they effective?
Without ramp meters, multiple cars try to merge simultaneously. Drivers on the freeway slow down to allow the cars enter and these slower speeds quickly cause backups. If cars enter the highway in controlled intervals, they are less likely to cause a disruption to the traffic on the freeway. A short wait on the ramp allows drivers to increase their average freeway speed and shorten overall freeway travel times. Ramp meters also reduce the number of accidents that often occur when multiple vehicles merge onto the highway at the same time.

How do ramp meters work?
Ramp meters are part of a large computer-operated system that is managed in WSDOT's Traffic Management Centers (TMCs). Magnetic "loops" are embedded in the pavement that provide the TMCs with information about traffic flow, such as the volume and speed of vehicles on freeways and ramps. This traffic data is continually fed to the ramp meters, which automatically alter their cycles to maximize traffic flow on both the ramps and the freeways.

Instructional Video Download Link:
http://www.dot.state.ga.us/specialsubjects/roadconstruction/rampmeters/video/ramp%20meter%20video.zip

Stills from the Video:

C.2

C.2

C.3 RETURNED SURVEYS

Scanned copies of all returned surveys are included in this section.

(1)

Survey on Ramp Metering and Public Opinion – Part 1

1) Have you heard of the term *ramp metering* before?

___ Yes
X No
___ Unsure

2) A basic definition of ramp metering is using a signal at the end of a freeway on-ramp to control the rate at which the vehicles enter the freeway. Have you ever heard of this concept before?

___ Yes
X No
___ Unsure

IF YOU ANSWERED NO TO QUESTIONS 1 AND 2, YOU DO NOT NEED TO ANSWER THE FOLLOWING QUESTIONS

3) Have you ever experienced a ramp meter?

___ Yes
___ No
___ Unsure

4) If approaching a ramp meter would you feel comfortable in knowing how to proceed?

___ Yes
___ No
___ Unsure

5) What are the benefits of ramp metering? (mark all that apply)

___ Unsure
X Reduce congestion on the freeway
X Decrease wait time to enter the freeway
X Improve safety
X Reduce vehicle emissions
X Increase capacity of the freeway
X Relatively low cost
X Reduce congestion on the local roads

6) If you were approaching an on-ramp to I-376, and you encountered a queue of vehicles stopped on the on-ramp, would you be willing to wait to enter the freeway?

X Yes

How long would you be willing to wait?

___ 0-2 minutes
X 3-5 minutes
___ 6-8 minutes
___ 9-12 minutes
___ 13-15 minutes
___ would need more information

___ No (would find a different route)
___ Would need more information

7) Would you be opposed to the idea of installing ramp meters in Pittsburgh (for example on I-376)?

___ Yes
X No
___ Would need more information

8) If ramp meters were installed in Pittsburgh (for example on I-376) would you try to find alternate routes to avoid the meters?

___ Yes
_X_ No
___ Would need more information

PLEASE STOP AND REVIEW THE INFORMATIONAL MATERIAL

Survey on Ramp Metering and Public Opinion – Part 2

1) Before this survey, had you ever heard of ramp metering before?

___ Yes
X No
___ Unsure

2) If approaching a ramp meter would you feel comfortable in knowing how to proceed?

___ Yes
X No
___ Unsure

3) What are the benefits of ramp metering? (mark all that apply)

___ Unsure
X Reduce congestion on the freeway
X Decrease wait time to enter the freeway
X Improve safety
X Reduce vehicle emissions
X Increase capacity of the freeway
X Relatively low cost
X Reduce congestion on the local roads

4)) If you were approaching an on-ramp to I-376, and you encountered a queue of vehicles stopped on the on-ramp, would you be willing to wait to enter the freeway?

X Yes

How long would you be willing to wait?

___ 0-2 minutes

X 3-5 minutes

___ 6-8 minutes

___ 9-12 minutes

___ 13-15 minutes

___ would need more information

___ No (would find a different route)

___ Would need more information

5) Would you be opposed to the idea of installing ramp meters in Pittsburgh (for example on I-376)?

___ Yes

X No

___ Would need more information

6) If ramp meters were installed in Pittsburgh (for example on I-376) would you try to find alternate routes to avoid the meters?

___ Yes

X No

___ Would need more information

7) Which method(s) would be your preferred method for receiving information on ramp metering?

___ Flyer
X Website
X Email
___ Automated message by calling a toll-free number
___ Sign at the future location of the ramp meter
___ Open house meeting
X Local News
X Newspaper article
X Social Networking site (such as Twitter or Facebook)

8) Which method(s) would you be most likely to pay attention to?

___ Flyer
X Website
X Email
___ Automated message by calling a toll-free number
___ Sign at the future location of the ramp meter
___ Open house meeting
X Local News
___ Newspaper article
___ Social Networking site (such as Twitter or Facebook)

9) Before answering the second part of this survey, which informational materials did you review?

___ The "How to Use Ramp Meters" Flyer
___ The "Frequently Asked Questions" Flyer
___ Website
X Video
___ Asked questions

(2)

Survey on Ramp Metering and Public Opinion – Part 1

1) Have you heard of the term *ramp metering* before?

X Yes
___ No
___ Unsure

2) A basic definition of ramp metering is using a signal at the end of a freeway on-ramp to control the rate at which the vehicles enter the freeway. Have you ever heard of this concept before?

X Yes
___ No
___ Unsure

IF YOU ANSWERED NO TO QUESTIONS 1 AND 2, YOU DO NOT NEED TO ANSWER THE FOLLOWING QUESTIONS

3) Have you ever experienced a ramp meter?

___ Yes
X No
___ Unsure

4) If approaching a ramp meter would you feel comfortable in knowing how to proceed?

___ Yes
X No
___ Unsure

5) What are the benefits of ramp metering? (mark all that apply)

___ Unsure
X Reduce congestion on the freeway
X Decrease wait time to enter the freeway
X Improve safety
___ Reduce vehicle emissions
___ Increase capacity of the freeway
X Relatively low cost
X Reduce congestion on the local roads

6) If you were approaching an on-ramp to I-376, and you encountered a queue of vehicles stopped on the on-ramp, would you be willing to wait to enter the freeway?

___ Yes

How long would you be willing to wait?

___ 0-2 minutes
___ 3-5 minutes
___ 6-8 minutes
___ 9-12 minutes
___ 13-15 minutes
___ would need more information

X No (would find a different route)
___ Would need more information

7) Would you be opposed to the idea of installing ramp meters in Pittsburgh (for example on I-376)?

___ Yes
X No
___ Would need more information

8) If ramp meters were installed in Pittsburgh (for example on I-376) would you try to find alternate routes to avoid the meters?

___ Yes
X No
___ Would need more information

PLEASE STOP AND REVIEW THE INFORMATIONAL MATERIAL

Survey on Ramp Metering and Public Opinion – Part 2

1) Before this survey, had you ever heard of ramp metering before?

- [x] Yes
- [ ] No
- [ ] Unsure

2) If approaching a ramp meter would you feel comfortable in knowing how to proceed?

- [x] Yes
- [ ] No
- [ ] Unsure

3) What are the benefits of ramp metering? (mark all that apply)

- [ ] Unsure
- [x] Reduce congestion on the freeway
- [x] Decrease wait time to enter the freeway
- [x] Improve safety
- [ ] Reduce vehicle emissions
- [ ] Increase capacity of the freeway
- [x] Relatively low cost
- [x] Reduce congestion on the local roads

4)) If you were approaching an on-ramp to I-376, and you encountered a queue of vehicles stopped on the on-ramp, would you be willing to wait to enter the freeway?

X Yes

How long would you be willing to wait?

X 0-2 minutes

___ 3-5 minutes

___ 6-8 minutes

___ 9-12 minutes

___ 13-15 minutes

___ would need more information

___ No (would find a different route)

___ Would need more information

5) Would you be opposed to the idea of installing ramp meters in Pittsburgh (for example on I-376)?

___ Yes

X No

___ Would need more information

6) If ramp meters were installed in Pittsburgh (for example on I-376) would you try to find alternate routes to avoid the meters?

___ Yes

X No

___ Would need more information

7) Which method(s) would be your preferred method for receiving information on ramp metering?

___ Flyer
___ Website
___ Email
___ Automated message by calling a toll-free number
___ Sign at the future location of the ramp meter
___ Open house meeting
X Local News
___ Newspaper article
X Social Networking site (such as Twitter or Facebook)

8) Which method(s) would you be most likely to pay attention to?

___ Flyer
___ Website
___ Email
___ Automated message by calling a toll-free number
___ Sign at the future location of the ramp meter
___ Open house meeting
X Local News
___ Newspaper article
___ Social Networking site (such as Twitter or Facebook)

9) Before answering the second part of this survey, which informational materials did you review?

X The "How to Use Ramp Meters" Flyer
___ The "Frequently Asked Questions" Flyer
___ Website
X Video
X Asked questions

(3)

Survey on Ramp Metering and Public Opinion – Part 1

1) Have you heard of the term *ramp metering* before?

___ Yes
_X_ No
___ Unsure

2) A basic definition of ramp metering is using a signal at the end of a freeway on-ramp to control the rate at which the vehicles enter the freeway. Have you ever heard of this concept before?

___ Yes
_X_ No
___ Unsure

IF YOU ANSWERED NO TO QUESTIONS 1 AND 2, YOU DO NOT NEED TO ANSWER THE FOLLOWING QUESTIONS

3) Have you ever experienced a ramp meter?

___ Yes
___ No
___ Unsure

4) If approaching a ramp meter would you feel comfortable in knowing how to proceed?

___ Yes
___ No
___ Unsure

5) What are the benefits of ramp metering? (mark all that apply)

___ Unsure
___ Reduce congestion on the freeway
___ Decrease wait time to enter the freeway
___ Improve safety
___ Reduce vehicle emissions
___ Increase capacity of the freeway
___ Relatively low cost
___ Reduce congestion on the local roads

6) If you were approaching an on-ramp to I-376, and you encountered a queue of vehicles stopped on the on-ramp, would you be willing to wait to enter the freeway?

___ Yes

How long would you be willing to wait?

___ 0-2 minutes
___ 3-5 minutes
___ 6-8 minutes
___ 9-12 minutes
___ 13-15 minutes
___ would need more information

___ No (would find a different route)
___ Would need more information

7) Would you be opposed to the idea of installing ramp meters in Pittsburgh (for example on I-376)?

___ Yes
___ No
___ Would need more information

8) If ramp meters were installed in Pittsburgh (for example on I-376) would you try to find alternate routes to avoid the meters?

___ Yes

___ No

___ Would need more information

PLEASE STOP AND REVIEW THE INFORMATIONAL MATERIAL

Survey on Ramp Metering and Public Opinion – Part 2

1) Before this survey, had you ever heard of ramp metering before?

___ Yes
X No
___ Unsure

2) If approaching a ramp meter would you feel comfortable in knowing how to proceed?

X Yes
___ No
___ Unsure

3) What are the benefits of ramp metering? (mark all that apply)

___ Unsure
X Reduce congestion on the freeway
X Decrease wait time to enter the freeway
X Improve safety
X Reduce vehicle emissions
___ Increase capacity of the freeway
___ Relatively low cost
___ Reduce congestion on the local roads

4)) If you were approaching an on-ramp to I-376, and you encountered a queue of vehicles stopped on the on-ramp, would you be willing to wait to enter the freeway?

X Yes

How long would you be willing to wait?

X 0-2 minutes

___ 3-5 minutes

___ 6-8 minutes

___ 9-12 minutes

___ 13-15 minutes

___ would need more information

___ No (would find a different route)

___ Would need more information

5) Would you be opposed to the idea of installing ramp meters in Pittsburgh (for example on I-376)?

___ Yes

X No!

___ Would need more information

6) If ramp meters were installed in Pittsburgh (for example on I-376) would you try to find alternate routes to avoid the meters?

___ Yes

X No

___ Would need more information

7) Which method(s) would be your preferred method for receiving information on ramp metering?

___ Flyer
_X_ Website
___ Email
___ Automated message by calling a toll-free number
_X_ Sign at the future location of the ramp meter
___ Open house meeting
_X_ Local News
___ Newspaper article
___ Social Networking site (such as Twitter or Facebook)

8) Which method(s) would you be most likely to pay attention to?

___ Flyer
_X_ Website
___ Email
___ Automated message by calling a toll-free number
_X_ Sign at the future location of the ramp meter
___ Open house meeting
_X_ Local News
___ Newspaper article
___ Social Networking site (such as Twitter or Facebook)

9) Before answering the second part of this survey, which informational materials did you review?

___ The "How to Use Ramp Meters" Flyer
___ The "Frequently Asked Questions" Flyer
_X_ Website
_X_ Video
_X_ Asked questions

(4)

Survey on Ramp Metering and Public Opinion – Part 1

1) Have you heard of the term *ramp metering* before?

___ Yes
___ No
X Unsure

2) A basic definition of ramp metering is using a signal at the end of a freeway on-ramp to control the rate at which the vehicles enter the freeway. Have you ever heard of this concept before?

___ Yes
___ No
X Unsure

IF YOU ANSWERED NO TO QUESTIONS 1 AND 2, YOU DO NOT NEED TO ANSWER THE FOLLOWING QUESTIONS

3) Have you ever experienced a ramp meter?

___ Yes
___ No
___ Unsure

4) If approaching a ramp meter would you feel comfortable in knowing how to proceed?

___ Yes
___ No
___ Unsure

5) What are the benefits of ramp metering? (mark all that apply)

___ Unsure
___ Reduce congestion on the freeway
___ Decrease wait time to enter the freeway
___ Improve safety
___ Reduce vehicle emissions
___ Increase capacity of the freeway
___ Relatively low cost
___ Reduce congestion on the local roads

6) If you were approaching an on-ramp to I-376, and you encountered a queue of vehicles stopped on the on-ramp, would you be willing to wait to enter the freeway?

___ Yes

How long would you be willing to wait?

___ 0-2 minutes
___ 3-5 minutes
___ 6-8 minutes
___ 9-12 minutes
___ 13-15 minutes
___ would need more information

___ No (would find a different route)
___ Would need more information

7) Would you be opposed to the idea of installing ramp meters in Pittsburgh (for example on I-376)?

___ Yes
___ No
___ Would need more information

8) If ramp meters were installed in Pittsburgh (for example on I-376) would you try to find alternate routes to avoid the meters?

___ Yes

___ No

___ Would need more information

PLEASE STOP AND REVIEW THE INFORMATIONAL MATERIAL

Survey on Ramp Metering and Public Opinion – Part 2

1) Before this survey, had you ever heard of ramp metering before?

___ Yes
___ No
X Unsure

2) If approaching a ramp meter would you feel comfortable in knowing how to proceed?

X Yes
___ No
___ Unsure

3) What are the benefits of ramp metering? (mark all that apply)

X Unsure
X Reduce congestion on the freeway
___ Decrease wait time to enter the freeway
X Improve safety
___ Reduce vehicle emissions
___ Increase capacity of the freeway
___ Relatively low cost
___ Reduce congestion on the local roads

4)) If you were approaching an on-ramp to I-376, and you encountered a queue of vehicles stopped on the on-ramp, would you be willing to wait to enter the freeway?

X Yes

How long would you be willing to wait?

X 0-2 minutes

___ 3-5 minutes

___ 6-8 minutes

___ 9-12 minutes

___ 13-15 minutes

___ would need more information

___ No (would find a different route)

___ Would need more information

5) Would you be opposed to the idea of installing ramp meters in Pittsburgh (for example on I-376)?

___ Yes

___ No

X Would need more information

6) If ramp meters were installed in Pittsburgh (for example on I-376) would you try to find alternate routes to avoid the meters?

___ Yes

X No

___ Would need more information

7) Which method(s) would be your preferred method for receiving information on ramp metering?

___ Flyer
X Website
X Email
___ Automated message by calling a toll-free number
___ Sign at the future location of the ramp meter
___ Open house meeting
X Local News
___ Newspaper article
___ Social Networking site (such as Twitter or Facebook)

8) Which method(s) would you be most likely to pay attention to?

___ Flyer
X Website
X Email
___ Automated message by calling a toll-free number
___ Sign at the future location of the ramp meter
___ Open house meeting
X Local News
___ Newspaper article
___ Social Networking site (such as Twitter or Facebook)

9) Before answering the second part of this survey, which informational materials did you review?

___ The "How to Use Ramp Meters" Flyer
___ The "Frequently Asked Questions" Flyer
X Website
X Video
X Asked questions

5

Survey on Ramp Metering and Public Opinion – Part 1

1) Have you heard of the term *ramp metering* before?

___ Yes
X No
___ Unsure

2) A basic definition of ramp metering is using a signal at the end of a freeway on-ramp to control the rate at which the vehicles enter the freeway. Have you ever heard of this concept before?

___ Yes
X No
___ Unsure

IF YOU ANSWERED NO TO QUESTIONS 1 AND 2, YOU DO NOT NEED TO ANSWER THE FOLLOWING QUESTIONS

3) Have you ever experienced a ramp meter?

___ Yes
___ No
___ Unsure

4) If approaching a ramp meter would you feel comfortable in knowing how to proceed?

___ Yes
___ No
___ Unsure

5) What are the benefits of ramp metering? (mark all that apply)

___ Unsure
___ Reduce congestion on the freeway
___ Decrease wait time to enter the freeway
___ Improve safety
___ Reduce vehicle emissions
___ Increase capacity of the freeway
___ Relatively low cost
___ Reduce congestion on the local roads

6) If you were approaching an on-ramp to I-376, and you encountered a queue of vehicles stopped on the on-ramp, would you be willing to wait to enter the freeway?

___ Yes

How long would you be willing to wait?

___ 0-2 minutes
___ 3-5 minutes
___ 6-8 minutes
___ 9-12 minutes
___ 13-15 minutes
___ would need more information

___ No (would find a different route)
___ Would need more information

7) Would you be opposed to the idea of installing ramp meters in Pittsburgh (for example on I-376)?

___ Yes
___ No
___ Would need more information

8) If ramp meters were installed in Pittsburgh (for example on I-376) would you try to find alternate routes to avoid the meters?

___ Yes

___ No

___ Would need more information

PLEASE STOP AND REVIEW THE INFORMATIONAL MATERIAL

Survey on Ramp Metering and Public Opinion – Part 2

1) Before this survey, had you ever heard of ramp metering before?

___ Yes
X No
___ Unsure

2) If approaching a ramp meter would you feel comfortable in knowing how to proceed?

X Yes
___ No
___ Unsure

3) What are the benefits of ramp metering? (mark all that apply)

___ Unsure
X Reduce congestion on the freeway
___ Decrease wait time to enter the freeway
X Improve safety
___ Reduce vehicle emissions
___ Increase capacity of the freeway
X Relatively low cost
___ Reduce congestion on the local roads

4)) If you were approaching an on-ramp to I-376, and you encountered a queue of vehicles stopped on the on-ramp, would you be willing to wait to enter the freeway?

X Yes

How long would you be willing to wait?

X 0-2 minutes

___ 3-5 minutes

___ 6-8 minutes

___ 9-12 minutes

___ 13-15 minutes

___ would need more information

___ No (would find a different route)

___ Would need more information

5) Would you be opposed to the idea of installing ramp meters in Pittsburgh (for example on I-376)?

___ Yes

X No

___ Would need more information

6) If ramp meters were installed in Pittsburgh (for example on I-376) would you try to find alternate routes to avoid the meters?

___ Yes

X No

X Would need more information

7) Which method(s) would be your preferred method for receiving information on ramp metering?

- [x] Flyer
- [ ] Website
- [ ] Email
- [ ] Automated message by calling a toll-free number
- [ ] Sign at the future location of the ramp meter
- [ ] Open house meeting
- [ ] Local News
- [x] Newspaper article
- [ ] Social Networking site (such as Twitter or Facebook)

8) Which method(s) would you be most likely to pay attention to?

- [ ] Flyer
- [ ] Website
- [ ] Email
- [ ] Automated message by calling a toll-free number
- [ ] Sign at the future location of the ramp meter
- [ ] Open house meeting
- [x] Local News
- [x] Newspaper article
- [ ] Social Networking site (such as Twitter or Facebook)

9) Before answering the second part of this survey, which informational materials did you review?

- [x] The "How to Use Ramp Meters" Flyer
- [ ] The "Frequently Asked Questions" Flyer
- [ ] Website
- [x] Video
- [ ] Asked questions

(6)

Survey on Ramp Metering and Public Opinion – Part 1

1) Have you heard of the term *ramp metering* before?

___ Yes
___ No
___ Unsure

2) A basic definition of ramp metering is using a signal at the end of a freeway on-ramp to control the rate at which the vehicles enter the freeway. Have you ever heard of this concept before?

___ Yes
___ No
___ Unsure

IF YOU ANSWERED NO TO QUESTIONS 1 AND 2, YOU DO NOT NEED TO ANSWER THE FOLLOWING QUESTIONS

3) Have you ever experienced a ramp meter?

___ Yes
___ No
___ Unsure

4) If approaching a ramp meter would you feel comfortable in knowing how to proceed?

___ Yes
___ No
___ Unsure

5) What are the benefits of ramp metering? (mark all that apply)

___ Unsure
___ Reduce congestion on the freeway
___ Decrease wait time to enter the freeway
___ Improve safety
___ Reduce vehicle emissions
___ Increase capacity of the freeway
___ Relatively low cost
___ Reduce congestion on the local roads

6) If you were approaching an on-ramp to I-376, and you encountered a queue of vehicles stopped on the on-ramp, would you be willing to wait to enter the freeway?

___ Yes

How long would you be willing to wait?

___ 0-2 minutes
___ 3-5 minutes
___ 6-8 minutes
___ 9-12 minutes
___ 13-15 minutes
___ would need more information

___ No (would find a different route)
___ Would need more information

7) Would you be opposed to the idea of installing ramp meters in Pittsburgh (for example on I-376)?

___ Yes
___ No
___ Would need more information

8) If ramp meters were installed in Pittsburgh (for example on I-376) would you try to find alternate routes to avoid the meters?

___ Yes
___ No
___ Would need more information

PLEASE STOP AND REVIEW THE INFORMATIONAL MATERIAL

Survey on Ramp Metering and Public Opinion – Part 2

1) Before this survey, had you ever heard of ramp metering before?

___ Yes
___ No
___ Unsure

2) If approaching a ramp meter would you feel comfortable in knowing how to proceed?

___ Yes
___ No
___ Unsure

3) What are the benefits of ramp metering? (mark all that apply)

___ Unsure
___ Reduce congestion on the freeway
___ Decrease wait time to enter the freeway
___ Improve safety
___ Reduce vehicle emissions
___ Increase capacity of the freeway
___ Relatively low cost
___ Reduce congestion on the local roads

4)) If you were approaching an on-ramp to I-376, and you encountered a queue of vehicles stopped on the on-ramp, would you be willing to wait to enter the freeway?

___ Yes

How long would you be willing to wait?

___ 0-2 minutes

___ 3-5 minutes

___ 6-8 minutes

___ 9-12 minutes

___ 13-15 minutes

___ would need more information

___ No (would find a different route)

___ Would need more information

5) Would you be opposed to the idea of installing ramp meters in Pittsburgh (for example on I-376)?

___ Yes

___ No

___ Would need more information

6) If ramp meters were installed in Pittsburgh (for example on I-376) would you try to find alternate routes to avoid the meters?

___ Yes

___ No

___ Would need more information

7) Which method(s) would be your preferred method for receiving information on ramp metering?

___ Flyer
___ Website
___ Email
___ Automated message by calling a toll-free number
___ Sign at the future location of the ramp meter
___ Open house meeting
___ Local News
___ Newspaper article
___ Social Networking site (such as Twitter or Facebook)

8) Which method(s) would you be most likely to pay attention to?

___ Flyer
___ Website
___ Email
___ Automated message by calling a toll-free number
___ Sign at the future location of the ramp meter
___ Open house meeting
___ Local News
___ Newspaper article
___ Social Networking site (such as Twitter or Facebook)

9) Before answering the second part of this survey, which informational materials did you review?

___ The "How to Use Ramp Meters" Flyer
___ The "Frequently Asked Questions" Flyer
___ Website
___ Video
___ Asked questions

(7)

Survey on Ramp Metering and Public Opinion – Part 1

1) Have you heard of the term *ramp metering* before?

X Yes
___ No
___ Unsure

2) A basic definition of ramp metering is using a signal at the end of a freeway on-ramp to control the rate at which the vehicles enter the freeway. Have you ever heard of this concept before?

X Yes
___ No
___ Unsure

IF YOU ANSWERED NO TO QUESTIONS 1 AND 2, YOU DO NOT NEED TO ANSWER THE FOLLOWING QUESTIONS

3) Have you ever experienced a ramp meter?

X Yes
___ No
___ Unsure

4) If approaching a ramp meter would you feel comfortable in knowing how to proceed?

X Yes
___ No
___ Unsure

5) What are the benefits of ramp metering? (mark all that apply)

___ Unsure
X Reduce congestion on the freeway
___ Decrease wait time to enter the freeway
X Improve safety
___ Reduce vehicle emissions
___ Increase capacity of the freeway
___ Relatively low cost
___ Reduce congestion on the local roads

6) If you were approaching an on-ramp to I-376, and you encountered a queue of vehicles stopped on the on-ramp, would you be willing to wait to enter the freeway?

X Yes

How long would you be willing to wait?

___ 0-2 minutes
X 3-5 minutes
___ 6-8 minutes
___ 9-12 minutes
___ 13-15 minutes
___ would need more information

___ No (would find a different route)
___ Would need more information

7) Would you be opposed to the idea of installing ramp meters in Pittsburgh (for example on I-376)?

___ Yes
X No
___ Would need more information

8) If ramp meters were installed in Pittsburgh (for example on I-376) would you try to find alternate routes to avoid the meters?

___ Yes

X No

___ Would need more information

PLEASE STOP AND REVIEW THE INFORMATIONAL MATERIAL

Survey on Ramp Metering and Public Opinion – Part 2

1) Before this survey, had you ever heard of ramp metering before?

- [X] Yes
- [ ] No
- [ ] Unsure

2) If approaching a ramp meter would you feel comfortable in knowing how to proceed?

- [X] Yes
- [ ] No
- [ ] Unsure

3) What are the benefits of ramp metering? (mark all that apply)

- [ ] Unsure
- [X] Reduce congestion on the freeway
- [ ] Decrease wait time to enter the freeway
- [X] Improve safety
- [ ] Reduce vehicle emissions
- [X] Increase capacity of the freeway
- [X] Relatively low cost
- [ ] Reduce congestion on the local roads

4)) If you were approaching an on-ramp to I-376, and you encountered a queue of vehicles stopped on the on-ramp, would you be willing to wait to enter the freeway?

___ Yes

How long would you be willing to wait?

___ 0-2 minutes

X 3-5 minutes

___ 6-8 minutes

___ 9-12 minutes

___ 13-15 minutes

___ would need more information

___ No (would find a different route)

___ Would need more information

5) Would you be opposed to the idea of installing ramp meters in Pittsburgh (for example on I-376)?

___ Yes

X No

___ Would need more information

6) If ramp meters were installed in Pittsburgh (for example on I-376) would you try to find alternate routes to avoid the meters?

___ Yes

X No

___ Would need more information

7) Which method(s) would be your preferred method for receiving information on ramp metering?

___ Flyer
X Website
X Email
___ Automated message by calling a toll-free number
X Sign at the future location of the ramp meter
___ Open house meeting
X Local News
X Newspaper article
X Social Networking site (such as Twitter or Facebook)

8) Which method(s) would you be most likely to pay attention to?

___ Flyer
X Website
X Email
___ Automated message by calling a toll-free number
X Sign at the future location of the ramp meter
___ Open house meeting
X Local News
___ Newspaper article
X Social Networking site (such as Twitter or Facebook)

9) Before answering the second part of this survey, which informational materials did you review?

___ The "How to Use Ramp Meters" Flyer
___ The "Frequently Asked Questions" Flyer
___ Website
X Video
___ Asked questions

(8)

Survey on Ramp Metering and Public Opinion – Part 1

1) Have you heard of the term *ramp metering* before?

___ Yes
X No
___ Unsure

2) A basic definition of ramp metering is using a signal at the end of a freeway on-ramp to control the rate at which the vehicles enter the freeway. Have you ever heard of this concept before?

X Yes
___ No
___ Unsure

IF YOU ANSWERED NO TO QUESTIONS 1 AND 2, YOU DO NOT NEED TO ANSWER THE FOLLOWING QUESTIONS

3) Have you ever experienced a ramp meter?

___ Yes
X No
___ Unsure

4) If approaching a ramp meter would you feel comfortable in knowing how to proceed?

X Yes
___ No
___ Unsure

5) What are the benefits of ramp metering? (mark all that apply)

___ Unsure
X Reduce congestion on the freeway
___ Decrease wait time to enter the freeway
___ Improve safety
___ Reduce vehicle emissions
___ Increase capacity of the freeway
___ Relatively low cost
___ Reduce congestion on the local roads

6) If you were approaching an on-ramp to I-376, and you encountered a queue of vehicles stopped on the on-ramp, would you be willing to wait to enter the freeway?

X Yes

How long would you be willing to wait?

X 0-2 minutes
___ 3-5 minutes
___ 6-8 minutes
___ 9-12 minutes
___ 13-15 minutes
___ would need more information

___ No (would find a different route)
___ Would need more information

7) Would you be opposed to the idea of installing ramp meters in Pittsburgh (for example on I-376)?

___ Yes
X No
___ Would need more information

8) If ramp meters were installed in Pittsburgh (for example on I-376) would you try to find alternate routes to avoid the meters?

___ Yes

X No

___ Would need more information

PLEASE STOP AND REVIEW THE INFORMATIONAL MATERIAL

Survey on Ramp Metering and Public Opinion – Part 2

1) Before this survey, had you ever heard of ramp metering before?

___ Yes
_X_ No
___ Unsure

2) If approaching a ramp meter would you feel comfortable in knowing how to proceed?

_X_ Yes
___ No
___ Unsure

3) What are the benefits of ramp metering? (mark all that apply)

___ Unsure
_X_ Reduce congestion on the freeway
___ Decrease wait time to enter the freeway
_X_ Improve safety
___ Reduce vehicle emissions
___ Increase capacity of the freeway
___ Relatively low cost
___ Reduce congestion on the local roads

4)) If you were approaching an on-ramp to I-376, and you encountered a queue of vehicles stopped on the on-ramp, would you be willing to wait to enter the freeway?

X Yes

How long would you be willing to wait?

X 0-2 minutes

___ 3-5 minutes

___ 6-8 minutes

___ 9-12 minutes

___ 13-15 minutes

___ would need more information

___ No (would find a different route)

___ Would need more information

5) Would you be opposed to the idea of installing ramp meters in Pittsburgh (for example on I-376)?

___ Yes

X No

___ Would need more information

6) If ramp meters were installed in Pittsburgh (for example on I-376) would you try to find alternate routes to avoid the meters?

___ Yes

X No

___ Would need more information

7) Which method(s) would be your preferred method for receiving information on ramp metering?

___ Flyer
X Website
X Email
___ Automated message by calling a toll-free number
___ Sign at the future location of the ramp meter
___ Open house meeting
___ Local News
___ Newspaper article
___ Social Networking site (such as Twitter or Facebook)

8) Which method(s) would you be most likely to pay attention to?

___ Flyer
___ Website
X Email
___ Automated message by calling a toll-free number
___ Sign at the future location of the ramp meter
___ Open house meeting
___ Local News
___ Newspaper article
___ Social Networking site (such as Twitter or Facebook)

9) Before answering the second part of this survey, which informational materials did you review?

___ The "How to Use Ramp Meters" Flyer
___ The "Frequently Asked Questions" Flyer
___ Website
X Video
___ Asked questions

(9)

Survey on Ramp Metering and Public Opinion – Part 1

1) Have you heard of the term *ramp metering* before?

___ Yes
√ No
___ Unsure

2) A basic definition of ramp metering is using a signal at the end of a freeway on-ramp to control the rate at which the vehicles enter the freeway. Have you ever heard of this concept before?

___ Yes
√ No
___ Unsure

IF YOU ANSWERED NO TO QUESTIONS 1 AND 2, YOU DO NOT NEED TO ANSWER THE FOLLOWING QUESTIONS

3) Have you ever experienced a ramp meter?

___ Yes
___ No
___ Unsure

4) If approaching a ramp meter would you feel comfortable in knowing how to proceed?

___ Yes
___ No
___ Unsure

5) What are the benefits of ramp metering? (mark all that apply)

___ Unsure
___ Reduce congestion on the freeway
___ Decrease wait time to enter the freeway
___ Improve safety
___ Reduce vehicle emissions
___ Increase capacity of the freeway
___ Relatively low cost
___ Reduce congestion on the local roads

6) If you were approaching an on-ramp to I-376, and you encountered a queue of vehicles stopped on the on-ramp, would you be willing to wait to enter the freeway?

___ Yes

How long would you be willing to wait?

___ 0-2 minutes
___ 3-5 minutes
___ 6-8 minutes
___ 9-12 minutes
___ 13-15 minutes
___ would need more information

___ No (would find a different route)
___ Would need more information

7) Would you be opposed to the idea of installing ramp meters in Pittsburgh (for example on I-376)?

___ Yes
___ No
___ Would need more information

8) If ramp meters were installed in Pittsburgh (for example on I-376) would you try to find alternate routes to avoid the meters?

___ Yes

___ No

___ Would need more information

PLEASE STOP AND REVIEW THE INFORMATIONAL MATERIAL

Survey on Ramp Metering and Public Opinion – Part 2

1) Before this survey, had you ever heard of ramp metering before?

___ Yes
√ No
___ Unsure

2) If approaching a ramp meter would you feel comfortable in knowing how to proceed?

√ Yes
___ No
___ Unsure

3) What are the benefits of ramp metering? (mark all that apply)

___ Unsure
√ Reduce congestion on the freeway
√ Decrease wait time to enter the freeway
√ Improve safety
___ Reduce vehicle emissions
___ Increase capacity of the freeway
___ Relatively low cost
√ Reduce congestion on the local roads

4)) If you were approaching an on-ramp to I-376, and you encountered a queue of vehicles stopped on the on-ramp, would you be willing to wait to enter the freeway?

_√_ Yes

How long would you be willing to wait?

_√_ 0-2 minutes

___ 3-5 minutes

___ 6-8 minutes

___ 9-12 minutes

___ 13-15 minutes

___ would need more information

___ No (would find a different route)

___ Would need more information

5) Would you be opposed to the idea of installing ramp meters in Pittsburgh (for example on I-376)?

___ Yes

_√_ No

___ Would need more information

6) If ramp meters were installed in Pittsburgh (for example on I-376) would you try to find alternate routes to avoid the meters?

___ Yes

_√_ No

___ Would need more information

7) Which method(s) would be your preferred method for receiving information on ramp metering?

- [x] Flyer
- [x] Website
- [ ] Email
- [ ] Automated message by calling a toll-free number
- [x] Sign at the future location of the ramp meter
- [x] Open house meeting
- [x] Local News
- [x] Newspaper article
- [ ] Social Networking site (such as Twitter or Facebook)

8) Which method(s) would you be most likely to pay attention to?

- [ ] Flyer
- [ ] Website
- [ ] Email
- [ ] Automated message by calling a toll-free number
- [x] Sign at the future location of the ramp meter
- [ ] Open house meeting
- [ ] Local News
- [ ] Newspaper article
- [ ] Social Networking site (such as Twitter or Facebook)

9) Before answering the second part of this survey, which informational materials did you review?

- [x] The "How to Use Ramp Meters" Flyer
- [x] The "Frequently Asked Questions" Flyer
- [ ] Website
- [ ] Video
- [ ] Asked questions

(10)

Survey on Ramp Metering and Public Opinion – Part 1

1) Have you heard of the term *ramp metering* before?

___ Yes
X No
___ Unsure

2) A basic definition of ramp metering is using a signal at the end of a freeway on-ramp to control the rate at which the vehicles enter the freeway. Have you ever heard of this concept before?

___ Yes
X No
___ Unsure

IF YOU ANSWERED NO TO QUESTIONS 1 AND 2, YOU DO NOT NEED TO ANSWER THE FOLLOWING QUESTIONS

3) Have you ever experienced a ramp meter?

___ Yes
___ No
___ Unsure

4) If approaching a ramp meter would you feel comfortable in knowing how to proceed?

___ Yes
___ No
___ Unsure

5) What are the benefits of ramp metering? (mark all that apply)

___ Unsure
___ Reduce congestion on the freeway
___ Decrease wait time to enter the freeway
___ Improve safety
___ Reduce vehicle emissions
___ Increase capacity of the freeway
___ Relatively low cost
___ Reduce congestion on the local roads

6) If you were approaching an on-ramp to I-376, and you encountered a queue of vehicles stopped on the on-ramp, would you be willing to wait to enter the freeway?

___ Yes

How long would you be willing to wait?

___ 0-2 minutes
___ 3-5 minutes
___ 6-8 minutes
___ 9-12 minutes
___ 13-15 minutes
___ would need more information

___ No (would find a different route)
___ Would need more information

7) Would you be opposed to the idea of installing ramp meters in Pittsburgh (for example on I-376)?

___ Yes
___ No
___ Would need more information

8) If ramp meters were installed in Pittsburgh (for example on I-376) would you try to find alternate routes to avoid the meters?

___ Yes

___ No

___ Would need more information

PLEASE STOP AND REVIEW THE INFORMATIONAL MATERIAL

Survey on Ramp Metering and Public Opinion – Part 2

1) Before this survey, had you ever heard of ramp metering before?

___ Yes
_X_ No
___ Unsure

2) If approaching a ramp meter would you feel comfortable in knowing how to proceed?

_X_ Yes
___ No
___ Unsure

3) What are the benefits of ramp metering? (mark all that apply)

___ Unsure
_X_ Reduce congestion on the freeway
___ Decrease wait time to enter the freeway
_X_ Improve safety
___ Reduce vehicle emissions
___ Increase capacity of the freeway
___ Relatively low cost
___ Reduce congestion on the local roads

4)) If you were approaching an on-ramp to I-376, and you encountered a queue of vehicles stopped on the on-ramp, would you be willing to wait to enter the freeway?

X Yes

How long would you be willing to wait?

X 0-2 minutes

___ 3-5 minutes

___ 6-8 minutes

___ 9-12 minutes

___ 13-15 minutes

___ would need more information

___ No (would find a different route)

___ Would need more information

5) Would you be opposed to the idea of installing ramp meters in Pittsburgh (for example on I-376)?

___ Yes

X No

___ Would need more information

6) If ramp meters were installed in Pittsburgh (for example on I-376) would you try to find alternate routes to avoid the meters?

___ Yes

X No

___ Would need more information

7) Which method(s) would be your preferred method for receiving information on ramp metering?

___ Flyer
X Website
X Email
___ Automated message by calling a toll-free number
___ Sign at the future location of the ramp meter
X Open house meeting
X Local News
___ Newspaper article
___ Social Networking site (such as Twitter or Facebook)

8) Which method(s) would you be most likely to pay attention to?

___ Flyer
X Website
X Email
___ Automated message by calling a toll-free number
___ Sign at the future location of the ramp meter
___ Open house meeting
X Local News
___ Newspaper article
___ Social Networking site (such as Twitter or Facebook)

9) Before answering the second part of this survey, which informational materials did you review?

___ The "How to Use Ramp Meters" Flyer
___ The "Frequently Asked Questions" Flyer
___ Website
X Video
___ Asked questions

(11)

Survey on Ramp Metering and Public Opinion – Part 1

1) Have you heard of the term *ramp metering* before?

___ Yes

X No

___ Unsure

2) A basic definition of ramp metering is using a signal at the end of a freeway on-ramp to control the rate at which the vehicles enter the freeway. Have you ever heard of this concept before?

___ Yes

X No

___ Unsure

IF YOU ANSWERED NO TO QUESTIONS 1 AND 2, YOU DO NOT NEED TO ANSWER THE FOLLOWING QUESTIONS

3) Have you ever experienced a ramp meter?

___ Yes

___ No

___ Unsure

4) If approaching a ramp meter would you feel comfortable in knowing how to proceed?

___ Yes

___ No

___ Unsure

5) What are the benefits of ramp metering? (mark all that apply)

___ Unsure
___ Reduce congestion on the freeway
___ Decrease wait time to enter the freeway
___ Improve safety
___ Reduce vehicle emissions
___ Increase capacity of the freeway
___ Relatively low cost
___ Reduce congestion on the local roads

6) If you were approaching an on-ramp to I-376, and you encountered a queue of vehicles stopped on the on-ramp, would you be willing to wait to enter the freeway?

___ Yes

How long would you be willing to wait?

___ 0-2 minutes
___ 3-5 minutes
___ 6-8 minutes
___ 9-12 minutes
___ 13-15 minutes
___ would need more information

___ No (would find a different route)
___ Would need more information

7) Would you be opposed to the idea of installing ramp meters in Pittsburgh (for example on I-376)?

___ Yes
___ No
___ Would need more information

8) If ramp meters were installed in Pittsburgh (for example on I-376) would you try to find alternate routes to avoid the meters?

___ Yes

___ No

___ Would need more information

PLEASE STOP AND REVIEW THE INFORMATIONAL MATERIAL

Survey on Ramp Metering and Public Opinion – Part 2

1) Before this survey, had you ever heard of ramp metering before?

___ Yes
X No
___ Unsure

2) If approaching a ramp meter would you feel comfortable in knowing how to proceed?

X Yes
___ No
___ Unsure

3) What are the benefits of ramp metering? (mark all that apply)

___ Unsure
X Reduce congestion on the freeway
X Decrease wait time to enter the freeway
X Improve safety
___ Reduce vehicle emissions
X Increase capacity of the freeway
___ Relatively low cost
X Reduce congestion on the local roads

4)) If you were approaching an on-ramp to I-376, and you encountered a queue of vehicles stopped on the on-ramp, would you be willing to wait to enter the freeway?

X Yes

How long would you be willing to wait?

X 0-2 minutes

___ 3-5 minutes

___ 6-8 minutes

___ 9-12 minutes

___ 13-15 minutes

___ would need more information

___ No (would find a different route)

___ Would need more information

5) Would you be opposed to the idea of installing ramp meters in Pittsburgh (for example on I-376)?

___ Yes

X No

___ Would need more information

6) If ramp meters were installed in Pittsburgh (for example on I-376) would you try to find alternate routes to avoid the meters?

___ Yes

X No

___ Would need more information

7) Which method(s) would be your preferred method for receiving information on ramp metering?

___ Flyer
X Website
X Email
___ Automated message by calling a toll-free number
X Sign at the future location of the ramp meter
___ Open house meeting
X Local News
___ Newspaper article
___ Social Networking site (such as Twitter or Facebook)

8) Which method(s) would you be most likely to pay attention to?

___ Flyer
___ Website
X Email
___ Automated message by calling a toll-free number
X Sign at the future location of the ramp meter
___ Open house meeting
X Local News
___ Newspaper article
___ Social Networking site (such as Twitter or Facebook)

9) Before answering the second part of this survey, which informational materials did you review?

X The "How to Use Ramp Meters" Flyer
___ The "Frequently Asked Questions" Flyer
___ Website
___ Video
___ Asked questions

(12)

Survey on Ramp Metering and Public Opinion – Part 1

1) Have you heard of the term *ramp metering* before?

___ Yes
✓ No
___ Unsure

2) A basic definition of ramp metering is using a signal at the end of a freeway on-ramp to control the rate at which the vehicles enter the freeway. Have you ever heard of this concept before?

✓ Yes
___ No
___ Unsure

IF YOU ANSWERED NO TO QUESTIONS 1 AND 2, YOU DO NOT NEED TO ANSWER THE FOLLOWING QUESTIONS

3) Have you ever experienced a ramp meter?

✓ Yes
___ No
___ Unsure

4) If approaching a ramp meter would you feel comfortable in knowing how to proceed?

✓ Yes
___ No
___ Unsure

5) What are the benefits of ramp metering? (mark all that apply)

___ Unsure
___✓ Reduce congestion on the freeway
___✓ Decrease wait time to enter the freeway
___✓ Improve safety
___✓ Reduce vehicle emissions
___ Increase capacity of the freeway
___ Relatively low cost
___✓ Reduce congestion on the local roads

6) If you were approaching an on-ramp to I-376, and you encountered a queue of vehicles stopped on the on-ramp, would you be willing to wait to enter the freeway?

___✓ Yes

How long would you be willing to wait?

___ 0-2 minutes
___✓ 3-5 minutes
___ 6-8 minutes
___ 9-12 minutes
___ 13-15 minutes
___ would need more information

___ No (would find a different route)
___ Would need more information

7) Would you be opposed to the idea of installing ramp meters in Pittsburgh (for example on I-376)?

___ Yes
___✓ No
___ Would need more information

8) If ramp meters were installed in Pittsburgh (for example on I-376) would you try to find alternate routes to avoid the meters?

___ Yes

_✓_ No

___ Would need more information

PLEASE STOP AND REVIEW THE INFORMATIONAL MATERIAL

Survey on Ramp Metering and Public Opinion – Part 2

1) Before this survey, had you ever heard of ramp metering before?

___ Yes
_✓_ No
___ Unsure

2) If approaching a ramp meter would you feel comfortable in knowing how to proceed?

_✓_ Yes
___ No
___ Unsure

3) What are the benefits of ramp metering? (mark all that apply)

___ Unsure
_✓_ Reduce congestion on the freeway
_✓_ Decrease wait time to enter the freeway
_✓_ Improve safety
_✓_ Reduce vehicle emissions
___ Increase capacity of the freeway
___ Relatively low cost
_✓_ Reduce congestion on the local roads

4)) If you were approaching an on-ramp to I-376, and you encountered a queue of vehicles stopped on the on-ramp, would you be willing to wait to enter the freeway?

✓ Yes

How long would you be willing to wait?

___ 0-2 minutes

___ 3-5 minutes

✓ 6-8 minutes

___ 9-12 minutes

___ 13-15 minutes

___ would need more information

___ No (would find a different route)

___ Would need more information

5) Would you be opposed to the idea of installing ramp meters in Pittsburgh (for example on I-376)?

___ Yes

✓ No

___ Would need more information

6) If ramp meters were installed in Pittsburgh (for example on I-376) would you try to find alternate routes to avoid the meters?

___ Yes

✓ No

___ Would need more information

7) Which method(s) would be your preferred method for receiving information on ramp metering?

___ Flyer
___ Website
___ Email
___ Automated message by calling a toll-free number
___ Sign at the future location of the ramp meter
___ Open house meeting
_✓_ Local News
_✓_ Newspaper article
___ Social Networking site (such as Twitter or Facebook)

8) Which method(s) would you be most likely to pay attention to?

___ Flyer
___ Website
___ Email
___ Automated message by calling a toll-free number
___ Sign at the future location of the ramp meter
___ Open house meeting
_✓_ Local News
_✓_ Newspaper article
___ Social Networking site (such as Twitter or Facebook)

9) Before answering the second part of this survey, which informational materials did you review?

___ The "How to Use Ramp Meters" Flyer
___ The "Frequently Asked Questions" Flyer
_✓_ Website
_✓_ Video
___ Asked questions

13

Survey on Ramp Metering and Public Opinion – Part 1

1) Have you heard of the term *ramp metering* before?

___ Yes
X No
___ Unsure

2) A basic definition of ramp metering is using a signal at the end of a freeway on-ramp to control the rate at which the vehicles enter the freeway. Have you ever heard of this concept before?

___ Yes
X No
___ Unsure

IF YOU ANSWERED NO TO QUESTIONS 1 AND 2, YOU DO NOT NEED TO ANSWER THE FOLLOWING QUESTIONS

3) Have you ever experienced a ramp meter?

___ Yes
___ No
___ Unsure

4) If approaching a ramp meter would you feel comfortable in knowing how to proceed?

___ Yes
___ No
___ Unsure

5) What are the benefits of ramp metering? (mark all that apply)

___ Unsure
___ Reduce congestion on the freeway
___ Decrease wait time to enter the freeway
___ Improve safety
___ Reduce vehicle emissions
___ Increase capacity of the freeway
___ Relatively low cost
___ Reduce congestion on the local roads

6) If you were approaching an on-ramp to I-376, and you encountered a queue of vehicles stopped on the on-ramp, would you be willing to wait to enter the freeway?

___ Yes

How long would you be willing to wait?

___ 0-2 minutes
___ 3-5 minutes
___ 6-8 minutes
___ 9-12 minutes
___ 13-15 minutes
___ would need more information

___ No (would find a different route)
___ Would need more information

7) Would you be opposed to the idea of installing ramp meters in Pittsburgh (for example on I-376)?

___ Yes
___ No
___ Would need more information

8) If ramp meters were installed in Pittsburgh (for example on I-376) would you try to find alternate routes to avoid the meters?

___ Yes

___ No

___ Would need more information

PLEASE STOP AND REVIEW THE INFORMATIONAL MATERIAL

Survey on Ramp Metering and Public Opinion – Part 2

1) Before this survey, had you ever heard of ramp metering before?

___ Yes
X No
___ Unsure

2) If approaching a ramp meter would you feel comfortable in knowing how to proceed?

___ Yes
___ No
X Unsure

3) What are the benefits of ramp metering? (mark all that apply)

___ Unsure
X Reduce congestion on the freeway
X Decrease wait time to enter the freeway
X Improve safety
___ Reduce vehicle emissions
___ Increase capacity of the freeway
___ Relatively low cost
X Reduce congestion on the local roads

4)) If you were approaching an on-ramp to I-376, and you encountered a queue of vehicles stopped on the on-ramp, would you be willing to wait to enter the freeway?

X Yes

How long would you be willing to wait?

___ 0-2 minutes

X 3-5 minutes

___ 6-8 minutes

___ 9-12 minutes

___ 13-15 minutes

___ would need more information

___ No (would find a different route)

___ Would need more information

5) Would you be opposed to the idea of installing ramp meters in Pittsburgh (for example on I-376)?

___ Yes

X No

___ Would need more information

6) If ramp meters were installed in Pittsburgh (for example on I-376) would you try to find alternate routes to avoid the meters?

___ Yes

X No

___ Would need more information

7) Which method(s) would be your preferred method for receiving information on ramp metering?

___ Flyer
X Website
___ Email
___ Automated message by calling a toll-free number
X Sign at the future location of the ramp meter
___ Open house meeting
X Local News
X Newspaper article
___ Social Networking site (such as Twitter or Facebook)

8) Which method(s) would you be most likely to pay attention to?

___ Flyer
___ Website
___ Email
___ Automated message by calling a toll-free number
X Sign at the future location of the ramp meter
___ Open house meeting
X Local News
X Newspaper article
___ Social Networking site (such as Twitter or Facebook)

9) Before answering the second part of this survey, which informational materials did you review?

___ The "How to Use Ramp Meters" Flyer
___ The "Frequently Asked Questions" Flyer
___ Website
X Video
___ Asked questions

(14)

Survey on Ramp Metering and Public Opinion – Part 1

1) Have you heard of the term *ramp metering* before?

___ Yes
___ No
_✓_ Unsure

2) A basic definition of ramp metering is using a signal at the end of a freeway on-ramp to control the rate at which the vehicles enter the freeway. Have you ever heard of this concept before?

✓ Yes
___ No
___ Unsure

IF YOU ANSWERED NO TO QUESTIONS 1 AND 2, YOU DO NOT NEED TO ANSWER THE FOLLOWING QUESTIONS

3) Have you ever experienced a ramp meter?

___ Yes
___ No
_✓_ Unsure

4) If approaching a ramp meter would you feel comfortable in knowing how to proceed?

___ Yes
___ No
_✓_ Unsure

5) What are the benefits of ramp metering? (mark all that apply)

___ Unsure
___ Reduce congestion on the freeway
_✓_ Decrease wait time to enter the freeway
_✓_ Improve safety
___ Reduce vehicle emissions
___ Increase capacity of the freeway
___ Relatively low cost
___ Reduce congestion on the local roads

6) If you were approaching an on-ramp to I-376, and you encountered a queue of vehicles stopped on the on-ramp, would you be willing to wait to enter the freeway?

_✓_ Yes

How long would you be willing to wait?

___ 0-2 minutes
_✓_ 3-5 minutes
___ 6-8 minutes
___ 9-12 minutes
___ 13-15 minutes
___ would need more information

___ No (would find a different route)
___ Would need more information

7) Would you be opposed to the idea of installing ramp meters in Pittsburgh (for example on I-376)?

___ Yes
_✓_ No
___ Would need more information

8) If ramp meters were installed in Pittsburgh (for example on I-376) would you try to find alternate routes to avoid the meters?

___ Yes
___ No
__✓ Would need more information

PLEASE STOP AND REVIEW THE INFORMATIONAL MATERIAL

Survey on Ramp Metering and Public Opinion – Part 2

1) Before this survey, had you ever heard of ramp metering before?

- ✓ Yes
- ___ No
- ___ Unsure

2) If approaching a ramp meter would you feel comfortable in knowing how to proceed?

- ✓ Yes
- ___ No
- ___ Unsure

3) What are the benefits of ramp metering? (mark all that apply)

- ___ Unsure
- ✓ Reduce congestion on the freeway
- ✓ Decrease wait time to enter the freeway
- ✓ Improve safety
- ___ Reduce vehicle emissions
- ___ Increase capacity of the freeway
- ___ Relatively low cost
- ___ Reduce congestion on the local roads

4)) If you were approaching an on-ramp to I-376, and you encountered a queue of vehicles stopped on the on-ramp, would you be willing to wait to enter the freeway?

✓ Yes

How long would you be willing to wait?

✓ 0-2 minutes

___ 3-5 minutes

___ 6-8 minutes

___ 9-12 minutes

___ 13-15 minutes

___ would need more information

___ No (would find a different route)

___ Would need more information

5) Would you be opposed to the idea of installing ramp meters in Pittsburgh (for example on I-376)?

___ Yes

✓ No

___ Would need more information

6) If ramp meters were installed in Pittsburgh (for example on I-376) would you try to find alternate routes to avoid the meters?

___ Yes

✓ No

___ Would need more information

7) Which method(s) would be your preferred method for receiving information on ramp metering?

___ Flyer
_✓_ Website
_✓_ Email
___ Automated message by calling a toll-free number
_✓_ Sign at the future location of the ramp meter
___ Open house meeting
___ Local News
___ Newspaper article
___ Social Networking site (such as Twitter or Facebook)

8) Which method(s) would you be most likely to pay attention to?

___ Flyer
___ Website
_✓_ Email
___ Automated message by calling a toll-free number
_✓_ Sign at the future location of the ramp meter
___ Open house meeting
___ Local News
___ Newspaper article
___ Social Networking site (such as Twitter or Facebook)

9) Before answering the second part of this survey, which informational materials did you review?

_✓_ The "How to Use Ramp Meters" Flyer
_✓_ The "Frequently Asked Questions" Flyer
___ Website
_✓_ Video
_✓_ Asked questions

(15)

Survey on Ramp Metering and Public Opinion – Part 1

1) Have you heard of the term *ramp metering* before?

___ Yes
_✓_ No
___ Unsure

2) A basic definition of ramp metering is using a signal at the end of a freeway on-ramp to control the rate at which the vehicles enter the freeway. Have you ever heard of this concept before?

_✓_ Yes
___ No
___ Unsure

IF YOU ANSWERED NO TO QUESTIONS 1 AND 2, YOU DO NOT NEED TO ANSWER THE FOLLOWING QUESTIONS

3) Have you ever experienced a ramp meter?

_✓_ Yes
___ No
___ Unsure

4) If approaching a ramp meter would you feel comfortable in knowing how to proceed?

_✓_ Yes
___ No
___ Unsure

5) What are the benefits of ramp metering? (mark all that apply)

___ Unsure
_✓_ Reduce congestion on the freeway
___ Decrease wait time to enter the freeway
___ Improve safety
___ Reduce vehicle emissions
_✓_ Increase capacity of the freeway
___ Relatively low cost
___ Reduce congestion on the local roads

6) If you were approaching an on-ramp to I-376, and you encountered a queue of vehicles stopped on the on-ramp, would you be willing to wait to enter the freeway?

___ Yes

How long would you be willing to wait?

___ 0-2 minutes
___ 3-5 minutes
___ 6-8 minutes
___ 9-12 minutes
___ 13-15 minutes
___ would need more information

_✓_ No (would find a different route)
_✓_ Would need more information

7) Would you be opposed to the idea of installing ramp meters in Pittsburgh (for example on I-376)?

_✓_ Yes
___ No
___ Would need more information

8) If ramp meters were installed in Pittsburgh (for example on I-376) would you try to find alternate routes to avoid the meters?

___ Yes
_✓_ No
___ Would need more information

PLEASE STOP AND REVIEW THE INFORMATIONAL MATERIAL

Survey on Ramp Metering and Public Opinion – Part 2

1) Before this survey, had you ever heard of ramp metering before?

___ Yes
_✓_ No
___ Unsure

2) If approaching a ramp meter would you feel comfortable in knowing how to proceed?

_✓_ Yes
___ No
___ Unsure

3) What are the benefits of ramp metering? (mark all that apply)

___ Unsure
_✓_ Reduce congestion on the freeway
___ Decrease wait time to enter the freeway
___ Improve safety
___ Reduce vehicle emissions
_✓_ Increase capacity of the freeway
___ Relatively low cost
___ Reduce congestion on the local roads

4)) If you were approaching an on-ramp to I-376, and you encountered a queue of vehicles stopped on the on-ramp, would you be willing to wait to enter the freeway?

___ Yes

How long would you be willing to wait?

___ 0-2 minutes

___ 3-5 minutes

___ 6-8 minutes

___ 9-12 minutes

___ 13-15 minutes

___ would need more information

___ No (would find a different route)

_√_ Would need more information

5) Would you be opposed to the idea of installing ramp meters in Pittsburgh (for example on I-376)?

_√_ Yes

___ No

___ Would need more information

6) If ramp meters were installed in Pittsburgh (for example on I-376) would you try to find alternate routes to avoid the meters?

_√_ Yes

_√_ No

___ Would need more information

7) Which method(s) would be your preferred method for receiving information on ramp metering?

___ Flyer
___ Website
___ Email
___ Automated message by calling a toll-free number
___ Sign at the future location of the ramp meter
___ Open house meeting
_√_ Local News
___ Newspaper article
___ Social Networking site (such as Twitter or Facebook)

8) Which method(s) would you be most likely to pay attention to?

___ Flyer
___ Website
___ Email
___ Automated message by calling a toll-free number
___ Sign at the future location of the ramp meter
___ Open house meeting
_√_ Local News
___ Newspaper article
___ Social Networking site (such as Twitter or Facebook)

9) Before answering the second part of this survey, which informational materials did you review?

_√_ The "How to Use Ramp Meters" Flyer
___ The "Frequently Asked Questions" Flyer
___ Website
___ Video
___ Asked questions

(16)

Survey on Ramp Metering and Public Opinion – Part 1

1) Have you heard of the term *ramp metering* before?

✓ Yes
___ No
___ Unsure

2) A basic definition of ramp metering is using a signal at the end of a freeway on-ramp to control the rate at which the vehicles enter the freeway. Have you ever heard of this concept before?

✓ Yes
___ No
___ Unsure

IF YOU ANSWERED NO TO QUESTIONS 1 AND 2, YOU DO NOT NEED TO ANSWER THE FOLLOWING QUESTIONS

3) Have you ever experienced a ramp meter?

✓ Yes
___ No
___ Unsure

4) If approaching a ramp meter would you feel comfortable in knowing how to proceed?

___ Yes
✓ No
___ Unsure

5) What are the benefits of ramp metering? (mark all that apply)

___ Unsure
✓ Reduce congestion on the freeway
✓ Decrease wait time to enter the freeway
___ Improve safety
___ Reduce vehicle emissions
✓ Increase capacity of the freeway
___ Relatively low cost
___ Reduce congestion on the local roads

6) If you were approaching an on-ramp to I-376, and you encountered a queue of vehicles stopped on the on-ramp, would you be willing to wait to enter the freeway?

✓ Yes

How long would you be willing to wait?

✓ 0-2 minutes
___ 3-5 minutes
___ 6-8 minutes
___ 9-12 minutes
___ 13-15 minutes
___ would need more information

___ No (would find a different route)
___ Would need more information

7) Would you be opposed to the idea of installing ramp meters in Pittsburgh (for example on I-376)?

___ Yes
___ No
X Would need more information

8) If ramp meters were installed in Pittsburgh (for example on I-376) would you try to find alternate routes to avoid the meters?

___ Yes

✓ No

___ Would need more information

PLEASE STOP AND REVIEW THE INFORMATIONAL MATERIAL

Survey on Ramp Metering and Public Opinion – Part 2

1) Before this survey, had you ever heard of ramp metering before?

- ✓ Yes
- ___ No
- ___ Unsure

2) If approaching a ramp meter would you feel comfortable in knowing how to proceed?

- ✓ Yes
- ___ No
- ___ Unsure

3) What are the benefits of ramp metering? (mark all that apply)

- ___ Unsure
- ✓ Reduce congestion on the freeway
- ✓ Decrease wait time to enter the freeway
- ✓ Improve safety
- ___ Reduce vehicle emissions
- ✓ Increase capacity of the freeway
- ✓ Relatively low cost
- ___ Reduce congestion on the local roads

4)) If you were approaching an on-ramp to I-376, and you encountered a queue of vehicles stopped on the on-ramp, would you be willing to wait to enter the freeway?

✓ Yes

How long would you be willing to wait?

- ✓ 0-2 minutes
- ___ 3-5 minutes
- ___ 6-8 minutes
- ___ 9-12 minutes
- ___ 13-15 minutes
- ___ would need more information

___ No (would find a different route)

___ Would need more information

5) Would you be opposed to the idea of installing ramp meters in Pittsburgh (for example on I-376)?

___ Yes

✓ No

___ Would need more information

6) If ramp meters were installed in Pittsburgh (for example on I-376) would you try to find alternate routes to avoid the meters?

___ Yes

✓ No

___ Would need more information

7) Which method(s) would be your preferred method for receiving information on ramp metering?

___ Flyer
✓ Website
✓ Email
___ Automated message by calling a toll-free number
✓ Sign at the future location of the ramp meter
___ Open house meeting
✓ Local News
___ Newspaper article
___ Social Networking site (such as Twitter or Facebook)

8) Which method(s) would you be most likely to pay attention to?

___ Flyer
✓ Website
___ Email
___ Automated message by calling a toll-free number
✓ Sign at the future location of the ramp meter
___ Open house meeting
✓ Local News
___ Newspaper article
___ Social Networking site (such as Twitter or Facebook)

9) Before answering the second part of this survey, which informational materials did you review?

✓ The "How to Use Ramp Meters" Flyer
___ The "Frequently Asked Questions" Flyer
___ Website
___ Video
___ Asked questions

17

Survey on Ramp Metering and Public Opinion – Part 1

1) Have you heard of the term *ramp metering* before?

___ Yes
✓ No
___ Unsure

2) A basic definition of ramp metering is using a signal at the end of a freeway on-ramp to control the rate at which the vehicles enter the freeway. Have you ever heard of this concept before?

___ Yes
✓ No
___ Unsure

IF YOU ANSWERED NO TO QUESTIONS 1 AND 2, YOU DO NOT NEED TO ANSWER THE FOLLOWING QUESTIONS

3) Have you ever experienced a ramp meter?

___ Yes
___ No
___ Unsure

4) If approaching a ramp meter would you feel comfortable in knowing how to proceed?

___ Yes
___ No
___ Unsure

5) What are the benefits of ramp metering? (mark all that apply)

___ Unsure
___ Reduce congestion on the freeway
___ Decrease wait time to enter the freeway
___ Improve safety
___ Reduce vehicle emissions
___ Increase capacity of the freeway
___ Relatively low cost
___ Reduce congestion on the local roads

6) If you were approaching an on-ramp to I-376, and you encountered a queue of vehicles stopped on the on-ramp, would you be willing to wait to enter the freeway?

___ Yes

How long would you be willing to wait?

___ 0-2 minutes
___ 3-5 minutes
___ 6-8 minutes
___ 9-12 minutes
___ 13-15 minutes
___ would need more information

___ No (would find a different route)
___ Would need more information

7) Would you be opposed to the idea of installing ramp meters in Pittsburgh (for example on I-376)?

___ Yes
___ No
___ Would need more information

8) If ramp meters were installed in Pittsburgh (for example on I-376) would you try to find alternate routes to avoid the meters?

___ Yes

___ No

___ Would need more information

PLEASE STOP AND REVIEW THE INFORMATIONAL MATERIAL

Survey on Ramp Metering and Public Opinion – Part 2

1) Before this survey, had you ever heard of ramp metering before?

___ Yes
_✓_ No
___ Unsure

2) If approaching a ramp meter would you feel comfortable in knowing how to proceed?

_✓_ Yes
___ No
___ Unsure

3) What are the benefits of ramp metering? (mark all that apply)

___ Unsure
___ Reduce congestion on the freeway
_✓_ Decrease wait time to enter the freeway
_✓_ Improve safety
___ Reduce vehicle emissions
___ Increase capacity of the freeway
___ Relatively low cost
___ Reduce congestion on the local roads

4)) If you were approaching an on-ramp to I-376, and you encountered a queue of vehicles stopped on the on-ramp, would you be willing to wait to enter the freeway?

✓ Yes

How long would you be willing to wait?

✓ 0-2 minutes

___ 3-5 minutes

___ 6-8 minutes

___ 9-12 minutes

___ 13-15 minutes

___ would need more information

___ No (would find a different route)

___ Would need more information

5) Would you be opposed to the idea of installing ramp meters in Pittsburgh (for example on I-376)?

✓ Yes

___ No

___ Would need more information

6) If ramp meters were installed in Pittsburgh (for example on I-376) would you try to find alternate routes to avoid the meters?

___ Yes

✓ No

___ Would need more information

7) Which method(s) would be your preferred method for receiving information on ramp metering?

- [x] Flyer
- [x] Website
- [x] Email
- [ ] Automated message by calling a toll-free number
- [ ] Sign at the future location of the ramp meter
- [ ] Open house meeting
- [x] Local News
- [x] Newspaper article
- [ ] Social Networking site (such as Twitter or Facebook)

8) Which method(s) would you be most likely to pay attention to?

- [x] Flyer
- [x] Website
- [x] Email
- [ ] Automated message by calling a toll-free number
- [ ] Sign at the future location of the ramp meter
- [ ] Open house meeting
- [x] Local News
- [x] Newspaper article
- [ ] Social Networking site (such as Twitter or Facebook)

9) Before answering the second part of this survey, which informational materials did you review?

- [x] The "How to Use Ramp Meters" Flyer
- [x] The "Frequently Asked Questions" Flyer
- [ ] Website
- [ ] Video
- [ ] Asked questions

(18)

Survey on Ramp Metering and Public Opinion – Part 1

1) Have you heard of the term *ramp metering* before?

___ Yes
✓ No
___ Unsure

2) A basic definition of ramp metering is using a signal at the end of a freeway on-ramp to control the rate at which the vehicles enter the freeway. Have you ever heard of this concept before?

✓ Yes
___ No
___ Unsure

IF YOU ANSWERED NO TO QUESTIONS 1 AND 2, YOU DO NOT NEED TO ANSWER THE FOLLOWING QUESTIONS

3) Have you ever experienced a ramp meter?

✓ Yes
___ No
___ Unsure

4) If approaching a ramp meter would you feel comfortable in knowing how to proceed?

✓ Yes
___ No
___ Unsure

5) What are the benefits of ramp metering? (mark all that apply)

- ___ Unsure
- ___ Reduce congestion on the freeway
- ___ Decrease wait time to enter the freeway
- ___ Improve safety
- ___ Reduce vehicle emissions
- ___ Increase capacity of the freeway
- ___ Relatively low cost
- ___ Reduce congestion on the local roads

6) If you were approaching an on-ramp to I-376, and you encountered a queue of vehicles stopped on the on-ramp, would you be willing to wait to enter the freeway?

- ___ Yes

  How long would you be willing to wait?

  - ___ 0-2 minutes
  - ___ 3-5 minutes
  - ___ 6-8 minutes
  - ___ 9-12 minutes
  - ___ 13-15 minutes
  - ___ would need more information

- ___ No (would find a different route)
- ___ Would need more information

7) Would you be opposed to the idea of installing ramp meters in Pittsburgh (for example on I-376)?

- ___ Yes
- ___ No
- ___ Would need more information

8) If ramp meters were installed in Pittsburgh (for example on I-376) would you try to find alternate routes to avoid the meters?

___ Yes

___ No

___ Would need more information

No

PLEASE STOP AND REVIEW THE INFORMATIONAL MATERIAL

Survey on Ramp Metering and Public Opinion – Part 2

1) Before this survey, had you ever heard of ramp metering before?

___ Yes
✓ No
___ Unsure

2) If approaching a ramp meter would you feel comfortable in knowing how to proceed?

✓ Yes
___ No
___ Unsure

3) What are the benefits of ramp metering? (mark all that apply)

___ Unsure
✓ Reduce congestion on the freeway
✓ Decrease wait time to enter the freeway
✓ Improve safety
___ Reduce vehicle emissions
___ Increase capacity of the freeway
___ Relatively low cost
___ Reduce congestion on the local roads

4)) If you were approaching an on-ramp to I-376, and you encountered a queue of vehicles stopped on the on-ramp, would you be willing to wait to enter the freeway?

✓ Yes

How long would you be willing to wait?

✓ 0-2 minutes

___ 3-5 minutes

___ 6-8 minutes

___ 9-12 minutes

___ 13-15 minutes

___ would need more information

___ No (would find a different route)

___ Would need more information

5) Would you be opposed to the idea of installing ramp meters in Pittsburgh (for example on I-376)?

✓ Yes

___ No

___ Would need more information

6) If ramp meters were installed in Pittsburgh (for example on I-376) would you try to find alternate routes to avoid the meters?

___ Yes

✓ No

___ Would need more information

7) Which method(s) would be your preferred method for receiving information on ramp metering?

___ Flyer
_✓_ Website
_✓_ Email
___ Automated message by calling a toll-free number
_✓_ Sign at the future location of the ramp meter
___ Open house meeting
___ Local News
_✓_ Newspaper article
___ Social Networking site (such as Twitter or Facebook)

8) Which method(s) would you be most likely to pay attention to?

___ Flyer
_✓_ Website
_✓_ Email
___ Automated message by calling a toll-free number
___ Sign at the future location of the ramp meter
___ Open house meeting
___ Local News
_✓_ Newspaper article
___ Social Networking site (such as Twitter or Facebook)

9) Before answering the second part of this survey, which informational materials did you review?

_✓_ The "How to Use Ramp Meters" Flyer
___ The "Frequently Asked Questions" Flyer
___ Website
___ Video
___ Asked questions

(19)

Survey on Ramp Metering and Public Opinion – Part 1

1) Have you heard of the term *ramp metering* before?

___ Yes
___ ✓ No
___ Unsure

2) A basic definition of ramp metering is using a signal at the end of a freeway on-ramp to control the rate at which the vehicles enter the freeway. Have you ever heard of this concept before?

___ Yes
___ ✓ No
___ Unsure

IF YOU ANSWERED NO TO QUESTIONS 1 AND 2, YOU DO NOT NEED TO ANSWER THE FOLLOWING QUESTIONS

3) Have you ever experienced a ramp meter?

___ Yes
___ No
___ Unsure

4) If approaching a ramp meter would you feel comfortable in knowing how to proceed?

___ Yes
___ No
___ Unsure

5) What are the benefits of ramp metering? (mark all that apply)

___ Unsure
___ Reduce congestion on the freeway
___ Decrease wait time to enter the freeway
___ Improve safety
___ Reduce vehicle emissions
___ Increase capacity of the freeway
___ Relatively low cost
___ Reduce congestion on the local roads

6) If you were approaching an on-ramp to I-376, and you encountered a queue of vehicles stopped on the on-ramp, would you be willing to wait to enter the freeway?

___ Yes

How long would you be willing to wait?

___ 0-2 minutes
___ 3-5 minutes
___ 6-8 minutes
___ 9-12 minutes
___ 13-15 minutes
___ would need more information

___ No (would find a different route)
___ Would need more information

7) Would you be opposed to the idea of installing ramp meters in Pittsburgh (for example on I-376)?

___ Yes
___ No
___ Would need more information

8) If ramp meters were installed in Pittsburgh (for example on I-376) would you try to find alternate routes to avoid the meters?

___ Yes

___ No

___ Would need more information

PLEASE STOP AND REVIEW THE INFORMATIONAL MATERIAL

Survey on Ramp Metering and Public Opinion – Part 2

1) Before this survey, had you ever heard of ramp metering before?

___ Yes
✓ No
___ Unsure

2) If approaching a ramp meter would you feel comfortable in knowing how to proceed?

✓ Yes
___ No
___ Unsure

3) What are the benefits of ramp metering? (mark all that apply)

___ Unsure
✓ Reduce congestion on the freeway
___ Decrease wait time to enter the freeway
___ Improve safety
___ Reduce vehicle emissions
✓ Increase capacity of the freeway
✓ Relatively low cost
___ Reduce congestion on the local roads

4)) If you were approaching an on-ramp to I-376, and you encountered a queue of vehicles stopped on the on-ramp, would you be willing to wait to enter the freeway?

___ Yes

How long would you be willing to wait?

___ 0-2 minutes

___ 3-5 minutes

___ 6-8 minutes

___ 9-12 minutes

___ 13-15 minutes

___ would need more information

___ No (would find a different route)

___ Would need more information

5) Would you be opposed to the idea of installing ramp meters in Pittsburgh (for example on I-376)?

___ Yes

___ No

___ Would need more information

6) If ramp meters were installed in Pittsburgh (for example on I-376) would you try to find alternate routes to avoid the meters?

___ Yes

___ No

___ Would need more information

7) Which method(s) would be your preferred method for receiving information on ramp metering?

___ Flyer
___ Website
___ Email
___ Automated message by calling a toll-free number
___ Sign at the future location of the ramp meter
___ Open house meeting
✓ Local News
✓ Newspaper article
___ Social Networking site (such as Twitter or Facebook)

8) Which method(s) would you be most likely to pay attention to?

___ Flyer
___ Website
___ Email
___ Automated message by calling a toll-free number
___ Sign at the future location of the ramp meter
___ Open house meeting
✓ Local News
✓ Newspaper article
___ Social Networking site (such as Twitter or Facebook)

9) Before answering the second part of this survey, which informational materials did you review?

___ The "How to Use Ramp Meters" Flyer
✓ The "Frequently Asked Questions" Flyer
___ Website
___ Video
___ Asked questions

(20)

Survey on Ramp Metering and Public Opinion – Part 1

1) Have you heard of the term *ramp metering* before?

___ Yes
X No
___ Unsure

2) A basic definition of ramp metering is using a signal at the end of a freeway on-ramp to control the rate at which the vehicles enter the freeway. Have you ever heard of this concept before?

___ Yes
X No
___ Unsure

IF YOU ANSWERED NO TO QUESTIONS 1 AND 2, YOU DO NOT NEED TO ANSWER THE FOLLOWING QUESTIONS

3) Have you ever experienced a ramp meter?

___ Yes
___ No
___ Unsure

4) If approaching a ramp meter would you feel comfortable in knowing how to proceed?

___ Yes
___ No
___ Unsure

5) What are the benefits of ramp metering? (mark all that apply)

___ Unsure
___ Reduce congestion on the freeway
___ Decrease wait time to enter the freeway
___ Improve safety
___ Reduce vehicle emissions
___ Increase capacity of the freeway
___ Relatively low cost
___ Reduce congestion on the local roads

6) If you were approaching an on-ramp to I-376, and you encountered a queue of vehicles stopped on the on-ramp, would you be willing to wait to enter the freeway?

___ Yes

How long would you be willing to wait?

___ 0-2 minutes
___ 3-5 minutes
___ 6-8 minutes
___ 9-12 minutes
___ 13-15 minutes
___ would need more information

___ No (would find a different route)
___ Would need more information

7) Would you be opposed to the idea of installing ramp meters in Pittsburgh (for example on I-376)?

___ Yes
___ No
___ Would need more information

8) If ramp meters were installed in Pittsburgh (for example on I-376) would you try to find alternate routes to avoid the meters?

___ Yes

___ No

___ Would need more information

PLEASE STOP AND REVIEW THE INFORMATIONAL MATERIAL

Survey on Ramp Metering and Public Opinion – Part 2

1) Before this survey, had you ever heard of ramp metering before?

___ Yes
X No
___ Unsure

2) If approaching a ramp meter would you feel comfortable in knowing how to proceed?

X Yes
___ No
___ Unsure

3) What are the benefits of ramp metering? (mark all that apply)

___ Unsure
X Reduce congestion on the freeway
___ Decrease wait time to enter the freeway
X Improve safety
___ Reduce vehicle emissions
___ Increase capacity of the freeway
___ Relatively low cost
___ Reduce congestion on the local roads

4)) If you were approaching an on-ramp to I-376, and you encountered a queue of vehicles stopped on the on-ramp, would you be willing to wait to enter the freeway?

- [x] Yes

  How long would you be willing to wait?

  - [x] 0-2 minutes
  - [ ] 3-5 minutes
  - [ ] 6-8 minutes
  - [ ] 9-12 minutes
  - [ ] 13-15 minutes
  - [ ] would need more information

- [ ] No (would find a different route)
- [ ] Would need more information

5) Would you be opposed to the idea of installing ramp meters in Pittsburgh (for example on I-376)?

- [x] Yes
- [ ] No
- [ ] Would need more information

6) If ramp meters were installed in Pittsburgh (for example on I-376) would you try to find alternate routes to avoid the meters?

- [ ] Yes
- [x] No
- [ ] Would need more information

7) Which method(s) would be your preferred method for receiving information on ramp metering?

___ Flyer
___ Website
___ Email
___ Automated message by calling a toll-free number
___ Sign at the future location of the ramp meter
___ Open house meeting
X Local News
X Newspaper article
___ Social Networking site (such as Twitter or Facebook)

8) Which method(s) would you be most likely to pay attention to?

___ Flyer
___ Website
___ Email
___ Automated message by calling a toll-free number
___ Sign at the future location of the ramp meter
___ Open house meeting
X Local News
X Newspaper article
___ Social Networking site (such as Twitter or Facebook)

9) Before answering the second part of this survey, which informational materials did you review?

X The "How to Use Ramp Meters" Flyer
___ The "Frequently Asked Questions" Flyer
___ Website
___ Video
___ Asked questions

(21)

Survey on Ramp Metering and Public Opinion – Part 1

1) Have you heard of the term *ramp metering* before?

___ Yes
X No
___ Unsure

2) A basic definition of ramp metering is using a signal at the end of a freeway on-ramp to control the rate at which the vehicles enter the freeway. Have you ever heard of this concept before?

X Yes
___ No
___ Unsure

IF YOU ANSWERED NO TO QUESTIONS 1 AND 2, YOU DO NOT NEED TO ANSWER THE FOLLOWING QUESTIONS

3) Have you ever experienced a ramp meter?

X Yes
___ No
___ Unsure

4) If approaching a ramp meter would you feel comfortable in knowing how to proceed?

X Yes
___ No
___ Unsure

5) What are the benefits of ramp metering? (mark all that apply)

___ Unsure
_X_ Reduce congestion on the freeway
_X_ Decrease wait time to enter the freeway
_X_ Improve safety
_X_ Reduce vehicle emissions
_X_ Increase capacity of the freeway
_X_ Relatively low cost
_X_ Reduce congestion on the local roads

6) If you were approaching an on-ramp to I-376, and you encountered a queue of vehicles stopped on the on-ramp, would you be willing to wait to enter the freeway?

_X_ Yes

How long would you be willing to wait?

_X_ 0-2 minutes
___ 3-5 minutes
___ 6-8 minutes
___ 9-12 minutes
___ 13-15 minutes
___ would need more information

___ No (would find a different route)
___ Would need more information

7) Would you be opposed to the idea of installing ramp meters in Pittsburgh (for example on I-376)?

___ Yes
_X_ No
___ Would need more information

8) If ramp meters were installed in Pittsburgh (for example on I-376) would you try to find alternate routes to avoid the meters?

___ Yes

_X_ No

___ Would need more information

PLEASE STOP AND REVIEW THE INFORMATIONAL MATERIAL

Survey on Ramp Metering and Public Opinion – Part 2

1) Before this survey, had you ever heard of ramp metering before?

___ Yes

X No

___ Unsure

2) If approaching a ramp meter would you feel comfortable in knowing how to proceed?

X Yes

___ No

___ Unsure

3) What are the benefits of ramp metering? (mark all that apply)

___ Unsure

X Reduce congestion on the freeway

X Decrease wait time to enter the freeway

X Improve safety

X Reduce vehicle emissions

X Increase capacity of the freeway

X Relatively low cost

X Reduce congestion on the local roads

4)) If you were approaching an on-ramp to I-376, and you encountered a queue of vehicles stopped on the on-ramp, would you be willing to wait to enter the freeway?

__X__ Yes

How long would you be willing to wait?

__X__ 0-2 minutes

___ 3-5 minutes

___ 6-8 minutes

___ 9-12 minutes

___ 13-15 minutes

___ would need more information

___ No (would find a different route)

___ Would need more information

5) Would you be opposed to the idea of installing ramp meters in Pittsburgh (for example on I-376)?

___ Yes

__X__ No

___ Would need more information

6) If ramp meters were installed in Pittsburgh (for example on I-376) would you try to find alternate routes to avoid the meters?

___ Yes

__X__ No

___ Would need more information

7) Which method(s) would be your preferred method for receiving information on ramp metering?

___ Flyer
_X_ Website
_X_ Email
___ Automated message by calling a toll-free number
___ Sign at the future location of the ramp meter
___ Open house meeting
___ Local News
_X_ Newspaper article
___ Social Networking site (such as Twitter or Facebook)

8) Which method(s) would you be most likely to pay attention to?

___ Flyer
___ Website
_X_ Email
___ Automated message by calling a toll-free number
___ Sign at the future location of the ramp meter
___ Open house meeting
___ Local News
___ Newspaper article
___ Social Networking site (such as Twitter or Facebook)

9) Before answering the second part of this survey, which informational materials did you review?

_X_ The "How to Use Ramp Meters" Flyer
_X_ The "Frequently Asked Questions" Flyer
___ Website
___ Video
___ Asked questions

22

Survey on Ramp Metering and Public Opinion – Part 1

1) Have you heard of the term *ramp metering* before?

___ Yes
✓ No
___ Unsure

2) A basic definition of ramp metering is using a signal at the end of a freeway on-ramp to control the rate at which the vehicles enter the freeway. Have you ever heard of this concept before?

✓ Yes
___ No
___ Unsure

IF YOU ANSWERED NO TO QUESTIONS 1 AND 2, YOU DO NOT NEED TO ANSWER THE FOLLOWING QUESTIONS

3) Have you ever experienced a ramp meter?

✓ Yes
___ No
___ Unsure

4) If approaching a ramp meter would you feel comfortable in knowing how to proceed?

✓ Yes
___ No
___ Unsure

5) What are the benefits of ramp metering? (mark all that apply)

___ Unsure
✓ Reduce congestion on the freeway
✓ Decrease wait time to enter the freeway
✓ Improve safety
___ Reduce vehicle emissions
✓ Increase capacity of the freeway
___ Relatively low cost
___ Reduce congestion on the local roads

6) If you were approaching an on-ramp to I-376, and you encountered a queue of vehicles stopped on the on-ramp, would you be willing to wait to enter the freeway?

✓ Yes

How long would you be willing to wait?

___ 0-2 minutes
___ 3-5 minutes
___ 6-8 minutes
___ 9-12 minutes
___ 13-15 minutes
✓ would need more information

___ No (would find a different route)
___ Would need more information

7) Would you be opposed to the idea of installing ramp meters in Pittsburgh (for example on I-376)?

___ Yes
✓ No
___ Would need more information

8) If ramp meters were installed in Pittsburgh (for example on I-376) would you try to find alternate routes to avoid the meters?

___ Yes

___ No

___✓ Would need more information

PLEASE STOP AND REVIEW THE INFORMATIONAL MATERIAL

Survey on Ramp Metering and Public Opinion – Part 2

1) Before this survey, had you ever heard of ramp metering before?

- ✓ Yes
- ___ No
- ___ Unsure

2) If approaching a ramp meter would you feel comfortable in knowing how to proceed?

- ✓ Yes
- ___ No
- ___ Unsure

3) What are the benefits of ramp metering? (mark all that apply)

- ___ Unsure
- ✓ Reduce congestion on the freeway
- ✓ Decrease wait time to enter the freeway
- ✓ Improve safety
- ✓ Reduce vehicle emissions
- ✓ Increase capacity of the freeway
- ___ Relatively low cost
- ___ Reduce congestion on the local roads

4)) If you were approaching an on-ramp to I-376, and you encountered a queue of vehicles stopped on the on-ramp, would you be willing to wait to enter the freeway?

✓ Yes

How long would you be willing to wait?

___ 0-2 minutes

___ 3-5 minutes

___ 6-8 minutes

___ 9-12 minutes

___ 13-15 minutes

✓ would need more information

___ No (would find a different route)

___ Would need more information

5) Would you be opposed to the idea of installing ramp meters in Pittsburgh (for example on I-376)?

___ Yes

✓ No

___ Would need more information

6) If ramp meters were installed in Pittsburgh (for example on I-376) would you try to find alternate routes to avoid the meters?

___ Yes

___ No

✓ Would need more information

7) Which method(s) would be your preferred method for receiving information on ramp metering?

___ Flyer
✓ Website
___ Email
___ Automated message by calling a toll-free number
✓ Sign at the future location of the ramp meter
___ Open house meeting
✓ Local News
✓ Newspaper article
___ Social Networking site (such as Twitter or Facebook)

8) Which method(s) would you be most likely to pay attention to?

___ Flyer
___ Website
___ Email
___ Automated message by calling a toll-free number
✓ Sign at the future location of the ramp meter
___ Open house meeting
✓ Local News
___ Newspaper article
___ Social Networking site (such as Twitter or Facebook)

9) Before answering the second part of this survey, which informational materials did you review?

✓ The "How to Use Ramp Meters" Flyer
✓ The "Frequently Asked Questions" Flyer
___ Website
___ Video
___ Asked questions

(23)

Survey on Ramp Metering and Public Opinion – Part 1

1) Have you heard of the term *ramp metering* before?

___ Yes
X No
___ Unsure

2) A basic definition of ramp metering is using a signal at the end of a freeway on-ramp to control the rate at which the vehicles enter the freeway. Have you ever heard of this concept before?

___ Yes
___ No
X Unsure

IF YOU ANSWERED NO TO QUESTIONS 1 AND 2, YOU DO NOT NEED TO ANSWER THE FOLLOWING QUESTIONS

3) Have you ever experienced a ramp meter?

___ Yes
___ No
___ Unsure

4) If approaching a ramp meter would you feel comfortable in knowing how to proceed?

___ Yes
___ No
___ Unsure

5) What are the benefits of ramp metering? (mark all that apply)

___ Unsure
___ Reduce congestion on the freeway
___ Decrease wait time to enter the freeway
___ Improve safety
___ Reduce vehicle emissions
___ Increase capacity of the freeway
___ Relatively low cost
___ Reduce congestion on the local roads

6) If you were approaching an on-ramp to I-376, and you encountered a queue of vehicles stopped on the on-ramp, would you be willing to wait to enter the freeway?

___ Yes

How long would you be willing to wait?

___ 0-2 minutes
___ 3-5 minutes
___ 6-8 minutes
___ 9-12 minutes
___ 13-15 minutes
___ would need more information

___ No (would find a different route)
___ Would need more information

7) Would you be opposed to the idea of installing ramp meters in Pittsburgh (for example on I-376)?

___ Yes
___ No
___ Would need more information

8) If ramp meters were installed in Pittsburgh (for example on I-376) would you try to find alternate routes to avoid the meters?

___ Yes

___ No

___ Would need more information

PLEASE STOP AND REVIEW THE INFORMATIONAL MATERIAL

Survey on Ramp Metering and Public Opinion – Part 2

1) Before this survey, had you ever heard of ramp metering before?

___ Yes
X No
___ Unsure

2) If approaching a ramp meter would you feel comfortable in knowing how to proceed?

X Yes
___ No
___ Unsure

3) What are the benefits of ramp metering? (mark all that apply)

___ Unsure
X Reduce congestion on the freeway
___ Decrease wait time to enter the freeway
X Improve safety
___ Reduce vehicle emissions
___ Increase capacity of the freeway
___ Relatively low cost
___ Reduce congestion on the local roads

4)) If you were approaching an on-ramp to I-376, and you encountered a queue of vehicles stopped on the on-ramp, would you be willing to wait to enter the freeway?

X Yes

How long would you be willing to wait?

X 0-2 minutes

___ 3-5 minutes

___ 6-8 minutes

___ 9-12 minutes

___ 13-15 minutes

___ would need more information

___ No (would find a different route)

___ Would need more information

5) Would you be opposed to the idea of installing ramp meters in Pittsburgh (for example on I-376)?

___ Yes

___ No

X Would need more information

6) If ramp meters were installed in Pittsburgh (for example on I-376) would you try to find alternate routes to avoid the meters?

___ Yes

___ No

X Would need more information

7) Which method(s) would be your preferred method for receiving information on ramp metering?

- [X] Flyer
- [X] Website
- [ ] Email
- [ ] Automated message by calling a toll-free number
- [ ] Sign at the future location of the ramp meter
- [ ] Open house meeting
- [ ] Local News
- [ ] Newspaper article
- [ ] Social Networking site (such as Twitter or Facebook)

8) Which method(s) would you be most likely to pay attention to?

- [X] Flyer
- [ ] Website
- [X] Email
- [ ] Automated message by calling a toll-free number
- [ ] Sign at the future location of the ramp meter
- [ ] Open house meeting
- [ ] Local News
- [ ] Newspaper article
- [ ] Social Networking site (such as Twitter or Facebook)

9) Before answering the second part of this survey, which informational materials did you review?

- [X] The "How to Use Ramp Meters" Flyer
- [X] The "Frequently Asked Questions" Flyer
- [ ] Website
- [ ] Video
- [ ] Asked questions

24

Survey on Ramp Metering and Public Opinion – Part 1

1) Have you heard of the term *ramp metering* before?

___ Yes

X No

___ Unsure

2) A basic definition of ramp metering is using a signal at the end of a freeway on-ramp to control the rate at which the vehicles enter the freeway. Have you ever heard of this concept before?

___ Yes

X No

___ Unsure

IF YOU ANSWERED NO TO QUESTIONS 1 AND 2, YOU DO NOT NEED TO ANSWER THE FOLLOWING QUESTIONS

3) Have you ever experienced a ramp meter?

___ Yes

___ No

___ Unsure

4) If approaching a ramp meter would you feel comfortable in knowing how to proceed?

___ Yes

___ No

___ Unsure

5) What are the benefits of ramp metering? (mark all that apply)

- ✓ Unsure
- ___ Reduce congestion on the freeway
- ___ Decrease wait time to enter the freeway
- ___ Improve safety
- ___ Reduce vehicle emissions
- ___ Increase capacity of the freeway
- ___ Relatively low cost
- ___ Reduce congestion on the local roads

6) If you were approaching an on-ramp to I-376, and you encountered a queue of vehicles stopped on the on-ramp, would you be willing to wait to enter the freeway?

- ___ Yes

  How long would you be willing to wait?

  - ___ 0-2 minutes
  - ___ 3-5 minutes
  - ___ 6-8 minutes
  - ___ 9-12 minutes
  - ___ 13-15 minutes
  - ___ would need more information

- ___ No (would find a different route)
- ___ Would need more information

7) Would you be opposed to the idea of installing ramp meters in Pittsburgh (for example on I-376)?

- ___ Yes
- ___ No
- ___ Would need more information

8) If ramp meters were installed in Pittsburgh (for example on I-376) would you try to find alternate routes to avoid the meters?

___ Yes

___ No

___ Would need more information

PLEASE STOP AND REVIEW THE INFORMATIONAL MATERIAL

Survey on Ramp Metering and Public Opinion – Part 2

1) Before this survey, had you ever heard of ramp metering before?

___ Yes
_X_ No
___ Unsure

2) If approaching a ramp meter would you feel comfortable in knowing how to proceed?

_X_ Yes
___ No
___ Unsure

3) What are the benefits of ramp metering? (mark all that apply)

___ Unsure
_X_ Reduce congestion on the freeway
___ Decrease wait time to enter the freeway
___ Improve safety
___ Reduce vehicle emissions
___ Increase capacity of the freeway
___ Relatively low cost
___ Reduce congestion on the local roads

4)) If you were approaching an on-ramp to I-376, and you encountered a queue of vehicles stopped on the on-ramp, would you be willing to wait to enter the freeway?

_X_ Yes

How long would you be willing to wait?

___ 0-2 minutes

___ 3-5 minutes

___ 6-8 minutes

_X_ 9-12 minutes

___ 13-15 minutes

___ would need more information

___ No (would find a different route)

___ Would need more information

5) Would you be opposed to the idea of installing ramp meters in Pittsburgh (for example on I-376)?

___ Yes

_X_ No

___ Would need more information

6) If ramp meters were installed in Pittsburgh (for example on I-376) would you try to find alternate routes to avoid the meters?

___ Yes

_X_ No

___ Would need more information

7) Which method(s) would be your preferred method for receiving information on ramp metering?

___ Flyer
___ Website
___ Email
___ Automated message by calling a toll-free number
___ Sign at the future location of the ramp meter
___ Open house meeting
_X_ Local News
___ Newspaper article
___ Social Networking site (such as Twitter or Facebook)

8) Which method(s) would you be most likely to pay attention to?

___ Flyer
___ Website
___ Email
___ Automated message by calling a toll-free number
___ Sign at the future location of the ramp meter
___ Open house meeting
_X_ Local News
___ Newspaper article
___ Social Networking site (such as Twitter or Facebook)

9) Before answering the second part of this survey, which informational materials did you review?

_X_ The "How to Use Ramp Meters" Flyer
_X_ The "Frequently Asked Questions" Flyer
___ Website
___ Video
___ Asked questions

25

Survey on Ramp Metering and Public Opinion – Part 1

1) Have you heard of the term *ramp metering* before?

___ Yes
✓ No
___ Unsure

2) A basic definition of ramp metering is using a signal at the end of a freeway on-ramp to control the rate at which the vehicles enter the freeway. Have you ever heard of this concept before?

___ Yes
✓ No
___ Unsure

IF YOU ANSWERED NO TO QUESTIONS 1 AND 2, YOU DO NOT NEED TO ANSWER THE FOLLOWING QUESTIONS

3) Have you ever experienced a ramp meter?

___ Yes
___ No
___ Unsure

4) If approaching a ramp meter would you feel comfortable in knowing how to proceed?

___ Yes
___ No
___ Unsure

5) What are the benefits of ramp metering? (mark all that apply)

___ Unsure
___ Reduce congestion on the freeway
___ Decrease wait time to enter the freeway
___ Improve safety
___ Reduce vehicle emissions
___ Increase capacity of the freeway
___ Relatively low cost
___ Reduce congestion on the local roads

6) If you were approaching an on-ramp to I-376, and you encountered a queue of vehicles stopped on the on-ramp, would you be willing to wait to enter the freeway?

___ Yes

How long would you be willing to wait?

___ 0-2 minutes
___ 3-5 minutes
___ 6-8 minutes
___ 9-12 minutes
___ 13-15 minutes
___ would need more information

___ No (would find a different route)
___ Would need more information

7) Would you be opposed to the idea of installing ramp meters in Pittsburgh (for example on I-376)?

___ Yes
___ No
___ Would need more information

8) If ramp meters were installed in Pittsburgh (for example on I-376) would you try to find alternate routes to avoid the meters?

___ Yes

___ No

___ Would need more information

PLEASE STOP AND REVIEW THE INFORMATIONAL MATERIAL

Survey on Ramp Metering and Public Opinion – Part 2

1) Before this survey, had you ever heard of ramp metering before?

___ Yes
_✓_ No
___ Unsure

2) If approaching a ramp meter would you feel comfortable in knowing how to proceed?

_✓_ Yes
___ No
___ Unsure

3) What are the benefits of ramp metering? (mark all that apply)

___ Unsure
_✓_ Reduce congestion on the freeway
___ Decrease wait time to enter the freeway
_✓_ Improve safety
_✓_ Reduce vehicle emissions
_✓_ Increase capacity of the freeway
_✓_ Relatively low cost
_✓_ Reduce congestion on the local roads

4)) If you were approaching an on-ramp to I-376, and you encountered a queue of vehicles stopped on the on-ramp, would you be willing to wait to enter the freeway?

✓ Yes

How long would you be willing to wait?

___ 0-2 minutes
✓ 3-5 minutes
___ 6-8 minutes
___ 9-12 minutes
___ 13-15 minutes
___ would need more information

___ No (would find a different route)
___ Would need more information

5) Would you be opposed to the idea of installing ramp meters in Pittsburgh (for example on I-376)?

___ Yes
✓ No
___ Would need more information

6) If ramp meters were installed in Pittsburgh (for example on I-376) would you try to find alternate routes to avoid the meters?

___ Yes
✓ No
___ Would need more information

7) Which method(s) would be your preferred method for receiving information on ramp metering?

___ Flyer
___ Website
___ Email
___ Automated message by calling a toll-free number
___ Sign at the future location of the ramp meter
___ Open house meeting
✓ Local News
✓ Newspaper article
___ Social Networking site (such as Twitter or Facebook)

8) Which method(s) would you be most likely to pay attention to?

___ Flyer
___ Website
___ Email
___ Automated message by calling a toll-free number
___ Sign at the future location of the ramp meter
___ Open house meeting
✓ Local News
✓ Newspaper article
___ Social Networking site (such as Twitter or Facebook)

9) Before answering the second part of this survey, which informational materials did you review?

✓ The "How to Use Ramp Meters" Flyer
✓ The "Frequently Asked Questions" Flyer
___ Website
___ Video
___ Asked questions

(26)

Survey on Ramp Metering and Public Opinion – Part 1

1) Have you heard of the term *ramp metering* before?

___ Yes
✔ No
___ Unsure

2) A basic definition of ramp metering is using a signal at the end of a freeway on-ramp to control the rate at which the vehicles enter the freeway. Have you ever heard of this concept before?

___ Yes
✔ No
___ Unsure

IF YOU ANSWERED NO TO QUESTIONS 1 AND 2, YOU DO NOT NEED TO ANSWER THE FOLLOWING QUESTIONS

3) Have you ever experienced a ramp meter?

___ Yes
___ No
___ Unsure

4) If approaching a ramp meter would you feel comfortable in knowing how to proceed?

___ Yes
___ No
___ Unsure

5) What are the benefits of ramp metering? (mark all that apply)

___ Unsure
___ Reduce congestion on the freeway
___ Decrease wait time to enter the freeway
___ Improve safety
___ Reduce vehicle emissions
___ Increase capacity of the freeway
___ Relatively low cost
___ Reduce congestion on the local roads

6) If you were approaching an on-ramp to I-376, and you encountered a queue of vehicles stopped on the on-ramp, would you be willing to wait to enter the freeway?

___ Yes

How long would you be willing to wait?

___ 0-2 minutes
___ 3-5 minutes
___ 6-8 minutes
___ 9-12 minutes
___ 13-15 minutes
___ would need more information

___ No (would find a different route)
___ Would need more information

7) Would you be opposed to the idea of installing ramp meters in Pittsburgh (for example on I-376)?

___ Yes
___ No
___ Would need more information

8) If ramp meters were installed in Pittsburgh (for example on I-376) would you try to find alternate routes to avoid the meters?

___ Yes

___ No

___ Would need more information

PLEASE STOP AND REVIEW THE INFORMATIONAL MATERIAL

Survey on Ramp Metering and Public Opinion – Part 2

1) Before this survey, had you ever heard of ramp metering before?

___ Yes
_✓_ No
___ Unsure

2) If approaching a ramp meter would you feel comfortable in knowing how to proceed?

_✓_ Yes
___ No
___ Unsure

3) What are the benefits of ramp metering? (mark all that apply)

___ Unsure
_✓_ Reduce congestion on the freeway
___ Decrease wait time to enter the freeway
_✓_ Improve safety
___ Reduce vehicle emissions
_✓_ Increase capacity of the freeway
___ Relatively low cost
___ Reduce congestion on the local roads

4)) If you were approaching an on-ramp to I-376, and you encountered a queue of vehicles stopped on the on-ramp, would you be willing to wait to enter the freeway?

✓ Yes

How long would you be willing to wait?

___ 0-2 minutes

✓ 3-5 minutes

___ 6-8 minutes

___ 9-12 minutes

___ 13-15 minutes

___ would need more information

___ No (would find a different route)

___ Would need more information

5) Would you be opposed to the idea of installing ramp meters in Pittsburgh (for example on I-376)?

___ Yes

✓ No

___ Would need more information

6) If ramp meters were installed in Pittsburgh (for example on I-376) would you try to find alternate routes to avoid the meters?

___ Yes

✓ No

___ Would need more information

7) Which method(s) would be your preferred method for receiving information on ramp metering?

___ Flyer
__✓ Website
___ Email
___ Automated message by calling a toll-free number
__✓ Sign at the future location of the ramp meter
___ Open house meeting
__✓ Local News
__✓ Newspaper article
___ Social Networking site (such as Twitter or Facebook)

8) Which method(s) would you be most likely to pay attention to?

___ Flyer
___ Website
___ Email
___ Automated message by calling a toll-free number
__✓ Sign at the future location of the ramp meter
___ Open house meeting
__✓ Local News
__✓ Newspaper article
___ Social Networking site (such as Twitter or Facebook)

9) Before answering the second part of this survey, which informational materials did you review?

__✓ The "How to Use Ramp Meters" Flyer
__✓ The "Frequently Asked Questions" Flyer
___ Website
___ Video
___ Asked questions

(27)

Survey on Ramp Metering and Public Opinion – Part 1

1) Have you heard of the term *ramp metering* before?

___ Yes
X No
___ Unsure

2) A basic definition of ramp metering is using a signal at the end of a freeway on-ramp to control the rate at which the vehicles enter the freeway. Have you ever heard of this concept before?

X Yes
___ No
___ Unsure

IF YOU ANSWERED NO TO QUESTIONS 1 AND 2, YOU DO NOT NEED TO ANSWER THE FOLLOWING QUESTIONS

3) Have you ever experienced a ramp meter?

X Yes
___ No
___ Unsure

4) If approaching a ramp meter would you feel comfortable in knowing how to proceed?

X Yes
___ No
___ Unsure

5) What are the benefits of ramp metering? (mark all that apply)

___ Unsure
X Reduce congestion on the freeway
___ Decrease wait time to enter the freeway
X Improve safety
___ Reduce vehicle emissions
___ Increase capacity of the freeway
___ Relatively low cost
___ Reduce congestion on the local roads

6) If you were approaching an on-ramp to I-376, and you encountered a queue of vehicles stopped on the on-ramp, would you be willing to wait to enter the freeway?

X Yes

How long would you be willing to wait?

___ 0-2 minutes
X 3-5 minutes
___ 6-8 minutes
___ 9-12 minutes
___ 13-15 minutes
___ would need more information

___ No (would find a different route)
___ Would need more information

7) Would you be opposed to the idea of installing ramp meters in Pittsburgh (for example on I-376)?

___ Yes
___ No
X Would need more information

8) If ramp meters were installed in Pittsburgh (for example on I-376) would you try to find alternate routes to avoid the meters?

___ Yes

___ No

X Would need more information

PLEASE STOP AND REVIEW THE INFORMATIONAL MATERIAL

Survey on Ramp Metering and Public Opinion – Part 2

1) Before this survey, had you ever heard of ramp metering before?

- X Yes
- ___ No
- ___ Unsure

2) If approaching a ramp meter would you feel comfortable in knowing how to proceed?

- X Yes
- ___ No
- ___ Unsure

3) What are the benefits of ramp metering? (mark all that apply)

- ___ Unsure
- X Reduce congestion on the freeway
- X Decrease wait time to enter the freeway
- X Improve safety
- ___ Reduce vehicle emissions
- ___ Increase capacity of the freeway
- ___ Relatively low cost
- ___ Reduce congestion on the local roads

4)) If you were approaching an on-ramp to I-376, and you encountered a queue of vehicles stopped on the on-ramp, would you be willing to wait to enter the freeway?

_X_ Yes

How long would you be willing to wait?

___ 0-2 minutes

_X_ 3-5 minutes

___ 6-8 minutes

___ 9-12 minutes

___ 13-15 minutes

___ would need more information

___ No (would find a different route)

___ Would need more information

5) Would you be opposed to the idea of installing ramp meters in Pittsburgh (for example on I-376)?

___ Yes

___ No

_X_ Would need more information

6) If ramp meters were installed in Pittsburgh (for example on I-376) would you try to find alternate routes to avoid the meters?

___ Yes

_X_ No

___ Would need more information

7) Which method(s) would be your preferred method for receiving information on ramp metering?

___ Flyer
___ Website
___ Email
___ Automated message by calling a toll-free number
___ Sign at the future location of the ramp meter
___ Open house meeting
X Local News
___ Newspaper article
___ Social Networking site (such as Twitter or Facebook)

8) Which method(s) would you be most likely to pay attention to?

___ Flyer
___ Website
X Email
___ Automated message by calling a toll-free number
___ Sign at the future location of the ramp meter
___ Open house meeting
X Local News
___ Newspaper article
___ Social Networking site (such as Twitter or Facebook)

9) Before answering the second part of this survey, which informational materials did you review?

X The "How to Use Ramp Meters" Flyer
___ The "Frequently Asked Questions" Flyer
___ Website
___ Video
___ Asked questions

28

Survey on Ramp Metering and Public Opinion – Part 1

1) Have you heard of the term *ramp metering* before?

___ Yes
X No
___ Unsure

2) A basic definition of ramp metering is using a signal at the end of a freeway on-ramp to control the rate at which the vehicles enter the freeway. Have you ever heard of this concept before?

___ Yes
X No
___ Unsure

IF YOU ANSWERED NO TO QUESTIONS 1 AND 2, YOU DO NOT NEED TO ANSWER THE FOLLOWING QUESTIONS

3) Have you ever experienced a ramp meter?

___ Yes
___ No
___ Unsure

4) If approaching a ramp meter would you feel comfortable in knowing how to proceed?

___ Yes
___ No
___ Unsure

5) What are the benefits of ramp metering? (mark all that apply)

___ Unsure
___ Reduce congestion on the freeway
___ Decrease wait time to enter the freeway
___ Improve safety
___ Reduce vehicle emissions
___ Increase capacity of the freeway
___ Relatively low cost
___ Reduce congestion on the local roads

6) If you were approaching an on-ramp to I-376, and you encountered a queue of vehicles stopped on the on-ramp, would you be willing to wait to enter the freeway?

___ Yes

How long would you be willing to wait?

___ 0-2 minutes
___ 3-5 minutes
___ 6-8 minutes
___ 9-12 minutes
___ 13-15 minutes
___ would need more information

___ No (would find a different route)
___ Would need more information

7) Would you be opposed to the idea of installing ramp meters in Pittsburgh (for example on I-376)?

___ Yes
___ No
___ Would need more information

8) If ramp meters were installed in Pittsburgh (for example on I-376) would you try to find alternate routes to avoid the meters?

___ Yes

___ No

___ Would need more information

PLEASE STOP AND REVIEW THE INFORMATIONAL MATERIAL

Survey on Ramp Metering and Public Opinion – Part 2

1) Before this survey, had you ever heard of ramp metering before?

___ Yes
_X_ No
___ Unsure

2) If approaching a ramp meter would you feel comfortable in knowing how to proceed?

_X_ Yes
___ No
___ Unsure

3) What are the benefits of ramp metering? (mark all that apply)

___ Unsure
_X_ Reduce congestion on the freeway
___ Decrease wait time to enter the freeway
_X_ Improve safety
___ Reduce vehicle emissions
___ Increase capacity of the freeway
___ Relatively low cost
_X_ Reduce congestion on the local roads

4)) If you were approaching an on-ramp to I-376, and you encountered a queue of vehicles stopped on the on-ramp, would you be willing to wait to enter the freeway?

X Yes

How long would you be willing to wait?

X 0-2 minutes

___ 3-5 minutes

___ 6-8 minutes

___ 9-12 minutes

___ 13-15 minutes

___ would need more information

___ No (would find a different route)

___ Would need more information

5) Would you be opposed to the idea of installing ramp meters in Pittsburgh (for example on I-376)?

___ Yes

X No

___ Would need more information

6) If ramp meters were installed in Pittsburgh (for example on I-376) would you try to find alternate routes to avoid the meters?

___ Yes

X No

___ Would need more information

7) Which method(s) would be your preferred method for receiving information on ramp metering?

___ Flyer
X Website
X Email
___ Automated message by calling a toll-free number
X Sign at the future location of the ramp meter
___ Open house meeting
X Local News
X Newspaper article
___ Social Networking site (such as Twitter or Facebook)

8) Which method(s) would you be most likely to pay attention to?

___ Flyer
___ Website
___ Email
___ Automated message by calling a toll-free number
X Sign at the future location of the ramp meter
___ Open house meeting
X Local News
___ Newspaper article
___ Social Networking site (such as Twitter or Facebook)

9) Before answering the second part of this survey, which informational materials did you review?

___ The "How to Use Ramp Meters" Flyer
___ The "Frequently Asked Questions" Flyer
___ Website
X Video
___ Asked questions

29

Survey on Ramp Metering and Public Opinion – Part 1

1) Have you heard of the term *ramp metering* before?

___ Yes
_✓_ No
___ Unsure

2) A basic definition of ramp metering is using a signal at the end of a freeway on-ramp to control the rate at which the vehicles enter the freeway. Have you ever heard of this concept before?

___ Yes
_✓_ No
___ Unsure

IF YOU ANSWERED NO TO QUESTIONS 1 AND 2, YOU DO NOT NEED TO ANSWER THE FOLLOWING QUESTIONS

3) Have you ever experienced a ramp meter?

___ Yes
___ No
___ Unsure

4) If approaching a ramp meter would you feel comfortable in knowing how to proceed?

___ Yes
___ No
___ Unsure

5) What are the benefits of ramp metering? (mark all that apply)

___ Unsure
___ Reduce congestion on the freeway
___ Decrease wait time to enter the freeway
___ Improve safety
___ Reduce vehicle emissions
___ Increase capacity of the freeway
___ Relatively low cost
___ Reduce congestion on the local roads

6) If you were approaching an on-ramp to I-376, and you encountered a queue of vehicles stopped on the on-ramp, would you be willing to wait to enter the freeway?

___ Yes

How long would you be willing to wait?

___ 0-2 minutes
___ 3-5 minutes
___ 6-8 minutes
___ 9-12 minutes
___ 13-15 minutes
___ would need more information

___ No (would find a different route)
___ Would need more information

7) Would you be opposed to the idea of installing ramp meters in Pittsburgh (for example on I-376)?

___ Yes
___ No
___ Would need more information

8) If ramp meters were installed in Pittsburgh (for example on I-376) would you try to find alternate routes to avoid the meters?

___ Yes

___ No

___ Would need more information

PLEASE STOP AND REVIEW THE INFORMATIONAL MATERIAL

Survey on Ramp Metering and Public Opinion – Part 2

1) Before this survey, had you ever heard of ramp metering before?

___ Yes
_✓_ No
___ Unsure

2) If approaching a ramp meter would you feel comfortable in knowing how to proceed?

_✓_ Yes
___ No
___ Unsure

3) What are the benefits of ramp metering? (mark all that apply)

___ Unsure
_✓_ Reduce congestion on the freeway
___ Decrease wait time to enter the freeway
_✓_ Improve safety
___ Reduce vehicle emissions
___ Increase capacity of the freeway
___ Relatively low cost
___ Reduce congestion on the local roads

4)) If you were approaching an on-ramp to I-376, and you encountered a queue of vehicles stopped on the on-ramp, would you be willing to wait to enter the freeway?

✓ Yes

How long would you be willing to wait?

___ 0-2 minutes

✓ 3-5 minutes

___ 6-8 minutes

___ 9-12 minutes

___ 13-15 minutes

___ would need more information

___ No (would find a different route)

___ Would need more information

5) Would you be opposed to the idea of installing ramp meters in Pittsburgh (for example on I-376)?

___ Yes

✓ No

___ Would need more information

6) If ramp meters were installed in Pittsburgh (for example on I-376) would you try to find alternate routes to avoid the meters?

___ Yes

___ No

✓ Would need more information

7) Which method(s) would be your preferred method for receiving information on ramp metering?

- [x] Flyer
- [ ] Website
- [x] Email
- [ ] Automated message by calling a toll-free number
- [x] Sign at the future location of the ramp meter
- [ ] Open house meeting
- [x] Local News
- [ ] Newspaper article
- [ ] Social Networking site (such as Twitter or Facebook)

8) Which method(s) would you be most likely to pay attention to?

- [x] Flyer
- [ ] Website
- [ ] Email
- [ ] Automated message by calling a toll-free number
- [x] Sign at the future location of the ramp meter
- [ ] Open house meeting
- [x] Local News
- [ ] Newspaper article
- [ ] Social Networking site (such as Twitter or Facebook)

9) Before answering the second part of this survey, which informational materials did you review?

- [x] The "How to Use Ramp Meters" Flyer
- [ ] The "Frequently Asked Questions" Flyer
- [ ] Website
- [x] Video
- [x] Asked questions

30

Survey on Ramp Metering and Public Opinion – Part 1

1) Have you heard of the term *ramp metering* before?

___ Yes
✓ No
___ Unsure

2) A basic definition of ramp metering is using a signal at the end of a freeway on-ramp to control the rate at which the vehicles enter the freeway. Have you ever heard of this concept before?

✓ Yes
___ No
___ Unsure

IF YOU ANSWERED NO TO QUESTIONS 1 AND 2, YOU DO NOT NEED TO ANSWER THE FOLLOWING QUESTIONS

3) Have you ever experienced a ramp meter?

✓ Yes
___ No
___ Unsure

4) If approaching a ramp meter would you feel comfortable in knowing how to proceed?

✓ Yes
___ No
___ Unsure

5) What are the benefits of ramp metering? (mark all that apply)

___ Unsure
___ Reduce congestion on the freeway
✓ Decrease wait time to enter the freeway
✓ Improve safety
___ Reduce vehicle emissions
✓ Increase capacity of the freeway
___ Relatively low cost
___ Reduce congestion on the local roads

6) If you were approaching an on-ramp to I-376, and you encountered a queue of vehicles stopped on the on-ramp, would you be willing to wait to enter the freeway?

✓ Yes

How long would you be willing to wait?

___ 0-2 minutes
✓ 3-5 minutes
___ 6-8 minutes
___ 9-12 minutes
___ 13-15 minutes
___ would need more information

___ No (would find a different route)
___ Would need more information

7) Would you be opposed to the idea of installing ramp meters in Pittsburgh (for example on I-376)?

___ Yes
✓ No
___ Would need more information

8) If ramp meters were installed in Pittsburgh (for example on I-376) would you try to find alternate routes to avoid the meters?

___ Yes

_✓_ No

___ Would need more information

PLEASE STOP AND REVIEW THE INFORMATIONAL MATERIAL

Survey on Ramp Metering and Public Opinion – Part 2

1) Before this survey, had you ever heard of ramp metering before?

___ Yes
✓ No
___ Unsure

2) If approaching a ramp meter would you feel comfortable in knowing how to proceed?

✓ Yes
___ No
___ Unsure

3) What are the benefits of ramp metering? (mark all that apply)

___ Unsure
✓ Reduce congestion on the freeway
✓ Decrease wait time to enter the freeway
✓ Improve safety
___ Reduce vehicle emissions
✓ Increase capacity of the freeway
___ Relatively low cost
___ Reduce congestion on the local roads

4)) If you were approaching an on-ramp to I-376, and you encountered a queue of vehicles stopped on the on-ramp, would you be willing to wait to enter the freeway?

✓ Yes

How long would you be willing to wait?

✓ 0-2 minutes

___ 3-5 minutes

___ 6-8 minutes

___ 9-12 minutes

___ 13-15 minutes

___ would need more information

___ No (would find a different route)

___ Would need more information

5) Would you be opposed to the idea of installing ramp meters in Pittsburgh (for example on I-376)?

___ Yes

✓ No

___ Would need more information

6) If ramp meters were installed in Pittsburgh (for example on I-376) would you try to find alternate routes to avoid the meters?

___ Yes

✓ No

___ Would need more information

7) Which method(s) would be your preferred method for receiving information on ramp metering?

___ Flyer
___ Website
___ Email
___ Automated message by calling a toll-free number
_✓_ Sign at the future location of the ramp meter
___ Open house meeting
___ Local News
___ Newspaper article
___ Social Networking site (such as Twitter or Facebook)

8) Which method(s) would you be most likely to pay attention to?

___ Flyer
___ Website
___ Email
___ Automated message by calling a toll-free number
_✓_ Sign at the future location of the ramp meter
___ Open house meeting
___ Local News
___ Newspaper article
___ Social Networking site (such as Twitter or Facebook)

9) Before answering the second part of this survey, which informational materials did you review?

___ The "How to Use Ramp Meters" Flyer
___ The "Frequently Asked Questions" Flyer
___ Website
_✓_ Video
___ Asked questions

(31)

Survey on Ramp Metering and Public Opinion – Part 1

1) Have you heard of the term *ramp metering* before?

___ Yes
X No
___ Unsure

2) A basic definition of ramp metering is using a signal at the end of a freeway on-ramp to control the rate at which the vehicles enter the freeway. Have you ever heard of this concept before?

___ Yes
X No
___ Unsure

IF YOU ANSWERED NO TO QUESTIONS 1 AND 2, YOU DO NOT NEED TO ANSWER THE FOLLOWING QUESTIONS

3) Have you ever experienced a ramp meter?

___ Yes
___ No
___ Unsure

4) If approaching a ramp meter would you feel comfortable in knowing how to proceed?

___ Yes
___ No
___ Unsure

5) What are the benefits of ramp metering? (mark all that apply)

___ Unsure
___ Reduce congestion on the freeway
___ Decrease wait time to enter the freeway
___ Improve safety
___ Reduce vehicle emissions
___ Increase capacity of the freeway
___ Relatively low cost
___ Reduce congestion on the local roads

6) If you were approaching an on-ramp to I-376, and you encountered a queue of vehicles stopped on the on-ramp, would you be willing to wait to enter the freeway?

___ Yes

How long would you be willing to wait?

___ 0-2 minutes
___ 3-5 minutes
___ 6-8 minutes
___ 9-12 minutes
___ 13-15 minutes
___ would need more information

___ No (would find a different route)
___ Would need more information

7) Would you be opposed to the idea of installing ramp meters in Pittsburgh (for example on I-376)?

___ Yes
___ No
___ Would need more information

8) If ramp meters were installed in Pittsburgh (for example on I-376) would you try to find alternate routes to avoid the meters?

___ Yes

___ No

___ Would need more information

PLEASE STOP AND REVIEW THE INFORMATIONAL MATERIAL

Survey on Ramp Metering and Public Opinion – Part 2

1) Before this survey, had you ever heard of ramp metering before?

___ Yes
_X_ No
___ Unsure

2) If approaching a ramp meter would you feel comfortable in knowing how to proceed?

_X_ Yes
___ No
___ Unsure

3) What are the benefits of ramp metering? (mark all that apply)

___ Unsure
_X_ Reduce congestion on the freeway
_X_ Decrease wait time to enter the freeway
___ Improve safety
___ Reduce vehicle emissions
_X_ Increase capacity of the freeway
___ Relatively low cost
_X_ Reduce congestion on the local roads

4)) If you were approaching an on-ramp to I-376, and you encountered a queue of vehicles stopped on the on-ramp, would you be willing to wait to enter the freeway?

___ Yes

How long would you be willing to wait?

___ 0-2 minutes

___ 3-5 minutes

___ 6-8 minutes

___ 9-12 minutes

___ 13-15 minutes

___ would need more information

X No (would find a different route)

___ Would need more information

5) Would you be opposed to the idea of installing ramp meters in Pittsburgh (for example on I-376)?

___ Yes

X No

___ Would need more information

6) If ramp meters were installed in Pittsburgh (for example on I-376) would you try to find alternate routes to avoid the meters?

___ Yes

X No

___ Would need more information

7) Which method(s) would be your preferred method for receiving information on ramp metering?

- [x] Flyer
- [ ] Website
- [ ] Email
- [ ] Automated message by calling a toll-free number
- [ ] Sign at the future location of the ramp meter
- [ ] Open house meeting
- [ ] Local News
- [ ] Newspaper article
- [ ] Social Networking site (such as Twitter or Facebook)

8) Which method(s) would you be most likely to pay attention to?

- [x] Flyer
- [ ] Website
- [ ] Email
- [ ] Automated message by calling a toll-free number
- [ ] Sign at the future location of the ramp meter
- [ ] Open house meeting
- [ ] Local News
- [ ] Newspaper article
- [ ] Social Networking site (such as Twitter or Facebook)

9) Before answering the second part of this survey, which informational materials did you review?

- [ ] The "How to Use Ramp Meters" Flyer
- [ ] The "Frequently Asked Questions" Flyer
- [ ] Website
- [x] Video
- [ ] Asked questions

C.4 SPREADSHEET OF SUMMARIZED RESPONSES

The results of the test group surveys were manually summarized into an excel spreadsheet. A copy of this spreadsheet is provided in this section.

Questions		Participant 1		Participant 2		Participant 3		Participant 4		Participant 5		Participant 6		Participant 7		Participant 8		Participant 9		Participant 10		Participant 11		Participant 12		Participant 13	
		part 1	part 2	part 1	part 2	part 1	part 2	part 1	part 2	part 1	part 2	part 1	part 2	part 1	part 2	part 1	part 2	part 1	part 2	part 1	part 2	part 1	part 2	part 1	part 2	part 1	part 2
heard of ramp meter?	yes	0	0	1	1	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	no	1	1	0	0	1	1	0	0	1	1	1	1	0	0	1	1	1	1	1	1	1	1	1	1	1	1
	unsure	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
heard of the descriped concept?	yes	0		1		0		0		0		1		1		1		0		0		0		1		0	
	no	1		0		1		0		1		0		0		0		1		1		1		0		1	
	unsure	0		0		0		1		0		0		0		0		0		0		0		0		0	
experienced one?	yes			0								0		1		0								1			
	no			1								1		0		1								0			
	unsure			0								0		0		0								0			
know how to use one?	yes		0	0	1		1		1		1	0	1	1	1	1	1		1		1		1	1	1		0
	no		1	1	0		0		0		0	0	0	0	0	0	0		0		0		0	0	0		0
	unsure		0	0	0		0		0		0	1	0	0	0	0	0		0		0		0	0	0		1
	unsure			0	0		0		1		0	0	0	0	0	0	0		0		0		0	0	0		0
benefits	reduce congestion		1	1	1		1		1		1	1	1	1	1	1	1		1		1		1	1	1		1
	decrease wait time		1	1	1		1		0		0	1	1	0	0	0	0		1		0		1	1	1		1
	improve safety		1	1	1		1		1		1	1	1	1	1	0	1		1		1		1	1	1		1
	reduce emissions		1	0	0		1		0		0	0	0	0	0	0	0		0		0		0	1	1		0
	increase capacity		1	0	0		0		0		0	1	1	0	1	0	0		0		0		1	0	0		0
	low cost		1	1	1		0		0		1	0	0	0	1	0	0		0		0		0	0	0		0
	reduce congestion on local roads		1	1	1		0		0		0	0	1	0	0	0	0		1		0		1	1	1		1
would you wait?	yes		1	0	1		1		1		1	1	1	1	1	1	1		1		1		1	1	1		1
	no		0	1	0		0		0		0	0	0	0	0	0	0		0		0		0	0	0		0
	more info		0	0	0		0		0		0	0	0	0	0	0	0		0		0		0	0	0		0
how long?	0-2 min		0		1		1		1		1	0	1	0	0	1	1		1		1		1	0	0		0
	3-5 min		1		0		0		0		0	1	0	1	1	0	0		0		0		0	1	0		1
	6-8 min		0		0		0		0		0	0	0	0	0	0	0		0		0		0	0	1		0
	9-12 min		0		0		0		0		0	0	0	0	0	0	0		0		0		0	0	0		0
	13-15 min		0		0		0		0		0	0	0	0	0	0	0		0		0		0	0	0		0
	more info		0		0		0		0		0	0	0	0	0	0	0		0		0		0	0	0		0
oposed to meters?	yes		0	0	0		0		0		0	0	0	0	0	0	0		0		0		0	0	0		0
	no		1	1	1		1		0		1	0	1	1	1	1	1		1		1		1	1	1		1
	more info		0	0	0		0		1		0	1	0	0	0	0	0		0		0		0	0	0		0
find alternate routes?	yes		0	0	0		0		0		0	0	0	0	0	0	0		0		0		0	0	0		0
	no		1	1	1		1		1		0	0	1	1	1	1	1		1		1		1	1	1		1
	more info		0	0	0		0		0		1	1	0	0	0	0	0		0		0		0	0	0		0
which is preferred method?	flyer		0		0		0		0		1		0		0		0		1		0		0		0		0
	website		1		0		1		1		0		1		1		1		1		1		1		0		1
	email		1		0		0		1		0		0		1		1		0		1		1		0		0
	automated message		0		0		0		0		0		0		0		0		0		0		0		0		0
	sign		0		0		1		0		0		0		1		0		1		0		1		0		1
	meeting		0		0		0		0		0		0		0		0		1		1		0		0		0
which would you pay attention to?	news		1		1		1		1		0		1		1		0		1		1		1		1		1
	newspaper		1		0		0		0		1		1		1		0		1		0		0		1		1
	social networking		1		1		0		0		0		0		1		0		0		0		0		0		0
	flyer		0		0		0		0		0		0		0		0		0		0		0		0		0
	website		1		0		1		1		0		1		1		0		0		1		0		0		0
	email		1		0		0		1		0		0		1		1		0		1		1		0		0
	automated message		0		0		0		0		0		0		0		0		0		0		0		0		0
	sign		0		0		1		0		0		0		1		0		1		0		1		0		1
	meeting		0		0		0		0		0		0		0		0		0		0		0		0		0
	news		1		1		1		1		1		1		1		0		0		1		1		1		1
	newspaper		0		0		0		0		0		0		0		0		0		0		0		1		1
	social networking		0		0		0		0		0		0		1		0		0		0		0		0		0
which info material did you review?	how to use ramp meters flver		0		1		0		0		1		0		0		0		1		0		1		0		0
	FAQ flyer		0		0		0		0		0		0		0		0		1		0		0		0		0
	website		0		0		1		1		0		1		0		0		0		0		0		1		0
	video		1		1		1		1		1		1		1		1		0		1		0		1		1
	asked questions		0		1		1		1		0		0		0		0		0		0		0		0		0

Questions		Participant 14		Participant 15		Participant 16		Participant 17		Participant 18		Participant 19		Participant 20		Participant 21		Participant 22		Participant 23		Participant 24		Participant 25		Participant 26	
		part 1	part 2	part 1	part 2	part 1	part 2	part 1	part 2	part 1	part 2	part 1	part 2	part 1	part 2	part 1	part 2	part 1	part 2	part 1	part 2	part 1	part 2	part 1	part 2	part 1	part 2
heard of ramp meter?	yes	0	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	no	0	0	1	1	0	0	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1
	unsure	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
heard of the descriped concept?	yes	1		1		1		0		1		0		0		1		1		0		0		0		0	
	no	0		0		0		1		0		1		1		0		0		0		1		1		1	
	unsure	0		0		0		0		0		0		0		0		0		1		0		0		0	
experienced one?	yes	0		1		1				1						1		1									
	no	0		0		0				0						0		0									
	unsure	1		0		0				0						0		0									
know how to use one?	yes	0	1	1	1	0	1		1	1	1		1		1	1	1	1	1		1		1		1		1
	no	0	0	0	0	1	0		0	0	0		0		0	0	0	0	0		0		0		0		0
	unsure	1	0	0	0	0	0		0	0	0		0		0	0	0	0	0		0		0		0		0
	unsure	0	0	0	0	0	0		0	0	0		0		0	0	0	0	0		0		0		0		0
benefits	reduce congestion	0	1	1	1	1	1		0	1	1		1		1	1	1	1	1		1		1		1		1
	decrease wait time	1	1	0	0	1	1		1	1	1		0		0	1	1	1	1		0		0		0		0
	improve safety	1	1	0	0	0	1		1	1	1		0		1	1	1	1	1		1		0		1		1
	reduce emissions	0	0	0	0	0	0		0	0	0		0		0	1	1	0	1		0		0		1		0
	increase capacity	0	0	1	0	1	1		0	0	0		1		0	1	1	1	1		0		0		1		1
	low cost	0	0	0	0	0	1		0	0	0		1		0	1	1	0	0		0		0		1		0
	reduce congestion on local roads	0	0	0	0	0	0		0	0	0		0		0	1	1	0	0		0		0		1		0
would you wait?	yes	1	1	0	0	1	1		1	1	1		0		1	1	1	1	1		1		1		1		1
	no	0	0	0	0	0	0		0	0	0		0		0	0	0	0	0		0		0		0		0
	more info	0	0	1	1	0	0		0	0	0		1		0	0	0	0	0		0		0		0		0
how long?	0-2 min	0	1	0	0	1	1		1	1	1		0		1	1	1	0	0		1		0		0		0
	3-5 min	1	0	0	0	0	0		0	0	0		0		0	0	0	0	0		0		0		1		1
	6-8 min	0	0	0	0	0	0		0	0	0		0		0	0	0	0	0		0		0		0		0
	9-12 min	0	0	0	0	0	0		0	0	0		0		0	0	0	0	0		0		1		0		0
	13-15 min	0	0	0	0	0	0		0	0	0		0		0	0	0	0	0		0		0		0		0
	more info	0	0	0	0	0	0		0	0	0		0		0	0	0	1	1		0		0		0		0
oposed to meters?	yes	0	0	1	1	0	0		1	0	1		0		1	0	0	0	0		0		0		0		0
	no	1	1	0	0	0	1		0	0	0		0		0	1	1	1	1		0		1		1		1
	more info	0	0	0	0	1	0		0	1	0		1		0	0	0	0	0		1		0		0		0
find alternate routes?	yes	0	0	0	0	0	0		0	0	0		0		0	0	0	0	0		0		0		0		0
	no	0	1	1	1	1	1		1	1	1		0		1	1	1	0	0		0		1		1		1
	more info	1	0	0	0	0	0		0	0	0		1		0	0	0	1	1		1		0		0		0
which is preferred method?	flyer		0		0		0		1		0		0		0		0		0		1		0		0		0
	website		1		0		1		1		1		0		0		1		1		1		0		0		1
	email		1		0		1		1		1		0		0		1		0		0		0		0		0
	automated message		0		0		0		0		0		0		0		0		0		0		0		0		0
	sign		1		0		1		0		1		0		0		0		1		0		0		0		1
	meeting		0		0		0		0		0		0		0		0		0		0		0		0		0
	news		0		1		1		1		0		1		1		0		1		0		1		1		1
	newspaper		0		0		0		1		1		1		1		1		1		0		0		1		1
	social networking		0		0		0		0		0		0		0		0		0		0		0		0		0
which would you pay attention to?	flyer		0		0		0		1		0		0		0		0		0		1		0		0		0
	website		0		0		1		1		1		0		0		0		0		0		0		0		0
	email		1		0		0		1		1		0		0		1		0		1		0		0		0
	automated message		0		0		0		0		0		0		0		0		0		0		0		0		0
	sign		1		0		1		0		0		0		0		0		1		0		0		0		1
	meeting		0		0		0		0		0		0		0		0		0		0		0		0		0
	news		0		1		1		1		0		1		1		0		1		0		1		1		1
	newspaper		0		0		0		1		1		1		1		0		0		0		0		1		1
	social networking		0		0		0		0		0		0		0		0		0		0		0		0		0
which info material did you review?	how to use ramp meters flver		1		1		1		1		1		0		1		1		1		1		1		1		1
	FAQ flyer		1		0		0		1		0		1		0		1		1		1		1		1		1
	website		0		0		0		0		0		0		0		0		0		0		0		0		0
	video		1		0		0		0		0		0		0		0		0		0		0		0		0
	asked questions		1		0		0		0		0		0		0		0		0		0		0		0		0

Questions		Participant 27		Participant 28		Participant 29		Participant 30		Participant 31	
		part 1	part 2	part 1	part 2	part 1	part 2	part 1	part 2	part 1	part 2
heard of ramp meter?	yes	0	1	0	0	0	0	0	0	0	0
	no	1	0	1	1	1	1	1	1	1	1
	unsure	0	0	0	0	0	0	0	0	0	0
heard of the descriped concept?	yes	1		0		0		1		0	
	no	0		1		1		0		1	
	unsure	0		0		0		0		0	
experienced one?	yes	1						1			
	no	0						0			
	unsure	0						0			
know how to use one?	yes	1	1		1		1	1	1		1
	no	0	0		0		0	0	0		0
	unsure	0	0		0		0	0	0		0
benefits	unsure	0	0		0		0	0	0		0
	reduce congestion	1	1		1		1	0	1		1
	decrease wait time	0	1		0		0	1	1		1
	improve safety	1	1		1		1	1	1		0
	reduce emissions	0	0		0		0	0	0		0
	increase capacity	0	0		0		0	1	1		1
	low cost	0	0		0		0	0	0		0
	reduce congestion on local roads	0	0		1		0	0	0		1
would you wait?	yes	1	1		1		1	1	1		0
	no	0	0		0		0	0	0		1
	more info	0	0		0		0	0	0		0
how long?	0-2 min	0	0		1		0	0	1		0
	3-5 min	1	1		0		1	1	0		0
	6-8 min	0	0		0		0	0	0		0
	9-12 min	0	0		0		0	0	0		0
	13-15 min	0	0		0		0	0	0		0
	more info	0	0		0		0	0	0		0
oposed to meters?	yes	0	0		0		0	0	0		0
	no	0	0		1		1	1	1		1
	more info	1	1		0		0	0	0		0
find alternate routes?	yes	0	0		0		0	0	0		0
	no	0	1		1		0	1	1		1
	more info	1	0		0		1	0	0		0
which is preferred method?	flyer		0		0		1		0		1
	website		0		1		0		0		0
	email		0		1		1		0		0
	automated message		0		0		0		0		0
	sign		0		1		1		1		0
	meeting		0		0		0		0		0
	news		1		1		1		0		0
	newspaper		0		1		0		0		0
	social networking		0		0		0		0		0
which would you pay attention to?	flyer		0		0		1		0		0
	website		0		0		0		0		1
	email		1		0		0		0		0
	automated message		0		0		0		0		0
	sign		0		1		1		1		0
	meeting		0		0		0		0		0
	news		1		1		1		0		0
	newspaper		0		0		0		0		0
	social networking		0		0		0		0		0
which info material did you review?	how to use ramp meters flver		1		0		1		0		0
	FAQ flyer		0		0		0		0		0
	website		0		0		0		0		0
	video		0		1		1		1		1
	asked questions		0		0		1		0		0

C.5 CHART DATA

The data used for each figure was taken directly from the summary sheets. The specific data used to create the figures pertaining to the test group surveys is presented in this section.

Figure 9 Data

Background Questions for Test Group Survey Part 1	% That Ansered Yes
Have never heard of the term "ramp metering"	84%
After hearing a description, still not sure what ramp metering is	58%
Have never (or are unsure if have) experienced a ramp meter	71%
Would not feel completely comfortable in knowing how to use a ramp meter	71%

Figure 10 Data

Information Dissemination Methods	% Chosen as Preferred Method	% Chosen as Method Likely to Pay Attention To
flyer/handout	19%	10%
website	61%	32%
email	42%	39%
automated message	0%	0%
sign	42%	39%
open house meeting	6%	0%
local news	74%	74%
newspaper	52%	26%
social networking site	10%	3%

Figure 11 Data

Informational Material Provided During Survey	% that used this material
how to use ramp meters flyer	58%
FAQ flyer	32%
website	13%
video	52%
asked questions	16%

Figure 12 Data

Choices Provided for the Benefits of Ramp Metering	% Chosen in Part 1	% Chosen in Part 2
Correctly identified "reduce congestion on the freeway" as a benefit of ramp metering	85%	100%
Correctly identified "improve safety" as a denefit of ramp metering	77%	92%
Correctly identified "reduce vehicle emissions" as a benefit of ramp metering	15%	23%
Correctly identified "increase capacity of the freeway" as a benefit of ramp metering	46%	46%
Correctly Identified "relatively low cost" as a benefit of ramp metering	15%	31%
Incorrectly identified "decrease wait time to enter the freeway" as a benefit of ramp metering	69%	77%
Incorrectly identified "reduce congestion on the local roads" as a benefit of ramp metering	23%	31%

Figure 13 Data

Choices Provided for the Benefits of Ramp Metering	% Chosen in Part 2 by Particpants Who Had Never Heard of Ramp Metering
Correctly identified "reduce congestion on the freeway" as a benefit of ramp metering	94%
Correctly identified "improve safety" as a denefit of ramp metering	83%
Correctly identified "reduce vehicle emissions" as a benefit of ramp metering	17%
Correctly identified "increase capacity of the freeway" as a benefit of ramp metering	33%
Correctly Identified "relatively low cost" as a benefit of ramp metering	22%
Incorrectly identified "decrease wait time to enter the freeway" as a benefit of ramp metering	39%
Incorrectly identified "reduce congestion on the local roads" as a benefit of ramp metering	39%

Figure 14 Data

Questions That Were the Same in Part 1 and Part 2	% Answered Yes in Part 1	% Answered Yes in Part 2
Would feel comfortable in knowing how to use a ramp meter	29%	94%
Would be willing to wait at a ramp meter	85%	90%
Would be willing to wait for 0-2 min	33%	58%
Would be willing to wait for 3-5 min	50%	23%
Would be willing to wait for 6-8 min	0%	3%
Would be willing to wait for 9-12 min	0%	3%
Would be willing to wait for 13-15 min	0%	0%
Would need more info in determining how long would wait	8%	3%
Would not be opposed to installing ramp meters in Pittsburgh	62%	74%
Would need more info in deciding if for or against ramp meters	31%	13%
Would not try to find alternate routes	69%	84%
Would need more info in determining if would find alt. routes	31%	16%

Figure 15 Data

Time Participant Willing to Wait at a Ramp Meter, Changes from Part 1 to Part 2	% of Participants
time willing to wait stayed the same	62%
time willing to wait increased	15%
time willing to wait decreased	23%

BIBLIOGRAPHY

Belmonte, Louis and Blaum, Eugene. Personal Communication. April 16, 2010.

Demidovich, Mark. Personal Communication. December 8, 2008.

Federal Highway Administration (FHWA). (2006). *Ramp Management and Control Handbook* (Publication No. FHWA-HOP-06-001). Washington, DC: Office of Transportation Management.

FHWA. (2005). *Work Zone Public Information and Outreach Strategies* (Publication No. FHWA-HOP-05-067). Washington, DC: Office of Operations.

ITS Engineers and Constructors, Inc. (2003). *Ramp Meter Design, Operations, and Maintenance Guidelines* (Arizona Department of Transportation Contract No. T0159I0123). Phoenix, Arizona: Transportation Technology Group.

Kittelson & Associates, Inc. (2007). *A Synthesis of Ramp Metering Practices* (Project No. 7673.00). Portland, Oregon.

Quesnell, Chris. Personal Communication. January 2009.

Struzzi, James. Personal Communication. March 8, 2010.

Wisconsin Department of Transportation (WisDOT). (2009). *Motorists' Handbook* (WisDOT Publication No. BDS 126). Madison, Wisconsin: Department of Transportation.