EVALUATION OF PORTABLE CHANGEABLE MESSAGE SIGNS AT GOLDEN GATE NATIONAL RECREATION AREA

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EXECUTIVE SUMMARY

1. INTRODUCTION

Golden Gate National Recreation Area (GGNRA) is one of the largest urban parks in the world, and is one of the most popular sites within the national park system. This park encompasses approximately 75,400 acres of land and water and contains more than 28 miles of coastline within its boundaries.

Due to a high number of visitors, GGNRA wanted to improve traveler safety and decision-making for motorists visiting Stinson Beach and Muir Woods, both park sites in southwest Marin County. To accomplish this, GGNRA and the California Department of Transportation (Caltrans) agreed to place portable changeable message signs (PCMS) north and south, one in each direction, of the US Route 101 and State Route 1 interchange; therefore, motorists traveling both northbound and southbound on US Route 101 would have the benefit of these signs. GGNRA and Caltrans intend for these signs to broadcast messages about real-time parking and congestion information to motorists during the parks' congested periods from April through September.

There are not many examples of state transportation agencies and national parks that have partnered to address transportation challenges, and few state transportation agencies have targeted investments specifically toward a national park's transportation challenges. It is even rarer for the investment to include a technology component such as PCMS. Therefore, it is important to evaluate the results of this trial deployment, to see whether it was successful and what lessons could be applied to other transportation improvements that may influence park lands.

This report summarizes the results of this evaluation. Chapter 2 provides additional background on this research project. Chapter 3 summarizes the evaluation methodology which was employed. Chapters 4 through 7 describe the evaluation results according to various metrics, including visitor surveys, analyses of travel patterns, a review of operations and maintenance history, and surveys of involved stakeholders. Chapter 8 summarizes the findings of this evaluation and offers some conclusions and recommendations.

2. BACKGROUND

2.1. Project Description

California's national parks preserve important natural, cultural, historic and recreational resources for the enjoyment and benefit of California's residents along with millions of visitors every year. In addition to contributing to the quality of life, the parks are an important economic engine for the state and many of its communities. As visitation at park sites increases, there is growing concern that transportation of visitors to, from and within parks may affect the quality of the visitor experience, and even in some cases, the resources which visitors hope to enjoy.

Traditional infrastructure improvements to address these challenges are often neither desirable nor feasible in this context. One newer approach that is being considered is the use of intelligent transportation systems (ITS). ITS employs advanced computer, electronics and communications technologies to make the existing transportation system work more efficiently and safely. ITS has been successfully deployed in many urban areas and some rural areas. While the use of ITS in national parks has been more limited, there may be potential to address particular challenges in a less intrusive way than more traditional improvements.

Therefore, the California Department of Transportation (Caltrans) Division of Research and Innovation (DRI) funded a research study to examine how ITS could be used to address mutual park and district transportation challenges. Phase 1 of this effort assessed the transportation needs and ITS solutions for the state's national parks by focusing on two demonstration parks, Golden Gate National Recreation Area and Sequoia and Kings Canyon National Parks. Caltrans DRI funded a second phase of this project that includes, among other deliverables, the demonstrations of early-winner projects in each park.

2.2. Golden Gate National Recreation Area

The Golden Gate National Recreation Area (GGNRA) is one of the largest urban parks in the world, and one of the most popular within the national system with over 15 million visitors annually. This park is nearly two and a half times the size of San Francisco and contains more than 28 miles of coastline within its boundaries. Encompassing approximately 75,400 acres of land and water, popular park activities include ranger talks, hiking, biking, visiting historic military facilities, horseback riding, going to the beach, and engaging in ocean sports.

The complex compilation of the Golden Gate National Recreation Area is located on two peninsulas between the Pacific Ocean and the San Francisco Bay in western California, and anchors both sides of the Golden Gate Bridge, as shown in Figure 2-1. GGNRA spans both north and south of San Francisco and lies in San Francisco, Marin, and San Mateo Counties.

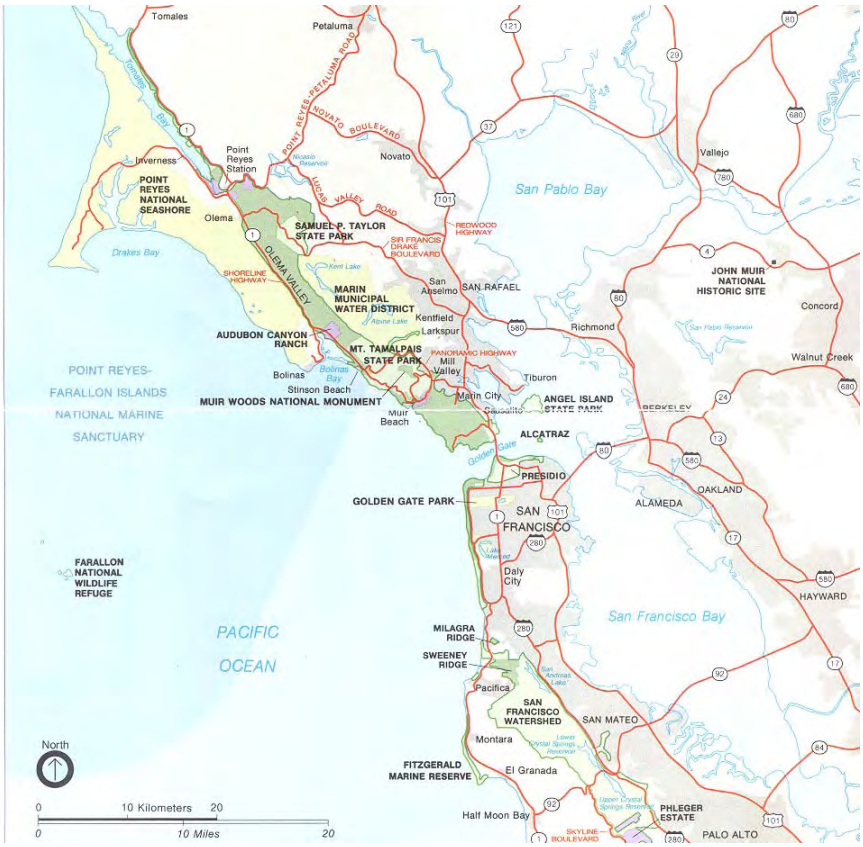


Figure 2-1: Area Map of Golden Gate National Recreation Area

(Source: National Park Service)

Most areas within the park are no more than an hour drive from San Francisco and it encompasses much of the available open space in the area; therefore, GGNRA is a popular destination for Bay Area residents. Results from surveys conducted in 2000 and 2001 to support the development of the Transportation Management Plan for the Marin Headlands and Fort Baker and the Southwest Marin Comprehensive Transportation Management Plan indicate that more than two-thirds of all visitors to the Marin areas of GGNRA are from the Bay Area (1).

Muir Woods National Monument, located in Marin County, is a separate national park unit but is managed jointly with GGNRA. Muir Woods protects old growth coastal redwood groves and provides numerous hiking opportunities, which connect with other public lands in the area. While visitation at GGNRA remains fairly constant throughout the year, the visitation at Muir Woods National Monument tends to peak in the summer months and shoulder weekends. Muir Woods visitors are more likely to be from outside of the Bay Area.

Due to GGNRA's proximity to San Francisco and other urban areas, there are several transit agencies that provide service from metropolitan areas to the southern lands of GGNRA, including the San Francisco Municipal Railway (MUNI) and the Golden Gate Bridge Highway and Transportation District (GGBHTD). According to the Marin Headland and Fort Baker

Transportation and Management plan surveys, 88 percent of all visitors entered Marin Headlands/Fort Baker areas in an automobile. Of the remaining entering visitors, 5 percent arrived by bicycle, 4 percent by public transit, and 3 percent by other means. Of those visitors surveyed, 70 percent said that they would try some alternative form of transportation other than driving if cars were prohibited. Forty-two percent of visitors would consider renting a bicycle at a transit station adjacent to the park. Nineteen percent of the visitors encountered problems getting to the park, or getting around inside, and poor signage was the most noted problem (1).

During Phase 1 of this research project, the research team reviewed park management plans and other regional studies, and conducted outreach meetings to local stakeholders to identify transportation challenges experienced by GGNRA. These are summarized in Table 2-1. Phase 1 also identified ITS themes, or aggregations of market packages from the National ITS Architecture that could be used to address park transportation challenges.

Table 2-1: List of Transportation Challenges at GGNRA

Challenge	Description
Roadway Congestion	Roadway congestion affects access during high visitation times at many locations throughout the recreation area, including US Route 101, State Route 1 Corridor, Conzelman Road, Rodeo Beach, the Marin Headlands, Vista Point, the south end of Golden Gate Bridge, 19th Avenue/Park Presidio Boulevard, Stinson Beach, Crissy Field/Bay Street, Fort Baker and Muir Woods. Sausalito has expressed concern about the potential traffic impacts when Fort Baker is redeveloped by National Park Service and generates additional traffic as a destination.
Inadequate Access	There is a desire to improve access to various park sites, including Crissy Field and the Presidio, in addition to neighborhoods, museums and other local attractions where automobile access is limited. This problem includes insufficient transit, and amenities and facilities for pedestrians and bicyclists to access and use park facilities.
Limited Parking	Overflow visitor parking is a challenge at several GGNRA locations, including Muir Woods, Stinson Beach, Conzelman Road, Rodeo Beach, Vista Point, Fort Mason and Fort Baker. At Muir Woods, for example, parking may back up one mile from the park entrance onto adjacent two-lane roadways which are not designed to support on-street parking. There is a lack of real-time information regarding parking availability and advance information about when crowded conditions might be expected. There is also concern about employee parking as the Presidio continues to be developed.
Transit Coordination and Information	The dispersed lands associated with GGNRA may make it difficult for a visitor to access park lands without an automobile. The variety of transit services in the Bay Area, plus the numerous other cultural, educational and recreational attractions in the area, provide an opportunity for coordinating transit service to improve the level of service and access to GGNRA lands. There is a need to inform travelers of available transit options, their schedules, and their estimated arrival times.
Lack of Planning Data	There is a need for improved data regarding visitation patterns in order to improve transportation planning for park lands and adjacent communities and neighborhoods. There is also a lack of data regarding visitor travel by non-motorized means.
Traveler Information	There is a need to provide tourists with information about parking, congestion, transit availability and weather prior to their visit, along with improved information about activities within the park and in surrounding areas. This traveler information needs to reach people in systems they will use and at locations that enable them to make appropriate decisions.
Work Zone/Event Coordination	There is need for better coordination between agencies on work zones and construction, and providing information on actual versus planned lane closures. There are also special events that impact traffic levels on roadways providing access to park sites. In some cases, estimated traffic impacts of events are not distributed to all affected agencies.
Emergency Response	With the Golden Gate Bridge frequently cited as a terrorist target, the park must be sensitive to evacuation and emergency response needs on its lands. There will be a need to ensure rapid coordination and dispatch of appropriate resources to respond to large-scale emergencies, and to provide visitors and others with appropriate information to allow them to alter their travel behavior and visitation activities as needed.

2.3. Early-Winner Project

In order to advance ITS in national parks, part of Phase 2 of the Caltrans research project sought to identify, deploy and evaluate early-winner projects at each park. Early-winner projects are established at a scale to promote rapid deployment and an early awareness of benefits among park and agency stakeholders and park visitors.

2.3.1. Selection

After completion of Phase 1 of the Caltrans DRI project, the research team reviewed the transportation needs that were identified and the ITS themes that were developed for GGNRA. With this as background and in light of available funding, the research team proposed several projects as candidate early-winner projects:

- Shared Use Portable Changeable Message Signs (PCMS) at US Route 101 and State Route 1 Interchange
- Park-wide Radio System
- Muir Woods/Stinson Beach Cameras
- NextBus™/AVL for MUNI and GGT
- Reservation System for Parking at Muir Woods and Stinson Beach
- Park Information Database and Integration with 511
- Event Management at Fort Mason and Crissy Field
- Pedestrian/Bicycle Trail Plan for GGNRA

These projects are described in more detail in a previous report (2). A teleconference was held involving GGNRA, Caltrans, Federal Highway Administration Central Federal Lands Highway Division, and MUNI to discuss various alternatives and determine which would be appropriate. The consensus which emerged was to pursue implementation of PCMS.

2.3.2. Implementation

The PCMS were proposed to be located on Caltrans right-of-way on US Route 101, several miles away from park sites and near the interchange with State Route 1, since this was a logical decision point for motorists headed to Muir Woods and Stinson Beach. It was recognized that there would need to be a memorandum of understanding (MOU) between Caltrans and GGNRA regarding the PCMS, to address issues related to location, posting and removal of messages, storage and transport. An MOU was developed over the course of several months, and is provided as Appendix A. As part of the MOU, Caltrans and GGNRA worked together to develop message sets which would be suitable for park needs and consistent with Caltrans sign usage standards. The agreed upon messages are provided as Appendix B. An encroachment permit, allowing location of the PCMS on Caltrans right-of-way, also had to be filed; see Appendix C.

As stipulated in the scope of work, the research team was responsible for developing specifications, issuing an invitation to bid, ordering the equipment, and making arrangements between the vendor and stakeholders for delivery, installation and training. The invitation for bid document, which includes the PCMS specifications, is provided as Appendix D. The total cost of the two PCMS, including delivery and a five-year warranty, was $58,000.

3. METHODOLOGY

The purpose of the early-winner project was to provide a demonstration that ITS could achieve measurable success toward addressing some of the park's transportation challenges. If such success is demonstrated, the early-winner project not only provides a foundation for future ITS investment, but also serves as an effective marketing piece for the potential of ITS to address transportation needs.

This chapter presents the methodology that was used to evaluate the effectiveness of the PCMS. A multi-objective approach was used, combining data on how much the signs were used, and their effectiveness as measured through qualitative and quantitative means.

3.1. Visitor Survey

The purpose of the visitor survey was to determine whether visitors had seen the PCMS, and how they responded to any information that was presented on the signs.

3.1.1. Survey Design

The survey questionnaire was prepared for on-site administration at the parking areas in front of the Muir Woods National Monument and Stinson Beach entrance stations. The survey asked questions related to:

- How often respondents visit a particular site
- Their perceptions of congestion
- Whether they noticed the signs, and if so, what was their opinion of the signs' performance
- What types of information would be helpful to be placed on the signs
- How the signs affected their trip

Demographic questions related to area of residence, number of people in the group, time of stay at the park, and others were asked to help classify and interpret responses. The survey form is included as Appendix E.

3.1.2. Survey Distribution

The survey questionnaire was prepared for on-site administration at the parking areas in front of the Muir Woods National Monument and Stinson Beach entrance stations. The respondent universe included all adult (18 and older) park users at each site, including both respondents who saw the PCMS and who did not.

Research team personnel randomly approached every third visitor at Stinson Beach and every tenth at Muir Woods as they entered the park, and asked them to be part of a voluntary and confidential survey about their trip to the park. Only one respondent per family group was to be surveyed. Assuming a 70 percent response rate, this distribution scheme was to result in approximately 700 completed surveys for each site. For parties that refused to respond, surveyors recorded on a log sheet acceptance or refusal and observational characteristics, including the size

of the party, language issues, and the presence of children. This data could then be used to compare respondents with non-respondents to check for non-response bias, as well as determine the validity and reliability of the sample drawn. If they decided to fill out the survey, they would turn it in at a lock box located at each entrance station.

Surveyors were located at each site between 9 AM and 7 PM on the weekend of September 15-18, 2005. Because the survey was administered on national park lands, the survey form and administration methodology were approved by the National Park Service and the Office of Management and Budget.

3.1.3. Statistics

Descriptive statistics, including frequencies, percentages, means and standard deviations, were calculated for the survey responses. These are shown in Appendix F. With the exception of questions 2 and 3 which dealt with their experience in visiting specific park sites, responses from the two sites were combined. Rated response questions (e.g. Questions 3, 11, 12 and 13) were analyzed by assigning a numerical value to each option with 5 representing the most positive answer and 1 representing the most negative answer. Percentages were based on the total responses for each question and not on the survey total, because some respondents did not answer every question. Some questions had invalid answers that were omitted and included in the "no answer" count. This occurred if more than one option was selected for a question requiring only one answer. In this case, all of the answers to that particular question for that individual were omitted. This was done to avoid biasing results by randomly choosing one of the answers to be included. Failure to comply with written instructions for a question also resulted in the response for that question being omitted.

Subsequent analysis using two-way tables, as shown in Appendix G, was conducted to identify any correlation between variables, such as between demographic characteristics and survey question answers. This information may be valuable not only for better understanding survey responses, but for extrapolating recommendations for improving information for visitors accessing park sites.

3.2. Operations and Maintenance

The basic level of determining success for PCMS implementation will be whether the PCMS are actually used to convey real-time information to visitors approaching the park from US Route 101. This occurs when several functions are successfully performed, including the sign's display and communication systems, allocation of staff resources to post and remove messages, and agreed upon message sets. This part of the evaluation covers a review of all of these functions.

Because the research team had essentially no day-to-day involvement with the signs, information on operations and maintenance experience was gathered through an internal stakeholder survey, and a log of sign usage.

3.2.1. Internal Stakeholder Survey

To gather information on their experiences with the PCMS, stakeholders were asked to fill out questionnaires before and after PCMS deployment. The pre-PCMS survey was a brief instrument covering perceptions of transportation challenges in and around GGNRA, and anticipated effects of the PCMS. The post-PCMS survey included more in-depth questions about experience with the PCMS, and included questions on PCMS effectiveness, operations and maintenance, storage and transport, and message requests. See Appendix H and Appendix J for the pre-PCMS and post-PCMS survey forms, respectively.

Surveys were sent to a total of 31 professionals, including 15 from Golden Gate National Recreation Area, seven from Caltrans District 4, five from Marin County, one from the Marin County Sheriff, and three from California State Parks. Although pre-PCMS and post-PCMS surveys were sent to the same group of people, there was a slightly higher response for the pre-survey (35 percent, compared to 26 percent).

Descriptive statistics were calculated on the survey results; these are provided in Appendix I and Appendix K, respectively. Percentages were based on the total responses for each question and not on the survey total, because respondents sometimes did not answer every question.

3.2.2. Sign Usage

Because the signs are located on Caltrans right-of-way, PCMS messages were developed according to Caltrans District 4 guidelines and were pre-approved by Caltrans District 4 personnel. The pre-approved messages are included as Appendix B. The U.S. Park Police Dispatch Center in the Presidio kept a log of messages posted, time activated, time deactivated, and person requesting activation. These logs were analyzed to demonstrate to what extent the park is utilizing the PCMS and for what purposes. The logs could also provide information on whether there were multiple simultaneous requests for messages and, if so, which was given priority; whether other entities, such as Caltrans, needed to utilize the sign; and whether messages were not posted because they had not been previously approved.

3.3. Changes in Travel Patterns

PCMS messages were designed to elicit a response among visitors traveling to the park. This response may be quantified by examining the extent to which visitors go to different park sites, which would be reflected by changes in traffic volume on park area roads; and the extent to which visitors use alternative transportation. This part of the methodology sought to examine how traffic volumes and shuttle usage changed in correlation to usage of PCMS[1].

[1] Data on parking lot usage would be another good quantitative measure; however, data on parking lot occupancy, especially the number of vehicles parked in “overflow”, was not available.

3.3.1. Shuttle Usage

An experimental shuttle was initiated by Marin County in 2005 to transport visitors between the Manzanita Park and Ride lot and Muir Woods. The sign was promoted through static signage posted just downstream of the PCMS on US Route 101 (see Figure 3-1), near the Manzanita exit onto State Route 1. The shuttle was funded by Marin County and was operated by Golden Gate Transit (GGT).

Logs of shuttle ridership were obtained from GGT to determine whether the PCMS had any correlation with ridership levels.

(Photo Courtesy of Paul Bignardi)

Figure 3-1: Static Sign for Muir Woods Shuttle

3.3.2. Traffic Volumes

Another potential influence of the PCMS would be on traffic volumes on roads in the Marin Headlands. Traffic counts (30-minute intervals) were collected at fourteen locations during the summer months as a part of a 2004 Robert Peccia and Associates study (3, 4). At most sites, data was collected in 30-minute intervals from July 2 to September 1, and then from September 9 to 22[2]. Data was collected by GGNRA personnel using traffic counters furnished by the research team at a subset of these locations in 2005. Data was collected in 15-minute intervals with data collection periods starting as early as July 3 and as late as July 30. Data collection continued through September. In many cases there were technical difficulties (e.g. broken tube) which resulted in a loss of data for multiple days. The locations where data collection occurred are listed in Table 3-1 and are shown in Figure 3-2.

Table 3-1: List of Traffic Data Collection Locations

Location	
1	Shoreline Highway, 300 feet east of Panoramic Hwy (near 3 Corners)
4	Shoreline Highway, near NPS Maintenance Facility (north of Stinson)
5	Tennessee Valley Road, 300 feet north of Oakwood Valley
6	Panoramic Highway, 500 feet north of Shoreline Hwy
9	Muir Woods Road, 200 feet west of 4 Corners
10	Muir Woods Road, 500 feet east of Shoreline Hwy
12	Sequoia Valley Road, just east of 4 Corners
13	Muir Beach Parking Lot Entrance
14	Stinson Beach Entrance

[2] Data collected during the September 9 to 22 was shifted by 12 hours because of an apparent counter programming error. This shift was justified when comparing the daily traffic profiles during the summer and during this mid-September period.

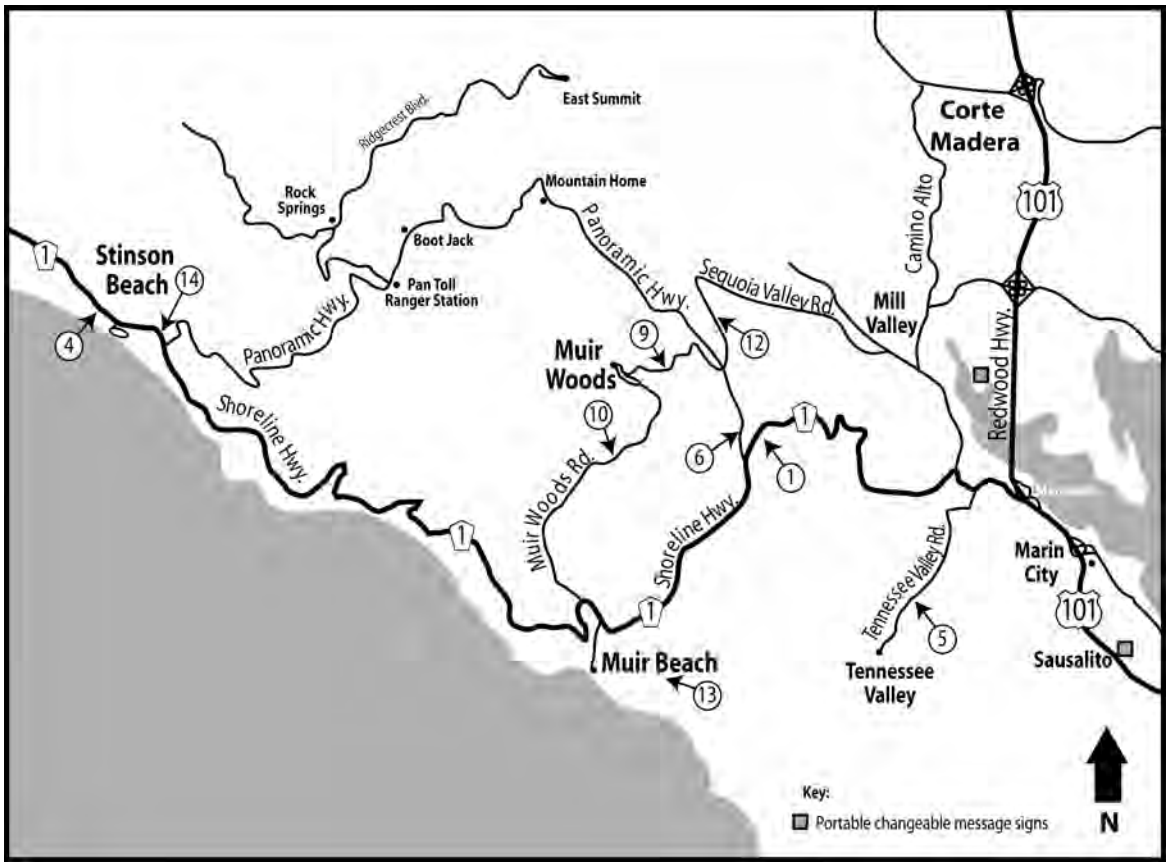


Figure 3-2: Map of Traffic Data Collection Locations

3.4. Stakeholder Perceptions

Technology is only as good as how it is used; if the stakeholders in charge of operation of the technology find it too complex or time-consuming, it will not be used to its full potential. Therefore, a final evaluation metric was to examine the perspectives of agency stakeholders involved with PCMS planning and operations. The survey instrument described in Section 3.2.1 was used to assess stakeholder expectations for the PCMS, and to what extent those expectations were realized. Beyond the objective data regarding operations and maintenance discussed in Section 3.2, this portion of the methodology seeks to elaborate on intangible considerations that may be decisive in the usage and value of PCMS in the future.

4. VISITOR SURVEY

There was a goal of having 700 respondents from each site. The actual number of responses was far less: 192 at Muir Woods and 73 at Stinson Beach. Based on the number of people who refused to complete surveys, the response rates at Muir Woods and Stinson Beach were 33 percent (192 of 583) and 32 percent (73 of 227), respectively.

The total number of responses was low for a couple of reasons. First, many visitors arrived at Muir Woods in tour buses, and staffing constraints made it difficult to distribute forms to every 10th passenger. Moreover, tour bus passengers spent little time at the park and had limited time to complete the surveys, and even if they did, they were generally not paying attention to road signs since they were not driving. In addition to these concerns, the weather was unfavorable.

The results of the survey for all questions are provided in Appendix F. Two-way tables showing the interrelationship between responses on two questions are provided in Appendix G.

Visitor surveys were also conducted in Phase 1 of this research project during 2001. The results of these surveys, which are documented in the Phase I Final Technical Report (5), are presented (when applicable) to highlight any changes that may be relevant in this analysis.

4.1. Demographics

Respondents were asked how often they had been to the particular park site, and during which seasons of the year they tend to frequent the park. Approximately 60 percent of respondents at Muir Woods were first time visitors, while 62 percent of respondents at Stinson Beach reported going to that site at least once a year.

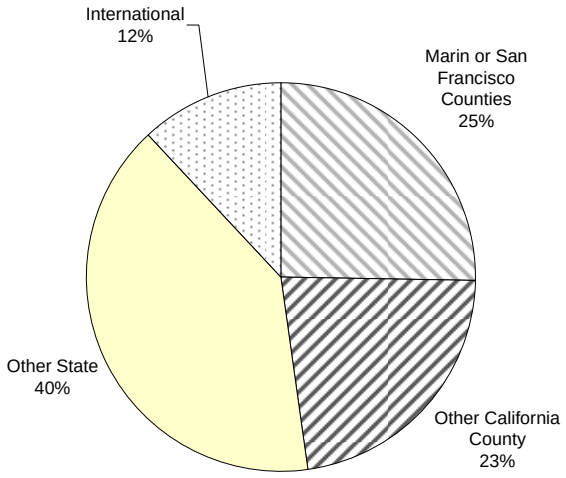


Figure 4-1: Area of Residence

As shown in Figure 4-1, the largest group of people to participate in the survey was out-of-state visitors, which made up 40 percent of the respondents. The counties of Marin and San Francisco, which are the closest counties to the park, made up 25 percent of respondents. However, visitors to each park showed markedly different residence profiles. Only 14 percent of Muir Woods respondents said they were from Marin or San Francisco Counties, compared to 58 percent of Stinson Beach respondents. Conversely, 64 percent of Muir Woods respondents said they were from outside of California, compared to only 18 percent of Stinson Beach respondents.

Further analysis revealed that, for both park sites, people whose area of residence was closer to the park (i.e. Marin or San Francisco Counties) were more likely to visit the park site more

frequently. Together, these results combine to form an observation consistent with data from the earlier visitor surveys: visitors to Muir Woods are more likely to be occasional visitors from out of the area, while visitors to Stinson Beach are more likely to be regular visitors from the area.

Respondents were asked how many people (adults, seniors and children) were included in their group on this visit to the park. The results of this are shown in Figure 4-2. Because a survey form was given to only one respondent per group, this distribution of group sizes might not be representative of visitors to the park overall. The most popular group sizes were between 2 and 5; this accounted for over 80 percent of responses. The average group size was slightly over 3 persons per group, with 80 percent of visitors being classified as adults.

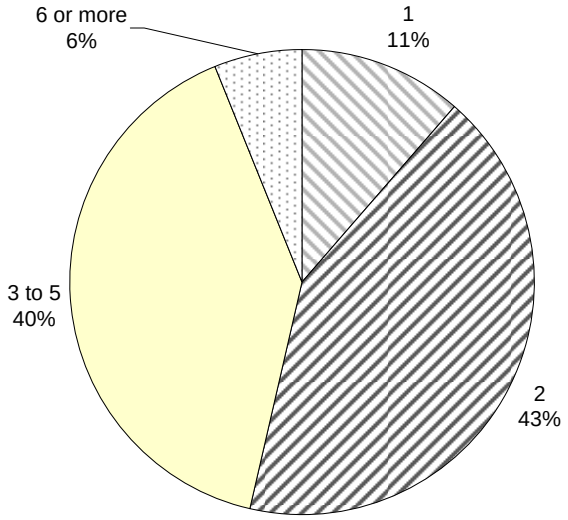


Figure 4-2: Number of People in Group

To examine the potential for non-response bias, survey staff recorded the group size of those who refused to complete a survey and compared it with the group size of respondents. One major difference is that approximately 30 percent of non-respondents at Muir Woods were from groups on tour buses. This skewed the typical group size of non-respondents toward larger groups than the typical group size for respondents. However, these respondents do not have the ability or need to respond to en-route traveler information as would motorists. After adjusting for this factor, group size tended to be slightly larger for non-respondents than for respondents at both sites.

Neither site has overnight accommodations, so all respondents indicated staying for 24 hours or less. As shown in Figure 4-3, nearly half of respondents were planning to stay at the site for 1 to 2 hours. The average length of stay was approximately 2.75 hours.

Nearly all respondents (94 percent) indicated that English was the primary language spoken at home. A similarly high percentage of respondents (93 percent) reported driving their own personal vehicle (e.g. car, sport-utility vehicle) to the park. Both of these percentages are comparable to the response shown in the 2001 surveys.

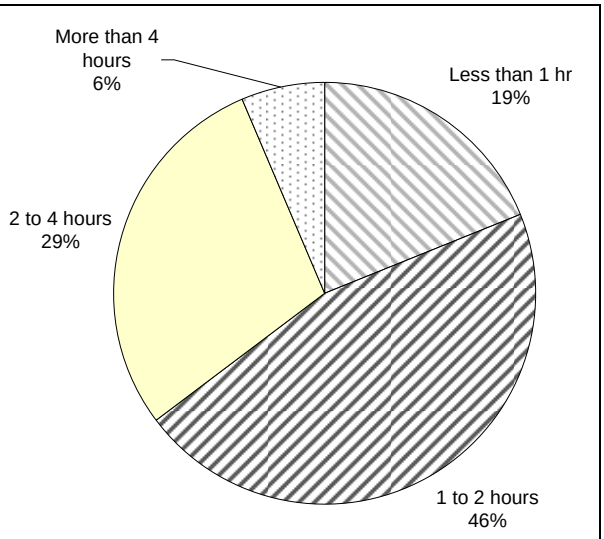


Figure 4-3: Length of Stay in Park

4.2. Perception of Congestion

The PCMS are intended to provide real-time information to motorists heading toward park sites to help them avoid congested roads and parking areas. Therefore, part of the effectiveness of the signs may depend in part on how bad visitors think the congestion is. Respondents were asked to categorize how congested they felt different parts of the transportation system were, including:

- US Route 101 (used by many visitors to access park sites),
- Park roads (roads connecting park sites),
- Parking, and
- Trails.

The results from this question can be seen in Figure 4-4. In general, the majority of respondents did not perceive significant congestion problems. The most congested aspect was parking lots, which had a mean value of 3.2, which is between “neutral” and “somewhat congested”. It is important to note that 24 percent of respondents thought that the parking lots were very congested; therefore, there was significant variation in how bad respondents thought the problem was. It should also be noted that unfavorable weather on the days that surveys were distributed may have depressed visitation (and congestion) levels compared to what would be normally expected at that time of year.

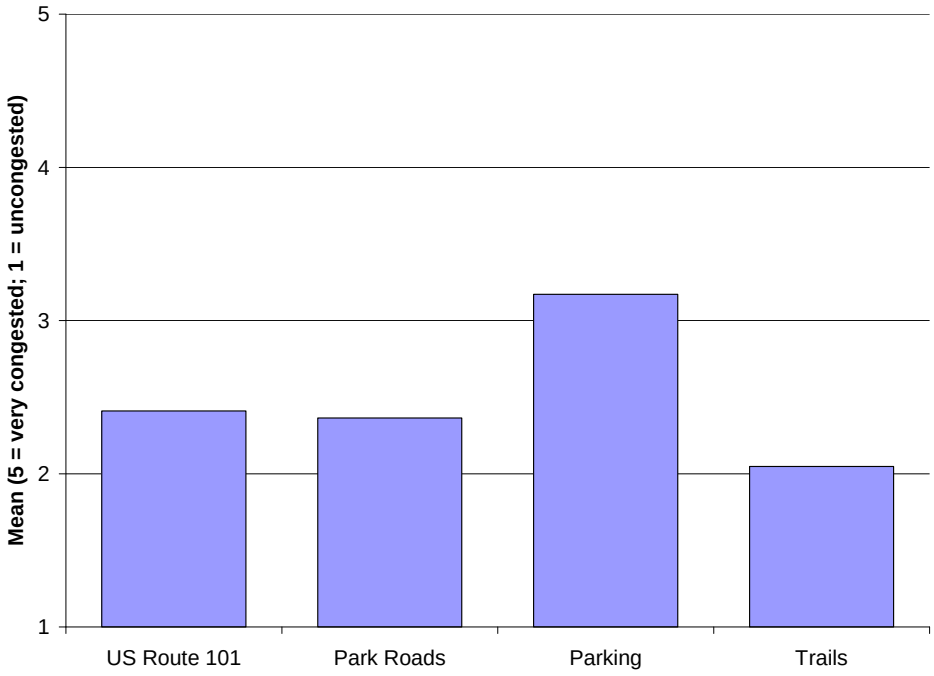


Figure 4-4: Mean Perception of Congestion

Overall, Muir Woods respondents perceived higher levels of congestion than Stinson Beach respondents. The difference between Muir Woods and Stinson Beach was lowest when asked about US Route 101, which makes sense since that is the most common freeway used to obtain access to a variety of park sites. However, a high percentage of Stinson Beach respondents reported "don't know" regarding congestion on US Route 101, indicating in part the tendency of Stinson Beach to attract more local users than Muir Woods. The biggest difference in congestion perception was in parking, where the mean rating at Muir Woods was 3.6, compared to 2.1 at Stinson Beach. This may be in part due to the time of year the survey was distributed and the poor weather on survey days.

Further analysis of the data revealed that respondents at Muir Woods who visited the park less frequently (i.e. were either first-time visitors or visit the park once every few years) perceived higher levels of congestion than more frequent visitors. Since many national park visitors have expectations of a serene and secluded experience, it is not surprising that visitors to Muir Woods, who may not be familiar with the persistent congestion in the region as well as at park sites, would be more sensitive to congestion.

The mean responses regarding congestion were relatively similar to the 2001 visitor survey.

4.3. Perceptions on PCMS

The majority of the survey was focused on respondents' perception of the PCMS. There were two challenges with this question during this survey implementation. First, since the surveys were conducted after Labor Day weekend, the PCMS were experiencing less usage by park

personnel. In fact, the PCMS were not even used for two of the days surveys were distributed (September 15 and 16). This reduced the likelihood that a visitor using US Route 101 would have seen a message. Second, there was construction activity with a different PCMS present in the vicinity of the park during the survey administration period. More specifically, the PCMS message read, "North 1 Traffic Use Panoramic Highway," and was located at the intersection of State Route 1 and Panoramic Highway for construction occurring between September 6 and October 5. As evidenced by the responses, some respondents were confused as to which signs were being asked about.

The survey was structured so that certain questions were answered only if a respondent had seen the sign, or if the sign had a message. Therefore, the number of respondents included in analysis of certain questions is far less than the total number of respondents.

4.3.1. Sign Exposure

Forty-three percent of all respondents indicated that they had seen the PCMS on US Route 101. A higher percentage of respondents destined for Muir Woods saw the sign than those visiting Stinson Beach. Of those who viewed the sign on US Route 101, 81 percent indicated that the sign had a message on it. Visitors to Muir Woods were more likely to see the sign than people visiting Stinson Beach.

Respondents who reported seeing the sign were asked if they could recall the sign's message. Half of the people who saw the message could not recall what was displayed when they were filling out the survey. Respondents reported a variety of messages that could have been posted on their way to the park (e.g. "MUIR WOODS PARKING FULL") as well as others that were from the construction PCMS (e.g. relating to Panoramic Highway).

4.3.2. Statements Regarding Message

Respondents who had seen a message on the sign were asked to agree or disagree with several statements regarding the quality of the message: whether it was accurate, useful, current, easy to understand, inadequate, or incomprehensible. The mean scores on these statements are graphed in Figure 4-5. As can be seen, respondents were generally positive about the message.

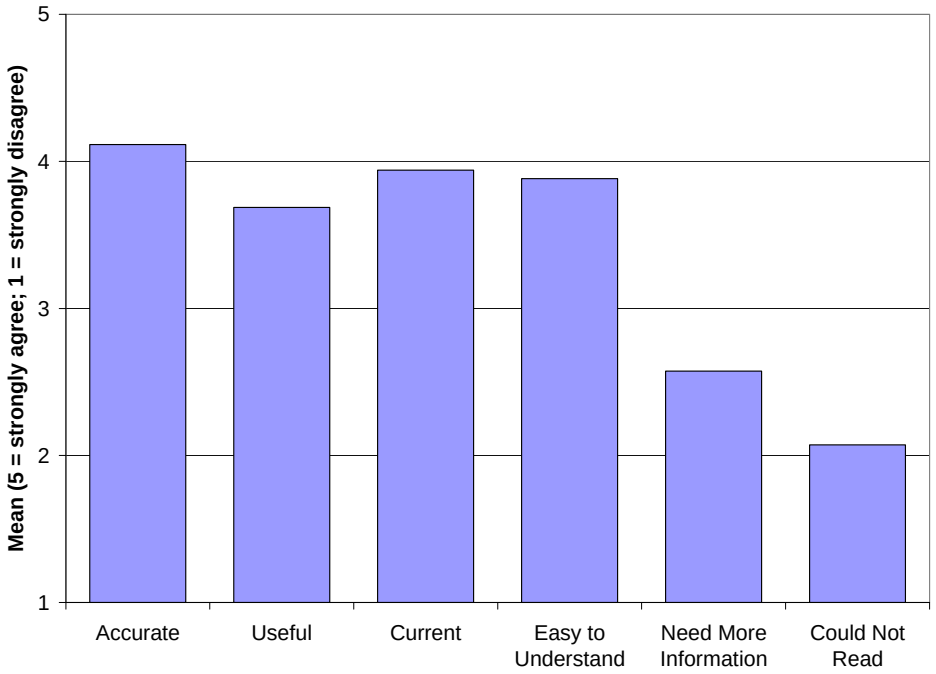


Figure 4-5: Message Quality

Question 7 asked those who had seen a message on the sign to characterize its usefulness. Question 10 asked those who had seen the PCMS, whether they saw a message of not, to characterize its usefulness. The mean score on Question 10 (3.72) was essentially identical to the mean score on Question 7 (3.69). This would suggest that even when visitors did not see the sign in use, they had an expectation of the type of information that might be displayed on the sign, and they thought that such information would be useful when displayed.

4.3.3. Information Content and Methods

When going to a national park, a traveler's information needs vary as they get closer to their destination. Days or months before a trip, the traveler may research information on the park's hours, activities, and facilities. Closer to the time of departure, they may inquire about road construction activities or weather that may affect their visit. On their way to the park, they may be interested in knowing about congestion or parking challenges that may affect the order in which they visit park sites they have already chosen. Throughout this process, the traveler may be interested in modal alternatives, although this interest may vary based on a person's experience in using transit.

Respondents were asked about the types of information that they would like to see on the sign. The top responses all refer to dynamic information: road closures (65 percent), parking full (57 percent), road work (57 percent) and road accidents (45 percent). These are relatively conventional messages for changeable message signs, and are relatively expected for an en-route information device. About a quarter of respondents (22 percent) indicated their desire to have

directions to turn to a highway advisory radio (HAR) station. While usage of HAR in urban commuting contexts is often limited, it is often used in national parks to provide static information about what visitors may expect at the park, such as the location of the visitor center, current attractions, and vehicle size or chains restrictions. HAR is generally not used for providing dynamic information in a national park context, although Sequoia and Kings Canyon National Parks are seeking to adopt that approach as their early winner project in this research project (6).

A majority of respondents who saw the sign (61 percent) thought that the PCMS was at a good location. However, in light of the progressively changing nature of tourists' traveler information needs, respondents were asked whether the sign should be supplemented by additional signage either before or after. Earlier signage could give travelers additional time to formulate other options for their trip, while later signage could serve to remind travelers of information they may have seen previously. As shown in Figure 4-6, respondents generally agreed that it would be helpful for similar signs to be provided earlier on their trip to the park, and to have similar signs in the park (provided they were designed to fit into the natural surroundings). Respondents expressed, on average, slight disagreement with the idea of using other means (e.g. radio) as substitutes for the signs to present information to visitors.

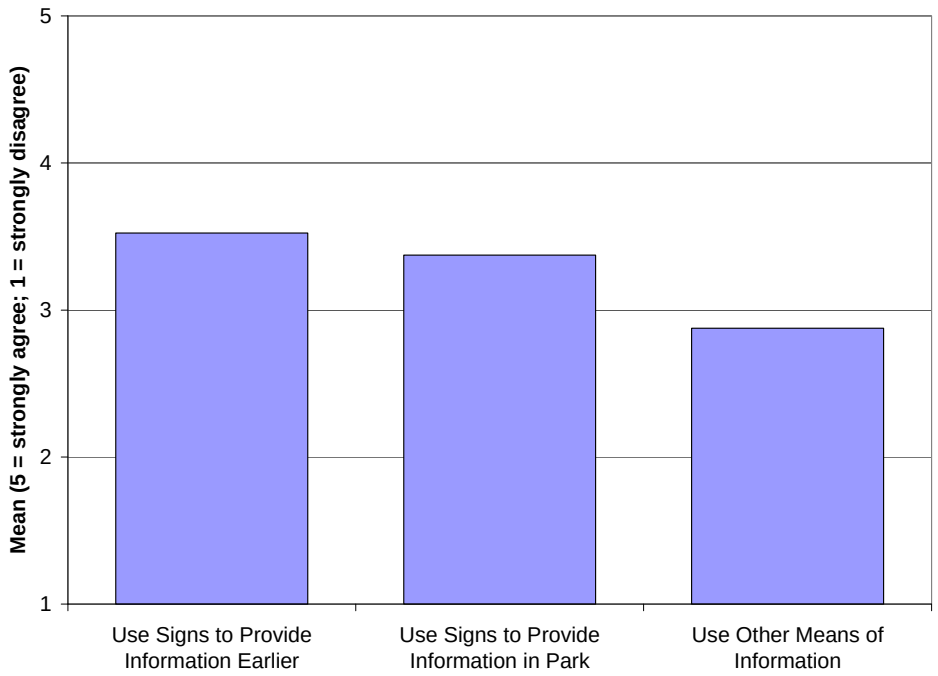


Figure 4-6: Use of Additional Signs or Other Means for Information

Together, these responses suggest that visitors believed the signs were appropriate and useful methods for conveying the types of information that the signs have been designed to convey.

4.3.4. How Information Was Used

While the signs were perceived as useful, 88 percent of respondents indicated that the sign information had no effect on their trip. With another 8 percent of respondents answering that the signs in general improved the visit, only 4 percent of respondents who saw the signs identified specific actions that the information caused them to take (e.g. going to different sites or changing the time of a visit).

Though very few respondents said that the sign message caused them to make specific changes in their trip itinerary, this does not necessarily imply that the information is without use. After all, a majority of respondents who saw the signs (62 percent) indicated that the signs were useful or very useful. Instead, one of the chief values of the signs during this survey period was to provide motorists a greater level of security regarding the conditions that they could expect on their visit to the park.

4.4. Summary

Visitors at Muir Woods and Stinson Beach were surveyed regarding their perceptions of the PCMS. While many respondents did not perceive significant congestion problems on their visit (with the exception of parking challenges at Muir Woods), respondents generally considered the signs to be useful and appropriate for providing dynamic information. The survey did not indicate any major effects of the signs on visitors' travel patterns.

5. OPERATIONS AND MAINTENANCE

This chapter examines information on operations and maintenance experience with the PCMS. This chapter includes findings from the internal stakeholder survey, as well as operational data recorded through sign usage logs.

5.1. Operations

"Operations" is normally defined to include all activities that are undertaken to support day-to-day usage of the PCMS. Because the PCMS were installed on a trial basis, the evaluation of operations was also designed to include experience related to mobilization, storage and transport of the equipment. Caltrans District 4 maintenance personnel were involved in these issues, and were not surveyed for this project. Long-term or permanent deployment of the PCMS would avoid many of these issues.

The operational assessment will therefore focus on evaluating the steps involved with posting and removing messages on the PCMS.

5.1.1. Requesting a Message

Half of the respondents (four of eight) surveyed have reported conditions to the Presidio Dispatch Center or requested a message to be posted on the PCMS. All of these respondents indicated that they made these requests based on personal observations, or reports from staff. Those who reported conditions for the messages indicated that they all at one time requested a message dealing with parking status. The majority of respondents reported that they requested messages that dealt with traffic congestion.

Only one of the respondents reported requesting a non-pre-approved message. When asked, respondents indicated that there should be pre-approved messages for road construction, special events taking place, and shuttle availability.

5.1.2. Selecting Message Content

Three respondents indicated that they had entered messages into the PCMS; this discussion refers to responses given by these three respondents. When determining when to place a message and which message should be used on the PCMS, several sources of information were used. All who input information onto the signs consulted with NPS personnel. Two of the respondents used visitors and Caltrans personnel as sources, while one respondent listed the California Highway Patrol as a source of information.

When the decision was made to post a message, appropriate messages were to be selected from the messages pre-approved by Caltrans (see Appendix B). These messages were designed to reflect a broad range of circumstances that may affect travel to park sites, and were phrased to conform to Caltrans message standards. The responses indicated that the message set was not adequate for all situations, even during the short trial period. Two of the three respondents received requests for a message that was not pre-approved. These requests did not happen very

often. One unapproved message, relating to both Muir Woods and Stinson Beach parking lots being full, was posted on three occasions. One respondent indicated that it would be beneficial to have this message pre-approved for future use.

There were no occasions when multiple agencies simultaneously requested messages for the PCMS; therefore, there was no experience in dealing with resolution of messaging priorities.

5.1.3. Posting and Removing Messages

These respondents generally agreed that the benefits of the PCMS outweigh the time spent entering messages. However, these respondents generally felt that there was some effort involved in posting messages. Two of the respondents said that this responsibility took more than 30 minutes per day. Two of the respondents also indicated that programming the PCMS was very difficult. All three of these respondents reported software problems, and remote connections that were either non-functional or required several attempts to connect. Two of the three also indicated problems in having their intended message not appearing at all.

5.1.4. Sign Usage

Logs maintained by the Presidio Dispatch Center were used to record PCMS usage during the demonstration period. Messages were posted 47 times during the demonstration period, with each message being displayed for an average of 4.5 hours. As shown in Figure 5-1, the signs received usage on every day of the week through the demonstration period, but were used predominantly on weekends, when travel to park sites normally peaks.

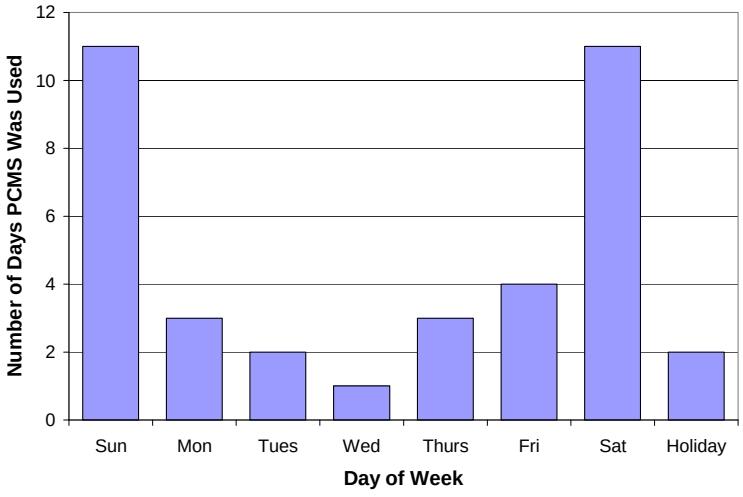


Figure 5-1: Sign Usage by Day of Week

The PCMS were normally used to display messages concerning parking availability at park sites, as shown in Figure 5-2. Of these messages, only the "Muir Woods and Stinson Parking Full" message was not pre-approved. Only one message was used on the PCMS on 86 percent of days when messages were posted. Three messages were used in the same day only on two days during

the demonstration period. It is unclear whether the signs would have been updated more frequently if remote connection to the signs were easier.

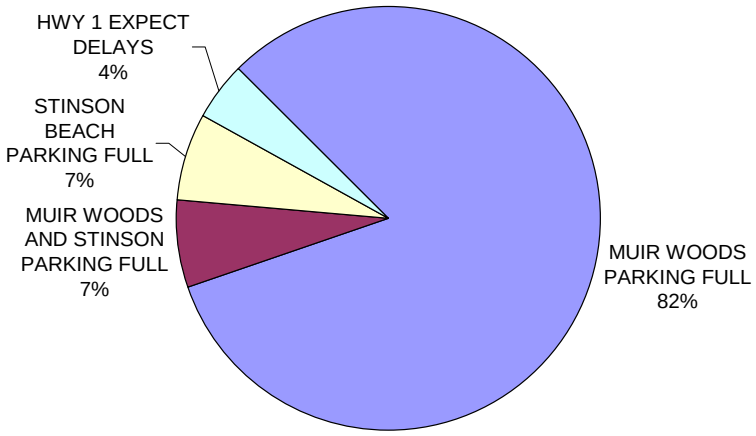


Figure 5-2: Frequency of Messages Displayed on PCMS

5.2. Maintenance

Maintenance of ITS field devices is a critical element to ensure their sustained usability. Two of the respondents indicated having done maintenance work on the PCMS during the demonstration period. The respondents indicated maintenance tasks included non-preventive maintenance, including a modem replacement, software rebooting, and cleaning of the solar panels after a power problem was recognized. The respondents assessed the level of difficulty in maintenance as "neutral"; i.e. neither simple nor complicated. This suggests that there is a learning curve regarding maintenance of the signs, but that maintenance gets easier as the staff person gains increased familiarity with the signs.

One other notable maintenance issue relates to vendor support of the signs. The software provided with the signs was purported to be NTCIP-compliant, as required in the bidding documents. However, the signs were shipped with a beta test version that had not been thoroughly tested, leaving these signs as a "guinea pig" on which the company's software could be evaluated and improved. In addition, after working with the vendor on issues with remote communications, it was learned that this aspect of the signs had not been well-tested before deployment either. Contributing factors to these technical difficulties were project delays that left very little time between receipt of the signs and the start of the peak visitation season[3].

[3] In fact, deployment of the signs occurred after the busy July 4th weekend.

6. CHANGES IN TRAVEL PATTERNS

One important aspect to the effectiveness of the PCMS is to quantify the effect to which the information conveyed on the PCMS affected travel patterns to the park. When the signs are displaying information regarding current parking and traffic conditions, it is expected that visitors headed toward park sites will respond in a measurable way. This could include the selection of alternative routes, modes or even destinations.

Data regarding shuttle usage, visitation and traffic volumes were collected in order to quantify the effects of the PCMS on travel patterns for visitors going to park sites. This chapter summarizes the results of analyzing this data.

6.1. Shuttle Usage

As noted in Chapter 3, the PCMS were located adjacent to promotional signage for the Muir Woods pilot shuttle. Visitors who were traveling by car on US Route 101 toward Muir Woods or perhaps other destinations in the Marin Headlands would be expected to see both dynamic and static signage. When the PCMS displays a message concerning Muir Woods, more people would be expected to take the Muir Woods Pilot Shuttle, and therefore, shuttle counts would increase.

6.1.1. Multiple Linear Regression

In order to test this hypothesis, linear regression was performed on shuttle usage statistics. The linear regression model sought to express shuttle ridership as a linear function of several variables, as shown in the following equation:

$$y = ax_1 + bx_2 + cx_3 + d$$

where y = shuttle ridership (riders per day)
x_1 = whether the PCMS was providing a message that day
x_2 = number of days since shuttle system started
x_3 = Muir Woods visitation on a given day

The value of *a* would show how strongly the PCMS message tended to increase shuttle ridership. However, other factors may increase shuttle ridership, including a greater awareness of the system through word-of-mouth and informal promotion over time (captured by the *b* parameter) and the number of visitors going to Muir Woods in a given day, which will relate to weather and other factors not associated with the shuttle (reflected by the *c* parameter).

The regression analysis only focused on weekend shuttle usage data. This is in part because the shuttle was promoted as only being available on weekends, and in part because park visitation is generally higher on weekends. The analysis period ranged from Memorial Day weekend (May 28) to Labor Day. The PCMS were used starting on July 4th weekend, so there were many data points when the shuttle was operational but no real-time information was provided regarding parking and traffic conditions at Muir Woods.

The results of the regression analysis are shown in Table 6-1. Of the three variables included in the regression, the variable (*a*) representing PCMS usage (x_1) had the highest ratio of parameter value to standard error. This suggests that it is the most robust of the three variables in the model. The parameter estimate for *a* indicates that, all else being equal, usage of the sign would add 119 shuttle passengers per day.

Table 6-1: Linear Regression Results for Estimation of Shuttle Usage

Variable	Parameter Value	Standard Error
PCMS Usage (*a*)	118.71	41.94
Days Since Pilot Started (*b*)	-0.169	0.561
Visitation (*c*)	0.0364	0.018
Y-intercept (*d*)	-64.13	76.65

A graph comparing actual with estimated shuttle ridership is provided in Figure 6-1. The regression model has an R^2 value of 0.68, which indicates a reasonably good fit.

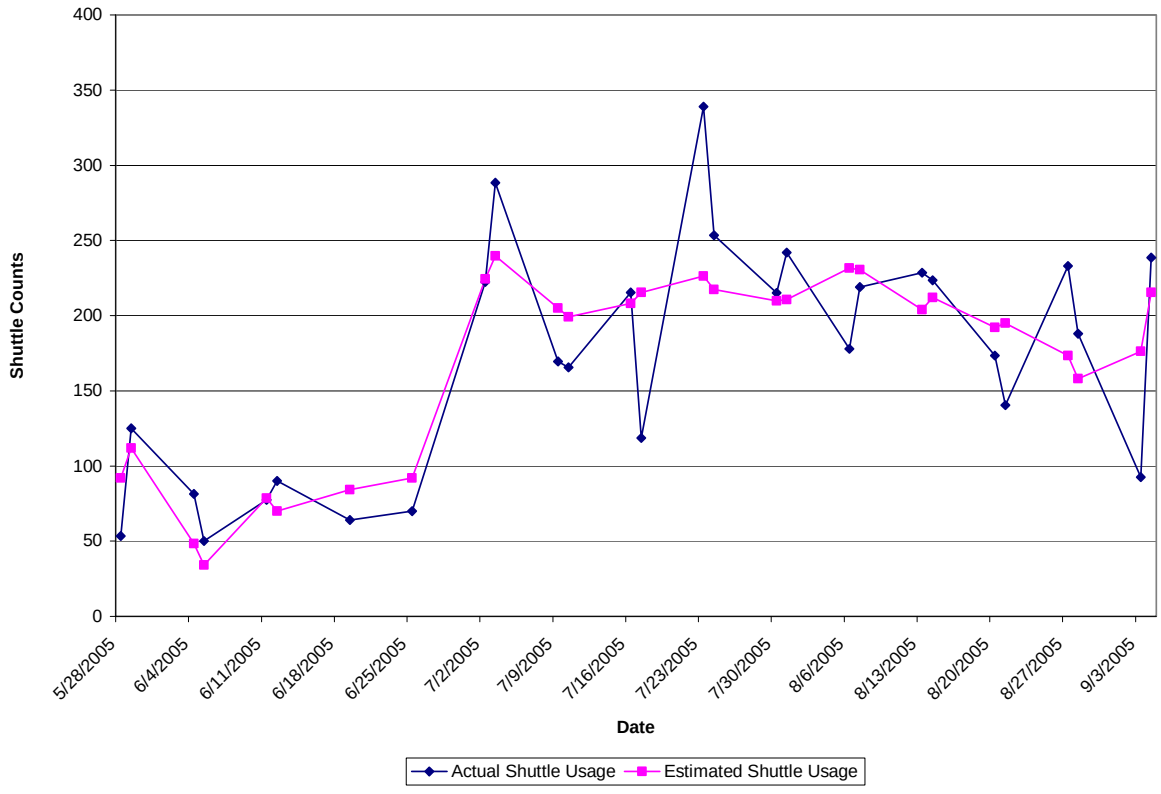


Figure 6-1: Actual vs. Estimated Shuttle Ridership

The regression results provided in Table 6-1 showed results for *b* – the parameter for the number of days since the shuttle was in use – as negative, along with a low ratio of the parameter to

standard error. Together, these suggest that including this variable in the model may not be appropriate. Therefore, the same procedures were applied on a model excluding x_2. The results of this analysis are shown in Table 6-2. The coefficients have a similar order of magnitude as the earlier model, but the ratios of parameter to standard error terms are all greater. With a comparable R^2 value, this suggests a better model form.

Table 6-2: Linear Regression Results for Estimation of Shuttle Usage (without x_2)

Variable	Parameter Value	Standard Error
PCMS Usage (*a*)	107.93	21.37
Visitation (*c*)	0.0389	0.0159
Y-intercept (*d*)	-75.97	64.57

Taking these results together, the PCMS had an estimated positive impact of 108 to 119 riders per day on the shuttle.

6.1.2. Mode Share

Another way of examining the influence of the PCMS on shuttle usage is to examine the percentage of visitors who accessed Muir Woods by shuttle, or the shuttle's mode share. The mode share was calculated for each day in the analysis period. The daily values were averaged over the pre-PCMS and post-PCMS periods. The results of this are shown in Table 6-3. The mode share for the Muir Woods shuttle increased from 2.0 percent to 4.6 percent, or a 135 percent increase. The percentage of visitors using transit increased, even as the total number of visitors increased. This means that the observed increase in transit usage did not come at the expense of reducing visitor interest in going to the park.

Table 6-3: Comparison in Shuttle Usage, Pre- and Post-PCMS

Period	Average Visitation to Muir Woods (per day)	Average Shuttle Usage (per day)	Average Mode Share for Shuttle
Pre-PCMS	3,921	77	1.96%
Post-PCMS	4,509	207	4.60%
% Change	**+15%**	**+171%**	**+135%**

While visitation increased, this should not be considered an effect of the shuttle, as the change in the number of shuttle riders (130) was much less than the change in daily visitation (588). Nonetheless, the analysis of the mode share shows a correlation between use of the PCMS and increased shuttle usage.

6.2. Traffic Volume Impact

A two-pronged approach was used to assess the potential effects of the PCMS on vehicle traffic. First, daily traffic volumes between 2004 (pre-PCMS) and 2005 (with PCMS) were examined to verify comparability in traffic volume data, and to identify (at a high level) any traffic volume trends associated with the PCMS. Second, based on the locations where traffic volume changes seem to have occurred, a more detailed analysis was undertaken by examining traffic volume data over smaller time intervals.

6.2.1. Daily Traffic Volumes

Traffic volumes were collected by two different contractors (RPA and WTI) using two different sets of equipment. Therefore, it is important to gauge the comparability of these two sets of data. One method of comparison is to see whether the traffic growth rates shown in comparing RPA's 2004 counts with WTI's 2005 counts data are comparable to traffic growth shown in traffic counts reported by Caltrans. Annual average daily traffic and peak hour traffic volume counts are reported by Caltrans at three reference points on State Route 1 within the Marin parklands area. Traffic growth at these locations was compared with similar locations from the RPA and WTI data collection efforts. Table 6-4 provides a location-by-location comparison.

It should be noted that there is some disagreement in the volume trends. However, there are at

Table 6-4: Caltrans Traffic Volumes on State Route 1, 2004 and 2005

		Caltrans	RPA/WTI	Caltrans	Caltrans	RPA/WTI
		Panoramic Highway, South (101-MRN-3.35)	Shoreline Highway, just E. of Panoramic Hwy (Location 1)	Muir Woods Road (101-MRN-5.92)	Panoramic Highway, North (101-MRN-12.21)	Shoreline Highway, near NPS Maint Facility (Location 4)
Peak Hour Volume (South)	2004	530	540	520	460	
	2005	530	490	530	470	
	Growth	0.0%	-9.3%	1.9%	2.2%	
Peak Hour Volume (North)	2004	500		460	560	230
	2005	500		470	590	250
	Growth	0.0%		2.2%	5.4%	8.7%
AADT (South)	2004	4,400	6,090	3,750	3,300	
	2005	4,400	5,470	3,800	3,400	
	Growth	0.0%	-10.2%	1.3%	3.0%	
AADT (North)	2004	3,550		3,300	4,700	2,830
	2005	3,550		3,400	4,900	2,540
	Growth	0.0%		3.0%	4.3%	-10.2%

(Sources: 7, 8)

Note: RPA and WTI data were included in averages only when data was available from both sources for comparable time periods. Hence, the AADT reflects a seasonal daily traffic volume.

least a couple of reasons why this may be expected. Traffic data from RPA/WTI was collected only during the summer months, which will have different traffic characteristics than the year as a whole. Because RPA/WTI data was collected over a shorter time period, the influence of externalities such as unusual weather or road construction activity will be magnified. In addition, traffic counts reported by Caltrans may not reflect actual counts, but could reflect some modeling and interpolation based on other data. Finally, the locations where traffic counts are reported may not be identical between Caltrans and RPA/WTI, or between RPA and WTI. The disagreement in volume trends may be explicable on these grounds.

Having explored the relative comparability of traffic volumes collected by RPA and WTI for State Route 1 (Shoreline Highway), it was important to see whether there was comparability between traffic volume data collected in 2004 and 2005 for other sites. Unfortunately, there were no reference sources of AADT volume data available. Instead, the 2004 and 2005 seasonal average daily traffic (ADT) volumes were compared for each site; see Table 6-5. The seasonal ADT volumes reflect traffic volumes collected on comparable days in each year (for example, 4th Sunday of July) when data was collected for both years. The number of data-collection days used in the comparison varies between 33 and 62 days, depending upon the site.

Table 6-5: Comparison of Seasonal ADT Volumes, 2004 to 2005

	Location	Seasonal ADT 2004 (RPA)	Seasonal ADT 2005 (WTI)	2005 as % of 2004
1	Shoreline Highway, 300 feet east of Panoramic Hwy (near 3 Corners)	7,370	7,210	98%
4	Shoreline Highway, near NPS Maintenance Facility (north of Stinson)	3,130	2,970	95%
5	Tennessee Valley Road, 300 feet north of Oakwood Valley	1,100	960	87%
6	Panoramic Highway, 500 feet north of Shoreline Hwy	3,300	3,490	106%
9	Muir Woods Road, 200 feet west of 4 Corners	1,850	1,820	98%
10	Muir Woods Road, 500 feet east of Shoreline Hwy	1,060	1,010	95%
12	Sequoia Valley Road, just east of 4 Corners	3,060	3,220	105%
13	Muir Beach Parking Lot Entrance	1,190	920	77%
14	Stinson Beach Entrance	1,680	2,100	125%

Locations 1 and 4 were discussed earlier in relation to the Caltrans traffic volume reports. Some of the other locations show fairly wide levels of variation, from a 23 percent drop in traffic at the Muir Beach Parking Lot entrance to a 25 percent increase in traffic at the Stinson Beach entrance. The variations in these estimates may reflect adjustments in placement of the road tubes, equipment problems (calibration or installation), or other factors. Nonetheless, in general these changes appear to be outside the bounds of normal traffic growth patterns.

One external factor that could influence the relationship between 2004 and 2005 traffic volumes could be the use of the PCMS. It would be interesting to note whether there were similar levels of variation between 2004 and 2005 observed on days when PCMS were used and days when

PCMS were not used. If there were different levels of variation, this would support (though not necessarily confirm) that the PCMS influenced traffic volumes[4].

Table 6-6 shows the results of this analysis. For each count location, three percentages are shown comparing 2005 to 2004 traffic volumes: for all days where traffic count data were available for similar days in both years ("Overall"); for days within that set when the PCMS were not used (only certain weekdays); and for days within that set when the PCMS were in use. A two-sample, two-tailed t-test was used to compare the percentages for weekday and weekend. If the percentage in the "w/ PCMS" column is higher than in the "w/o PCMS" column, this indicates that the PCMS appeared to attract relatively more traffic to this particular road segment. The column labeled "Significant?" indicates the threshold at which there was a statistically significant difference between the without- and with-PCMS days if there was a 10 percent level of significance or higher.

Table 6-6: Comparison of Seasonal Weekday and Weekend ADT Volumes, 2004 to 2005

		2005 as % of 2004			
Location		Overall	w/o PCMS	w/ PCMS	**Significant?**
1	Shoreline Highway, 300 feet east of Panoramic Hwy (near 3 Corners)	98%	94%	99%	0.10
4	Shoreline Highway, near NPS Maintenance Facility (north of Stinson)	95%	88%	99%	0.01
5	Tennessee Valley Road, 300 feet north of Oakwood Valley	87%	88%	86%	No
6	Panoramic Highway, 500 feet north of Shoreline Hwy	106%	102%	108%	No
9	Muir Woods Road, 200 feet west of 4 Corners	98%	108%	93%	0.01
10	Muir Woods Road, 500 feet east of Shoreline Hwy	95%	98%	93%	0.05
12	Sequoia Valley Road, just east of 4 Corners	105%	100%	109%	0.05
13	Muir Beach Parking Lot Entrance	77%	74%	80%	No
14	Stinson Beach Entrance	125%	119%	127%	0.10

As can be seen, statistically significant changes were observed at several locations. Many of the changes make sense. There appears to have been a relative decrease in weekend volumes on Muir Woods Road (Locations 9 and 10) compared to what would have been expected. The decrease in volumes on Muir Woods Road would be consistent with PCMS messages indicating that Muir Woods parking was full, which was a commonly used message (see Figure 5-2). Traffic bound for Muir Woods National Monument may have diverted to alternate destinations, which would explain the increase at Stinson Beach (Location 14). However, the increase in Stinson Beach visitation may also correlate with the increase in traffic at Location 4. In other words, the visitation increase at Stinson Beach may not necessarily have resulted from selection of an alternate park destination associated with PCMS information, since those visitors would have accessed Stinson Beach from Shoreline Highway south of Location 14. Therefore, the significance of the traffic volume changes observed for Locations 4 and 14 is hard to definitively explain.

Another ambiguous situation relates to the statistically significant increase observed at Sequoia Valley Road (Location 12). The increase here might be related to the non-statistically significant

[4] This is simplistic but conservative, since the signs may have been used on a longer holiday weekend and were not necessarily in use on every weekend day.

increase in traffic volumes on Panoramic Highway (Location 6). It may be that visitors saw the PCMS information, continued on to park sites via Panoramic Highway, and then turned on Sequoia Valley Road instead of proceeding to Muir Woods. This scenario seems somewhat unlikely, since there are earlier points at which the driver could make a decision to go to other destinations (for example, the eastern intersection of Panoramic Highway and Shoreline Highway). Moreover, a greater number of destinations would be available by continuing straight on Panoramic Highway as opposed to turning east on Sequoia Valley Road. However, the lack of traffic counts further north on Panoramic Highway, as well as west of Panoramic Highway on Shoreline Highway, make it impossible to form a more comprehensive explanation.

The final location where statistically significant change was observed in connection with the PCMS is an increase at Shoreline Highway east of Panoramic Highway (Location 1). This finding is counterintuitive, as any diversion effect associated with the PCMS should lead to, if anything, a decrease in traffic on days when the PCMS is displaying a message. If data were available on Shoreline Highway east of Tennessee Valley Road, this would help to better isolate and understand these effects.

Therefore, while traffic data at several locations could be worthy of further analysis, only two locations have been selected – Locations 9 and 10. In these cases, it is easier to isolate the effects of the PCMS than at the other sites where the PCMS appeared to have a statistically significant correlation with traffic volumes.

Having identified two locations of particular interest, it was important to identify the strength of the relationship between park visitation and traffic volume on these roads. After all, since PCMS were typically used on weekend days when visitation is higher, it may be that changes in park visitation could explain part or all of the changes in traffic volume, rather than PCMS messages. Least-squares regression was applied to relate traffic volumes at locations 9 and 10 with daily visitation at Muir Woods National Monument. To provide the best correlation between daily traffic volume and visitation, least-squares estimation was used to estimate parameters on the following equation form:

$$vol_x = a \times visitation + b$$

Least-squares regression was employed on several subsets of data; the results are shown in Table 6-7. Higher values of *a* indicate that Muir Woods visitation appears to have a higher impact on traffic volumes at these locations. Higher values of R^2 indicate a more robust relationship between traffic volumes and visitation levels.

Table 6-7: Regression of Traffic Volume as Function of Visitation

		Upper Muir Woods (#9)			Lower Muir Woods (#10)		
		a	b	R^2	a	b	R^2
2004	All days	0.604	-85	0.88	0.273	199	0.86
	Weekdays	0.416	333	0.90	0.203	352	0.87
	Weekends	0.598	117	0.91	0.263	306	0.75
	PCMS days	0.675	-293	0.81	0.296	133	0.75
2005	All days	0.549	-38	0.81	0.243	199	0.82
	Weekdays	0.361	510	0.67	0.188	345	0.70
	Weekends	0.561	-19	0.69	0.239	247	0.63
	PCMS days	0.638	-370	0.76	0.272	100	0.75
Combined	All days	0.568	-27	0.85	0.250	226	0.80
	Weekends	0.549	181	0.71	0.228	365	0.55
	Weekdays	0.408	359	0.87	0.189	370	0.78

As can be seen, both *a* and R^2 values are generally higher in 2004 than in 2005 for a given location and a given subset of traffic data. The higher value of *a* suggests that Muir Woods visitation has a smaller relative impact on traffic volume at these sites in 2005 than 2004. As an example, consider the subset of data for Upper Muir Woods on PCMS days (i.e. days when the PCMS was in use in 2005, and its equivalent day in 2004). According to the results of the regression analysis, an increase of 100 Muir Woods visitors in a given day in 2004 would result in an increase in daily traffic of 68 vehicles ($a = 0.675$), whereas in 2005 it would have resulted in an increase in daily traffic of 64 vehicles ($a = 0.638$). The lower value of *a* in 2005 could reflect the shift of some visitor traffic to shuttles. This could signify a shift of traffic away from Muir Woods to other sites so that non-Muir Woods or "background" traffic would play a larger role in the composition of traffic at Locations 9 and 10. This would also explain why R^2 values would be lower in 2005 than in 2004.

In summary, examination of the daily traffic data hints that there are traffic reduction benefits associated with the PCMS. A more close inspection of hourly data could be useful in better quantifying these impacts.

6.2.2. Hourly Traffic Volumes

Hourly traffic volumes in 2004 and 2005 at Upper Muir Woods Road (Location 9) and Lower Muir Woods Road (Location 10) were further investigated to quantify the effects of the PCMS. The first approach was to look at hourly traffic volume data at an aggregate level, grouped by days when the PCMS were posting a message and when they were not. The second approach was to look at traffic flow characteristics associated with specific days and time periods when messages were posted.

Aggregate

Traffic flow on most roads will have fairly predictable, repetitive patterns based on local land use characteristics, the hour of the day, the day of the week, and the month of the year. This predictability results in relatively consistent daily traffic volumes based on the day of the week

and the month of the year, as well as consistent patterns in hourly traffic variation in a given day. Variability due to the day of the week and month of the year are often greater on roads that provide access to recreational sites, as is true of Muir Woods Road. However, that variability tends to follow predictable patterns from year-to-year (for example, July 4th weekend is always busy), provided that there are no major external influencing factors, such as economic recession or significant nearby road construction activity.

The first approach to analyzing hourly traffic volume data relies on this assumption of predictability. It is assumed that traffic volumes in the summer of 2005, in the absence of PCMS, would resemble traffic volumes in 2004 in their variation throughout a given day. Daily traffic volumes in 2005, again in the absence of PCMS, would differ from those in 2004 based on a simple percentage growth rate. The effects of the PCMS on traffic volumes would then be determined by comparing actual 2005 traffic volumes with those that would have been expected based on 2004 volumes with the applied growth rate.

The methodology was applied as follows. First, traffic data collected by RPA during the summer of 2004 were converted to hourly traffic counts by direction. A dataset was created which included the volume observations for every hour, along with the day of the week and the time of day of that observation. A least squares regression was used to estimate a given hourly volume as follows:

$$vol_{wk,dir,hr} = b_{wk,dir} + a_{wk,dir,hr}$$

where $vol_{wk,dir,hr}$ = the traffic volume for a given day of the week (weekend or weekday) for a given direction (eastbound or westbound) for a given hour
$a_{wk,dir,hr}$ = the volume associated with a given day of the week, a given direction and a given hour
$b_{wk,dir}$ = a base traffic volume for a given day of the week and a given direction

Sixteen *a* parameters were estimated, with a unique parameter corresponding to each hour of the day between 6 AM and 10 PM[5]. Six separate least-squares estimates were developed: westbound weekdays when PCMS were not used in 2005, westbound weekdays when PCMS were used, westbound weekend, eastbound weekdays when PCMS were not used in 2005, eastbound weekdays when PCMS were used, and eastbound weekend. Since RPA data was collected during the summer months, several weeks of data were available to develop these daily profiles, so the results should be relatively insensitive to the effects of unusual events, such as variations in weather and traffic accidents.

The average profiles that were developed for each direction and day of week are shown in Figure 6-2. Westbound traffic at Location 9 (Upper Muir Woods Road) is traveling in the direction of the entrance to Muir Woods National Monument, as is eastbound traffic at Location 10 (Lower Muir Woods Road). The relative magnitudes of the traffic flows suggest that the predominant

[5] The same *a* parameter value was assumed for 6-7 AM and 10-11 PM. No *a* parameter value was used between 11 PM and 6 AM, since hourly traffic volumes on this road during those hours is essentially negligible, and was included as the *b* intercept term.

traffic pattern for vehicles going to Muir Woods is to access it to/from Upper Muir Woods Road. Westbound weekend traffic at Location 9 (going toward the park) plateaus from roughly 10 AM to 3 PM. Westbound weekend traffic at Location 10 (going away from the park) plateaus roughly two hours later. This approximately corresponds to the average length of visit reported in the visitor surveys.

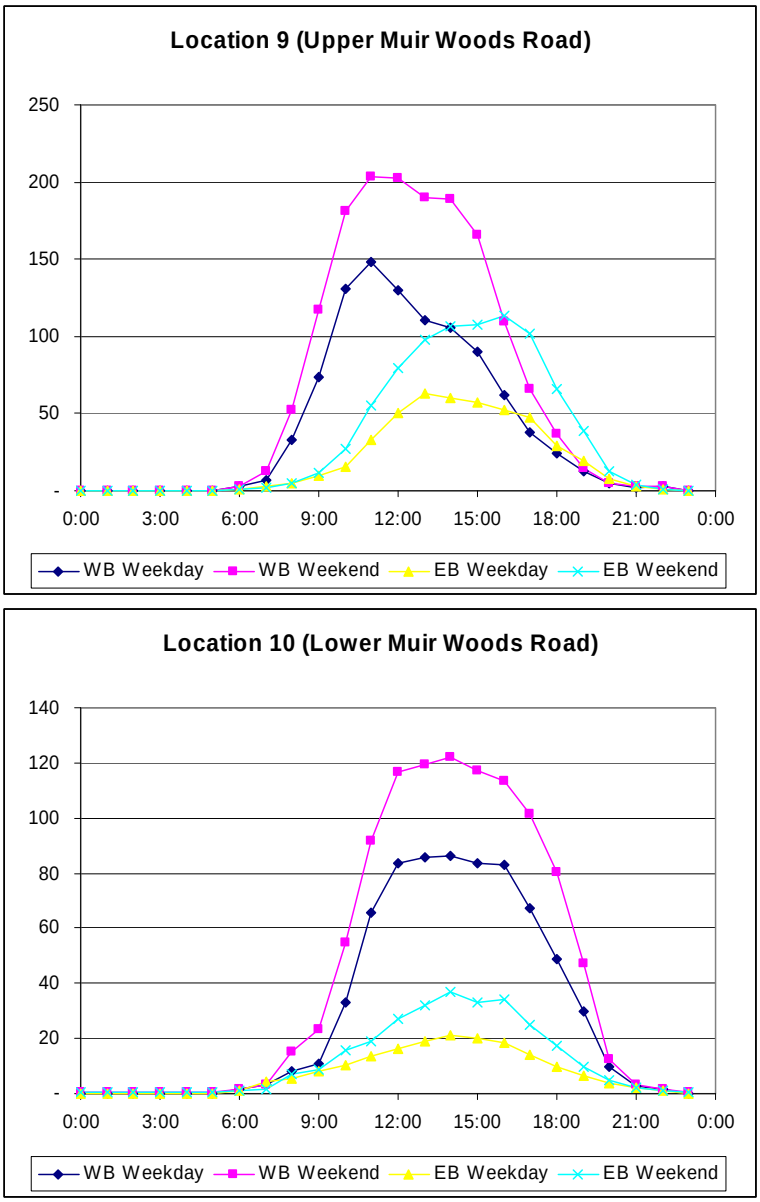


Figure 6-2: "Normal" Daily Traffic Profiles, Locations 9 and 10, 2004

Having established an hourly distribution of traffic for each site in each direction for weekdays and weekend days, it was necessary to develop a baseline traffic growth rate between 2004 and 2005. Since the PCMS were used on the weekends, there is limited ability to compare 2004 and 2005 weekend traffic volumes to establish a growth rate. This is also true of weekdays when the

PCMS were used. Therefore, traffic volumes from weekdays when the PCMS were not activated were used to establish growth rates.

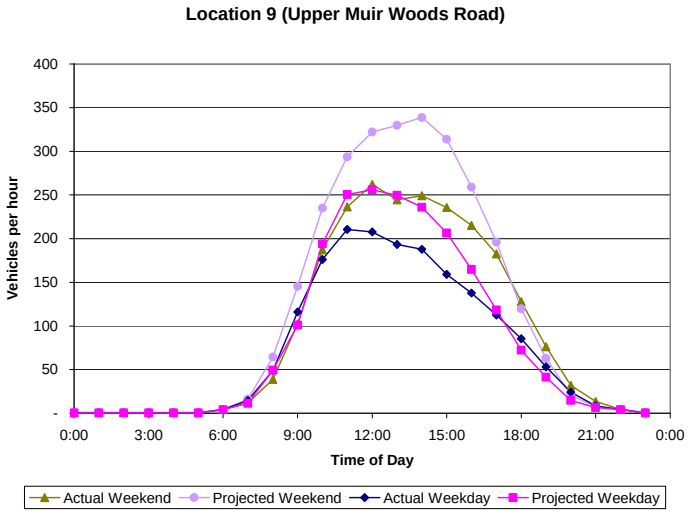
Table 6-8 summarizes the actual daily traffic volumes observed at Locations 9 and 10 for weekdays in 2004 for which the PCMS was not used in the equivalent weekday in 2005, differentiated by direction.

Table 6-8: Comparison of Daily Traffic Volumes, Locations 9 and 10, 2004-2005

	Upper Muir Woods Road (#9)			Lower Muir Woods Road (#10)		
	2004	2005	Growth	2004	2005	Growth
Westbound	924	1,033	12%	671	717	7%
Eastbound	435	521	20%	172	151	-12%
Total	1,359	1,553	14%	844	868	3%

These growth rates were applied to the 2004 "normal" traffic profiles for each site for weekend days and the weekdays when PCMS were used to develop a similar profile for 2005. Profiles for each direction were calculated separately, and then were combined for a bi-directional traffic volume. Then, these 2005 hypothetical volumes were compared to the observed 2005 volumes to calculate the effect of the PCMS. The resulting estimated change in traffic is shown in Figure 6-3. As can be seen, over the course of a typical weekend day, traffic volumes were 19 percent lower than they were expected to have been, had the PCMS not been there. Weekday traffic reductions were 12 to 14 percent, with a smaller reduction being expected given that park visitation levels are higher on weekend days. The change in traffic volumes is observed during the middle of the day, when traffic volumes are normally highest and when the PCMS would be in use.

	Actual Weekend	Projected Weekend	Actual Weekday	Projected Weekday
0:00	1	1	0	0
1:00	1	1	0	0
2:00	1	1	0	0
3:00	1	1	0	0
4:00	1	1	0	0
5:00	1	1	0	0
6:00	4	4	4	4
7:00	12	16	15	11
8:00	39	65	49	50
9:00	102	145	116	101
10:00	187	235	176	194
11:00	236	294	211	251
12:00	262	322	208	256
13:00	244	330	193	250
14:00	249	339	188	236
15:00	236	314	159	206
16:00	215	259	138	165
17:00	183	196	113	118
18:00	128	120	85	72
19:00	76	63	53	41
20:00	32	21	24	15
21:00	14	7	9	7
22:00	4	4	4	4
23:00	1	1	0	0
Total	**2,231**	**2,741**	**1,747**	**1,984**
Change (veh per day)		**510**		**236**
Percentage		**19%**		**12%**



	Actual Weekend	Projected Weekend	Actual Weekday	Projected Weekday
0:00	1	1	1	0
1:00	1	1	1	0
2:00	1	1	1	0
3:00	1	1	1	0
4:00	1	1	1	0
5:00	1	1	1	0
6:00	3	3	3	3
7:00	7	5	8	9
8:00	17	25	17	16
9:00	37	36	26	23
10:00	80	80	59	56
11:00	106	125	91	102
12:00	116	163	110	128
13:00	129	172	119	143
14:00	132	181	119	136
15:00	145	170	122	141
16:00	135	168	104	139
17:00	120	143	89	107
18:00	99	111	68	82
19:00	55	65	41	52
20:00	14	20	14	17
21:00	4	7	7	6
22:00	3	3	3	3
23:00	1	1	1	0
Total	**1,205**	**1,482**	**1,007**	**1,168**
Change (veh per day)		**276**		**161**
Percentage		**19%**		**14%**

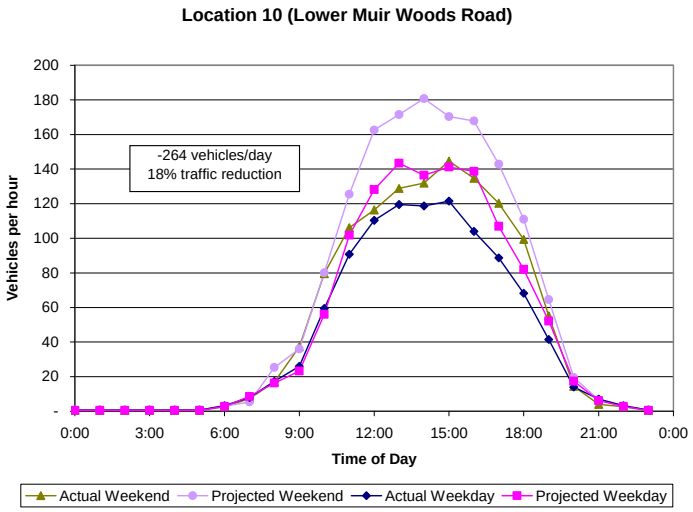


Figure 6-3: Change in 2005 Weekend Traffic Volumes Resulting from PCMS

A strength and a weakness of this approach is that it uses hypothetical traffic volumes as a ground for estimating the benefits of PCMS. It is a strength because a well-designed hypothetical traffic volume may be able to eliminate a variety of external factors and discern the effects that are solely attributable to the PCMS. This is also a weakness because there may be a variety of assumptions involved in generating the hypothetical volumes that could significantly affect the validity of these results.

Daily

A second way to look at the hourly data is to look at individual days when the PCMS were activated. This more detailed analysis can be used to confirm that the preceding analysis is valid and can allow for more focused analysis of what happens when messages are actually on.

To perform this analysis, traffic volumes were compared for a day when a PCMS was used in 2005 versus an equivalent day in 2004. Traffic volumes were compared for each direction at Locations 9 and 10. Daily volumes were compared to provide a sense of relative traffic growth (and to account for factors like weather). Volumes were then compared during the hours in which messages were posted. If the percentage increase of traffic was less during the hours when the message was posted than during the day as a whole, this would suggest that the PCMS had an effect on dampening traffic.

The results of this analysis are shown in Table 6-9. The table lists each date during which a message was displayed, the approximate times when the message was displayed, the text of messages used in that time, and then the observed traffic differences at Locations 9 and 10. Two percentages were calculated for each location: the percent change in daily traffic between 2004 and 2005, and the percent change in traffic during times when the sign was posting a message between the same years. The final column, "Effect", compares the percentage differences observed on overall daily traffic and on traffic observed during periods when the message was posted. The analysis is limited only to days when the PCMS were used in July and August, since 2005 traffic volumes recorded at Locations 9 and 10 in September were clearly errant.

As can be seen, for most days, a relative traffic reduction was observed at both Locations 9 and 10 during the time when the PCMS was in use. Comparing the average percentage changes in traffic volumes observed on a daily basis with those observed during times when a message was displayed, this analysis estimates that there was 2 to 7 percent less vehicle traffic when the PCMS were in use.

6.3. Summary

This chapter used a variety of modeling and statistical methods to quantify the effects of the PCMS on travel patterns to park sites. An analysis of ridership data from the pilot Muir Woods shuttle estimated that the PCMS had a positive effect on shuttle ridership of between 108 and 119 riders per day, and that the signs increased the mode share of transit from 2.0 percent to 4.6 percent. An analysis of daily traffic data showed that there were statistically significant effects on traffic volumes at several locations coincident with the use of the PCMS. An in-depth analysis of traffic volumes at two locations on Muir Woods Road, using hypothetical traffic volumes on a daily basis, estimated that the PCMS reduced daily traffic volumes by 19 percent on weekends and 12 to 14 percent on weekdays. A case study approach, looking at individual days when the PCMS were used, showed a more conservative reduction in traffic of 2 to 7 percent. All of these findings support the objective of reducing congestion on park area roads while not adversely affecting park visitation.

Table 6-9: Daily Traffic Changes Associated with PCMS Messages

Date	Hours	Message	Traffic Difference				Effect
			Location 9		Location 10		
			Daily	Message	Daily	Message	
July 2, 2005	11:30-17:30	MUIR WOODS PARKING FULL	NA	NA	-1%	2%	No Traffic Reductions
July 3, 2005	10:30-12:30	MUIR WOODS PARKING FULL	NA	NA	29%	35%	No Traffic Reductions
July 4, 2005	10:30-17:30	MUIR WOODS PARKING FULL	NA	NA	-14%	-20%	*Traffic Reduction at One Location*
July 9, 2005	10:30-17:30	HWY 1 EXPECT DELAYS	-3%	-3%	-1%	2%	No Traffic Reductions
July 10, 2005	10:30-15:30	MUIR WOODS PARKING FULL / HWY 1 EXPECT DELAYS	-8%	-9%	-6%	-4%	*Traffic Reduction at One Location*
July 16, 2005	11:00-16:30	MUIR WOODS PARKING FULL	-10%	-16%	-12%	-9%	*Traffic Reduction at One Location*
July 17, 2005	11:00-16:30	MUIR WOODS PARKING FULL / STINSON BEACH PARKING FULL	NA	NA	-8%	-8%	No Traffic Reductions
July 23, 2005	10:00-17:00	MUIR WOODS PARKING FULL / MUIR WOODS AND STINSON PARKING FULL / STINSON BEACH PARKING FULL	-2%	-8%	NA	NA	*Traffic Reduction at One Location*
July 24, 2005	11:30-16:30	MUIR WOODS PARKING FULL / MUIR WOODS AND STINSON PARKING FULL / STINSON BEACH PARKING FULL	-9%	-16%	-19%	-20%	**Traffic Reduction at Both Locations**
July 28, 2005	13:00-16:30	MUIR WOODS PARKING FULL	11%	8%	-6%	-14%	**Traffic Reduction at Both Locations**
July 29, 2005	11:00-16:30	MUIR WOODS PARKING FULL	3%	-3%	10%	-9%	**Traffic Reduction at Both Locations**
July 30, 2005	11:00-16:30	MUIR WOODS PARKING FULL	-22%	-27%	-23%	-36%	**Traffic Reduction at Both Locations**
July 31, 2005	11:00-17:00	MUIR WOODS PARKING FULL	-20%	-31%	-11%	-14%	**Traffic Reduction at Both Locations**
August 1, 2005	11:00-16:00	MUIR WOODS PARKING FULL	-9%	-24%	-3%	-5%	**Traffic Reduction at Both Locations**
August 2, 2005	11:00-16:00	MUIR WOODS PARKING FULL	0%	-2%	4%	4%	*Traffic Reduction at One Location*
August 3, 2005	11:00-16:00	MUIR WOODS PARKING FULL	3%	-6%	4%	11%	*Traffic Reduction at One Location*
August 4, 2005	11:00-16:00	MUIR WOODS PARKING FULL	5%	-4%	-8%	-8%	**Traffic Reduction at Both Locations**
August 5, 2005	11:00-16:00	MUIR WOODS PARKING FULL	-13%	-21%	-12%	-9%	*Traffic Reduction at One Location*
August 6, 2005	11:30-15:00	MUIR WOODS PARKING FULL	-1%	1%	-13%	-17%	*Traffic Reduction at One Location*
August 7, 2005	11:00-15:00	MUIR WOODS PARKING FULL	-9%	-11%	-7%	-10%	**Traffic Reduction at Both Locations**
August 8, 2005	11:00-16:00	MUIR WOODS PARKING FULL	-7%	-18%	-7%	-4%	*Traffic Reduction at One Location*
August 9, 2005	11:30-16:30	MUIR WOODS PARKING FULL	8%	-7%	0%	7%	*Traffic Reduction at One Location*
August 11, 2005	11:00-16:30	MUIR WOODS PARKING FULL	21%	7%	1%	0%	**Traffic Reduction at Both Locations**
August 12, 2005	11:00-17:00	MUIR WOODS PARKING FULL	-10%	-17%	2%	3%	*Traffic Reduction at One Location*
August 13, 2005	10:30-17:30	MUIR WOODS PARKING FULL	-12%	-18%	-16%	-22%	**Traffic Reduction at Both Locations**
August 14, 2005	11:00-16:30	MUIR WOODS PARKING FULL	-4%	-7%	-16%	-17%	**Traffic Reduction at Both Locations**
August 15, 2005	12:00-17:00	MUIR WOODS PARKING FULL	-3%	-12%	-7%	-9%	**Traffic Reduction at Both Locations**
August 19, 2005	12:30-17:00	MUIR WOODS PARKING FULL	8%	-5%	-4%	-6%	**Traffic Reduction at Both Locations**
August 20, 2005	11:00-16:30	MUIR WOODS PARKING FULL	-21%	-25%	-23%	-13%	*Traffic Reduction at One Location*
August 21, 2005	11:30-17:00	MUIR WOODS PARKING FULL	-17%	-26%	-24%	-32%	**Traffic Reduction at Both Locations**
August 27, 2005	10:30-16:30	MUIR WOODS PARKING FULL	-13%	-14%	-17%	-29%	**Traffic Reduction at Both Locations**
August 28, 2005	11:00-17:00	MUIR WOODS PARKING FULL	-16%	-21%	-6%	-14%	**Traffic Reduction at Both Locations**
Summary			**-5%**	**-12%**	**-7%**	**-9%**	

7. STAKEHOLDER PERCEPTIONS

On-going reliance on the PCMS depends, in part, on stakeholders' perceptions about how well they address transportation challenges at GGNRA. Surveys of internal stakeholders, conducted before and after implementation of the PCMS, were used to gauge these perceptions. The surveys were distributed to an identical mailing list and, although there were differences in who responded to each survey, these differences were minor and would likely not affect the interpretation of the results. Detailed survey responses for the pre-PCMS and post-PCMS surveys are found in Appendix I and Appendix K, respectively.

This chapter summarizes the key findings regarding stakeholders' perceptions of GGNRA transportation challenges, and PCMS effectiveness. The survey results are summarized across surveys for each question.

7.1. Did PCMS Address Transportation Challenges?

To understand respondents' opinions of transportation in and around GGNRA, they were asked to rank traffic challenges in the area, if there is a need for better traveler information, and how they felt better traveler information would affect travelers.

Prior to PCMS implementation, stakeholders were asked to assess the severity of transportation challenges around GGNRA using a 1-to-5 scale, where 1 is no challenge and 5 is a severe challenge. After PCMS implementation, stakeholders were asked to what extent the PCMS helped address those challenges, using a 1-to-5 scale, where 1 represented decreased frequency or severity and 5 represented increased frequency or severity. Because of the different scales used in each survey, it is helpful to reverse the ordering on the post-PCMS survey, to see how the PCMS' success in addressing various transportation challenges corresponded with the perceived severity of those challenges.

As shown in Figure 7-1, prior to PCMS implementation, stakeholders perceived parking as the biggest transportation challenge facing the park, followed by traffic back-ups. Congestion, park usage levels and visitor complaints all had mean rankings higher than "neutral", indicating that stakeholders generally agreed that these were problems. After PCMS implementation, respondents felt that parking conflicts, traffic congestion and vehicle speeds all improved. A couple of respondents suggested that there was an increase in visitor complaints. This may be the result of some of the issues with shuttle usage, since visitor surveys yielded a generally positive response regarding the PCMS.

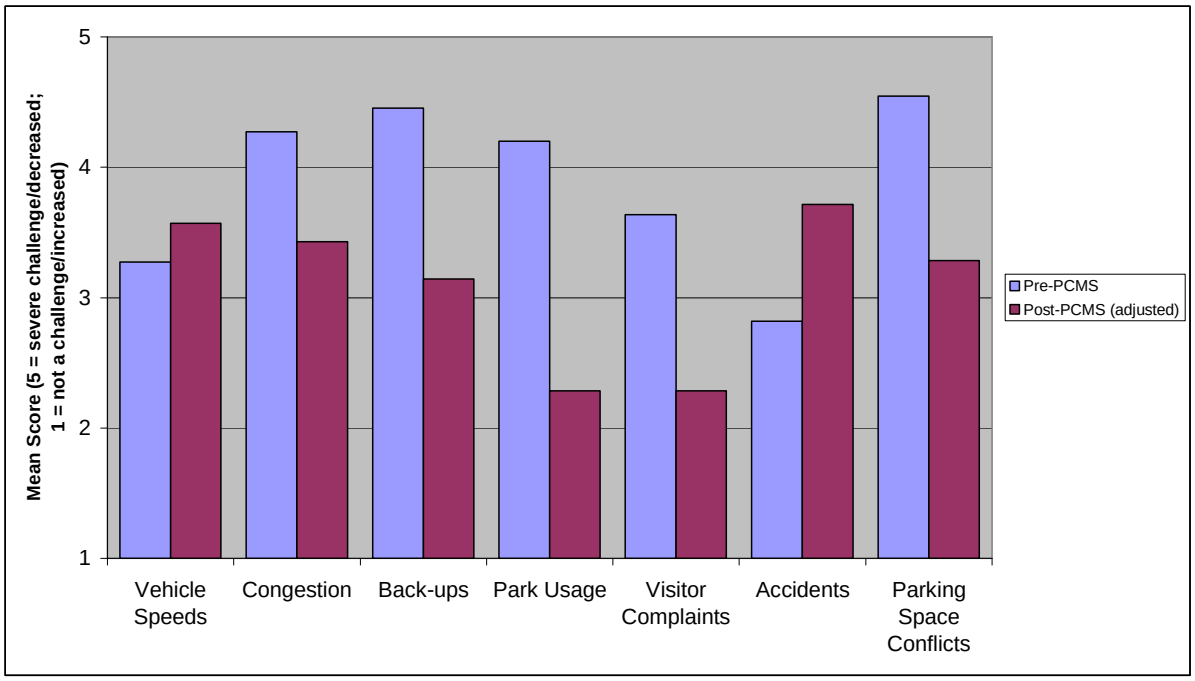


Figure 7-1: Differences in Challenges

7.2. How Did PCMS Help Traveler Information?

In the pre-implementation survey, all respondents agreed or strongly agreed that better traveler information needs to be provided to visitors. Respondents were then asked to assess the benefits of improved traveler information. In the pre-implementation survey, respondents were asked generically about traveler information improvements, whereas the post-implementation survey focused on whether stakeholders thought that the PCMS helped to realize some of these traveler information benefits. As shown in Figure 7-2, respondents generally agreed that improved traveler information, specifically through the PCMS, would provide all of the benefits stated on the questionnaire, including providing better (i.e. more current and relevant) information to motorists earlier, and allowing visitors to make more efficient decisions. While there were some changes in the mean scores between the surveys, it should be noted that stakeholders generally responded positively to the effectiveness of the PCMS in improving traveler information.

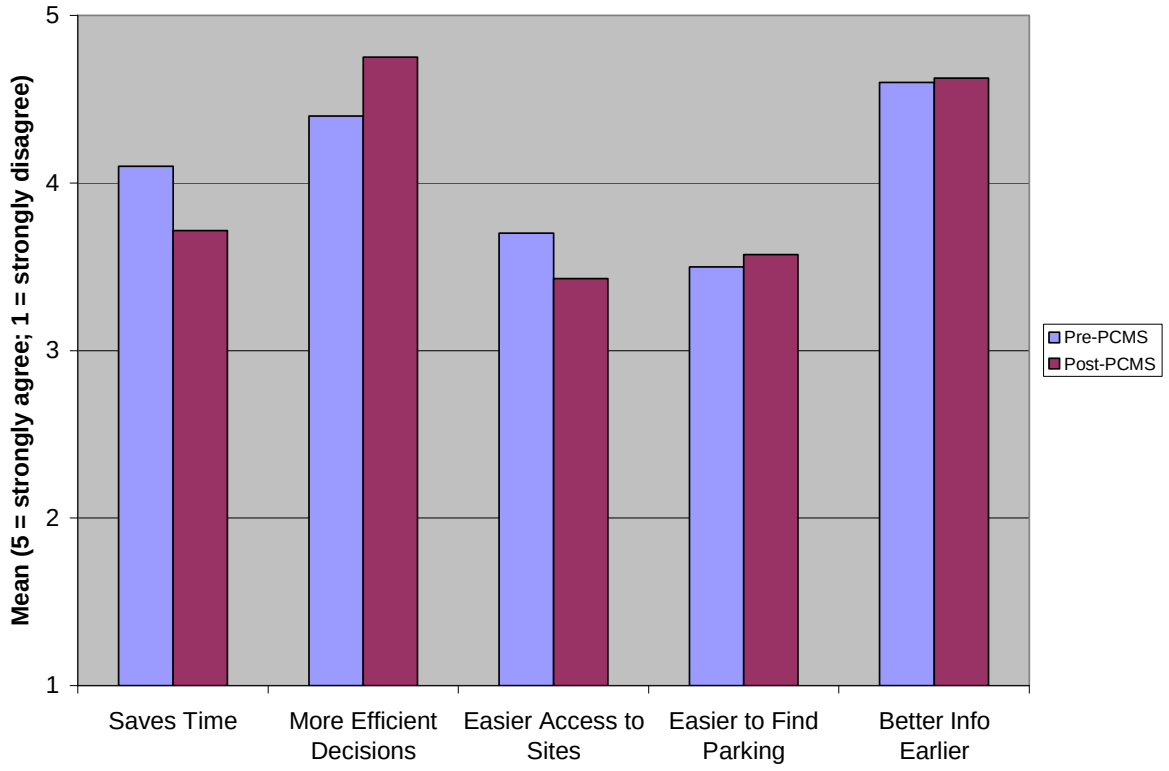


Figure 7-2: PCMS Effects on Drivers

7.3. PCMS Effectiveness

Respondents were asked to predict the effectiveness of the PCMS before their implementation, and then assess their usefulness afterward. As indicated by Figure 7-3, stakeholders were hopeful that the signs would be effective, and, after the demonstration project, they unanimously agreed that the signs were effective.

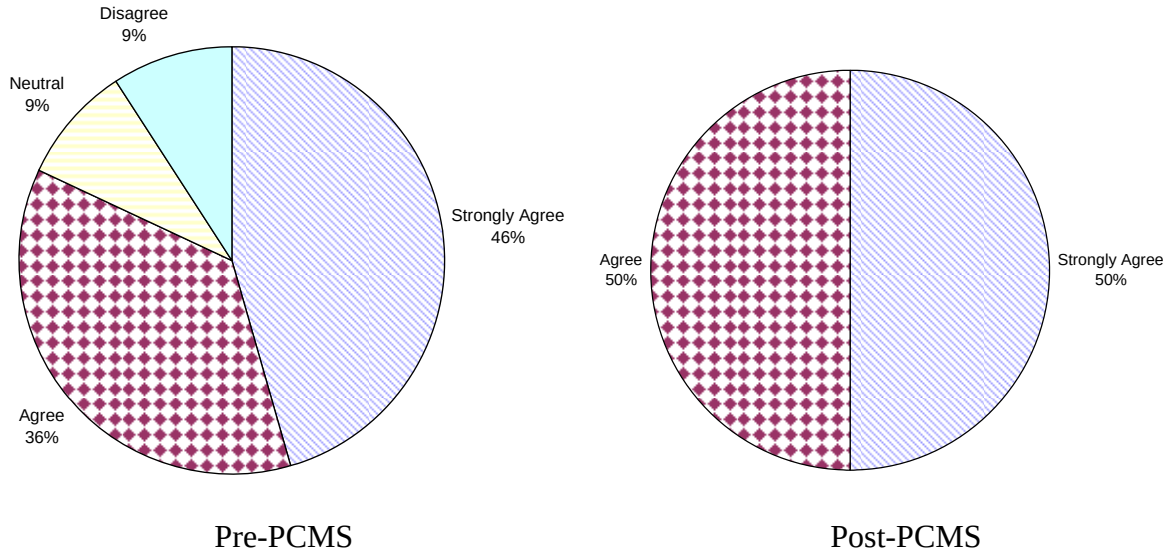


Figure 7-3: PCMS Effectiveness

One potential benefit of the PCMS is that it would save time for agency personnel who must address congestion and parking challenges associated with park visitor traffic. Respondents were therefore asked before PCMS implementation whether they expected to save time with the PCMS, and afterward, whether they felt they had saved time. The responses are shown in Figure 7-4. Approximately two-thirds of the respondents in both surveys thought that the PCMS would save time. The fact that these are essentially equal shows that the stakeholders thought that the PCMS delivered on their potential in saving time for their agencies.

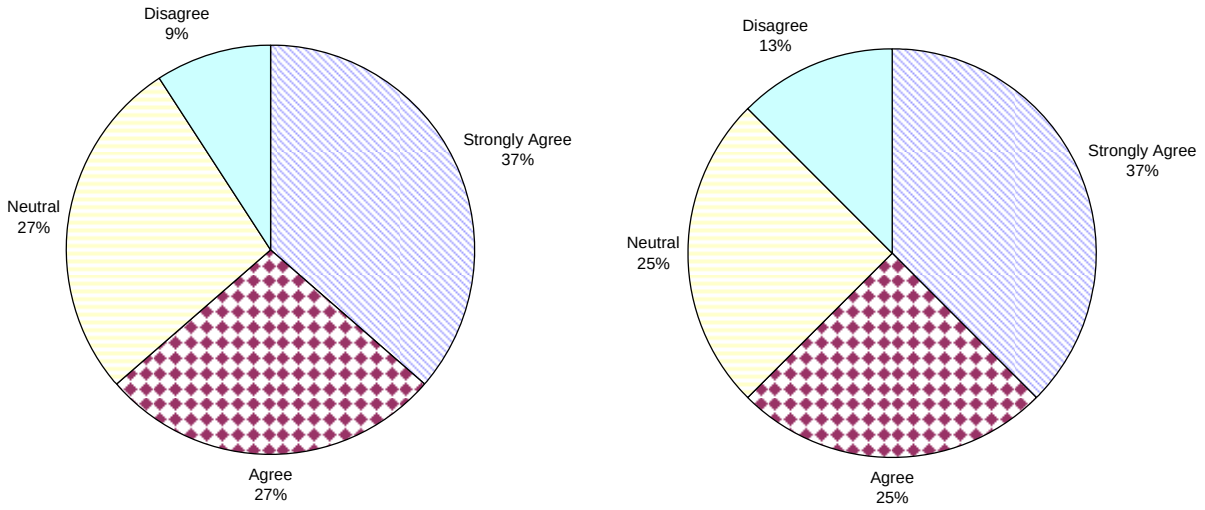


Figure 7-4: Will/Did PCMS Save Time for the Agencies?

In the post-PCMS survey, stakeholders were asked a couple of other questions regarding the effectiveness of the signs. Over 70 percent of respondents felt that the PCMS affected daily operations in either a positive or strongly positive way. Respondents unanimously agreed that the PCMS were appropriately located for providing traveler information, and they agreed with the messages that were posted on the signs.

8. SUMMARY AND NEXT STEPS

8.1. Summary and Recommendations

This report summarized an evaluation of PCMS deployed to help address transportation challenges associated with congestion and parking at select GGNRA sites located in Marin County. Four primary methods were used to evaluate PCMS effectiveness: visitor surveys, review of operations and maintenance records, shuttle and traffic count data, and surveys of involved stakeholders.

- Visitor Surveys. Visitors at Muir Woods and Stinson Beach were surveyed regarding their perceptions of the PCMS. While many respondents did not perceive significant congestion problems on their visit (with the exception of parking challenges at Muir Woods), respondents generally considered the signs to be useful and appropriate for providing dynamic information. The survey did not indicate any major effects of the signs on visitors' travel patterns.

- Operations and Maintenance. Messages were posted 47 times during the demonstration period, mostly on weekends, with each message being displayed for an average of 4.5 hours. Most of the time, only one message was posted per day, but this could have been because there were frequent challenges establishing remote connections to the signs. The pre-approved message set was mostly sufficient for traveler information needs, although one non-approved message was used. There were no reported conflicts between different agencies seeking to simultaneously post messages.

  Stakeholders indicated that there was some effort involved in posting messages. Stakeholders indicated that this responsibility took more than 30 minutes per day, and that programming the PCMS was very difficult. There were reports of software problems, remote connections that were either non-functional or required several attempts to connect, and messages that never appeared. Maintenance challenges included a modem replacement, software rebooting, and cleaning of the solar panels after a power problem was recognized.

- Shuttle Usage. An analysis of ridership data from the pilot Muir Woods shuttle estimated that the PCMS had a positive effect on shuttle ridership of between 108 and 119 riders per day, and that the signs increased the mode share of transit from 2.0 percent to 4.6 percent.

- Traffic Counts. Two different approaches were used to estimate the traffic impacts of the PCMS. One method estimated that the PCMS reduced daily traffic volumes by 19 percent on weekends and 12 to 14 percent on weekdays. A case study approach, looking at individual days when the PCMS were used, showed a more conservative reduction in traffic of 2 to 7 percent.

- Stakeholder Surveys. Pre- and post-PCMS surveys were used to see whether the PCMS were perceived to have met their promise. Respondents generally felt that the PCMS were an effective means of providing traveler information. They thought that the signs saved them

time, and affected daily operations in a positive way. They perceived that parking conflicts, traffic congestion and vehicle speeds all improved with PCMS implementation.

In summary, the PCMS appear to have been effective in helping to manage congestion and parking problems at GGNRA, and they were welcomed by stakeholders. However, there are a variety of operations and maintenance challenges that should be addressed as part of long-term implementation of the signs[6].

8.2. Next Steps

This research project was initiated to provide benefit to a specific national park, while also providing lessons learned that may be applicable to other parks in California. This section describes how the findings of this evaluation may be applied for each setting.

8.2.1. GGNRA

The purpose of the early-winner project was to demonstrate early success with ITS in addressing park transportation challenges. Early success could help to provide a foundation for future usage of ITS solutions, as appropriate. The evaluation results, documented in this report, show that the PCMS have been successful. Therefore, the PCMS might provide a base of functionality on which future ITS improvements might be built. How should the park proceed with future ITS implementation?

Coordinate with Regional ITS Planning Efforts

It is standard practice for ITS projects to be designed in the context of a regional ITS architecture. This is especially relevant for GGNRA for a couple of reasons. First, since many park visitors are residents in the immediate region, there are many opportunities for integration of park-based ITS into the regional system. Second, one of the park's biggest transportation challenges is improved pre-trip information, which in the context of GGNRA's dispersed land holdings would require information to be disseminated outside the park boundaries. Coordination with regional ITS planning efforts, including architecture development, is therefore vital. This coordination will often have the side benefit of creating awareness of other partnership opportunities outside of the ITS realm.

Continue and Improve Upon PCMS Usage

Based on the results of this evaluation, the PCMS should continue to be used, as conditions warrant, for providing real-time traveler information to visitors traveling toward GGNRA sites accessible by State Route 1. This will require renewing (or potentially re-writing) the MOU between Caltrans and GGNRA, because the PCMS were deployed as a pilot project. With the experience of the summer of 2005 in mind, park personnel should review message sets with

[6] Because the PCMS were installed as part of a pilot project, and because fewer park staff resources were available, the signs were not used in 2006.

Caltrans District 4 to make sure they more comprehensively reflect future use. Remote connectivity to the PCMS should be thoroughly tested before implementation (i.e. April/May of a given year). While the signs proved valuable even with spotty remote communication, improvements in connectivity would likely result in a multi-fold increase in PCMS utility.

Promote Alternative Access Options

The use of PCMS was effective in large part because they were placed at a decision point where the visitor could select a viable alternative for accessing park sites. It is likely that there would have been much less positive impact had the pilot shuttle not been in operation. Because of its complementary value to the PCMS (and future information outlets), the Muir Woods shuttle should continue to be made available. Based on previous experience, it is likely that funding for the shuttle would need to arise from non-park sources. Expansion of shuttle or transit service options to other park sites may also be beneficial in reducing traffic on park-area roads and overflow parking challenges.

Promote Additional Information Outlets

Park personnel have conveyed a vision of intercepting visitors earlier, even as early as at a hotel room, so that they make travel decisions that are more consistent with weather conditions, available parking, and other factors. The PCMS represent one step in that direction, and other candidate early-winner projects, such as adding cameras to provide pictures of current weather and parking at Muir or Stinson Beaches or experimenting with highway advisory radio, could provide additional help.

8.2.2. Other California Parks

GGNRA is different from other national parks in California because of its combination of very high visitation levels, especially from regional residents, and the diverse and dispersed nature of its land holdings. While other parks may also have challenges with parking and congestion, the solution tested at GGNRA may not be as successful elsewhere[7]. In addition, while the costs of ITS may have some comparability across several parks, the benefits may vary widely. However, the findings from this research do have some transferability to other parks.

Regional Coordination is Essential for Improving Traveler Information

Improved pre-trip traveler information is a common theme for most higher-visitation national parks and recreation areas. While providing that information can rely exclusively on NPS outlets such as a park telephone number, it is often more effective when it can be supported on a real-time basis as travelers are making their journey to the park. This requires partnership between the park and regional transportation agencies. GGNRA has had a long partnership with several area partners, including Caltrans District 4, the Metropolitan Transportation Commission, the Golden Gate Bridge, Highway and Transportation District, Marin County, the City and County of San

[7] The PCMS may work well at Santa Monica Mountains NRA, an urban park near the Los Angeles metropolitan area, which has some similar characteristics.

Francisco and others. This partnership has resulted in several, mutually beneficial efforts related to park and recreational travel, of which the PCMS is just one example. Parks and Caltrans districts containing parks should seek to strengthen their relationships with regional transportation agencies to support improved pre-trip traveler information.

ITS Can Be Deployed in a Context-Sensitive Fashion

National parks are designed to protect specific historical, natural and cultural resources, and the introduction of ITS can interfere with that context. The ITS elements deployed in this project were all located outside of the park boundary (on Caltrans right-of-way). Nonetheless, GGNRA park personnel believed that to promote a more consistent visitor experience, the PCMS should not use the conventional Caltrans orange paint color. Caltrans agreed to allow white for this pilot project: not the conventional brown traditionally used for NPS trailblazing signage, but not the orange usually associated with construction or work zone activity.

While national parks have control over the appearance of ITS elements within their boundary, this suggests that parks can also work with transportation agencies outside their boundaries to develop mutually acceptable approaches for ITS elements that meet park transportation needs while conforming to transportation agency guidelines.

Operations and Maintenance Are Critical for ITS

Support for operations and maintenance of ITS is key for its long-term success. Due to technical difficulties with the PCMS, the pilot project was more heavily dependent on support from park personnel than originally envisioned. However, even beyond these technical difficulties, the PCMS would not have been effective had they not been used consistently to display accurate, real-time information. Without that support from park personnel, the PCMS would not have been successful at all. Other parks considering ITS alternatives should recognize that they do not involve merely a one-time cost, but rather on-going support from staff.

Need for a Champion

Related to the preceding observation, it is important for a national park interested in ITS to have a champion for ITS. This person does not need to be a transportation engineer or a planner, but he or she does need to be an individual who understands how collection, archival and distribution of real-time information can help a park to better fulfill its mission. This falls outside of the direct resource preservation mandate under which national parks operate, and is therefore often not automatically available within a park's staff roster or organizational structure.

REFERENCES

1. Nelson/Nygaard Consulting Associates, Fehr & Peers, and BRW. *Transportation Management Plan for the Marin Headlands and Fort Baker-Existing Conditions Report.* Prepared for the Golden Gate National Recreation Area, National Park Service, November 2000.

2. J. Helmuth and C. Strong, "Feasibility Report for Early-Winner Project Concepts: Golden Gate National Recreation Area," Western Transportation Institute, Montana State University-Bozeman, October 2003.

3. Robert Peccia and Associates, *Comprehensive Transportation Management Plan for Parklands in Southwestern Marin: Existing Conditions, Technical Memorandum #3,* September 2003.

4. Robert Peccia and Associates, "2004 Summer Traffic Counting Summary," Technical Memorandum Prepared for CTMP Technical Advisory Committee, December 7, 2004.

5. C. Strong, J. Eidswick, S. Shafer, G. Dilworth and S. Turner, "Assessing Needs and Identifying Opportunities for ITS Applications in California's National Parks: Final Technical Report," Western Transportation Institute, Montana State University, June 2004.

6. C. Strong and J. Helmuth, "Feasibility Report for Early-Winner Project Concepts: Sequoia and Kings Canyon National Parks," Western Transportation Institute, Montana State University-Bozeman, September 2003.

7. 2004 and 2005 Traffic Volumes, Traffic and Vehicle Data Systems Unit Web Page, Accessed at http://www.dot.ca.gov/hq/traffops/saferesr/trafdata/ on January 3, 2007.

8. D.E. Widmayer, "2004 Summer Traffic Counting Summary," Technical Memorandum Prepared for CTMP Technical Advisory Committee, December 7, 2004.

APPENDIX A: DRAFT PCMS MEMORANDUM OF UNDERSTANDING

(Note: This is not the final version of the Memorandum of Understanding. The final version of this Memorandum of Understanding is available from Michael Savidge at Golden Gate National Recreation Area, Michael_J_Savidge@nps.gov, 415-561-4725.)

MEMORANDUM OF UNDERSTANDING
(MOU)
Between the
National Park Service (Golden Gate National Recreation Area) and
California Department of Transportation (Caltrans)
Effective _____, 2005
for the
Deployment of Intelligent Transportation Systems (ITS):
Portable Changeable Message Signs (PCMS)

ARTICLE I - BACKGROUND AND OBJECTIVES:

A. BACKGROUND:

This MOU is established for the purpose of improving congestion, access and safety to Golden Gate National Recreation Area (a unit of the National Park Service) within southwest Marin County. Since US 101 and CA State Route 1 (maintained by Caltrans), are heavily used significantly by visitors and residents accessing GGNRA park sites, it benefits both signatory agencies to make improvements to the operations of these roads. This MOA specifically addresses the use of portable changeable message signs (PCMS) for traffic control.

B. OBJECTIVES:

This MOU states that Caltrans and the National Park Service, Golden Gate National Recreation Area (hereinafter referred to as GGNRA) will support each other and work together in the deployment of technologies and equipment that may be used to relieve congestion, enhance access and improve safety in southwest Marin County. Specifically, Caltrans will allow the placement of PCMS units owned by GGNRA within the specific identified right-of-way owned by Caltrans on US 101 in Marin County for the purposes of a pilot test of this ITS equipment.

ARTICLE II - LEGISLATIVE AUTHORITY:

NPS (GGNRA) 16 U.S.C. §§1-3 A memorandum of understanding is used to document mutually agreed upon policies, procedures, objectives, and/or assistance relationships that do not involve funding. The legal authorities for this type of agreement are the enabling park legislation or the general management authorities found at **16 U.S.C. §§1-3**.

Caltrans: CALIFORNIA Streets
and Highways Code §§ (to be completed by Caltrans)

ARTICLE III - STATEMENT OF WORK:

A. EQUIPMENT AND LOCATION:

This MOU provides for the installation, operation and maintenance of two portable changeable message sign units (PCMS) on US Highway 101. The first PCMS unit will

be located southbound at milepost 5.05 (before Seminary Drive exit near Goodman Lumber), or southbound at milepost 5.64 (past Seminary Drive exit sign overpass). The second PCMS unit will be located northbound at milepost 2.7 (past Rodeo Avenue exit at a pullout near Caltrans callbox MR-101-30) or northbound at milepost 0.4. (between Alexander Avenue and Waldo Grade Tunnel).

B. PILOT PROJECT:

1. The parties mutually agree that it is in the public interest to perform a pilot implementation of two PCMS units for use on US 101. The PCMS units will be used by both parties to post messages related to highway conditions and incidents on US 101 and CA State Route 1 along with parking lot congestion status for NPS-GGNRA sites (i.e. Muir Woods, Stinson Beach, Muir Beach, etc.).

2. While GGNRA will retain ownership of the PCMS units and control most aspects of operation of the PCMS units, Caltrans shall have the capability of posting electronic messages relating to US 101, CA State Route 1 and related highway conditions and incidents utilizing mutually acceptable procedures.

3. GGNRA and Caltrans agree to develop mutually acceptable procedures for the operation of the PCMS units. Caltrans message requests will be sent to GGNRA or the U.S. Park Police Dispatch Center staff for placement on the PCMS units. GGNRA shall keep PCMS protocols, procedures, contact names and phone numbers associated with the PCMS use up-to-date, and shall immediately notify Caltrans in writing of all intended changes.

4. GGNRA and Caltrans will mutually develop a set of acceptable messages and establish priority levels to resolve conflicts in circumstances where more than one message is needed to be displayed on the PCMS units.

5. The parties mutually agree that due to the fact that these portable PCMS units will be used on Caltrans right-of-way, they must remain compliant with Caltrans policies, procedures, and practices and the Federal Highway Administration (FHA) Manual on Uniform Traffic Control Devices (MUTCD) relating to CMS design and placement requirements.

6. The parties mutually agree to inform the public during the planning and implementation of the Pilot Project deployment of PCMS units in all available GGNRA and Caltrans media.

7. This MOU does not remove any other obligations of a party imposed by law to share information with other agencies.

8. The laws of the United States of America govern this MOU.

C. NPS - GGNRA SPECIFIC OBLIGATIONS:

1. GGNRA shall provide for all operations, fueling, maintenance, and administrative costs relating to the operation of the PCMS units.

2. GGNRA shall be responsible for the coordination and management of the operation of the PCMS units from the U.S. Park Police Dispatch Center located in the Presidio of San Francisco.

3. GGNRA shall apply for necessary encroachment permits for required work and for the presence of the PCMS units within the State highway right of way, in accordance with Caltrans standard permit procedures.

4. GGNRA shall be responsible for creating and updating a PCMS use log indicating messages displayed, reason for use, time message was initiated time message was deactivated, name of operator (dispatcher), initiating agency, and whether there was a multiple need for PCMS unit at the time the message was displayed.

D. CALTRANS SPECIFIC OBLIGATIONS:

1. Caltrans, upon proper application by GGNRA, agrees to issue, at no cost, the necessary encroachment permits for the installation and use of the PCMS units at mutually agreed sites within State right-of-way on US 101 in Marin County.

2. Caltrans shall be responsible for transport and set-up of the PCMS units at the designated sites within State right-of-way on US 101 in Marin County at the start of the heavy visitor season (approximately April [exact date for 2005 season TBD]), two (2) days following receipt of correct notice of a request from GGNRA.

3. Caltrans shall be responsible for the removal of the PCMS units from State right-of-way on US 101 and storage at the Manzanita Maintenance Yard at the end of the heavy visitor season (approximately September [exact date for 2005 season TBD]), two (2) days following receipt of correct notice of a request from GGNRA.

4. Caltrans shall be responsible for moving the PCMS units if Caltrans determines they need to be moved for a valid reason (i.e. incident clean-up, construction project, etc.). If the PCMS units need to be moved, Caltrans shall provide notice to GGNRA of at least two (2) days prior to moving the PCMS units. An exception will be allowed for emergency situations, in which case, Caltrans shall be responsible for providing two (2) hours notice to GGNRA of that action once the PCMS unit(s) are moved.

ARTICLE IV - TERM OF AGREEMENT:

A. This MOU is made and entered into effective the _____ day of ____, 2005, between the National Park Service - Golden Gate National Recreation Area, and Caltrans. It shall be valid for a period of one year, commencing upon the effective date, or until a long-term agreement between the parties is agreed upon and becomes effective, provided that cooperative agreement becomes effective within the one year time period. If the parties desire; this MOU may be extended for periods of one year beyond the original end date, but the MOU cannot exist for a total of more than five years.

ARTICLE V - KEY OFFICIALS:

A. National Park Service – Golden Gate National Recreation Area: The GGNRA Project Manager for this MOU is Paul Bignardi – Transportation Planner, Building 201, Fort Mason, San Francisco, CA 94123. Phone (415) 561-4933. The GGNRA staff person responsible for the PCMS units and corresponding equipment is Bert Carlson, Communications Manager, Bldg. 35, Presidio, San Francisco, CA 94129. Phone (415) 561-5505 / 5510.

B. California Department of Transportation: The Caltrans Project Manager for this MOU

is Alan Chow, California Department of Transportation, District 4, P.O. Box 23660, Oakland, CA 94623. Phone (510) 286- 4577.

ARTICLE VI - PRIOR APPROVAL:

N/A

ARTICLE VII - REPORTS AND OTHER DELIVERABLES:

A. The parties mutually agree to allow staff from the Western Transportation Institute (WTI) to have access to data generated as part of the PCMS pilot project.

ARTICLE VIII - PROPERTY UTILIZATION:

A. During the off-season (approximately November – April [exact dates TBD for 2005-2006 season]), Caltrans shall use and operate the PCMS units during emergency situations without restriction.

B. GGNRA shall give Caltrans Manzanita Maintenance Yard staff two (2) days written notice before the two (2) PCMS units need to be transported and placed in the Caltrans right-of-way at the mutually agreed to locations.

C. If, during the off-season (approximately October – March), following completion of the Pilot Project time frame of the 2005 heavy visitor season, a jointly perceived need arises for the re-deployment of the PCMS units, Caltrans shall transport, set-up, and remove the PCMS units following adequate notice by GGNRA.

D. GGNRA (as the owner of the PCMS units) shall be responsible for the repair of the PCMS units if damaged, and for the replacement of the PCMS units if lost or stolen, unless the damage or loss occurs during an off-season emergency use by Caltrans, or if the damage or loss occurs within a Caltrans storage facility while the PCMS units are not in use. Under these circumstances, the responsibility for repair or replacement shall be with Caltrans.

ARTICLE IX - MODIFICATION AND TERMINATION:

A. The MOU may be amended upon the signed agreement by both parties to clarify or better describe operations responsibilities, maintenance responsibilities, and other concerns. Any amendments must include a written document setting forth the modification(s) signed by the consenting parties. This MOU shall be in effect once all required signatures are obtained, unless otherwise modified.

B. Either GGNRA or Caltrans may terminate participation in this MOU upon sixty (60) days prior notice to the other signatory party.

ARTICLE X - STANDARD CLAUSES:

A. CIVIL RIGHTS: During the performance of this MOU, the participants agree to abide by the terms of the U.S. Department of the Interior – Civil Rights Assurance Certification, of non-discrimination and will not discriminate against any person because of race, color, religion, sex, or national origin. The participants will take affirmative action to ensure that applicants are employed without regard to their race, color, sexual orientation, national origin, disabilities, religion, age or sex.

B. PROMOTIONS: Caltrans will not publicize or otherwise circulate promotional material (such as advertisements, sales brochures, press releases, speeches, still and motion

pictures, articles, manuscripts, or other publications), which state or imply Governmental, Departmental, bureau or Government employee endorsement of a product, service or position which Caltrans represents. No release of information relating to this Agreement may state, or imply that the United States Government approves of Caltrans' work or considers Caltrans' work product to be superior to other products or services.

C. PUBLICATION OF RESULTS OF STUDIES: No party will unilaterally publish a joint publication without consulting the other party. This restriction does not apply to popular publication of previously published technical matter. Publication pursuant to this MOU may be produced independently or in collaboration with others; however in all cases proper credit will be given to the efforts of those parties contributing to the publication. In the event no agreement is reached concerning the manner of publication or interpretation of results, either party may publish data after due notice and submission of the proposed manuscripts to the other. In such instances, the party publishing the data will give due credit to the cooperation provided by the other party, but will assume full responsibility for any statements on which there is a difference of opinion.

ARTICLE XI - SIGNATURES AND DATES:

IN WITNESS WHEREOF, GGNRA and Caltrans by their signatures have executed this MOU.

GOLDEN GATE NATIONAL RECREATION AREA	CALIFORNIA DEPARTMENT OF TRANSPORTATION – DISTRICT 4
By:_____	By:_____
Date:_____	Date:_____
Approved as to legal sufficiency:	Approved as to form and procedure:
By:_____	By:_____
Date:_____	Date:_____

APPENDIX B: APPROVED PCMS MESSAGES

All HAR and PCMS messages need to be updated as conditions change or at least once an hour.

HIGHWAY 1

```
HWY 1
EXPECT
DELAYS
```

PARKING FULL

```
MUIR            PARKING
WOODS           FULL

STINSON         PARKING
BEACH           FULL

MOUNT           PARKING
TAM             FULL
```

CLOSED

```
MUIR
WOODS
CLOSED

STINSON
BEACH
CLOSED

MOUNT
TAM
CLOSED
```

HAR MESSAGE SETS

The PCMS needs to be located in the effective range of the HAR for the following messages to be used.

HIGHWAY 1

```
HWY 1           TUNE
TRAFFIC         TO
INFO            AM XXX


PARK            TUNE
INFO            TO
                AM XXX
```

CLOSED

```
MUIR            TUNE
WOODS           TO
```

```
CLOSED          AM XXX

STINSON         TUNE
BEACH           TO
CLOSED          AM XXX

MOUNT           TUNE
TAM             TO
CLOSED          AM XXX
```

APPENDIX C: ENCROACHMENT PERMIT

(Note: The Encroachment Permit is available from Michael Savidge at Golden Gate National Recreation Area, Michael_J_Savidge@nps.gov, 415-561-4725.)

APPENDIX D: INVITATION FOR BID

Starts on following page

INVITATION FOR BID

Montana State University-Bozeman
Purchasing Department
104 Montana Hall
PO Box 172600
Bozeman, MT. 59717-2600
Tel. (406) 994-3211
Fax (406) 994-3000

THIS IS NOT AN ORDER

DATE**June 4, 2004**

Visit our Internet site:
http://www.state.mt.us/doa/GSD/osbs

Vendor Name/Address	Bid Number: **B0000940**
	Bid Title: **Portable Changeable Message Sign (CMS)**
	Bids will be received & publicly opened at Montana Hall, Montana State University, Bozeman, MT, 2:00 p.m. Mountain Time on:
	Bid Issued By: Shawna Lanphear, Director of Purchasing

IMPORTANT:

- Terms and Conditions are established in accordance with the laws of the State of Montana and are attached.
- To assure consideration, your response must be in the University Purchasing Department by 2:00 P.M. on the open date shown above. Show Bid number and due date under your return address on your proposal envelope. Bid may be sent by facsimile.
- Bids should be completed in ink and on this form.
- Bid net prices at which you agree to furnish any or all of the articles identified herein, F.O.B. destination freight prepaid and included.
- The University reserves the right to accept or reject bids on each item, groups of items, or all items, waive informalities and to contract in the best interest of the University.
- Bids are subject to the special terms and conditions attached hereto.
- By signing below, Vendor affirms having read all conditions noted herein, agrees thereto and has stated hereon the price at which he/she will furnish and deliver at the given locations the articles as specified.
- Vendors may submit alternate bids (a bid on supplies other than specified). Alternate bids are considered only if the Vendor is the lowest responsible Vendor on their primary bid. Bids must be clearly identified as "Primary" and "Alternate."

VENDOR MUST COMPLETE:

Name & Mailing Address of Vendor	Signature of person authorized to sign	Date of your Bid
		Your Bid #:
	Printed Name and Title	Telephone #: Fax #
	Federal Tax Identification #:	Email:

- This Bid is firm 30 days from date of opening unless otherwise noted.
- Successful Vendor guarantees delivery F.O.B. Destination within _____ days after receipt of order at address shown.
- Vendor will allow: _____% discount for payment within _____ days, or Net 30, after receipt of invoice or materials, whichever is later. If not identified, terms will be Net 30.

REQUIREMEMENTS and ADDITIONAL TERMS

Award Intent.
It is intended to award all items to one Vendor. Please bid accordingly.

Montana State University – Bozeman and the State of Montana reserve the right to limit the amount of expenditures associated with the awarded contract, without penalty, when in the sole judgment of Montana State University annual funding or program changes will not support the level of expenditures anticipated on the contract.

Fiscal Notation.
For fiscal reasons, the below listed items will require invoicing or billing dated no earlier than July 1, 204. Delivery and payment cannot be made until July 1, 2004. Please bid accordingly.

Delivery.
Please bid the lowest price F.O.B. Destination with no additional charges for freight, shipping or handling.

Upon selection, the Vendor awarded the contract must deliver the CMS and invoice WTI/MSU for equipment purchased by June 30, 2004. *Failure to provide an invoice by June 30 will result in non-payment of any uninvoiced charges*.

Installation and testing shall be completed on or before June 30, 2004. Training shall be completed on or before July 31, 2004

Ownership

If a contract is awarded, the University shall make the purchase. It will then assign the contract to Caltrans. On June 30, 2004, Caltrans intends to assign the contract to the Park.

All contract terms and conditions shall be fully assignable to all subsequent owners.

Price Proposals

The listed price proposal shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in the installation of the CMA, complete in place, including testing. The cost shall also include travel (including estimated airfare, lodging and rental car, along with $28 daily per-diem rates per State of Montana guidelines) and freight charges.

The price shall be broken out by the following elements:

- Cost per each CMS;
- Cost for freight per each CMS;
- Cost for training;
- Warranty (1 year) per each CMS,
- Extended 3 year Full Unit Warranty per each CMS;
- Extended 5 year Full Unit Warranty per each CMS; and
- Total cost of two CMS with freight, training, and 5-year warranty.
- Any additional spare parts, as required elsewhere in this invitation to bid
- Training and documentation
- Installation and testing

The Vendor shall also provide prices for on-call repair maintenance activities as described earlier. These prices shall not be included in the price of the system.

Warranty/ Maintenance and Support.

Provide warranty and maintenance and support policy details. Identify factors covered by warranty and service, such as 100% parts, 100% labor, pick up and delivery, on-site repair, loaner of equivalent equipment provided if removal from site is necessary, etc.

1. What are the warranties on the equipment identified?
2. What are the limitations on the warranties?
3. Why are their limitations?
4. Whom do you recognize as able to repair this equipment without voiding any warranties?

Provide documentation certifying that you are a factory authorized source for this area with:

1. In-house, factory-authorized service technicians
2. Service representative who will make on-site visits for maintenance and repairs.

Vendors bidding outside their normal service area must designate the name and address of a local service representative who will execute all services and maintenance in accordance with all terms and conditions of the manufacturer's warranty:

_____

_____

_____

A Vendor awarded the contract under such conditions will be held responsible for faithful execution of the warranty by their subcontractor. However, the University reserves the right, upon elapse of warranty, to obtain a service contract through the competitive bid process.

Liquidated Damages.

The State of Montana and University reserves the right to assess liquidated damages in the amount of one half of one percent (1/2 of 1%) per calendar work day on the amount of contract price for failure to comply with the conditions of award indicated on the bid proposal. This sum may be deducted from Vendor payment for failure to deliver/perform when specified. No premium will be awarded to the Vendor for delivery in advance of the specified time.

Insurance Requirements.

Certificates of insurance, indicating insurance coverage, shall be filed with the MSU-Bozeman Purchasing Department within ten (10) working days of date of notice award. The contractor shall maintain and provide a certificate for:

The required insurance certificates, except those relating to Workers' Compensation, **must** name Montana State University as an additional insured. All insurances must be valid for the entire contract period.

☒ Proof of compliance with the Workers' Compensation Act in the form of a Certificate of Insurance for Workers' Compensation insurance coverage, a Certificate of Independent Contractor Exemption, or proof of any other exemption allowed under the Act.

☒ Commercial General Liability Insurance (Occurrence Coverage), to include bodily injury, personal injury and property damage with combined single limits of $500,000 per claim and $1,000,000 aggregate per year, from an insurer with a Best's Rating of no less than A-.

☒ Automobile Liability Insurance with split limits of $200,000 per person (personal injury), $500,000 per accident (personal injury), and $100,000 per accident (property damage) from an insurer with a Best's Rating of no less than A-.

☐ Other: (Insert any other insurance requirements)

Contracts WILL NOT be issued to contractors that fail to submit insurance certifications as specified herein.

References.

The Vendor shall include three references of similar work done within the last five years. The purpose of these references is to assist WTI/MSU in investigating the Vendor's qualifications to do the work outlined in this invitation to bid. The references should include a description of the type, size and duration of these projects, the extent of the Vendor's involvement, and contact information (name, agency or organization name, phone number, e-mail address) for each referenced project.

Contract Management.

The Vendor shall designate one individual to act as a single point-of-contact for the project. This person would be responsible for ensuring the Vendor's compliance with the specifications listed in this document, including completion of installation work, testing, training, maintenance and technical support, invoicing, and all other project tasks.

Jaime Eidswick from WTI/MSU will act as a single point-of-contact for the project. All inquiries regarding this document, technical specifications, invoicing, and other concerns shall be addressed to her. She may be contacted at jeidswick@coe.montana.edu or (406) 444-3237.

Terms and Conditions.

Terms and Conditions attached shall be incorporated into the awarded contract.

A Contracted Service Agreement, sample attached, will be required to be signed prior to award of this order, which will incorporate the Specifications and Requirements in this Invitation For Bid.

Scope of Equipment and Services

The purpose of this section is to provide an overview of this document and the purpose of the procurement.

1 Definitions

- "Caltrans" refers to the California Department of Transportation, which has provided for WTI/MSU to undertake this research project.
- "CMS" refers to the changeable message signs being procured.
- "NPS" refers to the National Park Service, U.S. Department of the Interior.
- "Park" refers to Golden Gate National Recreation Area of the National Park Service, U.S. Department of the Interior, located in central California.
- "State" refers to the State of California, which is funding this research project.
- "Vendor" refers to the vendor or team of vendors submitting proposals to this request.
- "WTI/MSU" refers to the Western Transportation Institute based at Montana State University in Bozeman, Montana.

2 Overview of Project

The Golden Gate National Recreation Area ("Park") is one of the largest urban parks in the world, and is the most popular within the national system. This Park is nearly two and a half times the size of San Francisco and contains more than 28 miles of coastline within its boundaries. Encompassing approximately 75,400 acres of land and water, popular Park activities include hiking, biking, visiting historic military facilities, horseback riding, going to the beach, and engaging in ocean sports.

The Park is seeking to improve traveler safety and information for motorists visiting Stinson Beach and Muir Woods. To accomplish this, the Park and Caltrans have agreed to place portable changeable message signs (CMS) north and south (one per direction) of the US 101 and SR 1 interchange. The Park intends to operate these CMS' to display congestion and parking lot status information. Motorists traveling both north and southbound on US Route 101 would have the benefit of these '. The Park intends for these CMS' to broadcast messages during congested periods from May through November, and possibly at other times throughout the year.

The purpose of this procurement is to identify and enter into a contract with a Vendor who will supply, test, and train staff for two trailer mounted portable changeable message signs (CMS). These CMS are

being installed in the short-term to help evaluate their success in meeting Caltrans and Park goals, and in the long-term to help meet information needs for visitors going to the Park.

As Caltrans will be a partner in this operation, they will store the CMS in the Parks off-season, transport and set-up the CMS in their right-of-way, and have the option of requesting that the Park place a "Caltrans" message on the CMS.

3 Specification of Changeable Message Signs (CMS)

The purpose of this section is to provide the technical specifications and requirements with which the Vendor's proposed Changeable Message Sign and services must comply. The Vendor shall indicate compliance with each requirement and specification by initialing the line to the left of each paragraph.

_____ The Vendor shall comply with all applicable Federal and State laws, regulations and rules.

_____ The equipment shall meet the specifications as described below. If the Vendor has a product that does not meet one or more of the specifications, they shall provide written justification for each item as to how this specification is redundant, inappropriate for the Park's functional requirements, or is superseded by the Vendor's proposal.

3.1 Power Plant

_____ The CMS shall be powered with a minimum of four (4) 12 volt 258 amp/hour Concord batteries (PVX2580L) to provide a minimum of 10 day or 336 hour continuous display of a 3 line flashing message.

_____ The CMS shall be recharged with a solar array with a minimum of 600 Watts. They shall be single crystal photo voltaic cells for high performance even in reduced light or poor weather conditions. The solar panels shall have power tilting for cleaning. The solar array shall restore the batteries to a full charge within a 24-hour period independent of weather conditions.

_____ The power inlet shall be an external 12-volt source. There shall be a power manager and charge regulator to trace the charge and load controllers and 110 volt battery chargers with an external power inlet. The battery shall remain under warranty with the rest of the CMS components.

3.2 Sign

_____ The signboard shall be a full matrix LED changeable message sign with graphic display capabilities. The CMS dimensions shall be a minimum of 80"W x 56"H x maximum 10" thick.

_____ The CMS shall support 3 lines of 8 characters per line. The character height shall be 12". The CMS shall have a minimum visibility distance of 3,000 feet and a minimum legibility distance of 600 feet.

_____ The CMS shall be white. The frame shall be structural or extruded aluminum and shall be enclosed and contain a louver and fans to minimize heat build up. The CMS skin shall be made of aluminum sheets.

_____ The LED's shall emit amber light with a 592-nanometer wavelength, +/- 2 nanometers. The LED's shall be rated for 100,000 hours with an intensity of 6000-cd/sq. m. The viewing angle and cone of visibility shall have a minimum of 23 degrees, +/- 2 degrees.

_____ Each message cell module or character board shall have a matrix of 8W by 12H pixels. There shall be a photocell to adjust the LED's to ambient light conditions. Each pixel shall have 8 LED's in a 1 ¼" x 1 ¼" space and the distance between 2 adjacent pixels shall be ¼."

_____ There shall be a powered raising and lowering mechanism for the CMS. There shall be a non-glare ultraviolet resistant screen with gas shocks for easy and safe opening on the front of the CMS.

_____ Operating temperature range shall be from -30°C to 60°C. Operating humidity range shall be from 20 percent relative at 30°C to 95 percent relative at 50°C.

_____ The control console shall have a keyboard for pre-programmed and programming new messages, a power distribution center/meter module for checking battery and charging status, a separate port to plug in highway speed advisory radar, a serial port for plugging in a PC to download new messages and graphics, a sign board on/off switch, and a sign raise/lower switch. The control console shall be remotely controlled by cell phone and modem.

_____ The CMS shall have 14 fonts installed on it upon delivery. The specifications for these fonts are listed below.

Font Type	Font Size	Maximum Character	Character Spacing	Text Lines	Character Size (inches)
Single Stroke	7 x 5	8	1	3	11 x 8
	9 x 5	8	1	3	14.5 x 8
	11 x 6	7	1	3	17.5 x 9.5
	11 x 7	6	1	2	17.5 x 11
Double Stroke	12 x 7	6	1	2	19.5 x 11
	14 x 8	5	2	2	22.5 x 13
	16 x 10	4	2	2	26 x 16
Triple Stroke	15 x 8	5	2	2	24 x 13
	17 x 8	5	2	2	27.5 x 13
	17 x 10	4	2	2	27.5 x 16
	23 x 14	3	2	1	37 x 22.5
Quadruple Stroke	24 x 10	4	2	1	39 x 16
	28 x 14	3	3	1	45 x 22.5
	32 x 18	2	4	1	52 x 29

3.3 Trailer

_____ The CMS shall be trailer mounted. The trailer must be adequately rated to haul the weight of the entire message sign system.

_____ The trailer shall be a 2-wheel single axel trailer. It shall have 15" diameter, steel disc wheels equal to GVWR. The tires shall be light truck type, radial tubeless tires. The trailer frame shall be steel channel or steel tubing and the brakes shall be hydraulic, surge brakes.

_____ The trailer shall have a tongue that is integral with the frame and an adjustable tongue jack that swings away with a caster wheel. The trailer shall also have a pintle type hitch with a 7-wire socket, 4 leveling jacks that swing away with sand pads, lights legal for towing and the highway, a parking brake, 2 safety chains that are size 3/8" with safety hooks, and a control box made of 16-gauge sheet metal and mounted on the left side of the trailer bed.

3.4 Cell Phone and Modem

_____ The CMS shall be provided with a cellular phone and modem that allows for remote communications and utilizes error correction. The remote communications shall include the capability to check power plant status; check status and change message display; turn the CMS on and off; and program and download the message. Communications software shall be provided to communicate with remote sites.

3.5 Software/NTCIP Compliance

_____ The Vendor shall provide all software, programming hardware, and licenses necessary for testing and operating the CMS. Sign shall be shipped with the most recent firmware and

operating system if applicable. This software includes all applications related to the fully functional installation and operation of the system, including software used for installation and testing, message and remote operation control software, software for diagnostics and testing, and software used for logging message activity. If no software is necessary for the operation of this system, the Vendor shall indicate as such.

_____ The costs of any hardware requirements necessitated by the software, beyond the computer hardware currently available in the Park, must be included in the Vendor's price.

_____ Any software required for successful operation and testing of the CMS shall operate on a similar operating system platform as other computer equipment used in the Park.

_____ The user interface to the field controller should also be provided with a laptop computer (laptop computer is provided by the Park/WTI). The laptop computer should have the ability to display the stored and currently displayed messages. It should also allow the user to compose messages on the screen and then display them on the CMS. It should allow the user to run all diagnostic routines. Access with the laptop should be controlled through passwords. The CMS shall have an RS 232 port for connection to a laptop.

_____ The Vendor shall provide technical and troubleshooting support for the software for a minimum of five years after installation. The Vendor shall notify the buyer of any software, firmware, or operating system upgrades for the purchase equipment. The Vendor shall furnish all upgrades to the buyer free of charge and shipping costs during the warranty and contract period. The Vendor shall not be responsible for software upgrades if the Park changes its computer operating system, and the Vendor's software is not compatible with the new operating system.

_____ The Vendor shall be responsible for providing Park personnel with on-site training for using the software. The training shall include documentation that can be used by Park personnel as an on-going reference for using the software, as well as an in-person explanation of how to use the software. The training shall occur on one visit to the Park during business hours, and shall occur at a location within the Park to be determined by Park staff. The Park will be responsible for working with the Vendor to identify a time and location that will facilitate maximum attendance of key Park personnel. The training shall occur prior to the end of this contract.

_____ The software shall log all activity for the CMS, including:

- System initialization (including after power disruption)
- What messages are currently available in the library
- The current status of each CMS, including the message currently being broadcast
- What messages have been posted at what times

_____ The CMS shall be NTCIP compliant. See attached Spec wizard output – Attachment 1.

4 Installation

_____ The Vendor shall be responsible for delivering the CMS to the Caltrans Maintenance Yard in Manzanita (40 Shoreline Highway, Mill Valley, CA 94941. Phone: (415)289-2951). The Vendor shall include the cost of shipping equipment and travel in their cost estimate as necessary.

_____ Any device or components utilized in the portable trailer mounted changeable message signs which are not available from a minimum of two manufacturers shall have five such devices or components provided for each device utilized in these portable trailer mounted changeable message sign.

5 Testing

_____ The Vendor shall conduct testing once upon complete installation and integration of all system components (including field equipment and software) to confirm the system is operating according to functional and NTCIP requirements. The Vendor shall provide results

to WTI/MSU and to the Park. The Vendor shall indicate for which tests on-site, in-person verification by WTI/MSU or Park staff is required, and will schedule testing to insure that this verification will occur.

_____ The Vendor shall conduct and complete all testing prior to the end of the contract, as stated later in this invitation to bid. WTI/MSU reserves the right to withhold up to twenty-five (25) percent of the Vendor's price of the CMS until it is proven that the CMS has met its functional requirements.

_____ The Vendor may conduct interim testing as they deem necessary to verify successful operation of system components. The Vendor may report the results of these tests to either WTI/MSU or to the Park at the Vendor's discretion.

6 Maintenance / Warranty

_____ All equipment shall be warranted against defects and any failures which may occur through normal use for one (1) year from the date the equipment is placed in service and has been accepted by WTI/MSU on the basis of the test results. "Normal use" is defined to include the variation of weather typical of the locations of the field deployment. The warranty shall include Vendor's travel, reimbursement expenses, or CMS shipping costs in the event that the CMS needs to be repaired.

_____ The Vendor shall provide a technical support telephone number that shall be staffed by knowledgeable individuals to identify and troubleshoot major problems. The Vendor shall provide technical support for the entire warranty period during normal business hours from 8 a.m. to 5 p.m Pacific Daylight Time.

_____ The Vendor shall provide prices for maintenance and support required beyond the warranty period, including the cost of a service call from the nearest provider of repair service, and an hourly service rate.

7 Documentation

_____ All manuals, warranty forms, and license forms shall be submitted with the unit(s) for acceptance.

_____ The Vendor shall provide documentation updates during the warranty period, such that the Park will always have the most current version of system documentation.

_____ The Park shall retain the right to duplicate manuals exclusively for the purposes of operating, maintaining and testing the CMS' for this Park.

_____ The Vendor shall provide four complete operator instruction manuals for each piece of equipment supplied. Operator manuals shall include a complete description of operation including an operations guide for programming messages by central system and laptop on site.

_____ The Vendor shall also provide four complete service manuals for each unit of equipment supplied. Service manuals are to be written so that a qualified technician can read and interpret the contents effectively. The service manuals shall be comprehensive and at a minimum, shall include the following sections.

7.1 Introduction

_____ Each manual shall contain a general information section which shall include the following items: a list of applicable sub-assemblies that comprise the specified equipment; overall description of the equipment design features, performance, and applications; equipment specifications summary; and equipment installation instructions, if applicable.

7.2 Theory of Operation Section

_____ Each manual shall contain equipment theory of operation section, which shall include the following items: theory of operation of the standard equipment, with unique or unusual circuitry described in detail and theory of operation reflecting any modifications to the standard equipment.

7.3 Step-by-step Programming Instructions

_____ This section shall include how to program messages into the CMS. It shall include instructions for programming at the CMS as well as through the central software.

7.4 All Required Programming Software and Diagnostic Software

_____ This section shall include a description of the required programming and diagnostic software that have been provided. It should include information on installing and using this software.

7.5 All Required Programming Hardware, Cables, etc

_____ Each manual shall contain a section describing all hardware and cables needed for the programming of this device. This section shall include diagrams.

7.6 All Optional Diagnostic and Programming Software

_____ Each manual shall describe all optional diagnostic and programming software that can be utilized with the CMS. It shall also list how to obtain this optional software.

7.7 Schematic Diagram Section

_____ Each manual shall contain an equipment diagram section, which shall include the following items: schematic diagram(s) identifying all components of the CMS and interlocking diagrams showing how the trailer, CMS, and solar panels fit together shall also be provided.

7.8 Listing of Required and Recommended Test Equipment

_____ Each manual shall include a section describing required and recommended testing equipment, how to test the CMS' using this equipment, what the test results mean, and how to troubleshoot issues found during the testing.

7.9 Troubleshooting Information

_____ The manual shall include a section with information and charts on troubleshooting problems with the CMS to include Chassis operating voltages, waveforms, and test points at a minimum.

7.10 Installation Instructions

_____ The manual shall include procedures for removal and installation for replacing assemblies and subassemblies. It shall also include tips and warnings for doing this correctly, especially if improper sequencing of steps may result in component damage.

7.11 Replacement Parts Section

_____ Each manual shall contain an equipment replacement parts section, which shall include a component parts list(s) including electrical parts, mechanical parts, assemblies, and cabling.

7.12 Physical Requirements

_____ The manuals shall be written in English. The manuals shall be provided in hard copy and in software form.

_____ All pages, including latest revisions, shall be securely fastened together between protective covers (loose-leaf ring binding is acceptable). No page shall be subject to fading from exposure to any normal source of ambient lighting (ozalid reproduced pages are not acceptable).

8 Training

_____ The training shall include documentation that can be used by Park personnel as an on-going reference for operating, using and maintaining the system, as described earlier. The training shall also include a qualified factory-authorized service representative who is capable of answering questions from Park personnel about any aspect of the normal function of the system including operation, use and normal maintenance, adjustment, and repair of all components of the system.

_____ The training shall occur on one visit to the Park during business hours, and shall occur at a location within the Park to be determined by Park staff.

_____ The Park will be responsible for working with the Vendor to identify a time and location that will facilitate maximum attendance of key Park personnel.

_____ The training shall occur on or before July 31, 2004.

_____ It is preferred, but not required, that training would be conducted during the same timeframe as system delivery, in order to economize on travel costs.

ATTACHMENT 1

NTCIP Requirements

This portion of the specification defines the detailed NTCIP requirements for the Dynamic Message Signs covered by the procurement package.

Definitions

The following terms shall apply within the scope of this procurement specification:

DMS - A Dynamic Message Sign, includes the sign display, controller, cabinet, and other associated field equipment. The specific type of dynamic message sign (i.e., blank-out sign, changeable message sign, character matrix sign, full-matrix sign, etc.) for this procurement is specified elsewhere within this procurement specification.

FSORS - Full, Standardized Object Range Support

Full, Standardized Object Range Support – Support for, and proper implementation of, all valid values of an object as defined within the object's OBJECT-TYPE macro in the subject NTCIP standard; this is further defined in two distinct sub-requirements. (1) If the ACCESS of the object is read-write, a Management System shall be able to set the object to any valid value as defined by the SYNTAX and DESCRIPTION fields (except that the value of 'other' need not be supported when such a value is defined) and the indicated functionality shall be provided. (2) The value indicated by the object (e.g., in response to a 'get'), regardless of the ACCESS, shall reflect the current condition per the rules specified in the object's DESCRIPTION.

Management System – A computer system used to control an NTCIP component. This includes any laptop software used for field control as well as the central control software.

NTCIP Component – A DMS or a Management System.

NTCIP System – A Management System plus the various ASCs and DMSs controlled by the Management System.

Response Time – The time to prepare and begin transmission of a complete response containing the requested Application Layer information. This is measured as the time from receipt of the closing flag of the request to the transmission of the opening flag of the response when the device has immediate access to transmit.

References

This specification references several standards through their NTCIP designated names. The following list provides the full reference to the current version of each of these standards. In many cases, the standard is more widely known by its original NEMA assigned number; in these cases, the NEMA number is also identified. The content of the NEMA standard is identical to that of the NTCIP standard.

Each NTCIP Component covered by these project specifications shall implement the most recent version of the standard that is at the stage of Recommended or higher as of Sunday, January 01, 2004, including any and all Approved or Recommended Amendments to these standards as of the same date. It is the ultimate responsibility of the VENDOR to monitor NTCIP activities to discover any more recent documents.

Table 1: NTCIP Standards

Abbreviated Number	Full Number	Title	Known Amendments
NTCIP 1201	**NTCIP 1201:1997**	*Global Object Definitions*	Amendment #1 dated November

	(NEMA TS 3.4-1996)		2, 1998.
NTCIP1203	**NTCIP 1203:1997** (NEMA TS 3.6-1997)	*Object Definitions for Dynamic Message Signs*	The sign shall also comply to the NTCIP DMS WG Resolutions adopted at the May 2000 meeting.
NTCIP 2103	**NTCIP 2103v01.05 (User Comment)**	*Subnet Profile for Point-to-Point Protocol over RS-232*	
NTCIP 2201	**NTCIP 2201v01.03 (Working Draft)** (NEMA TS 3.3-1996 Clauses 3.4 and 3.5)	*Transportation Transport Profile* *Class B Profile* Clauses 3.4 and 3.5	Amendment #1 dated November 2, 1998
NTCIP 2301	**NTCIP 2301v01.07 (Recommended)** (NEMA TS 3.AP-STMF)	*Simple Transportation Management Framework (STMF) Application Profile*	

General Requirements

Subnet Level

Each NTCIP Component shall support NTCIP 2103 over both a null-modem connection and a contractor-provided, external dial-up modem connection. The dial-up modem shall support data rates of 9600 bps, 4800 bps, 2400 bps, 1200 bps, 600 bps, and 300 bps. The null-modem shall support the same speeds with a maximum of 19.2 kbps. Additionally, the NTCIP Component shall be able to make outgoing and receive incoming calls as necessary and support the following modem command sets:

- Hayes AT -Command Set
- MNP5
- MNP10
- V.42bis

NTCIP Components may support additional Subnet Profiles at the manufacturer's option. At any one time, only one Subnet Profile shall be active on a given serial port of the NTCIP Component. If the NTCIP Component has a serial port that supports multiple Subnet Profiles, the NTCIP Component shall be configurable to allow the field technician to activate the desired Subnet Profile and shall provide a visual indication of the currently selected Subnet Profile.

Transport Level

Each NTCIP Component shall comply with NTCIP 2201.

NTCIP Components may support additional Transport Profiles at the manufacturer's option. Response datagrams shall use the same Transport Profile used in the request. Each NTCIP Component shall support the receipt of datagrams conforming to any of the identified Transport Profiles at any time.

Application Level

Each DMS shall comply with NTCIP 2301 as a Managed Agent and shall meet the requirements for Conformance Level 1 (NOTE - See Amendment to standard). An NTCIP Component may support additional Application Profiles at the manufacturer's option. Responses shall use the same Application Profile used by the request. Each NTCIP Component shall support the receipt of Application data packets at any time allowed by the subject standards.

Information Level

Each NTCIP Component shall provide Full, Standardized Object Range Support of all objects required by these procurement specifications, unless otherwise indicated below or approved by the Project Engineer. The maximum Response Time for any object or group of objects shall be 75 milliseconds.

The DMS shall support all mandatory objects of all mandatory Conformance Groups as defined in NTCIP 1201 and NTCIP 1203. Table 2 indicates the modified object requirements for these mandatory objects.

Table 2: Modified Object Ranges for Mandatory Objects

Object	Reference	Project Requirement
moduleTableEntry	NTCIP 1201 Clause 2.2.3	Shall contain at least one row with moduleType equal to 3 (software). The moduleMake shall specify the name of the manufacturer, the moduleModel shall specify the manufacturer's name of the component and the modelVersion shall indicate the model version number of the component.
communityNamesMax	NTCIP 1201 Clause 2.8.2	Shall be at least 2
dmsNumPermanentMsg	NTCIP 1203 Clause 2.6.1.1.1.1	Shall be at least 20*
dmsMaxChangeableMsg	NTCIP 1203 Clause 2.6.1.1.1.3	Shall be at least 256**
dmsFreeChangeableMemory	NTCIP 1203 Clause 2.6.1.1.1.4	Shall be at least 256KB when no messages are stored.**
dmsMaxVolatileMsg	NTCIP 1203 Clause 2.6.1.1.1.6	Shall be at least 0**
dmsFreeVolatileMemory	NTCIP 1203 Clause 2.6.1.1.1.7	Shall be at least 0KB when no messages are stored.**
dmsMessageMultiString	NTCIP 1203 Clause 2.6.1.1.1.8.3	The DMS shall support any valid MULTI string containing any subset of those MULTI tags listed in Table 4
dmsControlMode	NTCIP 1203 Clause 2.7.1.1.1.1	The DMS shall support the following control modes: local external central centralOverride simulation

* The Permanent Messages shall display the content shown in Table 3.

** The values of dmsMaxVolatileMsg and dmsFreeVolatileMemory may be less if the provided value for dmsMaxChangeableMsg is equal to or greater than the sum of the stated requirements for dmsMaxVolatileMsg plus dmsMaxChangeableMsg **and** the provided value for dmsFreeChangeableMemory is equal to or greater than the sum of the stated requirements for dmsFreeVolatileMemory plus dmsFreeChangeableMemory.

Table 3: Content of Permanent Messages

Perm. Msg. Num.	Description
1	Messages will be provided after a Bidder has been chosen

2	x
3	x
4	x
5	x
6	x
7	x
8	x
9	x
10	x

Table 4: Required MULTI Tags

Code	Feature
fl (and /fl)	flashing text; flash rates shall be controllable in 0.5 second increments and shall be accurate to within 50% of this value. The fl and /fl tags shall support flashing on a line-by-line basis
fo	font
jl3	justification - line - center
jp3	justification - page - middle
nl	new line
np	new page; the sign shall support up to 2 instances in a message (i.e., up to 3 pages/frames in a message counting the first page)
pt	page time; these times shall be controllable in 0.5 second increments and shall be accurate to within 50% of this value

The NTCIP Component shall also implement all mandatory objects of the following optional conformance groups.

- GUI Appearance, as defined in NTCIP 1203.
- Font Configuration, as defined in NTCIP 1203. The following list indicates the modified object requirements for this conformance group.

Table 5: Modified Object Ranges for the Font Configuration Conformance Group

Object	Reference	Project Requirement
numFonts	NTCIP 1203 Clause 2.4.1.1.1.1	Shall be at least 14
maxFontCharacters	NTCIP 1203 Clause 2.4.1.1.1.3	Shall be at least Each font shall support character numbers from 32 (0x20) to 90 (0x5A), inclusive. Upon delivery, each character shall be set to a bit pattern that resembles the associated ASCII character.

- VMS Configuration, as defined in NTCIP 1203.
- Multi Configuration, as defined in NTCIP 1203. The following list indicates the modified object requirements for this conformance group.

Table 6: Modified Object Ranges for the MULTI Configuration Conformance Group

Object	Reference	Project Requirement
defaultBackgroundColor	NTCIP 1203 Clause 2.5.1.1.1.1	The DMS shall support the following background colors: black
defaultForegroundColor	NTCIP 1203 Clause 2.5.1.1.1.2	The DMS shall support the following foreground colors: amber
defaultJustificationLine	NTCIP 1203 Clause 2.5.1.1.1.6	The DMS shall support the following forms of line justification: left center
defaultJustificationPage	NTCIP 1203 Clause 2.5.1.1.1.7	The DMS shall support the following forms of page justification: top middle
defaultPageOnTime	NTCIP 1203 Clause 2.5.1.1.1.8	The DMS shall support the full range of these objects with step sizes no larger than 0.5 seconds
defaultPageOffTime	NTCIP 1203 Clause 2.5.1.1.1.9	The DMS shall support the full range of these objects with step sizes no larger than 0.5 seconds
defaultCharacterSet	NTCIP 1203 Clause 2.5.1.1.1.10	TheDMS shall support the following character sets: eightBit

- Multi Error Configuration, as defined in NTCIP 1203
- Illumination/Brightness Control, as defined in NTCIP 1203. The following list indicates the modified object requirements for this conformance group.

Table 7: Modified Object Ranges for the Illumination/Brightness Control Conformance Group

Object	Reference	Project Requirement
dmsIllumControl	NTCIP 1203 Clause 2.8.1.1.1.1	The DMS shall support the following illumination control modes: photocell timer manual
dmsIllumNumBrightLevels	NTCIP 1203 Clause 2.8.1.1.1.4	Shall be at least 255

- Auxiliary I/O, as defined in NTCIP 1203

Table 8: Modified Object Ranges for the Auxiliary I/OConformance Group

Object	Reference	Project Requirement
maxAuxIODigital	NTCIP 1203 Clause 2.10.1.1.1.1	Shall consist of at least 4 input ports, 4 output ports, and 4 bidirectional ports.
maxAuxIOAnalog	NTCIP 1203 Clause 2.10.1.1.1.2	Shall consist of at least 0 input ports, 0 output ports, and 0

		bidirectional ports.

- Status Error, as defined in NTCIP 1203
- Pixel Error Status, as defined in NTCIP 1203
- Power Status, as defined in NTCIP 1203

The NTCIP Component shall also implement the following optional objects:

Table 9: Optional Object Requirements

Object	Reference	Project Requirement
globalSetIDParameter	NTCIP 1201 Clause 2.2.1	FSORS
defaultFlashOn	NTCIP 1203 Clause 2.5.1.1.1.3	The DMS shall support the full range of these objects with step sizes no larger than 0.5 seconds
defaultFlashOff	NTCIP 1203 Clause 2.5.1.1.1.4	The DMS shall support the full range of these objects with step sizes no larger than 0.5 seconds
dmsSWReset	NTCIP 1203 Clause 2.7.1.1.1.2	FSORS
dmsMessageTimeRemaining	NTCIP 1203 Clause 2.7.1.1.1.4	FSORS
dmsMemoryMgmt	NTCIP 1203 Clause 2.7.1.1.1.16	The DMS shall support the following Memory Management Modes: normal clearChangeableMessages
dmsMultiOtherErrorDescription	NTCIP 1203 Clause 2.7.1.1.1.20	If the vendor implements any vendor-specific MULTI tags, the DMS shall provide meaningful error messages within this object whenever one of these tags generates an error.
dmsIllumLightOutputStatus	NTCIP 1203 Clause 2.8.1.1.1.9	FSORS
watchdogFailureCount	NTCIP 1203 Clause 2.11.1.1.1.5	FSORS
dmsStatDoorOpen	NTCIP 1203 Clause 2.11.1.1.1.6	FSORS
fanFailures	NTCIP 1203 Clause 2.11.2.1.1.8	FSORS
fanTestActivation	NTCIP 1203 Clause 2.11.2.1.1.9	FSORS
signVolts	NTCIP 1203 Clause 2.11.3.1.1.1	FSORS
tempMinCtrlCabinet	NTCIP 1203 Clause 2.11.4.1.1.1	FSORS
tempMaxCtrlCabinet	NTCIP 1203 Clause 2.11.4.1.1.2	FSORS
tempMinAmbient	NTCIP 1203 Clause 2.11.4.1.1.3	FSORS
tempMaxAmbient	NTCIP 1203 Clause 2.11.4.1.1.4	FSORS
tempMinSignHousing	NTCIP 1203 Clause 2.11.4.1.1.5	FSORS
tempMaxSignHousing	NTCIP 1203 Clause 2.11.4.1.1.6	FSORS

Documentation

Software shall be supplied with full documentation, including 3.5" floppy disk(s) and a CD-ROM containing ASCII versions of the following Management Information Base (MIB) files in Abstract Syntax Notation 1 (ASN.1) format:

- The relevant version of each official standard MIB Module referenced by the device functionality.
- If the device does not support the full range of any given object within a Standard MIB Module, a manufacturer specific version of the official Standard MIB Module with the supported range indicated in ASN.1 format in the SYNTAX and/or DESCRIPTION fields of the associated OBJECT TYPE macro. The filename of this file shall be identical to the standard MIB Module, except that it will have the extension ".man".
- A MIB Module in ASN.1 format containing any and all manufacturer-specific objects supported by the device with accurate and meaningful DESCRIPTION fields and supported ranges indicated in the SYNTAX field of the OBJECT-TYPE macros.
- A MIB containing any other objects supported by the device.

The manufacturer shall allow the use of any and all of this documentation by any party authorized by the Procuring Agency for systems integration purposes at any time initially or in the future, regardless of what parties are involved in the systems integration effort.

Acceptance Testing

The acceptance test shall use the NTCIP Exerciser, or other authorized testing tool, and shall follow the guidelines established in the ENTERPRISE Test Procedures. The Department reserves the right to enhance these tests as deemed appropriate to ensure device compliance.

Maintenance and Support

The NTCIP Component developer shall provide 40 hours of training on the NTCIP Component and Management System. In addition, the developer shall provide free software upgrades for a period of 24 months from acceptance of the components.

Interpretation Resolution

If the Project Engineer or NTCIP Component developer discovers an ambiguous statement in the standards referenced by this procurement specification, the Project Engineer shall provide an interpretation of the specification for use on the project.

Additional Requirements for NTCIP Message Signs

This attachment defines additional requirements for the NTCIP compliant signs being procured under this project based on recent interpretations of the standard by the NTCIP DMS Working Group. All signs purchased under this contract shall comply with the following requirements. Additional explanations and interpretations may be available at http://www.ntcip.org.

Blanking the Sign

The sign shall support a seventh memory type (i.e., dmsMessageMemoryType = 7), which shall indicate a blank message. The sign shall support 255 messages of this type, dmsMessageNumber = 1 to 255, and the dmsMessageRunTimePriority shall be equal to the dmsMessageNumber for each message. The dmsMessageMultiString shall be a zero-length octet string. The dmsMessageCRC shall be zero (0x0000) for all 255 of these messages and the normal CRC algorithm shall be ignored for the blank messages.

Message CRC Calculation

The dmsMessagePixelService and dmsMessageBeacon objects shall be disabled/off by default. If these objects are not present, the CRC shall be calculated with the default values.

Message Prioritization

There has been some question as to how the prioritization scheme works. For the purposes of this project, the following shall dictate operation.

Let X = the run time priority of the current message, A = the activation priority of the message being requested, and R = the run time priority of the message being requested.

A > X, R = A: In this case, the activation priority of the new message exceeds the run time priority of the existing message and therefore the new message is displayed and the new run time priority becomes that of the new message.

A < X, R = A: In this case, the activation priority does not exceed the run time priority of the existing message and therefore the display is not changed and the run time priority does not change.

A < X, R > X: In this case, the activation priority does not exceed the run time priority of the existing message and therefore the display is not changed and the run time priority does not change.

A > X, R < X: In this case, the activation priority of the new message exceeds the run time priority of the existing message and therefore the new message is displayed and the new run time priority becomes that of the new message.

R > A > X: In this case, the activation priority of the new message exceeds the run time priority of the existing message and therefore the new message is displayed and the new run time priority becomes that of the new message.

A = R = X: In this case, the activation priority of the new message is equal to the run time priority of the existing message and therefore the new message is displayed and the new run time priority becomes that of the new message.

The dmsMessageRuntimePriority for the currentBuffer shall be the value copied from the dmsMsgRunTimePriority object from the row identified by dmsMsgTableSource. If the scheduler is active, the dmsMsgTableSource object shall reference the schedule row.

For example, if the sign is currently displaying the EndDurationMessaage, the run time priority of the currentBuffer shall be the same as the run time priority defined for the message referenced by the End Duration Message.

Message Activation Code

The units for duration, as included in the MessageActivationCode, shall be minutes.

The MessageIDCode and MessageActivationCode are presented in the standard as bit fields. For additional clarity, they are presented below as ASN.1 structures. Encoding these structures according to the rules defined in OER (NTCIP 1102) will produce identical encodings.

```
MessageIDCode ::= SEQUENCE
{
msgMemoryType INTEGER(0..255),
messageNumber INTEGER(0..65535),
messageCRC OCTET STRING (SIZE (2))
}

MessageActivationCode ::= SEQUENCE
{
duration INTEGER(0..65535),
activatePriority INTEGER(0..255),
msgMemoryType INTEGER(0..255),
messageNumber INTEGER(0..65535),
```

messageCRC OCTET STRING (SIZE (2))
sourceAddress OCTET STRING (SIZE (4))
}

Downloading and Activating Messages

Message download shall not be allowed within a single command. SNMP requires that any objects set within the same data packet be set as if they were set simultaneously. As such, a sequence of data packets must be sent in order to properly store the new message in the message table and to then activate the message.

Operations on the Activation Code

If the sign processes a command for an invalid display, the display should not be affected; any previous message should continue displaying as if no such command had been received.

If the sign receives a request for the dmsActivateMessage object, it shall return the value for the last message that was successfully implemented; if this message was activated by a message ID code (such as EndDurationMessage), the duration will indicate 65535 (infinite), Activate priority of the associated code (e.g., 200 until there is a new object), and Source address of the sign.

Message Time Remaining

The sign shall support set requests on the Message Time Remaining object in order to allow a system to shorten or lengthen the remaining duration of the currently displayed message. If the system sets this object to zero (0), the sign shall immediately display the EndDurationMessage.

Null Character within a MULTI String

A null character shall not be allowed within a MULTI string as every character in the MULTI string must reference an entry in the character table of the font, and there is no row with a zero (0) row number.

MULTI Errors

If the sign controller does not implement one or more of the MULTI Tags encountered within a message, it shall generate a dmsMultiSyntaxError with a value of unsupportedTag.

MULTI Field Errors

The following table shall be used as a refinement to the Table 3-2 in NTCIP 1203-1997.

ID	Default Field Width	Allowable Widths	Fill Character	Justification	Overflow Fill	Example	Description
1	5	5	space	right	n/a	'_9:00'	Time, 12 hour format (no AM/PM indicator present)
2	5	5	0	right	n/a	'09:00'	Time, 24 hour format
3	3	2, 3	space	right	space (?)	'-10' or '_10'	Temperature, degrees Celsius (no plus sign)
4	3	2, 3	space	right	space (?)	'-10' or '_10'	Temperature, degrees Fahrenheit (no plus sign)
5	3	2, 3	space	right	'9'	' 90'	Speed, km/h
6	2	2, 3	space	right	'9'	' 55'	Speed, mph

7	3	3	n/a	n/a	n/a	'MON'	Day of week Shall be one of (SUN, MON, TUE, WED, THU, FRI, SAT)
		4-9	manufacturer specific				
8	2	2	0	right	n/a	'05'	Date of month (number)
9	2	2	0	right	n/a	'04'	Month of year (number)
10	2	2	0	right	n/a	'00'	Year, 2 digits
11	4	4	0	right	n/a	'2000'	Year, 4 digits
12 - 49							Reserved for future assignment
50 - 99							User-definable

Move Tag Operation

If a move tag width is not a multiple of a module width on a character matrix sign, the sign shall return an unsupportedTagValue error.

Scheduling

The scheduler function, if required by separate clauses of this specification, shall be activated by activating a message (i.e., setting an object with the SYNTAX of MessageActivationCode or MessageIDCode) with the dmsMessageMemoryType set to schedule(6), the dmsMessageNumber set to 1, and the dmsMessageCRC set to 0x00 00 (and a sufficiently high activation priority if it is a MessageActivationCode object).

Once activated, the scheduler shall continue to control the sign as if it were a normal message. For example, if the scheduler was activated with a MessageActivationCode, the schedule may be activated for a defined duration, however, this duration may be preempted if another command is received with a sufficiently high activation priority.

During schedule operation, the run time priority of the scheduler (i.e., dmsRunTimePriority.6.1) shall apply to the operation of the schedule and the run-time priority of the referenced message shall be ignored. Thus, the run-time priority shall be constant for all scheduled messages.

The values for dmsMessageMultiString.6.1, dmsMessageBeacon.6.1, and dmsMessagePixelService.6.1 shall be copied from the message called by the most recently called action and shall therefore reflect the most recently called message that would be called by the scheduler whether or not the scheduler is running.

The activation priority of any scheduled message shall be 200.

The action table shall have a fixed number of rows that is recorded in the numActionTableEntries object. Upon sign initialization, the dmsActionMsgCode shall default to 0x00 00 00 00 00, which shall disable the row. The sign shall also allow the central system to set this object to this value.

MONTANA STATE UNIVERSITY- BOZEMAN

Standard Terms and Conditions
Purchases with a Total Contact Value over $25,000

By submitting a response to this Invitation For Bid (IFB) or Request For Proposal (RFP), or acceptance of a contract, the vendor agrees to acceptance of the following Standard Terms and Conditions and any other provisions that are specific to this solicitation or contract.

ACCEPTANCE/REJECTION OF BIDS, PROPOSALS, OR LIMITED SOLICITATION RESPONSES: The University reserves the right to accept or reject any or all bids, proposals, or limited solicitation responses, wholly or in part, to make awards in any manner deemed in the best interest of the University. Bids, proposals, and limited solicitations will be firm for thirty days, unless stated otherwise in the text of the bid, proposal, or limited solicitation.

ACCESS AND RETENTION OF RECORDS: The contractor agrees to provide the University, Legislative Auditor, or their authorized agents, access to any records necessary to determine contract compliance (Mont. Code Ann § 18-1-118). The contractor agrees to create and retain records supporting the services rendered or supplies delivered for a period of three years after either the completion date of the contract or the conclusion of any claim, litigation, or exception relating to the contract taken by the University or third party.

ALTERATION OF SOLICITATION DOCUMENT: In the event of inconsistencies or contradictions between language contained in the University's solicitation document and a vendor's response, the language contained in the University's original solicitation document will prevail. Intentional manipulation and/or alteration of solicitation document language will result in the vendor's disqualification and possible debarment.

ASSIGMENT, TRANSFER AND SUBCONTRACTOR: The contractor shall not assign, transfer or subcontract any portion of this contract without the express written consent of the University (MCA § 18-4-141).

AUTHORITY: The following bid, request for proposal, limited solicitation or contract is issued under authority of Title 18, Montana Code Annotated, and the Administrative Rules of Montana, Title 2, chapter 5.

BID AND PROPOSAL PREPARATION: The price for each item must be stated and shall be clearly shown in the space(s) provided. Only one unit price shall be shown for each item unless specific provision is made in the form for an optional figure. The price of each item shall be extended to show the total price for the quantity requested. In case of error in extension, the unit price shall prevail.

COMPLIANCE WITH LAWS: The contractor must, in performance of work under the contract, fully comply with all applicable federal, state, or local laws, rules and regulations, including the Montana Human Rights Act, the Civil Rights Act of 1964, the Age Discrimination Act of 1975, the American Disabilities Act of 1990, and Section 504 of the Rehabilitation Act of 1973. Any subletting or subcontracting by the contractor subjects subcontractors to the same provisions. In accordance with section 49-3-207, MCA, the contractor agrees that the hiring of persons to perform the contract will be made on the basis of merit and qualifications and there will be no discrimination based upon race, color, religion, creed, political ideas, sex, age, marital status, physical or mental disability, or national origin by the persons performing the contract.

CONFORMANCE WITH CONTRACT: No alteration of the terms, conditions, delivery, price, quality, quantities, or specifications of this contract shall be granted without prior written consent of the University. Supplies delivered which do not conform to the contract terms, conditions, and specifications may be rejected and returned at the contractor's expense.

DEBARMENT: The contractor certifies that neither it nor its principals are presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction (contract) by any governmental department or agency. If the contractor cannot certify this statement, attach a written explanation for review by the University.

DISABILITY ACCOMODATIONS: The State of Montana does not discriminate on the basis of disability in the admission to, access to, or operations of its programs, services, or activities. Individuals, who need aids, alternative document formats, or services for effective communications or other disability-related accommodations in the programs and services offered, are invited to make their needs and preferences known to this office. Interested parties should provide as much advance notice as possible.

FACSIMILE RESPONSES: Facsimile responses will be accepted for invitations for bids, small purchases or limited solicitations ONLY if they are completely received by the University Purchasing Department prior to the time set for the receipt. Bids, or portions thereof, received after the due time will not be considered. Facsimile responses to Requests for Proposals are ONLY accepted on an exception basis with **prior** approval of the procurement officer.

FAILURE TO HONOR BID/PROPOSAL: If a bidder or offeror to whom a contract is awarded refuses to accept the award (PO/contract) or, fails to deliver in accordance with the contract terms and conditions, the University may, at its discretion, suspend the bidder/offeror for a period of time from entering into to any contracts with the University.

FORCE MAJEURE: Neither party shall be responsible for failure to fulfill its obligations due to causes beyond its reasonable control, including without limitation, acts or omissions of government or military authority, acts of God, materials shortages, transportation delays, fires, floods, labor disturbances, riots, wars, terrorist acts, or any other causes, directly or indirectly beyond the reasonable control of the non-performing party, so long as such party is using its best efforts to remedy such failure or delays.

HOLD HARMLESS/INDEMNIFICATION: The contractor agrees to protect, defend, and save the University, it's elected and appointed officials, agents, and employees, while acting within the scope of their duties as such, harmless from and against all claims, demands, causes of action of any kind or character, including the cost of defense thereof, arising in favor of the contractor's employees or third parties on account of bodily or personal injuries, death, or damage to property arising out of services performed or omissions of services or in any way resulting from the acts or omissions of the contractor and/or its agents, employees, representatives, assigns, subcontractors, except the sole negligence of the
University, under this agreement.

INTELLECTUAL PROPERTY: Ownership in any invention or discovery conceived and reduced to practice solely by one party in the performance of this contract will reside in that one party, and any patent rights in or patent issued thereon will reside in that one party. Ownership in any invention or discovery conceived or reduced to practice jointly by personnel of both parties and any patent rights in or patent issued thereon belong to both parties jointly. The contractor shall notify the University in writing of any invention conceived or reduced to practice under this agreement. The contractor will retain right, title and interest, including the right of copyright, in all work reduced to writing or fixed in any media (including reports, articles, photographs, recordings, data, computer programs and related documentation) produced solely by contractor under this contract. The University shall retain the same rights to work produced solely by its employees and agents. The parties will jointly own any work jointly produced under this agreement. The contractor grants MSU a perpetual, irrevocable, royalty free right to reproduce, publish, prepare derivative works, access data, practice patents or otherwise use, and authorize others to use, all work produced under this contract.

LATE BIDS AND PROPOSALS: Regardless of cause, late bids and proposals will not be accepted and will automatically be disqualified from further consideration. It shall be solely the vendor's risk to assure delivery at the designated time. Late bids and proposals will be retained on file in the MSU-Bozeman Purchasing Department unless the vendor requests the bid or proposal be returned to the vendor, at the expense of the vendor. Late bids and proposals may be destroyed if requested by the vendor.

PAYMENT TERM: All payment terms will be computed from the date of delivery of supplies or services OR receipt of a properly executed invoice, whichever is later. Unless otherwise noted, the University is allowed 30 days to pay such invoices. All contractors may be required to provide banking information at the time of contract execution in order to facilitate University electronic funds transfer payments.

PROTEST PROCEDURE: Bidders, offerors, and contractors may protest a solicitation or award of a contract per section 18-4-242, MCA and ARM 2.5.406. The protest must be in writing and state in detail all the protestor's objections. The complete protest must be submitted to the MSU-Bozeman Purchasing Department no later than the close of business 14 calendar days after the execution of the contract in question. If the 14th calendar day falls on a Saturday, Sunday, or legal holiday, the protest must be submitted by the end of the next business day. The University is under no obligation to delay, halt, or modify the procurement process due to a protest, contested case proceeding, or judicial review. Small purchases and limited solicitations (ARM 2.5.603) made pursuant to 18-4-305 and are exempt from protest procedures.

RECIPROCAL PREFERENCE: The State of Montana applies a reciprocal preference against a vendor submitting a bid from a state or country that grants a residency preference to its resident businesses. A reciprocal preference is only applied to an Invitation for Bid for supplies or an Invitation for Bid for non-construction services for public works as defined in section 18-2-401(9), MCA, and then only if federal funds are not involved. For a list of states that

grant resident preference, see http://www.discoveringmontana.com/doa/gsd/css/Resources under Reciprocal Preference.

REFERENCE TO CONTRACT: The contract or purchase order number MUST appear on all invoices, packing lists, packages and correspondence pertaining to the contract.

REGISTRATION WITH THE SECRETARY OF STATE: Any business intending to transact business in Montana must register with the Secretary of State. Businesses that are incorporated in another state or country, but who are conducting activity in Montana, must determine whether they are transacting business in Montana in accordance with sections 35-1-1026 and 35-8-1001, Montana Code Annotated. Such businesses may want to obtain the guidance of their attorney or accountant to determine whether their activity is considered transacting business. If businesses determine that they are transacting business in Montana, they must register with the Secretary of State and obtain a certificate of authority to demonstrate that they are in good standing in Montana. To obtain registration materials, call the Office of the Secretary of State at 406-444-3665, or visit our website at http://www.sos.state.mt.us.

SEPARABILITY CLAUSE: A declaration by any court, or any binding legal source, that any provision of this contract is illegal and void shall not affect the legality and enforceability of any other provision of this contract, unless the provisions are mutually dependant.

SHIPPING: Supplies shall be shipped prepaid, F.O.B. Destination, unless the contract specifies otherwise.

SOLICITATION DOCUMENT EXAMINATION: Vendors shall promptly notify the Montana State University-Bozeman Purchasing Department of any ambiguity, inconsistency, or error, which they may discover upon examination of a solicitation document.

TAX EXEMPTION: The University is exempt from Federal Excise Taxes (#53-0183246).

TECHNOLOGY ACCESS FOR BLIND OR VISUALLY IMPAIRED: Contractor acknowledges that no state funds may be expended for the purchase of information technology equipment and software for use by employees, program participants, or members of the public unless it provides blind or visually impaired individuals with access, including interactive use of the equipment and services, that is equivalent to that provided to individuals who are not blind or visually impaired. (MCA § 18-5-603.) Contact the State Procurement Bureau at (406) 444-2575 for more information concerning nonvisual access standards.

TERMINATION OF CONTRACT: Unless otherwise stated, the University may, by written notice to the contractor, terminate this contract in whole or in part at any time the contractor fails to perform this contract.

UNAVAILABILITY OF FUNDING: The University, at its sole discretion, may terminate or reduce the scope of this contract if available funding is reduced for any reason. (MCA § 18-4-313 (3).)

U.S. FUNDS: All prices and payments must be made in U.S. dollars.

VENUE: The laws of the State of Montana govern this solicitation. The parties agree that any litigation concerning this invitation for bid, request for proposal, or subsequent purchase order/contract, must be brought in the Eighteenth Judicial District in and for the County of Gallatin, State of Montana, and each party shall pay its own costs and attorney fees. (MCA § 18-1-401.)

WARRANTIES: The contractor warrants that items offered will conform to the specifications requested, to be fit and sufficient for the purpose manufactured, of good material and workmanship and free from defect. Items offered must be new and unused and of the latest model or manufacture, unless otherwise specified by the University. They shall be equal in quality and performance to those indicated herein. Descriptions used herein are specified solely for the purpose of indicating standards of quality, performance and/or use desired. Exceptions will be rejected.

Contracted Services Agreement
Montana State University-Bozeman

Social Security or Federal Identification #_____
Workers' Compensation #_____

1. PARTIES

THIS AGREEMENT is entered into by and between the Montana State University-xxxx, (herein referred to as "MSU-Bozeman") whose address and phone number are P.O. Box xxx, Bozeman, MT. 59717, (406) 994-xxx and (insert contractor's name), (hereinafter referred to as the "Contractor"), whose Federal ID Number, address and phone number are as follows:

Federal ID Number:
Address:
Phone Number:
Fax Number:

I. Purpose: The purpose of this Agreement is to

II. Effective Date and Duration: The Contractor shall commence performance upon signature of the parties and shall complete performance to the satisfaction of MSU-Bozeman no later than _____ _____, 200_. MSU-Bozeman the right to extend the duration of this Agreement for a period not to exceed x months or x years upon written mutual consent of the parties. In no event shall the maximum duration of this Agreement exceed seven (7) years.

III. Services: The Contractor agrees to perform the following services: (insert scope of work or Attachment #)

IV. Consideration: MSU-Bozeman agrees to pay Contractor the sum of $ _____ for satisfactory comple of the contracted service. MSU-Bozeman agrees to pay this amount as follows: Net 30

In the event this Agreement is extended for an additional x months or x years, MSU-Bozeman agrees to pay Contractor sum of $_____ for satisfactory completion of the contracted service. MSU-Bozeman agrees to pay the additional amount as follows: Net 30

V. Relationship of the Parties: It is mutually agreed that Contractor is an independent contractor and not an employe MSU-Bozeman for purposes of this Agreement. It is understood that the Contractor is not subject to the supervision an control of MSU-Bozeman; nor is the Contractor carrying out the regular business of MSU-Bozeman. Each of the parties be solely and entirely responsible for its own acts and/or the acts of its employees or agents. No benefits provided by MSU-Bozeman to its employees, including unemployment and workers' compensation insurance, will be provided to the Contractor or his/her/its employees.

VI. Ownership and Publication of Materials: All material and other information generated under this Agreement sha the sole property of MSU-Bozeman.

VII. Access to Records: The Contractor shall adequately account for and maintain reasonable records for his/her/its performance and allow access to these records by MSU-Bozeman, the Legislative Auditor and/or the Legislative Fiscal Analyst as may be necessary for audit purposes and in determining compliance with the terms of this Agreement.

The Contractor shall submit a record of expenditures incurred for the performance and completion of this Agreement. MSU-Bozeman may verify all expenditure receipts and disperse funds in an amount equal to the approved expenditures

All records pertaining to this Agreement must be retained by the Contractor for a period of three years from the complet date of this Agreement. If any litigation, claim or audit is started before the expiration of the three-year period, the recor must be retained until the litigation, claim or audit findings have been resolved.

VIII. Indemnification: The Contractor agrees to defend, indemnify and hold MSU-Bozeman harmless from any and al losses and claims that may result to MSU-Bozeman because of the activity of the Contractor, his/her/its agents and/or employees.

IX. Non-discrimination: The Contractor agrees that under Section 49-3-207, Montana Code Annotated, and the fede civil rights acts, no part of this Agreement shall be performed in a manner which illegally discriminates against any pers on the basis of race, color, religion, creed, political ideas, sex, age, marital status, physical or mental handicap, or natio origin.

X. Modification: This Agreement contains the entire agreement between the parties, and no statements, promises or inducements made by either party, or agents or either party, that are not contained in this Agreement are valid or bindir This Agreement may not be enlarged, modified, or altered except by written amendment by the parties.

XI. Termination:

A. This Agreement may be terminated at any time upon the written mutual consent of the parties.

B. Either party may terminate this Agreement for failure of the other party to perform any of the services, duties or conditions contained in this Agreement after giving the other party written notice of the stated failure. The written notice must demand performance of the stated failure within a specified period of time of not less than (thirty) 30 days. If the demanded performance is not completed within the specified period, the termination is effective at the end of the specif period.

C. The above remedies are in addition to any other remedies provided by law or the terms of this Agreement.

XII. Severability: If one part of this Agreement is held to be illegal, void or in conflict with any Montana law, the validity the remainder of this Agreement remains operative and binding.

XIII. Assignment, Transfer and Subcontracting: There will be no assignment or transfer of this Agreement, or of an interest in this Agreement, unless both parties agree in writing. No services required under this Agreement, may be performed under subcontract unless both parties agree in writing.

XIV. Notice: All notices relating to this Agreement will be in writing and given to the contact person at the address prov for in this Agreement.

XV. Venue: This Agreement will be interpreted according to the laws of the State of Montana. The parties agree that, the event of litigation concerning this Agreement, venue shall be in the Eighteenth Judicial District of the State of Monta in and for the County of Gallatin.

This Agreement consists of three (3) pages plus attachments. The original will be retained by MSU-Bozeman. A co of the original shall have the same force and effect as the original for all purposes. To express the parties' intent to be bound by the terms of this Agreement, they have executed this document on the dates set forth below.

Department Head	Date	Contractor	Date
Dean	Date		
Principal Investigator	Date		
Grants & Contracts President/VP	Date		
MSU Legal Counsel Approved for Legal Format *(Required for contracts over $5,000)*	Date	Director of Purchasing Approved for Form *(Required for contracts over $25,000)*	Date

Agreement invalid unless signed by all required parties

#%#%#%#%#%#%#%#%#%#%#%#%#%
HAVE YOU REMEMBERED TO:

- Review Standard Terms and Conditions attached
- Properly identify return envelope with Bid Number
- Sign Bid in ink on the front page
- Initial any changes to Bid
- Complete the delivery information
- Review and complete all requirements listed to ensure Bid compliance

#%#%#%#%#%#%#%#%#%#%#%#%#%

APPENDIX E: VISITOR SURVEY INSTRUMENT

VISITOR INFORMATION STUDY

The Western Transportation Institute, the California Department of Transportation (Caltrans) and the National Park Service are working together to improve your trip to Muir Woods National Monument and the Stinson Beach area of the Golden Gate National Recreation Area (GGNRA), and would like your help today in filling out a survey. The purpose of this survey is to understand what sources of information visitors use in their trip decision-making on a visit to either Muir Woods National Monument or Stinson Beach. **This survey is confidential and voluntary, and will take about "5" minutes.** This project is sponsored by the U.S. Department of Transportation and is being administered by the **Western Transportation Institute, Montana State University on behalf of the NPS.**

INSTRUCTIONS:
1. Please complete all questions on this survey. *Do not write your name or address on the survey form.*
2. Return the completed survey in the drop box located at the park site.

1. Which Golden Gate National Recreation Area site were you visiting when you received this questionnaire?
   Stinson Beach _____ - **please answer questions #2a and #3a**
   Muir Woods _____ - **please answer questions #2b and #3b**

2a. How **often** do you visit Stinson Beach?
(Check only ONE)
- ❒ This was my first visit
- ❒ Once every few years
- ❒ Once per year
- ❒ 2 to 4 times per year
- ❒ At least 5 times per year

2b. How **often** do you visit Muir Woods National Monument?
(Check only ONE)
- ❒ This was my first visit
- ❒ Once every few years
- ❒ Once per year
- ❒ 2 to 4 times per year
- ❒ At least 5 times per year

3a. During which **seasons** do you normally visit Stinson Beach?
(Check ALL that apply)
❒ Spring ❒ Summer ❒ Fall ❒ Winter

3b. During which **seasons** do you normally visit Muir Woods National Monument?
(Check ALL that apply)
❒ Spring ❒ Summer ❒ Fall ❒ Winter

4. Please rate **how congested** (with traffic) each of the following areas was during your visit. Please circle only one response for each area.

Areas	Very Congested	Somewhat Congested	Neutral	Somewhat Uncongested	Uncongested	I Don't Know
a) US Hwy. 101	5	4	3	2	1	NA
b) Roads leading to the park	5	4	3	2	1	NA
c) Parking lots	5	4	3	2	1	NA
d) Trails	5	4	3	2	1	NA

This next set of questions relates to parking & shuttle information about these park sites you may have seen on your way here today on **highway message signs**. Two new signs have been deployed on US Hwy. 101 in Marin County as part of a pilot transportation project for the summer of 2005. One is located on Hwy. 101 going north just past the Golden Gate Bridge as the highway climbs toward the tunnels. The other is located on Hwy. 101 going south just past the Tiburon / Blithedale Road exit. A photo of the sign is shown in the picture at right.

5. **On this trip**, did you see either one of these highway message signs located on US Hwy. 101?
   ❒ Yes – **proceed to #6** ❒ No – **proceed to #13**

6. Did the sign have a message on it? ❒ Yes ❒ No
   If no, proceed to question #8.
   If yes, what did the message say to the best of your recollection?
   _____

7. How strongly would you **agree or disagree** with the following statements regarding the highway message sign? *(5 = strongly agree, 1 = strongly disagree)*

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
a) The information was accurate.	5	4	3	2	1
b) The information was useful to me and/or my group.	5	4	3	2	1
c) The information seemed current.	5	4	3	2	1
d) The information was easy to understand.	5	4	3	2	1
e) I needed more information.	5	4	3	2	1
f) I could not read it	5	4	3	2	1

8. What **type of information** would you want to see on the sign?
   (Check ALL that apply)
   ❒ Park hours and entrance fees
   ❒ Activities at park
   ❒ Information on road closures
   ❒ Road accidents
   ❒ Other (please list _____)
   ❒ Road work / construction
   ❒ Whether parking areas are full
   ❒ Transit / shuttle info
   ❒ Directions to other parking
   ❒ Directions to other park areas
   ❒ Weather
   ❒ Directions to tune to park radio for more information

9. How strongly would you **agree or disagree** with the following statements regarding the highway message sign? *(5 = strongly agree, 1 = strongly disagree)*

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
a) The park should use similar highway message signs to provide parking status or shuttle stop information earlier in San Francisco on the way to the park.	5	4	3	2	1
b) The park should use similar highway message signs within the park, provided they can be designed to fit in with the natural surroundings.	5	4	3	2	1
c) The park should use some other means rather than highway message signs for providing traveler parking & shuttle information.	5	4	3	2	1
Provide suggestion:_____					

10. Overall **HOW USEFUL** is the portable highway message sign? (*Check only one*)

Very Useful	Useful	Neutral	Useless	Very Useless	Don't Recall
☐	☐	☐	☐	☐	☐

11. Was the portable highway message sign in a good location? (*Check only one*)
- ☐ Yes
- ☐ No
- ☐ Don't Recall

12. How did the sign message **affect your trip**? *(Check ALL that apply)*
- ☐ I spent more time in the park
- ☐ I spent less time in the park
- ☐ I changed my plans and went to a different part of the park first than I had originally planned
- ☐ I went to Sausalito or Marin City first/instead
- ☐ I changed the time of day that I visited Muir Woods or Stinson Beach
- ☐ I used the free shuttle or public transportation to get to Muir Woods
- ☐ I had a better visit because of the information I received
- ☐ The information had no effect on my trip

13. The following information is needed to ensure that the findings of this survey are representative of visitors to the Stinson Beach and/or Muir Woods National Monument. It will be used for purposes of this survey only.

a. Where do you live?	☐ Marin or San Francisco County ☐ Other California County (please list if known) _____ ☐ Other State (please list state) _____ ☐ International (please list country _____
b. How many people were in your party?	_____ adults (18 - 64) _____ seniors (65+) _____ children (under 18)
c. How long did you spend at the park on this trip?	Fill in one blank: _____ days **or** _____ hours
d. What language do you primarily speak at home?	☐ English ☐ Spanish ☐ Other (please list) _____
e. What type of vehicle do you use to get to the Golden Gate National Recreation Area?	☐ Automobile / Truck / SUV / Motorcycle ☐ Recreation Vehicle (RV) ☐ Bicycle ☐ Public Transportation ☐ Private Transportation (e.g. tour bus) ☐ Other (please list) _____

Please provide any comments that you think would help us in this study. Write on back of this paper or on a separate piece of paper if needed. _____

_____

Thank you for your help in completing this survey. Results will be available after May 2006 on the following website: http://www.coe.montana.edu/wti/wti/display.php?id=69.

Further information about this survey can be obtained from the following address: Information Collection Clearance Officer, WASO Administration Program Center, National Park Service, 1849 C Street, N.W., Washington, D.C. 20240.

PRIVACY ACT and PAPERWORK REDUCTION ACT statement:
16 U.S.C. 1a-7 authorizes collection of this information. This information will be used by WTI, CALTRANS & park managers to better serve the visiting public. Response to this request is completely voluntary, and confidential. No action may be taken against you for refusing to supply the information requested. Permanent data will be anonymous. An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number.
BURDEN ESTIMATE STATEMENT: Public reporting burden for this form is estimated to average "5" minutes per response. Direct comments regarding the burden estimate or any other aspect of this form to Information Collection Clearance Officer, WASO Administration Program Center, National Park Service, 1849 C Street, N.W., Washington, D.C. 20240.

THANK YOU VERY MUCH FOR YOUR PARTICIPATION!

APPENDIX F: VISITOR SURVEY DETAILED RESULTS

The following parts to this appendix show the survey question layout and the summary statistics. The statistical results shown include: frequencies, percentages, means and standard deviations. The symbol * indicates number not answered, which is not a factor in our calculations.

1. Which Golden Gate National Recreation Area site were you visiting when you received this questionnaire?

	Count	Percent
Muir Woods	192	72.5
Stinson Beach	73	27.5
	N =	265
	* =	-

2. How often do you visit Muir Woods National Monument or Stinson Beach?

	Muir Woods		Stinson Beach	
	Count	Percent	Count	Percent
My first time	114	59.7	19	26.8
Once every few years	40	20.9	8	11.3
Once per year	12	6.3	5	7.0
2-4 times per year	18	9.4	13	18.3
At least 5 times per year	7	3.7	26	36.6
	N =	191	**N =**	71
	*** =**	1	*** =**	2

3. During which seasons do you normally visit Muir Woods National Monument or Stinson Beach?

	Muir Woods		Stinson Beach	
	Count	Percent	Count	Percent
Spring	35	18.3	28	39.4
Summer	82	42.9	66	93.0
Fall	124	64.9	36	50.7
Winter	25	13.1	23	32.4
	N =	191	**N =**	71
	*** =**	1	*** =**	2

4. Please rate how congested (with traffic) each of the following areas was during your visit. Please circle only one response for each area.

	US Route 101		Park Roads		Parking		Trails	
	Count	Pct	Count	Pct	Count	Pct	Count	Pct
(5) Very congested	7	2.7	5	1.9	61	23.7	2	0.8
(4) Somewhat congested	54	20.8	46	17.8	65	25.3	47	18.5
(3) Neutral	77	29.7	67	26.0	41	16.0	54	21.3
(2) Somewhat uncongested	49	18.9	61	23.6	38	14.8	47	18.5
(1) Uncongested	44	17.0	78	30.2	51	19.8	66	26.0
Don't know	28	10.8	1	0.4	1	0.4	38	15.0
	N =	259	**N =**	258	**N =**	257	**N =**	254
	*** =**	6	*** =**	7	*** =**	8	*** =**	11
	Mean	2.70	**Mean**	2.37	**Mean**	3.18	**Mean**	2.41
	St Dev	1.12	**St Dev**	1.15	**St Dev**	1.46	**St Dev**	1.16

5. On this trip, did you see either one of these highway message signs located on US Hwy. 101?

	Count	Percent
Yes	110	43.0
No	146	57.0
	N =	256
	* =	9

6. Did the sign have a message on it?

	Count	Percent
Yes	87	81.3
No	20	18.7
	N =	107
	* =	3

If so, do you recall what the sign said?

	Count	Percent
Yes	47	51.1
No	45	48.9
	N =	92
	* =	18

	Count	Percent
Detour	15	33.3
Don't Remember	10	22.2
Highway 1	6	13.3
Muir Woods	6	13.3
Parking Full	4	8.9
Road Closure	4	8.9
Could Not Read	3	6.7
Panoramic Hwy	3	6.7
Muir Road	2	4.4
Scenic Route	2	4.4
Road Conditions	1	2.2
Road Construction	1	2.2
Traffic	1	2.2
Water level	1	2.2
	N =	45
	* =	2

7. How strongly would you agree or disagree with the following statements regarding the highway message sign?

	Accurate		Useful		Current		Easy to Understand		Need More Information		Could Not Read	
	Count	Pct	Count	Pct	Count	Pct	Count	Pct	Count	Pct	Count	Pct
(5) Strongly agree	25	35.7	18	26.9	20	29.9	21	30.9	3	4.4	2	2.9
(4) Agree	29	41.4	17	25.4	28	41.8	26	38.2	10	14.7	6	8.7
(3) Neutral	15	21.4	26	38.8	15	22.4	14	20.6	18	26.5	14	20.3
(2) Disagree	1	1.4	5	7.5	3	4.5	6	8.8	29	42.6	20	29.0
(1) Strongly disagree	-	-	1	1.5	1	1.5	1	1.5	8	11.8	27	39.1
	N =	70	**N =**	67	**N =**	67	**N =**	68	**N =**	68	**N =**	69
	*** =**	17	*** =**	20	*** =**	20	*** =**	19	*** =**	19	*** =**	18
	Mean	4.11	**Mean**	3.69	**Mean**	3.94	**Mean**	3.88	**Mean**	2.57	**Mean**	2.07
	St Dev	0.79	**St Dev**	1.00	**St Dev**	0.92	**St Dev**	1.00	**St Dev**	1.03	**St Dev**	1.10

8. What type of information would you want to see on the sign?

	Count	Pct
Park hours	27	25.2
Activities at Park	13	12.1
Info. on Road Closures	70	65.4
Road Accidents	45	42.1
Other	5	4.7
Road work	57	53.3
Parking Full	61	57.0
Transit/Shuttle	19	17.8
Directions parking	34	31.8
Directions to other parking	18	16.8
Weather	13	12.1
Directions for park radio	24	22.4
	N =	107
	* =	3

Other response included: Directions to visitor's center/ranger station (1.0%); and where else to go in short-term if lot is full or road is backed up (1.0%)

9. How strongly would you agree or disagree with the following statements regarding the highway message sign?

	Use Earlier in San Francisco		Use within Park		Use Other Means for Information	
	Count	Pct	Count	Pct	Count	Pct
(5) Strongly agree	14	13.1	20	18.7	6	5.7
(4) Agree	45	42.1	35	32.7	12	11.4
(3) Neutral	33	30.8	29	27.1	54	51.4
(2) Disagree	13	12.1	11	10.3	29	27.6
(1) Strongly disagree	2	1.9	12	11.2	4	3.8
	N =	107	**N =**	107	**N =**	105
	*** =**	3	*** =**	3	*** =**	5
	Mean	3.52	**Mean**	3.37	**Mean**	2.88
	St Dev	0.94	**St Dev**	1.22	**St Dev**	0.87

Responses for Other Means included: Radio (3.8%), Web site (1.9%), Small non-electronic signs (1.0%)

10. Overall HOW USEFUL is the portable highway message sign?

	Count	Percent
(5) Very Useful	17	15.6
(4) Useful	51	46.8
(3) Neutral	31	28.4
(2) Useless	5	4.6
(1) Very Useless	2	1.8
Don't Recall	3	2.8
	N =	109
	*** =**	1
	Mean	3.72
	St Dev	0.86

11. Was the portable highway message sign in a good location?

	Count	Percent
Yes	66	61.1
No	32	29.6
Don't Recall	10	9.3
	N =	108
	* =	2

12. How did the sign message affect your trip? (Check ALL that apply)

	Count	Percent
I spent more time in the park	2	2.0
I spent less time in the park	-	-
I changed my plans and went to a different part of the park first than I had originally planned	-	-
I went to Sausalito or Marin City first/instead	1	1.0
I changed the time of day that I visited Muir Woods or Stinson Beach	1	1.0
I used the free shuttle or public transportation to get to Muir Woods	-	-
I had a better visit because of the information I received	8	7.8
The information had no effect on my trip	90	88.2
	N =	102
	* =	8

13. The following information is needed to ensure that the findings of this survey are representative of visitors to the Stinson Beach and/or Muir Woods National Monument. It will be used for purposes of this survey only.

    a) Where do you live?

	Count	Percent
Marin or San Francisco County	65	25.3
Other California County	58	22.6
Other State	103	40.1
International	31	12.1
	N =	257
	*** =**	8

b) How many people were in your party?

	Count	Percent
1	29	11.3
2	108	42.2
3 to 5	103	40.2
6 or more	16	6.3
	N =	256
	*** =**	9

	Total	Per Group Average
Adults	626	2.4
Seniors	83	0.3
Children	72	0.3
	N =	256
	*** =**	9

c) How long did you spend at the park on this trip?

	Count	Percent
Less than 1 hr	47	18.8
1 to 2 hours	115	46.0
2 to 4 hours	72	28.8
More than 4 hours	16	6.4
	N =	250
	*** =**	15
	Mean	2.76
	St Dev	3.23

d) What language do you primarily speak at home?

	Count	Percent
English	240	94.1
Spanish	3	1.2
Other	12	4.7
	N =	255
	*** =**	10

Other responses included: Chinese, Dutch, French, German, Hebrew, Indian, Japanese, Russian, and Swedish.

e) What type of vehicle do you use to get to the Golden Gate National Recreation Area?

	Count	Percent
Automobile	237	93.3
Bicycle	1	0.4
Private transportation (e.g. tour bus)	7	2.8
Recreational vehicle	2	0.8
Public transportation	2	0.8
Other	5	2.0
	N =	254
	*** =**	11

Additional Comments:

- I have been coming to Stinson Beach, Mt Tam, GGNRA etc. very frequently for 50 yrs and have always found them for the most part well-maintained and enjoyable.
- We were at Stinson on a Thursday partly in order to avoid traffic and crowds
- Brought visitors from Granada, Spain to park – enjoyed by all
- Good luck
- Would support a fee-based mass transit system (hybrid buses, etc.). The park is in great condition. Rangers are helpful and friendly; very knowledgeable about the region.
- Shuttle at Stinson Beach to return hikers who take the 4.5 mi trail down at certain times. Thanks! We love our National Parks. More funding, more employees, more parks!
- What an amazing park.
- We have tried to come before on weekends but the traffic was so congested that we gave up.
- Because I was concentrating on the road, I did not see the message sign until I had almost passed it, but I did want to read it!
- Totally enjoyed our time here. Plan to return and spend more time.
- I like Muir Woods very much. I've never seen such peaceful places in my life. I want to come back here one day.
- Question 2B needed the choice of being here before but not within time span
- More signs on 101 would be better
- Do not widen roads, as it will fetch more tourists; and will spoil the eternal calmness of the park. You make it more approachable and it takes no time to get it cornered into a tourist spot creating lots of waste and chaos….Take Niagara Falls for instance… 150 years ago, it was a truly calm place with limited tourist inflow, and now, even at 6 am you've lot of tourists. Talking that "They can hear silence!"
- Very beautiful clean park. Easy to get to. The road signs to the park where easy to get to/follow. We were also in Yosemite. Your California parks are wonderful – clean and well maintained/marked. Thank for a great vacation
- Easy-to-print directions and maps online would be useful. Directions on and after HWY 1 earlier before the forks would be good.
- Clearer directions on parts of 101
- Advise recreational vehicles that no parking is available.
- Muir Woods is beautiful. We visit it every time we can.
- I'm sad I didn't see the sign; it seems like a great idea.

- Better signs to Muir Woods from 101. I was aware of the signs but they didn't seem to have actual information displayed at the time. Also, we missed the exit from 101 north to Muir as the sign posts were not clear until we left 101 (could be because we are British and driving on the wrong side!!)
- Somehow there needs to be more parking. The park itself is beautiful
- It was not clear (from Hwy. 101) that Hwy 1 leads to Muir Woods (it says Stinson Beach but not Muir Woods). The sign would help if it mentioned Muir Woods
- Beautiful site!! Gorgeous!! I am so proud we saved this place!! Great trails.
- Park is kept clean and in very good condition; however, the parking facilities are an inconvenience. If park fees were higher and could facilitate more parking spaces, that would be great.
- Need more parking close to park.
- Parking was very crowded but there was no clear indication of where else we could go or that there was plenty of parking available. Further, signage not clear on where to begin trail. Otherwise, a phenomenal experience.
- The park is gorgeous. The staff were very helpful.
- I really like it here because it's peaceful and helps me inside. Thanks.
- Beautiful.
- The big trees were really big and really nice to look at. They made me feel small, like an ant or some small bug.
- I would be very interested in regular and reliable public transportation, e.g. shuttle buses and or park and ride.
- Muir Woods is nice.
- Don't know public transportation could get up here from downtown San Francisco; if so, may have used it.
- Lights on signs could be brighter so you could see them better.
- Go early in the AM; not crowded.
- Lack of guardrails on roads to park is a little disconcerting.
- Didn't answer trail congestion because main trails are packed while those heading up mountain have only light traffic. The electronic sign that I didn't see is extremely helpful.
- Was a wonderful park and worth a wait if required.
- Beautiful and awe-inspiring.
- Parking could be improved; more trails so a more serene experience.
- We loved the park; parking was hard to find.
- Although I currently live in Sacramento, I grew up in the Bay Area and have been to Muir Woods and Stinson Beach countless times in the last 20 years. The congestion has grown significantly, but I got lucky on this occasion. Local wireless or radio in several languages would be better than signage. I think signage cheapens the look of the area and creates too much of a "tourist look" (even though it is).
- Signs to say un-even pathways could make it easier for less able and disabled visitors. Otherwise, a real treat; it was a wonderful experience, with lots of memories to take back home.
- I did not have any trouble getting to park with original signs.
- More warnings for sharp curves would be helpful.

- It is easier to park at Muir Woods than it is to park at Muir Beach. There should be a shuttle from Muir Woods to Muir Beach.
- More funding for parks.
- Survey staff was very helpful and polite.
- Very well maintained, picturesque roads leading into the park.
- More parking needed for Muir Woods.
- Strengthen crooked roads and add guard rails, separate bike path.

APPENDIX G: PIVOT TABLE COMPARISONS

Question 1 (Site) vs. Question 4a (Perceived Congestion on US Route 101)

	Muir Woods		Stinson Beach	
	Count	Pct	Count	Pct
(5) Very congested	6	3.2	1	1.4
(4) Somewhat congested	43	22.6	11	15.9
(3) Neutral	65	34.2	12	17.4
(2) Somewhat uncongested	36	18.9	13	18.8
(1) Uncongested	33	17.4	11	15.9
Don't know	7	3.7	21	30.4
	N =	190	**N =**	69
	*** =**	2	*** =**	4
	Mean	2.74	**Mean**	2.54
	St Dev	1.11	**St Dev**	1.15

Question 1 (Site) vs. Question 4b (Perceived Congestion on Park Roads)

	Muir Woods		Stinson Beach	
	Count	Pct	Count	Pct
(5) Very congested	5	2.7	-	-
(4) Somewhat congested	38	20.2	8	11.4
(3) Neutral	56	29.8	11	15.7
(2) Somewhat uncongested	36	19.1	25	35.7
(1) Uncongested	52	27.7	26	37.1
Don't know	1	0.5	-	-
	N =	188	**N =**	70
	*** =**	4	*** =**	3
	Mean	2.51	**Mean**	2.01
	St Dev	1.17	**St Dev**	1.00

Question 1 (Site) vs. Question 4c (Perceived Congestion on Parking)

	Muir Woods		Stinson Beach	
	Count	Pct	Count	Pct
(5) Very congested	60	32.1	1	1.4
(4) Somewhat congested	55	29.4	10	14.3
(3) Neutral	29	15.5	12	17.1
(2) Somewhat uncongested	20	10.7	18	25.7
(1) Uncongested	22	11.8	29	41.4
Don't know	1	0.5	-	-
	N =	187	**N =**	70
	*** =**	5	*** =**	3
	Mean	3.60	**Mean**	2.09
	St Dev	1.35	**St Dev**	1.14

Question 1 (Site) vs. Question 4d (Perceived Congestion on Trails)

	Muir Woods		Stinson Beach	
	Count	Pct	Count	Pct
(5) Very congested	2	1.1	-	-
(4) Somewhat congested	45	24.2	2	2.9
(3) Neutral	53	28.5	1	1.5
(2) Somewhat uncongested	45	24.2	2	2.9
(1) Uncongested	39	21.0	27	39.7
Don't know	2	1.1	36	52.9
	N =	186	**N =**	68
	*** =**	6	*** =**	5
	Mean	2.60	**Mean**	1.31
	St Dev	1.11	**St Dev**	0.82

Question 1 (Site) vs. Question 5 (Seeing the Sign)

	Muir Woods		Stinson Beach	
	Count	Pct	Count	Pct
Yes, I saw the sign	87	46.5	23	33.3
No, I did not see the sign	100	53.5	46	66.7
	N =	187	**N =**	69
	*** =**	5	*** =**	4

Question 1 (Site) vs. Question 6 (Message on Sign)

	Muir Woods		Stinson Beach	
	Count	Pct	Count	Pct
Yes, I saw a message	75	89.3	12	52.2
No, I did not see a message	9	10.7	11	47.8
	N =	84	**N =**	23
	*** =**	3	*** =**	-

Question 1 (Site) vs. Question 7a (Message Accuracy)

	Muir Woods		Stinson Beach	
	Count	Pct	Count	Pct
(5) Very congested	22	34.4	3	50.0
(4) Somewhat congested	27	42.2	2	33.3
(3) Neutral	14	21.9	1	16.7
(2) Somewhat uncongested	1	1.6	-	-
(1) Uncongested	-	-	-	-
Don't know	-	-	-	-
	N =	64	**N =**	6
	*** =**	11	*** =**	6
	Mean	4.09	**Mean**	4.33
	St Dev	0.79	**St Dev**	0.82

Question 1 (Site) vs. Question 7b (Message Usefulness)

	Muir Woods		Stinson Beach	
	Count	Pct	Count	Pct
(5) Very congested	15	24.6	3	50.0
(4) Somewhat congested	15	24.6	2	33.3
(3) Neutral	25	41.0	1	16.7
(2) Somewhat uncongested	5	8.2	-	-
(1) Uncongested	1	1.6	-	-
Don't know	-	-	-	-
	N =	61	**N =**	6
	*** =**	14	*** =**	6
	Mean	3.62	**Mean**	4.33
	St Dev	1.00	**St Dev**	0.82

Question 1 (Site) vs. Question 7c (Message is Current)

	Muir Woods		Stinson Beach	
	Count	Pct	Count	Pct
(5) Very congested	18	29.5	2	33.3
(4) Somewhat congested	25	41.0	3	50.0
(3) Neutral	14	23.0	1	16.7
(2) Somewhat uncongested	3	4.9	-	-
(1) Uncongested	1	1.6	-	-
Don't know	-	-	-	-
	N =	61	**N =**	6
	*** =**	14	*** =**	6
	Mean	3.92	**Mean**	4.17
	St Dev	0.94	**St Dev**	0.75

Question 1 (Site) vs. Question 7d (Message is Easy to Understand)

	Muir Woods		Stinson Beach	
	Count	Pct	Count	Pct
(5) Very congested	20	32.3	1	16.7
(4) Somewhat congested	21	33.9	5	83.3
(3) Neutral	14	22.6	-	-
(2) Somewhat uncongested	6	9.7	-	-
(1) Uncongested	1	1.6	-	-
Don't know	-	-	-	-
	N =	62	**N =**	6
	*** =**	13	*** =**	6
	Mean	3.85	**Mean**	4.17
	St Dev	1.04	**St Dev**	0.41

Question 1 (Site) vs. Question 7e (Need More Information)

	Muir Woods		Stinson Beach	
	Count	Pct	Count	Pct
(5) Very congested	3	4.8	-	-
(4) Somewhat congested	10	16.1	-	-
(3) Neutral	15	24.2	3	50.0
(2) Somewhat uncongested	26	41.9	3	50.0
(1) Uncongested	8	12.9	-	-
Don't know	-	-	-	-
	N =	62	**N =**	6
	*** =**	13	*** =**	6
	Mean	2.58	**Mean**	2.50
	St Dev	1.06	**St Dev**	0.55

Question 1 (Site) vs. Question 7f (Could Not Read)

	Muir Woods		Stinson Beach	
	Count	Pct	Count	Pct
(5) Very congested	2	3.2	-	-
(4) Somewhat congested	6	9.5	-	-
(3) Neutral	12	19.0	2	33.3
(2) Somewhat uncongested	18	28.6	2	33.3
(1) Uncongested	25	39.7	2	33.3
Don't know	-	-	-	-
	N =	63	**N =**	6
	*** =**	12	*** =**	6
	Mean	2.08	**Mean**	2.00
	St Dev	1.13	**St Dev**	0.89

Question 1 (Site) vs. Question 8 (Type of Information)

	Muir Woods		Stinson Beach	
	Count	Pct	Count	Pct
Park hours	22	25.6	7	33.3
Activities at Park	7	8.1	6	28.6
Info. on Road Closures	53	61.6	20	95.2
Road Accidents	34	39.5	11	52.4
Other	3	3.5	2	9.5
Road work	44	51.2	13	61.9
Parking Full	42	48.8	20	95.2
Transit/Shuttle	15	17.4	5	23.8
Directions parking	26	30.2	8	38.1
Directions to other parking	17	19.8	1	4.8
Weather	10	11.6	3	14.3
Directions for park radio	20	23.3	5	23.8
	N =	86	**N =**	21
	* =	1	* =	2

Question 1 (Site) vs. Question 9a (Use Earlier in San Francisco)

	Muir Woods		Stinson Beach	
	Count	Pct	Count	Pct
(5) Strongly agree	12	14.0	2	9.5
(4) Agree	37	43.0	8	38.1
(3) Neutral	23	26.7	10	47.6
(2) Disagree	12	14.0	1	4.8
(1) Strongly disagree	2	2.3	-	-
	N =	86	**N =**	21
	*** =**	1	*** =**	2
	Mean	3.52	**Mean**	3.52
	St Dev	0.98	**St Dev**	0.75

Question 1 (Site) vs. Question 9b (Use in Park)

	Muir Woods		Stinson Beach	
	Count	Pct	Count	Pct
(5) Strongly agree	11	12.8	9	42.9
(4) Agree	31	36.0	4	19.0
(3) Neutral	21	24.4	8	38.1
(2) Disagree	11	12.8	-	-
(1) Strongly disagree	12	14.0	-	-
	N =	86	**N =**	21
	*** =**	1	*** =**	2
	Mean	3.21	**Mean**	4.05
	St Dev	1.24	**St Dev**	0.92

Question 1 (Site) vs. Question 9c (Use Other Means of Information)

	Muir Woods		Stinson Beach	
	Count	Pct	Count	Pct
(5) Strongly agree	6	7.1	-	-
(4) Agree	11	13.1	1	4.8
(3) Neutral	37	44.0	17	81.0
(2) Disagree	26	31.0	3	14.3
(1) Strongly disagree	4	4.8	-	-
	N =	84	**N =**	21
	*** =**	3	*** =**	2
	Mean	2.87	**Mean**	2.90
	St Dev	0.95	**St Dev**	0.44

Question 1 (Site) vs. Question 10 (Sign Usefulness)

	Muir Woods		Stinson Beach	
	Count	Pct	Count	Pct
(5) Very Useful	17	19.5	-	-
(4) Useful	43	49.4	8	36.4
(3) Neutral	19	21.8	12	54.5
(2) Useless	5	5.7	-	-
(1) Very Useless	2	2.3	-	-
Don't know	1	1.1	2	9.1
	N =	87	**N =**	22
	*** =**	-	*** =**	1
	Mean	3.79	**Mean**	3.40
	St Dev	0.91	**St Dev**	0.50

Question 1 (Site) vs. Question 11 (Good Location)

	Muir Woods		Stinson Beach	
	Count	Pct	Count	Pct
Yes	55	63.2	11	52.4
No	23	26.4	9	42.9
Don't Recall	9	10.3	1	4.8
	N =	87	**N =**	21
	*** =**	-	*** =**	2

Question 1 (Site) vs. Question 12 (Effect on Trip)

	Muir Woods		Stinson Beach	
	Count	Pct	Count	Pct
I spent more time in the park	2	2.4	-	-
I spent less time in the park	-	-	-	-
I changed my plans and went to a different part of the park first than I had originally planned	-	-	-	-
I went to Sausalito or Marin City first/instead	1	1.2	-	-
I changed the time of day that I visited Muir Woods or Stinson Beach	1	1.2	-	-
I used the free shuttle or public transportation to get to Muir Woods	-	-	-	-
I had a better visit because of the information I received	6	7.2	2	10.5
The information had no effect on my trip	73	88.0	17	89.5
	N =	83	**N =**	19
	* =	4	* =	4

Question 1 (Site) vs. Question 13a (Area of Residence)

	Muir Woods		Stinson Beach	
	Count	Percent	Count	Percent
Marin or San Francisco County	26	13.7	39	58.2
Other California County	42	22.1	16	23.9
Other State	93	48.9	10	14.9
International	29	15.3	2	3.0
	N =	190	**N =**	67
	*** =**	2	*** =**	6

Question 1 (Site) vs. Question 13b (Group Size)

	Muir Woods		Stinson Beach	
	Count	Percent	Count	Percent
1	13	6.8	16	24.2
2	91	47.9	17	25.8
3 to 5	76	40.0	27	40.9
6 or more	10	5.3	6	9.1
	N =	190	**N =**	66
	*** =**	2	*** =**	7
	Mean	3.05	**Mean**	3.06
	St Dev	2.71	**St Dev**	2.09

Question 1 (Site) vs. Question 13c (Length of Stay)

	Muir Woods		Stinson Beach	
	Count	Percent	Count	Percent
Less than 1 hr	28	14.7	19	31.7
1 to 2 hrs	96	50.5	19	31.7
2 to 4 hrs	56	29.5	16	26.7
More than 4 hrs	10	5.3	6	10.0
	N =	190	**N =**	60
	*** =**	2	*** =**	13
	Mean	2.77	**Mean**	2.73
	St Dev	3.27	**St Dev**	3.12

Question 2 (Visit Frequency) vs. Question 4a (Perceived Congestion on US Route 101)

	At least once per year		Less than once per year	
	Count	Percent	Count	Percent
(5) Very congested	1	1.3	6	3.3
(4) Somewhat congested	15	19.0	39	21.7
(3) Neutral	18	22.8	59	32.8
(2) Somewhat uncongested	18	22.8	31	17.2
(1) Uncongested	8	10.1	36	20.0
Don't know	19	24.1	9	5.0
	N =	79	**N =**	180
	*** =**	2	*** =**	1
	Mean	2.72	**Mean**	2.70
	St Dev	1.04	**St Dev**	1.14

Question 2 (Visit Frequency) vs. Question 4b (Perceived Congestion on Park Roads)

	At least once per year		Less than once per year	
	Count	Percent	Count	Percent
(5) Very congested	1	1.3	4	2.2
(4) Somewhat congested	22	27.8	24	13.3
(3) Neutral	13	16.5	54	30.0
(2) Somewhat uncongested	24	30.4	37	20.6
(1) Uncongested	20	25.3	58	32.2
Don't know	-	-	1	0.6
	N =	80	**N =**	178
	*** =**	1	*** =**	3
	Mean	2.50	**Mean**	2.32
	St Dev	1.18	**St Dev**	1.13

Question 2 (Visit Frequency) vs. Question 4c (Perceived Congestion on Parking)

	At least once per year		Less than once per year	
	Count	Percent	Count	Percent
(5) Very congested	22	27.8	39	21.7
(4) Somewhat congested	11	13.9	54	30.0
(3) Neutral	14	17.7	27	15.0
(2) Somewhat uncongested	13	16.5	25	13.9
(1) Uncongested	20	25.3	31	17.2
Don't know	-	-	1	0.6
	N =	80	**N =**	177
	*** =**	1	*** =**	4
	Mean	3.03	**Mean**	3.26
	St Dev	1.56	**St Dev**	1.41

Question 2 (Visit Frequency) vs. Question 4d (Perceived Congestion on Trails)

	At least once per year		Less than once per year	
	Count	Percent	Count	Percent
(5) Very congested	-	-	2	1.1
(4) Somewhat congested	13	16.5	34	18.9
(3) Neutral	12	15.2	42	23.3
(2) Somewhat uncongested	9	11.4	38	21.1
(1) Uncongested	21	26.6	45	25.0
Don't know	21	26.6	17	9.4
	N =	76	**N =**	178
	*** =**	5	*** =**	3
	Mean	2.31	**Mean**	2.44
	St Dev	1.22	**St Dev**	1.14

Question 2 (Visit Frequency) vs. Question 5 (Seeing the Sign)

	At least once per year		Less than once per year	
	Count	Percent	Count	Percent
Yes, I saw the sign	34	43.0	76	42.9
No, I did not see the sign	45	57.0	101	57.1
	N =	79	**N =**	177
	*** =**	2	*** =**	4

Question 2 (Visit Frequency) vs. Question 6 (Message on Sign)

	At least once per year		Less than once per year	
	Count	Percent	Count	Percent
Yes, I saw the sign	25	75.8	62	83.8
No, I did not see the sign	8	24.2	12	16.2
	N =	33	**N =**	74
	*** =**	1	*** =**	2

Question 2 (Visit Frequency) vs. Question 7a (Message Accuracy)

	At least once per year		Less than once per year	
	Count	Pct	Count	Pct
(5) Strongly agree	8	40.0	17	34.0
(4) Agree	8	40.0	21	42.0
(3) Neutral	4	20.0	11	22.0
(2) Disagree	-	-	1	2.0
(1) Strongly disagree	-	-	-	-
	N =	20	**N =**	50
	*** =**	5	*** =**	12
	Mean	4.20	**Mean**	4.08
	St Dev	0.77	**St Dev**	0.80

Question 2 (Visit Frequency) vs. Question 7b (Message Usefulness)

	At least once per year		Less than once per year	
	Count	Pct	Count	Pct
(5) Strongly agree	7	38.9	11	22.4
(4) Agree	3	16.7	14	28.6
(3) Neutral	7	38.9	19	38.8
(2) Disagree	1	5.6	4	8.2
(1) Strongly disagree	-	-	1	2.0
	N =	18	**N =**	49
	*** =**	7	*** =**	13
	Mean	3.89	**Mean**	3.61
	St Dev	1.02	**St Dev**	1.01

Question 2 (Visit Frequency) vs. Question 7c (Message is Current)

	At least once per year		Less than once per year	
	Count	Pct	Count	Pct
(5) Strongly agree	6	35.3	14	28.0
(4) Agree	9	52.9	19	38.0
(3) Neutral	2	11.8	13	26.0
(2) Disagree	-	-	3	6.0
(1) Strongly disagree	-	-	1	2.0
	N =	17	**N =**	50
	*** =**	8	*** =**	12
	Mean	4.24	**Mean**	3.84
	St Dev	0.66	**St Dev**	0.99

Question 2 (Visit Frequency) vs. Question 7d (Message is Easy to Understand)

	At least once per year		Less than once per year	
	Count	Pct	Count	Pct
(5) Strongly agree	5	29.4	16	31.4
(4) Agree	9	52.9	17	33.3
(3) Neutral	2	11.8	12	23.5
(2) Disagree	1	5.9	5	9.8
(1) Strongly disagree	-	-	1	2.0
	N =	17	**N =**	51
	*** =**	8	*** =**	11
	Mean	4.06	**Mean**	3.82
	St Dev	0.83	**St Dev**	1.06

Question 2 (Visit Frequency) vs. Question 7e (Need More Information)

	At least once per year		Less than once per year	
	Count	Pct	Count	Pct
(5) Strongly agree	1	5.9	2	3.9
(4) Agree	5	29.4	5	9.8
(3) Neutral	3	17.6	15	29.4
(2) Disagree	6	35.3	23	45.1
(1) Strongly disagree	2	11.8	6	11.8
	N =	17	**N =**	51
	*** =**	8	*** =**	11
	Mean	2.82	**Mean**	2.49
	St Dev	1.27	**St Dev**	1.03

Question 2 (Visit Frequency) vs. Question 7f (Could Not Read)

	At least once per year		Less than once per year	
	Count	Pct	Count	Pct
(5) Strongly agree	-	-	2	3.8
(4) Agree	4	23.5	2	3.8
(3) Neutral	1	5.9	13	25.0
(2) Disagree	5	29.4	15	28.8
(1) Strongly disagree	7	41.2	20	38.5
	N =	17	**N =**	52
	*** =**	8	*** =**	10
	Mean	2.12	**Mean**	2.06
	St Dev	1.62	**St Dev**	1.38

Question 2 (Visit Frequency) vs. Question 8 (Type of Information)

	At least once per year		Less than once per year	
	Count	Pct	Count	Pct
Park hours	5	15.6	24	32.0
Activities at Park	4	12.5	9	12.0
Info. on Road Closures	25	78.1	48	64.0
Road Accidents	15	46.9	30	40.0
Other	1	3.1	4	5.3
Road work	20	62.5	37	49.3
Parking Full	22	68.8	40	53.3
Transit/Shuttle	7	21.9	13	17.3
Directions parking	10	31.3	24	32.0
Directions to other parking	3	9.4	15	20.0
Weather	2	6.3	11	14.7
Directions for park radio	8	25.0	17	22.7
	N =	32	**N =**	75
	* =	2	* =	1

Question 2 (Visit Frequency) vs. Question 9a (Use Earlier in San Francisco)

	At least once per year		Less than once per year	
	Count	Pct	Count	Pct
(5) Strongly agree	3	9.4	11	14.7
(4) Agree	12	37.5	33	44.0
(3) Neutral	9	28.1	24	32.0
(2) Disagree	8	25.0	5	6.7
(1) Strongly disagree	-	-	2	2.7
	N =	32	**N =**	75
	*** =**	2	*** =**	1
	Mean	3.31	**Mean**	3.61
	St Dev	0.97	**St Dev**	0.93

Question 2 (Visit Frequency) vs. Question 9b (Use in Park)

	At least once per year		Less than once per year	
	Count	Pct	Count	Pct
(5) Strongly agree	7	21.9	13	17.3
(4) Agree	6	18.8	29	38.7
(3) Neutral	11	34.4	18	24.0
(2) Disagree	3	9.4	8	10.7
(1) Strongly disagree	5	15.6	7	9.3
	N =	32	**N =**	75
	*** =**	2	*** =**	1
	Mean	3.22	**Mean**	3.44
	St Dev	1.46	**St Dev**	1.24

Question 2 (Visit Frequency) vs. Question 9c (Use Other Means of Information)

	At least once per year		Less than once per year	
	Count	Pct	Count	Pct
(5) Strongly agree	-	-	6	8.2
(4) Agree	2	6.3	10	13.7
(3) Neutral	18	56.3	36	49.3
(2) Disagree	11	34.4	18	24.7
(1) Strongly disagree	1	3.1	3	4.1
	N =	32	**N =**	73
	*** =**	2	*** =**	3
	Mean	2.66	**Mean**	2.97
	St Dev	0.66	**St Dev**	0.96

Question 2 (Visit Frequency) vs. Question 10 (Sign Usefulness)

	At least once per year		Less than once per year	
	Count	Pct	Count	Pct
(5) Strongly agree	7	21.2	10	13.2
(4) Agree	14	42.4	37	48.7
(3) Neutral	9	27.3	22	28.9
(2) Disagree	1	3.0	4	5.3
(1) Strongly disagree	-	-	2	2.6
Don't recall	2	6.1	1	1.3
	N =	33	**N =**	76
	*** =**	1	*** =**	-
	Mean	3.64	**Mean**	3.61
	St Dev	1.26	**St Dev**	0.89

Question 2 (Visit Frequency) vs. Question 11 (Good Location)

	Muir Woods		Stinson Beach	
	Count	Pct	Count	Pct
Yes	23	26.4	9	42.9
No	55	63.2	11	52.4
Don't Recall	9	10.3	1	4.8
	N =	87	**N =**	21
	*** =**	-	*** =**	2

Question 2 (Visit Frequency) vs. Question 12 (Effect on Trip)

	At least once per year		Less than once per year	
	Count	Percent	Count	Percent
I spent more time in the park	1	20.0	1	6.3
I spent less time in the park	-	-	-	-
I changed my plans and went to a different part of the park first than I had originally planned	-	-	-	-
I went to Sausalito or Marin City first/instead	-	-	1	6.3
I changed the time of day that I visited Muir Woods or Stinson Beach	-	-	1	6.3
I used the free shuttle or public transportation to get to Muir Woods	-	-	-	-
I had a better visit because of the information I received	5	100.0	3	18.8
The information had no effect on my trip	24	480.0	66	412.5
	N =	30	**N =**	72
	* =	4	* =	4

Question 2 (Visit Frequency) vs. Question 13a (Area of Residence)

	At least once per year		Less than once per year	
	Count	Pct	Count	Pct
Marin or San Francisco County	49	62.8	16	8.9
Other California County	22	28.2	36	20.1
Other State	7	9.0	96	53.6
International	-	-	31	17.3
	N =	78	**N =**	179
	*** =**	3	*** =**	2

Question 2 (Visit Frequency) vs. Question 13b (Group Size)

	At least once per year		Less than once per year	
	Count	Pct	Count	Pct
1	19	24.7	10	5.6
2	28	36.4	80	44.7
3 to 5	26	33.8	77	43.0
6 or more	4	5.2	12	6.7
	N =	77	**N =**	179
	*** =**	4	*** =**	2
	Mean	2.65	**Mean**	3.22
	St Dev	1.64	**St Dev**	2.86

Question 2 (Visit Frequency) vs. Question 13c (Length of Stay)

	At least once per year		Less than once per year	
	Count	Pct	Count	Pct
Less than 1 hr	12	16.9	35	19.6
1 to 2 hours	28	39.4	87	48.6
2 to 4 hours	25	-	47	26.3
More than 4 hours	6	8.5	10	5.6
	N =	71	**N =**	179
	*** =**	10	*** =**	2
	Mean	2.53	**Mean**	2.85
	St Dev	1.29	**St Dev**	3.73

Question 4a (US Route 101 Congestion) vs. Question 13a (Area of Residence)

	Marin or SF		Other Calif.		Other State		International	
	Count	Pct	Count	Pct	Count	Pct	Count	Pct
(5) Very congested	1	1.6	2	3.4	3	2.9	1	3.2
(4) Somewhat congested	10	15.6	11	19.0	26	25.2	6	19.4
(3) Neutral	15	23.4	22	37.9	30	29.1	10	32.3
(2) Somewhat uncongested	10	15.6	16	27.6	18	17.5	5	16.1
(1) Uncongested	8	12.5	6	10.3	22	21.4	6	19.4
Don't know	20	31.3	1	1.7	4	3.9	3	9.7
	N =	64	**N =**	58	**N =**	103	**N =**	31
	*** =**	1	*** =**	-	*** =**	-	*** =**	-
	Mean	2.68	**Mean**	2.77	**Mean**	2.70	**Mean**	2.68
	St Dev	1.09	**St Dev**	1.00	**St Dev**	1.17	**St Dev**	1.16

Question 4b (Park Roads Congestion) vs. Question 13a (Area of Residence)

	Marin or SF		Other Calif.		Other State		International	
	Count	Pct	Count	Pct	Count	Pct	Count	Pct
(5) Very congested	-	-	1	1.7	2	2.0	1	3.3
(4) Somewhat congested	14	21.9	13	22.4	14	13.7	5	16.7
(3) Neutral	12	18.8	17	29.3	32	31.4	6	20.0
(2) Somewhat uncongested	17	26.6	19	32.8	19	18.6	6	20.0
(1) Uncongested	21	32.8	8	13.8	34	33.3	12	40.0
Don't know	-	-	-	-	1	1.0	-	-
	N =	64	**N =**	58	**N =**	102	**N =**	30
	*** =**	1	*** =**	-	*** =**	1	*** =**	1
	Mean	2.30	**Mean**	2.66	**Mean**	2.32	**Mean**	2.23
	St Dev	1.15	**St Dev**	1.04	**St Dev**	1.14	**St Dev**	1.25

Question 4c (Parking Congestion) vs. Question 13a (Area of Residence)

	Marin or SF		Other Calif.		Other State		International	
	Count	Pct	Count	Pct	Count	Pct	Count	Pct
(5) Very congested	10	15.6	24	42.1	19	18.6	7	23.3
(4) Somewhat congested	11	17.2	17	29.8	32	31.4	5	16.7
(3) Neutral	11	17.2	6	10.5	15	14.7	9	30.0
(2) Somewhat uncongested	12	18.8	6	10.5	16	15.7	4	13.3
(1) Uncongested	20	31.3	4	7.0	19	18.6	5	16.7
Don't know	-	-	-	-	1	1.0	-	-
	N =	64	**N =**	57	**N =**	102	**N =**	30
	*** =**	1	*** =**	1	*** =**	1	*** =**	1
	Mean	2.67	**Mean**	3.89	**Mean**	3.16	**Mean**	3.17
	St Dev	1.47	**St Dev**	1.26	**St Dev**	1.41	**St Dev**	1.39

Question 4d (Trails Congestion) vs. Question 13a (Area of Residence)

	Marin or SF		Other Calif.		Other State		International	
	Count	Pct	Count	Pct	Count	Pct	Count	Pct
(5) Very congested	-	-	1	1.8	1	1.0	-	-
(4) Somewhat congested	9	14.5	14	25.0	20	19.6	3	10.0
(3) Neutral	9	14.5	8	14.3	25	24.5	12	40.0
(2) Somewhat uncongested	4	6.5	16	28.6	22	21.6	5	16.7
(1) Uncongested	17	27.4	11	19.6	26	25.5	9	30.0
Don't know	23	37.1	6	10.7	8	7.8	1	3.3
	N =	62	**N =**	56	**N =**	102	**N =**	30
	*** =**	3	*** =**	2	*** =**	1	*** =**	1
	Mean	2.26	**Mean**	2.56	**Mean**	2.45	**Mean**	2.31
	St Dev	1.25	**St Dev**	1.18	**St Dev**	1.14	**St Dev**	1.04

Question 5 (Seeing the Sign) vs. Question 13a (Area of Residence)

	Marin or SF		Other Calif.		Other State		International	
	Count	Pct	Count	Pct	Count	Pct	Count	Pct
Yes	25	38.5	30	51.7	39	38.6	16	53.3
No	40	61.5	28	48.3	62	61.4	14	46.7
	N =	65	**N =**	58	**N =**	101	**N =**	30
	*** =**	-	*** =**	-	*** =**	2	*** =**	1

Question 6 (Message on Sign) vs. Question 13a (Area of Residence)

	Marin or SF		Other Calif.		Other State		International	
	Count	Pct	Count	Pct	Count	Pct	Count	Pct
Yes	19	79.2	24	80.0	31	83.8	13	81.3
No	5	20.8	6	20.0	6	16.2	3	18.8
	N =	24	**N =**	30	**N =**	37	**N =**	16
	*** =**	1	*** =**	-	*** =**	2	*** =**	-

Question 7a (Message Accuracy) vs. Question 13a (Area of Residence)

	Marin or SF		Other Calif.		Other State		International	
	Count	Pct	Count	Pct	Count	Pct	Count	Pct
(5) Very congested	7	43.8	4	26.7	11	37.9	3	30.0
(4) Somewhat congested	7	43.8	9	60.0	9	31.0	4	40.0
(3) Neutral	2	12.5	2	13.3	9	31.0	2	20.0
(2) Somewhat uncongested	-	-	-	-	-	-	1	10.0
(1) Uncongested	-	-	-	-	-	-	-	-
Don't know	-	-	-	-	-	-	-	-
	N =	16	**N =**	15	**N =**	29	**N =**	10
	*** =**	3	*** =**	9	*** =**	2	*** =**	3
	Mean	4.31	**Mean**	4.13	**Mean**	4.07	**Mean**	3.90
	St Dev	0.70	**St Dev**	0.64	**St Dev**	0.84	**St Dev**	0.99

Question 7b (Message Usefulness) vs. Question 13a (Area of Residence)

	Marin or SF		Other Calif.		Other State		International	
	Count	Pct	Count	Pct	Count	Pct	Count	Pct
(5) Very congested	6	40.0	3	21.4	7	24.1	2	22.2
(4) Somewhat congested	2	13.3	4	28.6	11	37.9	-	-
(3) Neutral	7	46.7	4	28.6	10	34.5	5	55.6
(2) Somewhat uncongested	-	-	3	21.4	1	3.4	1	11.1
(1) Uncongested	-	-	-	-	-	-	1	11.1
Don't know	-	-	-	-	-	-	-	-
	N =	15	**N =**	14	**N =**	29	**N =**	9
	*** =**	4	*** =**	10	*** =**	2	*** =**	4
	Mean	3.93	**Mean**	3.50	**Mean**	3.83	**Mean**	3.11
	St Dev	0.96	**St Dev**	1.09	**St Dev**	0.85	**St Dev**	1.27

Question 7c (Message is Current) vs. Question 13a (Area of Residence)

	Marin or SF		Other Calif.		Other State		International	
	Count	Pct	Count	Pct	Count	Pct	Count	Pct
(5) Very congested	6	42.9	3	21.4	10	34.5	1	10.0
(4) Somewhat congested	4	28.6	9	64.3	11	37.9	4	40.0
(3) Neutral	4	28.6	2	14.3	7	24.1	2	20.0
(2) Somewhat uncongested	-	-	-	-	1	3.4	2	20.0
(1) Uncongested	-	-	-	-	-	-	1	10.0
Don't know	-	-	-	-	-	-	-	-
	N =	14	**N =**	14	**N =**	29	**N =**	10
	*** =**	5	*** =**	10	*** =**	2	*** =**	3
	Mean	4.14	**Mean**	4.07	**Mean**	4.03	**Mean**	3.20
	St Dev	0.86	**St Dev**	0.62	**St Dev**	0.87	**St Dev**	1.23

Question 7d (Message is Easy to Understand) vs. Question 13a (Area of Residence)

	Marin or SF		Other Calif.		Other State		International	
	Count	Pct	Count	Pct	Count	Pct	Count	Pct
(5) Very congested	6	40.0	3	21.4	10	34.5	2	20.0
(4) Somewhat congested	6	40.0	8	57.1	9	31.0	3	30.0
(3) Neutral	2	13.3	3	21.4	7	24.1	2	20.0
(2) Somewhat uncongested	1	6.7	-	-	3	10.3	2	20.0
(1) Uncongested	-	-	-	-	-	-	1	10.0
Don't know	-	-	-	-	-	-	-	-
	N =	15	**N =**	14	**N =**	29	**N =**	10
	*** =**	4	*** =**	10	*** =**	2	*** =**	3
	Mean	4.13	**Mean**	4.00	**Mean**	3.90	**Mean**	3.30
	St Dev	0.92	**St Dev**	0.68	**St Dev**	1.01	**St Dev**	1.34

Question 7e (Need More Information) vs. Question 13a (Area of Residence)

	Marin or SF		Other Calif.		Other State		International	
	Count	Pct	Count	Pct	Count	Pct	Count	Pct
(5) Very congested	-	-	1	7.1	-	-	2	20.0
(4) Somewhat congested	2	13.3	4	28.6	3	10.3	1	10.0
(3) Neutral	3	20.0	1	7.1	10	34.5	4	40.0
(2) Somewhat uncongested	7	46.7	8	57.1	11	37.9	3	30.0
(1) Uncongested	3	20.0	-	-	5	17.2	-	-
Don't know	-	-	-	-	-	-	-	-
	N =	15	**N =**	14	**N =**	29	**N =**	10
	*** =**	4	*** =**	10	*** =**	2	*** =**	3
	Mean	2.27	**Mean**	2.86	**Mean**	2.38	**Mean**	3.20
	St Dev	0.96	**St Dev**	1.10	**St Dev**	0.90	**St Dev**	1.14

Question 7f (Could Not Read) vs. Question 13a (Area of Residence)

	Marin or SF		Other Calif.		Other State		International	
	Count	Pct	Count	Pct	Count	Pct	Count	Pct
(5) Very congested	-	-	-	-	2	6.7	-	-
(4) Somewhat congested	2	13.3	3	20.0	1	3.3	-	-
(3) Neutral	2	13.3	-	-	8	26.7	4	44.4
(2) Somewhat uncongested	4	26.7	3	20.0	10	33.3	3	33.3
(1) Uncongested	7	46.7	9	60.0	9	30.0	2	22.2
Don't know	-	-	-	-	-	-	-	-
	N =	15	**N =**	15	**N =**	30	**N =**	9
	*** =**	4	*** =**	9	*** =**	1	*** =**	4
	Mean	1.93	**Mean**	1.80	**Mean**	2.23	**Mean**	2.22
	St Dev	1.10	**St Dev**	1.21	**St Dev**	1.14	**St Dev**	0.83

Question 8 (Type of Information) vs. Question 13a (Area of Residence)

	Marin or SF		Other Calif.		Other State		International	
	Count	Pct	Count	Pct	Count	Pct	Count	Pct
Park hours	5	20.8	6	20.0	14	37.8	4	25.0
Activities at Park	2	8.3	3	10.0	5	13.5	3	18.8
Info. on Road Closures	18	75.0	21	70.0	26	70.3	8	50.0
Road Accidents	10	41.7	13	43.3	15	40.5	7	43.8
Other	1	4.2	1	3.3	2	5.4	1	6.3
Road work	14	58.3	15	50.0	23	62.2	5	31.3
Parking Full	15	62.5	19	63.3	18	48.6	10	62.5
Transit/Shuttle	5	20.8	4	13.3	8	21.6	3	18.8
Directions parking	4	16.7	11	36.7	14	37.8	5	31.3
Directions to other parking	1	4.2	4	13.3	11	29.7	2	12.5
Weather	1	4.2	2	6.7	9	24.3	1	6.3
Directions for park radio	2	8.3	9	30.0	12	32.4	2	12.5
	N =	24	**N =**	30	**N =**	37	**N =**	16
	* =	1	* =	-	* =	2	* =	-

Question 9a (Use Earlier in San Francisco) vs. Question 13a (Area of Residence)

	Marin or SF		Other Calif.		Other State		International	
	Count	Pct	Count	Pct	Count	Pct	Count	Pct
(5) Strongly agree	2	8.0	3	11.1	7	17.9	2	12.5
(4) Agree	10	40.0	9	33.3	19	48.7	7	43.8
(3) Neutral	7	28.0	11	40.7	9	23.1	6	37.5
(2) Disagree	5	20.0	3	11.1	4	10.3	1	6.3
(1) Strongly disagree	1	4.0	1	3.7	-	-	-	-
	N =	25	**N =**	27	**N =**	39	**N =**	16
	*** =**	-	*** =**	3	*** =**	-	*** =**	-
	Mean	3.28	**Mean**	3.37	**Mean**	3.74	**Mean**	3.63
	St Dev	1.02	**St Dev**	0.97	**St Dev**	0.88	**St Dev**	0.81

Question 9b (Use in Park) vs. Question 13a (Area of Residence)

	Muir Woods		Stinson Beach		Other State		International	
	Count	Pct	Count	Pct	Count	Pct	Count	Pct
(5) Strongly agree	5	20.0	7	25.9	5	12.8	3	18.8
(4) Agree	6	24.0	6	22.2	14	35.9	9	56.3
(3) Neutral	6	24.0	8	29.6	12	30.8	3	18.8
(2) Disagree	2	8.0	4	14.8	5	12.8	-	-
(1) Strongly disagree	6	24.0	2	7.4	3	7.7	1	6.3
	N =	25	**N =**	27	**N =**	39	**N =**	16
	*** =**	-	*** =**	3	*** =**	-	*** =**	-
	Mean	3.08	**Mean**	3.44	**Mean**	3.33	**Mean**	3.81
	St Dev	1.47	**St Dev**	1.25	**St Dev**	1.11	**St Dev**	0.98

Question 9c (Use Other Means of Information) vs. Question 13a (Area of Residence)

	Muir Woods		Stinson Beach		Other State		International	
	Count	Pct	Count	Pct	Count	Pct	Count	Pct
(5) Strongly agree	2	8.3	1	3.7	2	5.3	1	6.3
(4) Agree	1	4.2	5	18.5	4	10.5	2	12.5
(3) Neutral	14	58.3	15	55.6	17	44.7	8	50.0
(2) Disagree	7	29.2	6	22.2	12	31.6	4	25.0
(1) Strongly disagree	-	-	-	-	3	7.9	1	6.3
	N =	24	**N =**	27	**N =**	38	**N =**	16
	*** =**	1	*** =**	3	*** =**	1	*** =**	-
	Mean	2.92	**Mean**	3.04	**Mean**	2.74	**Mean**	2.88
	St Dev	0.83	**St Dev**	0.76	**St Dev**	0.95	**St Dev**	0.96

Question 10 (Sign Usefulness) vs. Question 13a (Area of Residence)

	Marin or SF		Other Calif.		Other State		International	
	Count	Pct	Count	Pct	Count	Pct	Count	Pct
(5) Very Useful	5	20.0	3	10.3	7	17.9	2	12.5
(4) Useful	11	44.0	10	34.5	22	56.4	8	50.0
(3) Neutral	5	20.0	12	41.4	9	23.1	5	31.3
(2) Useless	3	12.0	1	3.4	-	-	1	6.3
(1) Very Useless	-	-	1	3.4	1	2.6	-	-
Don't know	1	4.0	2	6.9	-	-	-	-
	N =	25	**N =**	29	**N =**	39	**N =**	16
	*** =**	-	*** =**	1	*** =**	-	*** =**	-
	Mean	3.75	**Mean**	3.48	**Mean**	3.87	**Mean**	3.69
	St Dev	0.94	**St Dev**	0.89	**St Dev**	0.80	**St Dev**	0.79

Question 11 (Good Location) vs. Question 13a (Area of Residence)

	Marin or SF		Other Calif.		Other State		International	
	Count	Pct	Count	Pct	Count	Pct	Count	Pct
Yes	17	70.8	16	55.2	24	61.5	9	56.3
No	6	25.0	9	31.0	14	35.9	3	18.8
Don't Recall	1	4.2	4	13.8	1	2.6	4	25.0
	N =	24	**N =**	29	**N =**	39	**N =**	16
	*** =**	1	*** =**	1	*** =**	-	*** =**	-

Question 12 (Effect on Trip) vs. Question 13a (Area of Residence)

	Marin or SF		Other Calif.		Other State		International	
	Count	Pct	Count	Pct	Count	Pct	Count	Pct
I spent more time in the park	1	4.5	-	-	1	2.8	-	-
I spent less time in the park	-	-	-	-	-	-	-	-
I changed my plans and went to a different part of the park first than I had originally planned	-	-	-	-	-	-	-	-
I went to Sausalito or Marin City first/instead	-	-	-	-	1	2.8	-	-
I changed the time of day that I visited Muir Woods or Stinson Beach	-	-	-	-	1	2.8	-	-
I used the free shuttle or public transportation to get to Muir Woods	-	-	-	-	-	-	-	-
I had a better visit because of the information I received	4	18.2	3	10.7	1	2.8	-	-
The information had no effect on my trip	17	77.3	25	89.3	32	88.9	16	100.0
	N =	22	**N =**	28	**N =**	36	**N =**	16
	*** =**	3	*** =**	2	*** =**	3	*** =**	-

Question 13b (Group Size) vs. Question 13a (Area of Residence)

	Marin or SF		Other Calif.		Other State		International	
	Count	Pct	Count	Pct	Count	Pct	Count	Pct
1	19	29.7	5	8.6	4	3.9	1	3.2
2	18	28.1	23	39.7	52	50.5	15	48.4
3 to 5	23	35.9	24	41.4	42	40.8	14	45.2
6 or more	4	6.3	6	10.3	5	4.9	1	3.2
	N =	64	**N =**	58	**N =**	103	**N =**	31
	*** =**	1	*** =**	-	*** =**	-	*** =**	-
	Mean	2.73	**Mean**	3.33	**Mean**	3.14	**Mean**	2.90
	St Dev	2.01	**St Dev**	1.79	**St Dev**	3.40	**St Dev**	1.19

Question 13c (Length of Stay) vs. Question 13a (Area of Residence)

	Marin or SF		Other Calif.		Other State		International	
	Count	Pct	Count	Pct	Count	Pct	Count	Pct
Less than 1 hr	12	20.0	7	12.5	19	18.6	8	25.8
1 to 2 hours	31	51.7	21	37.5	52	51.0	11	35.5
2 to 4 hours	14	23.3	23	41.1	24	23.5	11	35.5
More than 4 hours	3	5.0	5	8.9	7	6.9	1	3.2
	N =	60	**N =**	56	**N =**	102	**N =**	31
	*** =**	5	*** =**	2	*** =**	1	*** =**	-
	Mean	2.21	**Mean**	3.42	**Mean**	2.67	**Mean**	3.00
	St Dev	1.13	**St Dev**	4.15	**St Dev**	3.20	**St Dev**	4.04

APPENDIX H: INTERNAL STAKEHOLDERS PRE-PCMS SURVEY

PORTABLE CHANGEABLE MESSAGE SIGNS STAKEHOLDER PRE-SURVEY

This survey is part of an Intelligent Transportation System (ITS) pilot project focusing on National Parks in California. It is a cooperative project co-managed by the Western Transportation Institute located at Montana State University, Caltrans and the participating parks (Golden Gate National Recreation Area and Sequoia-Kings Canyon National Parks). For the purposes of the pilot project and this survey, the boundaries of the parklands within Golden Gate National Recreation Area are to include Muir Woods National Monument.

Please take time to fill out this survey in order to provide feedback about the transportation challenges in the Marin portion of Golden Gate National Recreation Area and your initial feelings about the effect that the Portable Changeable Message Signs (PCMS) that were deployed for use by the Golden Gate National Recreation Area on U.S. 101 on either side of the exit onto State Route 1 in July 2005 will have on these challenges.

This survey is being administered by the Western Transportation Institute at Montana State University.

Demographic Questions

1. What agency do you work for?

   _____

2. What will be your role and responsibility with regards to the Golden Gate National Recreation Area Portable Changeable Message Signs (PCMS)? (*Please check all that apply*)

Roles and Responsibilities			
(a) Operate PCMS (i.e. post messages)	____ Yes		____ No
(b) Maintain PCMS	____ Yes		____ No
(c) Store and transport PCMS	____ Yes		____ No
(d) Call in conditions/request messages to be posted	____ Yes		____ No
(e) Other (*please specify*)	____ Yes		____ No

Transportation In and Around GGNRA

3. Please rank your opinion of the severity of the following traffic challenges in and around the Marin portion of GGNRA prior to the deployment of the PCMS. (*Please circle only one per question*)

	Severe Challenge		**Neutral**		**No Challenge**	
(a) Vehicle Speeds	5	4	3	2	1	Don't Know
(b) Traffic Congestion (slow speed)	5	4	3	2	1	Don't Know
(c) Traffic back-ups (stop & go traffic)	5	4	3	2	1	Don't Know
(d) Park usage	5	4	3	2	1	Don't Know
(e) Visitor complaints/ questions to your agency	5	4	3	2	1	Don't Know
(f) Accidents (severity of accidents)	5	4	3	2	1	Don't Know
(g) Parking space conflicts	5	4	3	2	1	Don't Know

4. Do you feel that there is a need to provide better traveler information to Golden Gate National Recreation Area visitors about congested roads and parking lot status in the Marin portion of GGNRA?

Strongly Agree		**Neutral**		**Strongly Disagree**
5	4	3	2	1

5. How do you feel that better traveler information will affect drivers? (*Please circle only one per question*)

	Strongly Agree		**Neutral**		**Strongly Disagree**
(a) Saves time	5	4	3	2	1
(b) Allows for more efficient decisions	5	4	3	2	1
(c) Makes getting to park sites easier	5	4	3	2	1
(d) Makes finding a parking space easier	5	4	3	2	1
(e) Provides travelers with better information earlier	5	4	3	2	1
(f) Other (*please specify*):	5	4	3	2	1

Effect of the PCMS

6. The project chosen for GGNRA is to deploy two PCMS on U.S. 101, do you feel these will be an effective way of dealing with the congestion and parking challenges at Golden Gate National Recreation Area, as opposed to building new parking lots and widening roads? (*Please circle only one*)

Strongly Agree		**Neutral**		**Strongly Disagree**
5	4	3	2	1

PCMS on US 101

7. Do you believe that your agency will save time by using PCMS to provide traveler information to the public? (*Please circle only one*)

Strongly Agree		**Neutral**		**Strongly Disagree**
5	4	3	2	1

8. General Comments/Suggestions:

_____

_____

APPENDIX I: INTERNAL PRE-PCMS SURVEY DETAILED RESULTS

The following parts to this appendix show the survey question layout and the summary statistics. The statistical results shown include: frequencies, percentages, means and standard deviations. The symbol * indicates number not answered, which is not a factor in our calculations.

Demographic Questions

1. What agency do you work for?

	Count	Percent
National Park Service	8	72.7
California State Parks	1	9.1
Caltrans District 4	1	9.1
Marin County Public Works	1	9.1
	N =	11
	* =	-

2. What will be your role and responsibility with regards to the Golden Gate National Recreation Area Portable Changeable Message Signs (PCMS)? (*Please check all that apply*)

	Operate PCMS		Maintain PCMS		Store/ Transport PCMS		Call in Conditions		Other	
	Count	Pct	Count	Pct	Count	Pct	Count	Pct	Count	Pct
Yes	2	50.0	2	40.0	-	-	4	57.1	3	60.0
No	2	50.0	3	60.0	5	100.0	3	42.9	2	40.0
	N =	4	**N =**	5	**N =**	5	**N =**	7	**N =**	5
	* =	7	* =	6	* =	6	* =	4	* =	6

Comments

- Assist in project planning and evaluation
- Project manager for the NPS elements of the PCMS pilot project. Field level staff to determine changing traffic and management priorities that can determine the selection of message for the PCMS units.
- Regarding Item (b), our communications center is responsible for maintaining the telephone link into the message signs as well as the laptop computer used for remote access.

Transportation In and Around GGNRA

3. Please rank your opinion of the severity of the following traffic challenges in and around the Marin portion of GGNRA prior to the deployment of the PCMS. (*Please circle only one per question*)

	Vehicle Speeds		Traffic Congestion		Traffic Back-ups		Park Usage		Visitor Complaints		Accidents		Parking Space Conflicts	
	Count	Pct	Count	Pct	Count	Pct	Count	Pct	Count	Pct	Count	Pct	Count	Pct
(5) Severe Challenge	2	18.2	5	45.5	6	54.5	4	40.0	1	9.1	1	9.1	8	72.7
(4) Somewhat Challenging	2	18.2	4	36.4	4	36.4	4	40.0	5	45.5	2	18.2	1	9.1
(3) Neutral	4	36.4	2	18.2	1	9.1	2	20.0	5	45.5	4	36.4	2	18.2
(2) Somewhat Unchallenging	3	27.3	-	-	-	-	-	-	-	-	2	18.2	-	-
(1) No Challenge	-	-	-	-	-	-	-	-	-	-	2	18.2	-	-
N =	11		11		11		10		11		11		11	
*** =**	-		-		-		1		-		-		-	
Mean	3.27		4.27		4.45		4.20		3.64		2.82		4.55	
St Dev	1.10		0.82		0.69		0.79		0.67		1.25		0.85	

4. Do you feel that there is a need to provide better traveler information to Golden Gate National Recreation Area visitors about congested roads and parking lot status in the Marin portion of GGNRA?

	Trav Info Need	
	Count	Percent
(5) Strongly Agree	8	80.0
(4) Agree	2	20.0
(3) Neutral	-	-
(2) Disagree	-	-
(1) Strongly Disagree	-	-
N =	10	
*** =**	1	
Mean	4.80	
St. Dev	0.42	

5. How do you feel that better traveler information will affect drivers?

	Saves Time		Efficient Decisions		Ease Getting to Sites		Ease Finding Parking		Better Info. Earlier		Other	
	Count	Pct	Count	Pct	Count	Pct	Count	Pct	Count	Pct	Count	Pct
(5) Strongly Agree	4	40.0	5	50.0	2	20.0	1	10.0	6	60.0	1	100.0
(4) Agree	3	30.0	4	40.0	4	40.0	5	50.0	4	40.0	-	-
(3) Neutral	3	30.0	1	10.0	3	30.0	3	30.0	-	-	-	-
(2) Disagree	-	-	-	-	1	10.0	-	-	-	-	-	-
(1) Strongly Disagree	-	-	-	-	-	-	1	10.0	-	-	-	-
N =	10		10		10		10		10		1	
*** =**	1		1		1		1		1		10	
Mean	4.10		4.40		3.70		3.50		4.60		5.00	
St Dev	0.88		0.70		0.95		1.08		0.52		-	

Comments

- Allows visitors to choose not to proceed into the congested park areas, or to choose to visit at another time. Both are sub-elements of "allows for more efficient decisions", but they are worth noting independently. Traveler information also can result in calmer drivers/visitors, because they have the information they need to make any decisions rather than proceeding into an unknown and potentially stressful situation.

Effect of the PCMS

6. The project chosen for GGNRA is to deploy two PCMS on U.S. 101, do you feel these will be an effective way of dealing with the congestion and parking challenges at Golden Gate National Recreation Area, as opposed to building new parking lots and widening roads?

	Effective Way to Deal with Congestion	
	Count	Percent
(5) Strongly Agree	5	45.5
(4) Agree	4	36.4
(3) Neutral	1	9.1
(2) Disagree	1	9.1
(1) Strongly Disagree	-	-
	N =	11
	*** =**	-
	Mean	4.18
	St. Dev	0.98

7. Do you believe that your agency will save time by using PCMS to provide traveler information to the public?

	Save Time	
	Count	Percent
(5) Strongly Agree	4	36.4
(4) Agree	3	27.3
(3) Neutral	3	27.3
(2) Disagree	1	9.1
(1) Strongly Disagree	-	-
	N =	11
	*** =**	-
	Mean	3.91
	St. Dev	1.04

8. General Comments / Suggestions

- These responses and viewpoints expressed on this survey are limited to the Caltrans District 4 Office of System and Regional Planning, and should not be used to suggest they reflect the views of the California Department of Transportation as a whole, or the views of other functional units within Caltrans District 4.

- For future applications of survey questionnaires like this one, please design it so it can be completed electronically and returned by email.

- My answers are based on the summer season. Traffic changes dramatically during the fall, winter and summer seasons. Since the deployment of the two PCMS on US Route 101 there has been a dramatic increase in shuttle bus use. In fact, there have not been enough buses once the PCMS is turned on. But the roads are still clogged and the parking situation is still a mess. Many visitors to Muir Woods rent a car and we are just one stop along the way.

- Marin County has started a pilot Muir Woods Shuttle this year. The shuttle operates on weekends and holidays. It started on Memorial Day weekend and will end the weekend of Labor Day. The number of passengers using the shuttle has increased since NPS started using the PCMS.

- I run the public safety communications center that is tasked as the point that remotely programs the messages in these signs. We are, as a rule, very busy on the same days that you may expect full parking lots in our Marin County lands. We are a 9-1-1 PSAP, we provide radio-dispatching services for police, fire and medical, and we run an alarm central station that receives alarms from over 400 alarm accounts. We normally only have two persons on duty at a time. Having said this, it is very difficult to take one of our senior employees away from the regular duties to accomplish changes on the message signs. Add to this the fact that the software is very prone to crashing, and you have created a difficult position for our senior dispatchers. This has led to our need to have field personnel respond to the signs directly and program messages at the sign location.

- I have some suspicions and observations regarding the software crashes. First of all, I noticed some problems when the Centralo software was trying to load concurrently with McAfee Anti-Virus. Once when McAfee was still loading, the Centralo primary screen went blank and did not reappear for a minute or two. Second, I noticed that when this version of Centralo is running it has a great tendency to hog system resource – the software "maxes out" the CPU usage – up to 100 percent, most of the time that it operates. I have been experimenting, but do not know if this has a direct link with our system crashes.

- Our communications staff also have expressed concern regarding the use of these signs under the scenario in which field patrol units request sign activation, but do not remain in the immediate area to monitor ongoing parking lot conditions. The downside here is that the signs can indicate a "full" condition long after parking spaces become available.

- The signs need to convey the FREE SHUTTLE BUS somehow…..

- This system needs field and oversight staffing as well as coordination with web site, shuttle service and 511 systems as well as other services for success and true change in visitor behavior. In addition, we need to address what other options to offer so that is a positive experience…in other words, visitors are not just learning parks are crowded, they learn to access ITS systems early in trip planning to make intelligent choices for their whole visit or whole day.

APPENDIX J: INTERNAL STAKEHOLDERS POST-PCMS SURVEY

PORTABLE CHANGEABLE MESSAGE SIGNS STAKEHOLDER SURVEY

This survey is part of an Intelligent Transportation System (ITS) pilot project focusing on National Parks in California. It is a cooperative project co-managed by the Western Transportation Institute located at Montana State University, Caltrans and the participating parks (Golden Gate National Recreation Area and Sequoia-Kings Canyon National Parks). For the purposes of the pilot project and this survey, the boundaries of the parklands within Golden Gate National Recreation Area are to include Muir Woods National Monument.

Please take time to fill out this survey in order to provide feedback about the Portable Changeable Message Signs (PCMS) that were deployed for use by the Golden Gate National Recreation Area / Muir Woods National Monument on U.S. 101 on either side of the exit onto State Route 1 in July 2005.

This survey is being administered by the Western Transportation Institute at Montana State University.

PCMS on US 101

Demographic Questions

1. What agency do you work for?

   _____

2. What is your role and responsibility with regards to the Golden Gate National Recreation Area / Muir Woods National Monument Portable Changeable Message Signs (PCMS)? (*Please put an x in the box for all that apply*)

Roles and Responsibilities	**Yes**	**No**
(a) Operate PCMS (i.e. post messages)		
(b) Maintain PCMS		
(c) Store and transport PCMS		
(d) Call in conditions/request messages to be posted		
(e) Other (*please specify*)		

General PCMS Questions

3. In general, from your observations, do you agree with the messages they display? *(Please put an x on the line that applies)*

   _____ Yes _____ No

4. Do you feel that the PCMS are in good locations for providing traveler information about Golden Gate National Recreation Area / Muir Woods National Monument? *(Please put an x on the line that applies)*

   _____ Yes _____ No

   If you answered no, please indicate where better locations would be. _____

   _____

Effect of the PCMS

5. How do the PCMS affect your daily operations? (*Please circle or highlight only one*)

Strongly Positive		Neutral		Strongly Negative
5	4	3	2	1

6. Now that the PCMS are installed as compared to before installed, please rate the difference you see. (*Please circle or highlight only one number for each question)*

	Increased		Neutral		Decreased	
(a) Vehicle Speeds	5	4	3	2	1	Don't Know
(b) Traffic Congestion (slow speed)	5	4	3	2	1	Don't Know
(c) Traffic back-ups (stop & go traffic)	5	4	3	2	1	Don't Know
(d) Park usage	5	4	3	2	1	Don't Know
(e) Visitor complaints/ questions to your agency	5	4	3	2	1	Don't Know
(f) Accidents (severity of accidents)	5	4	3	2	1	Don't Know
(g) Parking space conflicts	5	4	3	2	1	Don't Know

7. How do you believe PCMS affects drivers? (*Please circle or highlight only one number for each question*)

	Strongly Agree		Neutral		Strongly Disagree
(a) Saves time	5	4	3	2	1
(b) Allows for more efficient decisions	5	4	3	2	1
(c) Makes getting to park sites easier	5	4	3	2	1
(d) Makes finding a parking space easier	5	4	3	2	1
(e) Provides travelers with better information earlier	5	4	3	2	1
(f) Other (*please specify*):	5	4	3	2	1

8. Do you believe that your agency saves time by using PCMS to provide traveler information to the public? (*Please circle or highlight only one*)

Strongly Agree		Neutral		Strongly Disagree
5	4	3	2	1

9. Do you feel that the PCMS are an effective way of dealing with the congestion and parking challenges at Golden Gate National Recreation Area / Muir Woods National Monument, as opposed to building new parking lots and widening roads? (*Please circle or highlight only one*)

Strongly Agree		**Neutral**		**Strongly Disagree**
5	4	3	2	1

PCMS Operations

10. Have you ever input messages into the PCMS? *(Please put an x on the line that applies)*

_____ Yes _____ No

If you answered NO to Question 10, please skip to Question 27.

11. How much time per day do you spend reviewing, inputting, and removing messages into the PCMS? *(Please put an x on the line that applies)*

_____ 0-5 minutes _____ 6-15 minutes
_____ 16-30 minutes _____ More than 30 minutes

12. Do you believe that the benefits of the PCMS outweigh the time spent operating them? (*Please circle or highlight only one*)

Strongly Agree		**Neutral**		**Strongly Disagree**
5	4	3	2	1

13. How easy is the daily programming of the PCMS? (*Please circle or highlight only one*)

Very Easy		**Neutral**		**Very Difficult**
5	4	3	2	1

14. What challenges have you had with the PCMS? (*Please put an x in the box for all that apply*)

Challenges	**Yes**	**No**
(a) Software problems		
(b) PCMS will not display the message		
(c) PCMS displays the wrong message		
(d) Remote connection (dial-up) to PCMS does not work		
(e) Remote connection (dial-up) to PCMS takes several times before connecting to sign		
(f) Other (*please specify*):		

15. What sources do you use to gather the information to decide what message should be displayed? (*Please put an x in the box for all that apply*)

Sources	**Yes**	**No**
Visitors		
NPS Staff		
Caltrans		
California Highway Patrol		
Other (*please specify*):		

16. How easy is the PCMS software to use? (*Please circle or highlight only one*)

Very Easy		**Neutral**		**Very Difficult**	**Not Applicable**
5	4	3	2	1	NA

17. Are there ever multiple agencies that wish to use the PCMS at the same time? *(Please put an x on the line that applies)*
_____ Yes _____ No

If you answered NO to Question 17, please skip to Question 21.

18. How often do multiple agencies request a message posted on the PCMS at the same time? *(Please put an x on the line that applies)*
_____ Once or more per day
_____ Once or more per week
_____ Once or more per month
_____ Once or twice per year
_____ Never

19. Which agencies have requested messages to be posted at the same time?
_____

20. How do you decide which message to post when multiple messages are requested?
_____

21. Have you ever had a request to put up a message that is not a pre-approved message? *(Please put an x on the line that applies)*
_____ Yes _____ No

If you answered NO to Question 21, please skip to Question 27.

22. How many times have you had requests to post unapproved messages? *(Please put an x on the line that applies)*
    _____ Once or more per day
    _____ Once or more per week
    _____ Once or more per month
    _____ Once or twice per year
    _____ Never

23. What were the unapproved messages that were requested?
    _____

24. Which agency requested the unapproved messages?
    _____

25. Did you post the unapproved message? *(Please put an x on the line that applies)*
    _____ Yes _____ No

26. What additional messages would be beneficial to have pre-approved for use on the PCMS?
    _____

PCMS Maintenance

27. Have you ever done maintenance on the PCMS? *(Please put an x on the line that applies)*
    _____ Yes _____ No

If you answered NO to Question 27, please skip to Question 31.

28. What type of maintenance did the PCMS require?
    _____

29. How easy was the maintenance you had to perform on the PCMS? (*Please circle or highlight only one*)

Very Easy		Neutral		Very Difficult
5	4	3	2	1

PCMS Storage and Transport

30. List any difficulties of which you're aware involving the transport of the PCMS to the site.
    _____

Condition Call-in/Message Request for PCMS

31. Did you ever report conditions to the Presidio Dispatch Center and/or request a message to be posted on the PCMS? *(Please put an x on the line that applies)*
    _____ Yes _____ No

If you answered NO to Question 31, please skip to Question 36.

32. How did you determine the conditions you reported to the Presidio Dispatch Center? (*Please put an x in the box for all that apply*)

Method to Determine Conditions	**Yes**	**No**
Observed the conditions		
Staff reported conditions to you		
Viewed conditions via cameras		
Vehicle counters		
511		
Police scanner		
Phone call from the public		

33. What types of conditions did you report/messages request? (*Please put an x in the box for all that apply*)

Reported Conditions	**Yes**	**No**
Traffic congestion		
Traffic accident		
Parking lot status		
Park site closed		
Shuttle information		
Special event information		
Construction information		
Other (*please specify*):		

34. Did you ever request a message that was not pre-approved? *(Please put an x on the line that applies)*

_____ Yes _____ No _____ Do Not Know

35. What additional pre-approved messages do you feel should be available for your use?

_____

36. General Comments/Suggestions:

_____

_____

APPENDIX K: INTERNAL POST-PCMS SURVEY DETAILED RESULTS

The following parts to this appendix show the survey question layout and the summary statistics. The statistical results shown include: frequencies, percentages, means and standard deviations. The symbol * indicates the count of people that did not answer the question.

Demographic Questions

1. What agency do you work for?

	Count	Percent
California State Parks	1	12.5
Marin County	1	12.5
National Park Service	6	75.0
	N =	8
	* =	-

2. What is your role and responsibility with regards to the Golden Gate National Recreation Area / Muir Woods National Monument Portable Changeable Message Signs (PCMS)?

	Operate PCMS		**Maintain PCMS**		**Store/ Transport PCMS**		**Call in Conditions**		**Other**	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent	Count	Percent
Yes	3	60.0	2	40.0	-	-	5	71.4	3	100.0
No	2	40.0	3	60.0	4	100.0	2	28.6	-	-
	N =	5	**N =**	5	**N =**	4	**N =**	7	**N =**	3
	* =	3	* =	3	* =	4	* =	1	* =	5

Comments (Other)

- Performance management and planning; inter-agency agreements
- Troubleshoot PCMS
- Request transport to field site

General PCMS Questions

3. In general, from your observations, do you agree with the messages they display?

	Count	Percent
Agree	8	100.0
Disagree	-	-
	N =	8
	* =	-

4. Do you feel that the PCMS are in good locations for providing traveler information about Golden Gate National Recreation Area / Muir Woods National Monument?

	Count	Percent
Yes	8	100.0
No	-	-
	N =	8
	* =	-

Effect of the PCMS

5. How do the PCMS affect your daily operations?

	Count	Percent
(5) Strongly Positive	3	42.9
(4) Positive	2	28.6
(3) Neutral	2	28.6
(2) Negative	-	-
(1) Strongly Negative	-	-
	N =	7
	*** =**	1
	Mean	4.14
	St. Dev	0.90

6. Now that the PCMS are installed as compared to before installed, please rate the difference you see.

	Vehicle Speeds		Traffic Congestion		Traffic Back-ups		Park Usage		Visitor Complaints		Accidents		Parking Space Conflicts	
	Count	Pct	Count	Pct	Count	Pct	Count	Pct	Count	Pct	Count	Pct	Count	Pct
(5) Increased	-	-	-	-	-	-	1	14.3	2	28.6	-	-	-	-
(4) Somewhat Increased	-	-	-	-	-	-	2	28.6	-	-	-	-	1	14.3
(3) Neutral	3	42.9	2	28.6	3	42.9	2	28.6	3	42.9	3	42.9	1	14.3
(2) Somewhat Decreased	-	-	2	28.6	2	28.6	-	-	-	-	-	-	2	28.6
(1) Decreased	1	14.3	1	14.3	-	-	-	-	-	-	-	-	1	14.3
Don't Know	3	42.9	2	28.6	2	28.6	2	28.6	2	28.6	4	57.1	2	28.6
	N =	7	**N =**	7	**N =**	7	**N =**	7	**N =**	7	**N =**	7	**N =**	7
	*** =**	1	*** =**	1	*** =**	1	*** =**	1	*** =**	1	*** =**	1	*** =**	1
	Mean	1.43	**Mean**	1.57	**Mean**	1.86	**Mean**	2.71	**Mean**	2.71	**Mean**	1.29	**Mean**	1.71
	St Dev	1.51	**St Dev**	1.27	**St Dev**	1.35	**St Dev**	1.98	**St Dev**	2.06	**St Dev**	1.60	**St Dev**	1.50

7. How do you believe PCMS affects drivers?

	Saves Time		Efficient		Ease Getting		Ease Finding		Better Info.		Other	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent	Count	Percent	Count	Percent
(5) Strongly Agree	1	14.3	6	75.0	-	-	1	14.3	5	62.5	4	100.0
(4) Agree	3	42.9	2	25.0	3	42.9	3	42.9	3	37.5	-	-
(3) Neutral	3	42.9	-	-	4	57.1	2	28.6	-	-	-	-
(2) Disagree	-	-	-	-	-	-	1	14.3	-	-	-	-
(1) Strongly Disagree	-	-	-	-	-	-	-	-	-	-	-	-
N =	7		**N =**	8	**N =**	7	**N =**	7	**N =**	8	**N =**	4
*** =**	1		*** =**	-	*** =**	1	*** =**	1	*** =**	-	*** =**	4
Mean	3.71		**Mean**	4.75	**Mean**	3.43	**Mean**	3.57	**Mean**	4.63	**Mean**	5.00
St Dev	0.76		**St Dev**	0.46	**St Dev**	0.53	**St Dev**	0.98	**St Dev**	0.52	**St Dev**	-

Comments (Other)

- Supports other efforts such as the shuttle
- Provides motivation to use shuttle during peak weekends
- Sets visitors expectations for a more positive park experience
- Provides info that improves visitor experience

8. Do you believe that your agency saves time by using PCMS to provide traveler information to the public?

	Count	Percent
(1) Strongly Disagree	-	-
(2) Disagree	1	12.5
(3) Neutral	2	25.0
(4) Agree	2	25.0
(5) Strongly Agree	3	37.5
N =	8	
*** =**	-	
Mean	3.88	
St Dev	1.13	

9. Do you feel that the PCMS are an effective way of dealing with the congestion and parking challenges at Golden Gate National Recreation Area / Muir Woods National Monument, as opposed to building new parking lots and widening roads?

	Count	Percent
(5) Strongly Agree	4	50.0
(4) Agree	4	50.0
(3) Neutral	-	-
(2) Disagree	-	-
(1) Strongly Disagree	-	-
N =	8	
*** =**	-	
Mean	4.50	
St Dev	0.53	

PCMS Operations

10. Have you ever input messages into the PCMS? *(Please put an x on the line that applies)*

	Count	Percent
Yes	3	37.5
No	5	62.5
	N =	8
	* =	-

11. How much time per day do you spend reviewing, inputting, and removing messages into the PCMS?

	Count	Percent
0-5 minutes	-	-
6-15 minutes	-	-
16-30 minutes	1	33.3
>30 minutes	2	66.7
	N	3
	*****	5
	Mean	3.67
	St. Dev	1.15

Comments

- Changing the message was not a problem, but driving from a problem point or office to change the sign manually was a problem. Changing the message remotely was also a problem.

12. Do you believe that the benefits of the PCMS outweigh the time spent operating them?

	Count	Percent
(5) Strongly Agree	1	33.3
(4) Agree	2	66.7
(3) Neutral	-	-
(2) Disagree	-	-
(1) Strongly Disagree	-	-
	N =	3
	*** =**	5
	Mean	4.33
	St. Dev	0.58

13. How easy is the daily programming of the PCMS?

	Count	Percent
(5) Very Easy	1	33.3
(4) Easy	-	-
(3) Neutral	-	-
(2) Difficult	-	-
(1) Very Difficult	2	66.7
	N =	3
	*** =**	5
	Mean	2.33
	St Dev	2.31

Comments

- Daily programming was easy at the signs, but challenging when performed remotely. The remote operation was more efficient, but the time savings gained by doing the signs remotely versus driving directly to the sign for manual changes was often lost working with the balky software.

14. What challenges have you had with the PCMS? (*Please put an x in the box for all that apply*)

	Software Problems		**Did Not Display**		**Displays Wrong Message**		**Remote Connection Doesn't Work**		**Required Multiple Dial-up Attempts**		**Other**	
	Count	Pct	Count	Pct	Count	Pct	Count	Pct	Count	Pct	Count	Pct
Yes	3	100.0	2	66.7	-	-	3	100.0	3	100.0	2	100.0
No	-	-	1	33.3	3	100.0	-	-	-	-	-	-
	N =	3	**N =**	3	**N =**	3	**N =**	3	**N =**	3	**N =**	2
	*** =**	5	*** =**	5	*** =**	5	*** =**	5	*** =**	5	*** =**	6

Comments (Other)

- Other PCMS challenges have included hardware problems (bad solar panel that needed to be removed or the sign would not work), defective modem, the amount of time required to manually operate the signs, a busy and not entirely interested Dispatch Office that did not manage activation and deactivation of the PCMS units to their fullest ability.

15. What sources do you use to gather the information to decide what message should be displayed?

	Visitors		**NPS Staff**		**Caltrans**		**California Hwy Patrol**		**Other**	
	Count	Pct	Count	Pct	Count	Pct	Count	Pct	Count	Pct
Yes	2	66.7	3	100.0	2	66.7	1	33.3	-	-
No	1	33.3	-	-	1	33.3	2	66.7	1	100.0
	N =	3	**N =**	3	**N =**	3	**N =**	3	**N =**	1
	*** =**	5	*** =**	5	*** =**	5	*** =**	5	*** =**	6

16. How easy is the PCMS software to use?

	Count	Percent
(5) Very Easy	-	-
(4) Easy	-	-
(3) Neutral	1	33.3
(2) Difficult	-	-
(1) Very Difficult	2	66.7
Not Applicable	-	-
	N	3
	*****	5
	Mean	1.67
	St. Dev	1.15

Comments

- Not so difficult to use, but repeated breakdowns were a major problem.

17. Are there ever multiple agencies that wish to use the PCMS at the same time?

	Count	Percent
Yes	-	-
No	3	100.0
	N =	3
	* =	5

18. How often do multiple agencies request a message posted on the PCMS at the same time?

No respondents answered

19. Which agencies have requested messages to be posted at the same time?

No respondents answered

20. How do you decide which message to post when multiple messages are requested?

No respondents answered

21. Have you ever had a request to put up a message that is not a pre-approved message?

	Count	Percent
Yes	2	66.7
No	1	33.3
	N =	3
	* =	5

22. How many times have you had requests to post unapproved messages?

	Count	Percent
Once or more per day	-	-
Once or more per week	-	-
Once or more per month	1	50.0
Once or more per year	1	50.0
Never	-	-
	N =	2
	*** =**	6

23. What were the unapproved messages that were requested?

- Muir Woods and Stinson Parking Full
- Traffic advisory for flooded off-ramp ahead of sign

24. Which agency requested the unapproved messages?

- National Park Service
- California Highway Patrol

25. Did you post the unapproved message?

- "Muir Woods and Stinson Parking Full" – YES
- "Traffic advisory for flooded off-ramp ahead of sign" – NO

26. What additional messages would be beneficial to have pre-approved for use on the PCMS?

- Muir Woods and Stinson Parking Full

PCMS Maintenance

27. Have you ever done maintenance on the PCMS?

	Count	**Percent**
Yes	2	25.0
No	6	75.0
	N =	2
	* =	-

28. What kind of maintenance did the PCMS require?

- Swapped out a bad modem for a good modem, troubleshot solar panel problem, fixed problem
- Only rebooting of the software and cleaning of the solar panels

29. How easy was the maintenance you had to perform on the PCMS?

	Count	Percent
(5) Very Easy	-	-
(4) Easy	-	-
(3) Neutral	2	100.0
(2) Difficult	-	-
(1) Very Difficult	-	-
	N =	2
	*** =**	6
	Mean	3.00
	St Dev	-

PCMS Storage and Transport

30. List any difficulties of which you're aware involving the transport of the PCMS to the site.

No respondents answered

Condition Call-in/Message Request for PCMS

31. Did you ever report conditions to the Presidio Dispatch Center and/or request a message to be posted on the PCMS?

	Count	Percent
Yes	4	50.0
No	4	50.0
	N =	8
	* =	-

32. How did you determine the conditions you reported to the Presidio Dispatch Center?

	Observed the Conditions		Staff Reported Conditions		Viewed via Cameras		Vehicle Counters		511		Police Scanner		Phone Call from Public	
	Count	Pct	Count	Pct	Count	Pct	Count	Pct	Count	Pct	Count	Pct	Count	Pct
Yes	4	100.0	4	100.0	-	-	-	-	-	-	-	-	-	-
No	-	-	-	-	2	100.0	2	100.0	2	100.0	2	100.0	2	100.0
	N =	4	**N =**	4	**N =**	-	**N =**	2	**N =**	2	**N =**	2	**N =**	2
	*** =**	4	*** =**	4	*** =**	6	*** =**	6	*** =**	6	*** =**	6	*** =**	6

33. What types of conditions did you report/messages request?

	Traffic Congestion		Traffic Accident		Parking Lot Status		Park Site Closed		Shuttle Information		Special Event Information		Construction Information		Other	
	Count	Pct	Count	Pct	Count	Pct	Count	Pct	Count	Pct	Count	Pct	Count	Pct	Count	Pct
Yes	3	75.0	-	-	4	100.0	-	-	-	-	-	-	-	-	-	-
No	1	25.0	2	100.0	-	-	2	100.0	2	100.0	2	100.0	2	100.0	2	100.0
	N	4		2		4		2		2		2		2		2
	*****	4		6		4		6		6		6		6		6

34. Did you ever request a message that was not pre-approved?

	Count	Percent
Yes	1	25.0
No	1	25.0
Do Not Know	2	50.0
	N =	4
	* =	4

35. What additional pre-approved messages do you feel should be available for your use?

- Road construction, special events
- At least one additional message about shuttle availability.

36. General Comments/Suggestions:

- This summer was a great pilot with noticeable effects at Muir Woods and Stinson Beach. It was very helpful to have Paul Bignardi and Thomas assigned to making the ITS work so that all the bugs could be worked out and it could be effectively related to other efforts (i.e. shuttle, Stinson Beach-Muir Woods link), counters, 511, etc.

- Please improve the software.

- I am the Communications Center Manager for GGNRA. In this capacity, the center I supervise was responsible for the remote programming of the two pilot project message signs. I saw four main problems: 1) By far, the biggest problem was that the Centralo software was very “buggy”. It definitely took multiple attempts to program a sign. This meant that one of our communications center employees got diverted from their regular tasks whenever the request for a sign change came in. The fact of the bad software made the situation worse. 2) During the last few weeks on the highway, cellular service to one of the signs was down. 3) It was difficult at times to maintain the validity of what the signs were displaying. Frequently, roving patrols mid-day would call in with a sign posting – usually Muir Woods Parking Full. Later in the day, if we had the time to think about it, our dispatchers would need to prompt field personnel for a parking update. Our center cannot assume conditions without input from the field folks. 4) In the big scheme of things, our center dispatches for law, fire, and medical incidents. Then a sign change request came in, and it had necessarily taken lower priority. This would not have been such as issue had the software operated properly – but it did not. When our dispatchers became aware that the programming would be an involved process – they had to hold back on the requests until the rest of their workload was handled. This presents a dilemma – the same days that the lots are filling at Muir Woods are precisely the days that dispatcher regular workload is higher – more people in the parks. On the other hand, it is my understanding that the signs were very effective in diverting motorists onto the shuttle service to Muir Woods. This is excellent – in that it reduced congestion and parking lot confrontations. We do benefit from that – less traffic, improved park visitor experience, and fewer cases of fights over parking spaces. In my opinion, the program is a positive for our park but needs to have some of the rough edges worked out.

- The WTI evaluation period was affected by late submission of survey to WASO for approval such that signs may not have been out, nor shuttle available, during the late September WTI survey; however, we did include questions in another county shuttle survey that was approved earlier where visitors were surveyed during August period when these were operational and in peak period. Summary results are forthcoming.

- Getting the software to work was difficult and delayed deployment of the devices. The poor software quality also impacted internal staff (especially Park Dispatch) who became frustrated when the connection or software would crash. Being able to connect and communicate with the PCMS units via telephone to change/post messages would be advantageous (although I realize that this poses a security risk).

- I have seen the messages displayed while driving on the highway and they are easy to spot and read.