Understanding the Decision-making Process for Drivers Faced with Lane Restriction or Closures on Wisconsin Highways

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16. Abstract

The Wisconsin Department of Transportation (WisDOT) owns and operates a state highway network of 12,000 miles, which carries approximately 80 percent of vehicle miles traveled in the state. Construction, maintenance, weather and other events often lead to lane closures or restrictions, causing inconvenience to road users. WisDOT developed numerous strategies for identifying alternate routes that drivers can use when highway travel times are affected by planned or unplanned events. Despite these efforts, WisDOT has observed that many alternate routes are underused, even when those routes would save travelers significant travel time.

The objective of this project was to examine the decision-making processes of Wisconsin drivers regarding route selection, including their decisions to use (or not use) an alternate route instead of the highway network. Factors that were examined included how and when drivers make initial decisions about a preferred route, for both familiar and unfamiliar trips; the factors that influence their decisions to divert or not divert from their usual (or current) route to an alternate route; and the information sources they would most likely consult for travel and route information.

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CHAPTER 1. INTRODUCTION

The Wisconsin Department of Transportation (WisDOT) owns and operates a state highway network of 12,000 miles, which carries approximately 80 percent of vehicle miles traveled in the state. Because of the heavy traffic volumes carried, lane restrictions or closures on state highways have the potential to significantly impact drivers. For this reason, WisDOT has developed numerous strategies for identifying alternate routes that drivers can use when highway travel times are affected by planned or unplanned events. Many of these routes are marked with trailblazer signs, and WisDOT has made significant efforts to communicate information to drivers regarding traffic conditions, incidents and closures along the state highway network and to provide recommendations regarding alternate routes. Despite these efforts, WisDOT has observed that many alternate routes are underused, even when those routes would save travelers significant travel time.

The objective of this project was to examine the decision making processes of Wisconsin drivers regarding route selection, including their decisions to use (or not use) an alternate route instead of the highway network. Factors that were examined included how and when drivers make initial decisions about a preferred route, for both familiar and unfamiliar trips; the factors that influence their decisions to divert or not divert from their usual (or current) route to an alternate route; and the information sources they would most likely consult for travel and route information.

This project consisted of four tasks. Task 1 was a research synthesis that collected and reviewed information on current practices by other state and local transportation agencies pertaining to traveler information, particularly alternate route information. Task 2 reviewed and synthesized prior studies of driver route selection and route diversion behavior, and from this review generated a list of road user characteristics, environmental characteristics, roadway characteristics, and information characteristics that appear to influence driver decision-making; these were used to identify participant groups and to develop focus group and survey instruments for Task 3. In Task 3, researchers conducted focus groups with Wisconsin commuters, interviewed commercial drivers, and conducted surveys of travelers and commercial drivers to learn about their overall route selection decisions, the factors that make them more or less likely to divert to an alternate route, and the information sources that they currently use and that they would prefer to use for travel and alternate route information. In Task 4, the research team developed a set of recommended communication strategies for WisDOT to use for informing and encouraging drivers to take alternate routes when those alternate routes would be advantageous.

The remainder of this report is divided into five chapters. Chapter 2 describes communications strategies in use by the transportation agencies interviewed in Task 1. Chapter 3 is a review of past research pertaining to driver route decisions. Chapter 4 describes the commuter focus groups and commercial driver interviews and summarizes the results of those research activities. Chapter 5 describes the traveler and commercial surveys and provides an analysis of survey results. Chapter 6 provides recommendations for communications strategies.

CHAPTER 2. COMMUNICATIONS STRATEGIES – PRACTICES AMONG STATE AND LOCAL TRANSPORTATION AGENCIES

Introduction

The purpose of Task 1's research synthesis was to collect and review information on current practices pertaining to alternative route strategies in other states. This chapter documents the results of a literature review and an online search for outreach efforts conducted by state departments of transportation and local transportation agencies, and interviews conducted by telephone or e-mail with representatives of selected agencies.

Websites of all 50 state Departments of Transportation were searched for references to alternate route or detour recommendations. Further online searches identified a handful of cities and local transportation agencies that provide outreach to drivers regarding the availability of alternate routes. From the initial list, agencies that appeared to have particularly proactive outreach programs were contacted for further information. Interviews were conducted with fourteen state and local agencies via telephone and/or e-mail.

State of the Practice – Strategies in Use by State and Local Transportation Agencies

The state and local transportation agencies interviewed in this task use a variety of outreach methods to provide information to travelers about recommended alternate routes. For most of these agencies, specific alternate route recommendations are most frequently associated with planned roadway construction projects; generally, the interviewed agencies said that they are less likely to specify particular alternate routes for short-term projects or unexpected incidents (unless the effects of an incident are long-lasting enough to warrant an outreach effort). Alternate routes and associated outreach efforts have also been developed by two of the interviewed agencies to better accommodate tourist traffic on a seasonal and/or special-event basis.

Table 1 and the remainder of this section summarize the strategies employed by the interviewed agencies to communicate alternate route information. Descriptions of each agency's outreach program and strategies are provided in the next section.

Table 1. Summary of Agency Outreach Strategies Pertaining to Alternate Routes.

Agency	Online Outreach						Press/Media						Other Outreach Strategies				
	Website(s) with alt route directions or maps	Facebook	Twitter	Other social media	e-mail/ text/ RSS	Mobile Web/ smart phone apps	Paid TV	Paid radio	Bill-board	Print ads	PSAs (free)	Press releases/ press confs.	Flyers, posters, news-letters	DMS	Static signs	Local meet-ings, presen-tations	Other
Delaware DOT	✓	✓	✓		✓	✓					✓	✓			✓		✓
Gatlinburg, Tennessee	✓				✓				✓				✓	✓			✓
Idaho Transportation Dept. (ITD)	✓	✓	✓		✓	✓		✓				✓					
Iowa DOT	✓		✓	✓	✓	✓							✓	✓		✓	
Kentucky Transportation Cabinet	✓						✓	✓		✓			✓	✓			
Los Angeles Metro/Caltrans	✓	✓	✓	✓	✓		✓	✓		✓		✓		✓	✓		
Maine DOT	✓		✓*		✓			✓				✓	✓	✓	✓		✓
Massachusetts DOT	✓		✓	✓	✓				✓	✓	✓	✓	✓	✓	✓	✓	✓
Minnesota DOT	✓	✓	✓	✓		✓				✓		✓	✓	✓	✓	✓	
New York DOT, Region 1	✓				✓	✓						✓	✓	✓		✓	
Rhode Island DOT	✓	✓	✓	✓	✓	✓					✓	✓	✓	✓	✓		
San Francisco Bay Bridge Seismic Safety Projects	✓	✓	✓		✓	✓	✓	✓		✓	✓	✓	✓	✓			
Utah DOT	✓	✓	✓		✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Virginia DOT	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓	✓			

**Maine DOT ceased using Twitter updates after concerns were raised about driver distraction.*

Online Outreach

The agencies that were interviewed, and most of those that were reviewed in the online search, rely heavily on online communication and outreach. In general, state DOT websites and/or project-specific websites provide the most detailed information to travelers about alternate routes, including travel directions and maps of the routes. State and local "511" travel information websites are more often used to provide real-time updates on travel conditions and travel times; a few of these include a text description of a recommended alternate route, if applicable, as part of a real-time update. Delaware DOT's 511 traffic map includes "virtual" dynamic message signs with travel time estimates at numerous points along the displayed roadways; these DMS can actually be viewed only online, as the signs do not physically exist along the roadways.

Social media, most frequently Facebook and Twitter, are quickly becoming a widespread means of communication for transportation agencies. Six of the interviewed agencies post real-time traffic and roadway condition updates as Facebook messages, interspersed with other press releases and reports. Alternate route maps are sometimes posted on agency Facebook pages, though more often Facebook and other social media are used to "push" users back to the agency or project website for the maps and/or more complete information.

Twitter is particularly well-suited for real-time updates about specific roadways or regions, as Twitter messages can be categorized through the use of hashtags, allowing a traveler to follow or search for only the messages that pertain to his or her trip. The most prolific Twitter user among the interviewed agencies is the Los Angeles Metro transportation agency, which posts dozens of location-specific Tweets twice per day, seven days a week to provide updates on road closures along the Sepulveda Pass reconstruction project; some of Metro's Tweets receive over 700,000 views. In contrast, the Maine DOT introduced and then ceased travel updates via Twitter, after hearing concerns from Maine travelers about the potential for driver distraction.

A few of the interviewed agencies use YouTube and/or Flickr to post videos and pictures pertaining to general project information and, more rarely, to alternate routes. These media formats are not practical for providing real-time travel information, but can be used to post more general outreach messages. As one example, the Virginia DOT's "Tale of Two Tunnels" YouTube video encourages travelers to use the less-congested alternate routes to Virginia Beach during the tourist season. Los Angeles Metro broadcasts messages on Nixle (in addition to Facebook and Twitter), a social-media site that is used primarily by government agencies. The Iowa DOT maintains two blogs, one focusing on DOT news releases, the other on real-time traffic updates.

As alternatives or additions to social media, ten of the agencies provide traffic and construction updates to subscribers via text messages, RSS feeds, and e-mails. In general, subscriptions to any of these are customizable, so that travelers can select the categories of messages that are relevant to their route or region.

When these interviews were conducted in late 2011 and early 2012, Mobile Web applications had been developed for the Delaware and Utah DOT websites; as of January 2013, the Idaho, Iowa, Minnesota

and New York DOTs also have mobile device versions of their travel information websites. The Delaware DOT is increasing its emphasis on mobile web applications for the Apple and Google/Android platforms.

Press/Media Outreach

Outreach via mass media can be expensive, especially in the case of paid television advertising. Because of the cost of paid media, only about half of the interviewed agencies use paid advertisements for traveler outreach. Print ads are the most common paid media among the interviewed agencies, followed by radio and billboards. Utah DOT purchases ad space at movie theaters and in-game ads during basketball games. Only three of the interviewed agencies have used paid television ads in their traveler outreach campaigns; of those, one (the Kentucky Transportation Cabinet) last purchased television advertising in 2001.

However, local media networks often disseminate agencies' press releases regarding traffic events and advisories, including alternate routes, as well as offering free/earned public service announcement (PSA) spots. Most of the interviewed agencies have cultivated relationships with the local media, conducting press conferences or similar media events at the start of major projects and providing regular press releases on project progress (in the case of construction projects) and traffic impacts. Delaware DOT has gone a step further and purchased its own AM radio station for the purpose of broadcasting traffic and DOT news (similar to local highway advisory radio stations but with a larger broadcast area), and also provides local media outlets with real-time information on the transportation system.

In addition to the expense associated with developing traditional paid advertisements and purchasing media time/space, several of the agencies commented that traditional media is becoming too slow and unwieldy for the types of information they need to disseminate to travelers.

Other Outreach Strategies

Printed flyers, brochures, and posters are used to provide targeted information to specific neighborhoods, to businesses, and at highway rest stops and truck stops. Alternate route advisories and maps have been placed in some agencies' published travel guides and as inserts in printed road maps. Massachusetts DOT placed posters on all local buses, stickers on tollway booths, and printed "toll tickets" with project/travel information to be handed to tollway travelers with their receipts. For the San Francisco Bay Bridge Seismic Safety Projects, Caltrans and the Bay Area Transportation Authority used volunteers from stakeholder agencies and community groups to help distribute flyers about the projects to Bay Area neighborhoods and businesses.

Nine of the interviewed agencies use dynamic message signs to identify upcoming work zones and exits to alternate routes and in some cases to provide travel time estimates; six agencies also mark designated alternate routes with static signage. The Delaware DOT (DelDOT) uses both DMS and static signs (equipped with flashing beacons) to notify drivers to tune to DelDOT's radio station for traffic information.

Presentations and stakeholder meetings are occasionally conducted to reach out to local businesses, schools, or neighborhoods that will be particularly impacted by upcoming construction projects. The

Massachusetts DOT makes periodic presentations to local elected officials to provide project update information that the officials can then pass along to their constituents.

Agency Summaries

Each interviewed agency's outreach strategies and experiences are described in this section. Where possible, links to project websites and samples of alternate-route maps and other materials are provided.

Delaware Department of Transportation (DelDOT)

The DelDOT Transportation Management Center's (TMC) core mission is a fully integrated transportation management program; monitoring the state's transportation system and getting information out to the public, to media, and to other state and local agencies is a high priority. To support this objective, DelDOT has put resources into building a system to gather and analyze as much real-time traffic operating data as possible, as well as a variety of outlets to provide public, media, and interagency communication.

Online Outreach. DelDOT focuses most of its outreach online. The DelDOT website (http://www.deldot.gov/information/projects/) features individual construction project pages; an interactive map (see Figure 1) with color-coded traffic congestion levels, locations of highway incidents, and pop-up text boxes with incident details including alternate route information; and a button that users can click to listen to live reports from DelDOT's radio station (see Figure 2). Another feature of the interactive map is "virtual" dynamic message signs (DMS) showing travel times and other DMS-style messages; an unusual aspect of these virtual online signs is that in most cases, no corresponding physical DMS exist along the roadway. DelDOT's Communications department and the TMC collaborate to provide real-time updates to the interactive map and supporting information; data collection and dissemination is also integrated with police, fire, and emergency management agencies.

A developing addition to DelDOT's online presence is a "511-plus" travel information system, which will integrate a 511 telephone line with online information and with smartphone applications. A mobile website is already being developed, and DelDOT is working to develop mobile applications that are customizable according to users' preferences and locations. The agency sees smartphone development as an opportunity not only to disseminate but to gather information from roadway users. Applications are currently being developed for Apple and Android platforms; a goal is make the mobile application voice-responsive to minimize visual distractions on the road.

Traffic updates and alternate route advisories are also communicated on Facebook, via Twitter, and via RSS feed.

Press/Media. DelDOT does not use paid media, but usually gets sufficient media coverage in the form of news updates and traffic reports. The TMC provides traffic information free of charge to all local media outlets, and some local radio stations routinely refer to "our traffic cameras" on air. The News Journal newspaper has written a number of articles about DelDOT's traffic information outreach efforts. DelDOT owns a primary licensed radio station for traveler information (WTMC, 1380 AM) which currently broadcasts over approximately half the state; the agency is now building repeater sites to

expand the station's coverage to the rest of Delaware. As noted above, the radio can also be heard online at the DelDOT website.

Other Outreach Methods. DMS are still operated on some state highways, but are becoming a lower priority for real-time information dissemination; as stated above, the virtual "DMS" messages shown on the online interactive map are for the most part not associated with actual DMS along roadways. Where DMS are still in operation, DelDOT is beginning to display messages directing roadway users to DelDOT's radio station.

Results and Lessons Learned. Indications are that the public is beginning to rely on DelDOT's website for travel information. When Hurricane Irene came through the area, the DelDOT website received almost a million hits. No formal studies have examined traffic diversion rates, but a huge volume of data about the transportation system has been collected, and DelDOT is working with the University of Delaware to begin to analyze traffic patterns and system reliability, and to develop performance measures.

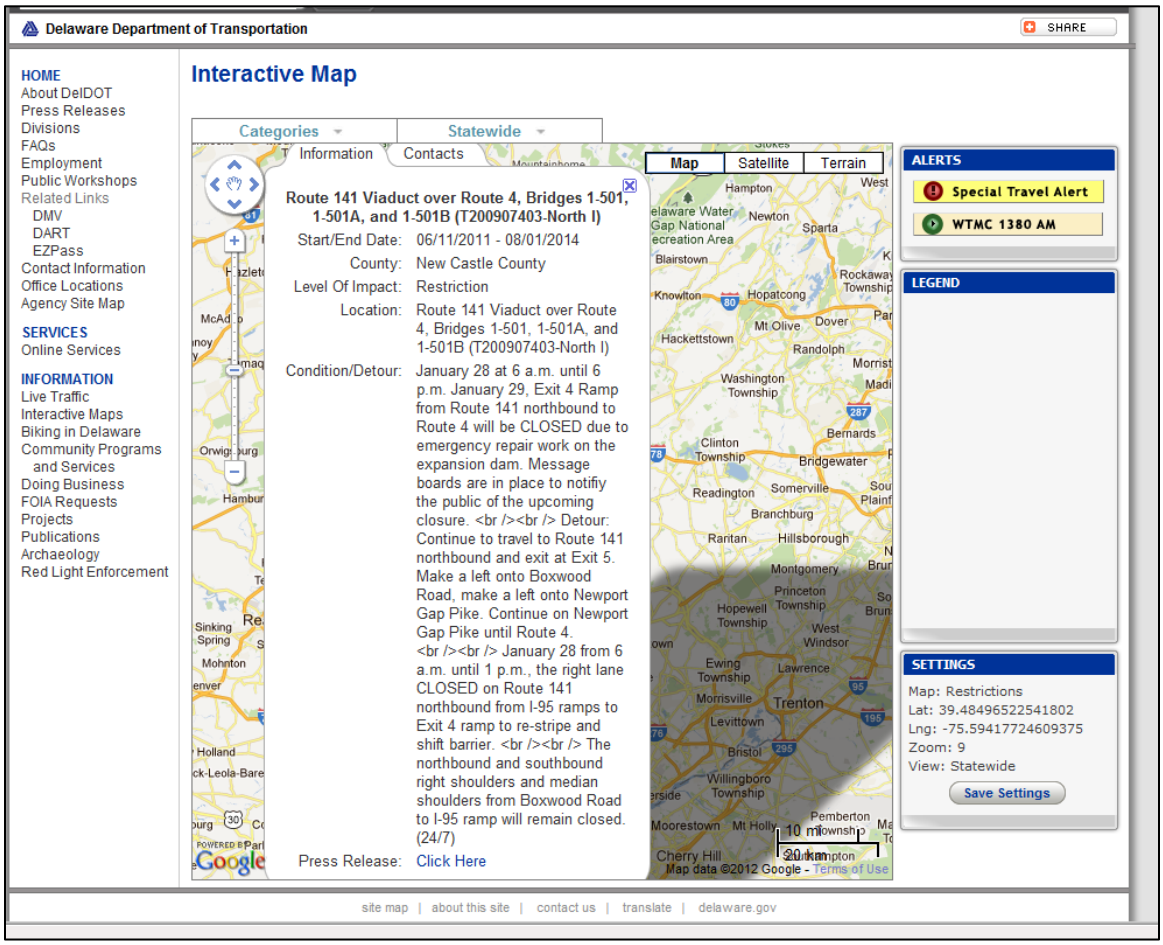


Figure 1. DelDOT website interactive map, displaying a lane restriction alert with alternate route information.

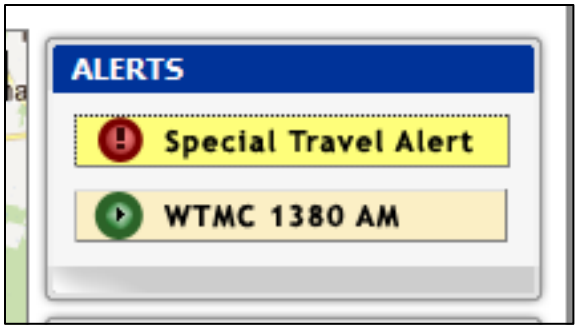


Figure 2. DelDOT website - buttons for Special Travel Alert and DelDOT radio station live feed.

Gatlinburg, Tennessee

Tourism is the primary industry in the city of Gatlinburg, Tennessee, and the surrounding Smoky Mountains region. Congestion due to tourist traffic can be especially heavy along Highways 66 and 441, which lead to Gatlinburg through the towns of Sevierville and Pigeon Forge; trip times from Interstate 40 to Gatlinburg can increase from 40 minutes (with free-flow traffic) to 90 minutes. Construction being conducted by the Tennessee DOT on Highway 66 from 2009 to 2011 further exacerbated congestion along this route. The city of Gatlinburg hired the consultant firm of Wilbur Smith, & Associates to perform a traffic study and to map alternate "scenic" routes to and from Gatlinburg specifically targeted to tourist traffic. These routes are longer, but when the primary routes are congested the travel times on the alternate routes tend to be shorter and more predictable. More recently, in response to occasional rockslides that block portions of Interstate 40, a committee has been formed to develop safety and traffic plans for that roadway, including alternate routes.

Online Outreach. The city's website (http://www.gatlinburg-tennessee.com/alternate_routes.php) provides travel directions from various surrounding cities and states, as well as three different maps detailing alternate routes to and from Gatlinburg when the primary routes are likely to be congested (See Figure 3).

Press/Media. A billboard on Interstate 81, just north of the area, advertises the alternate route for travelers coming from Virginia.

Other Outreach Methods. Information on the alternate routes is included in tourist brochures (see Figure 4) and the Gatlinburg vacation guide. Travelers can also sign up for text messages about traffic events and alternate routes.

Results and Lessons Learned. Since the alternate route information has been presented on the website and in tourist materials, the number of complaints that Gatlinburg's tourist office receives about traffic congestion and frustrating travel experiences into the area have diminished. From this and other anecdotal information, it appears that a number of people have begun to take advantage of the alternate routes.

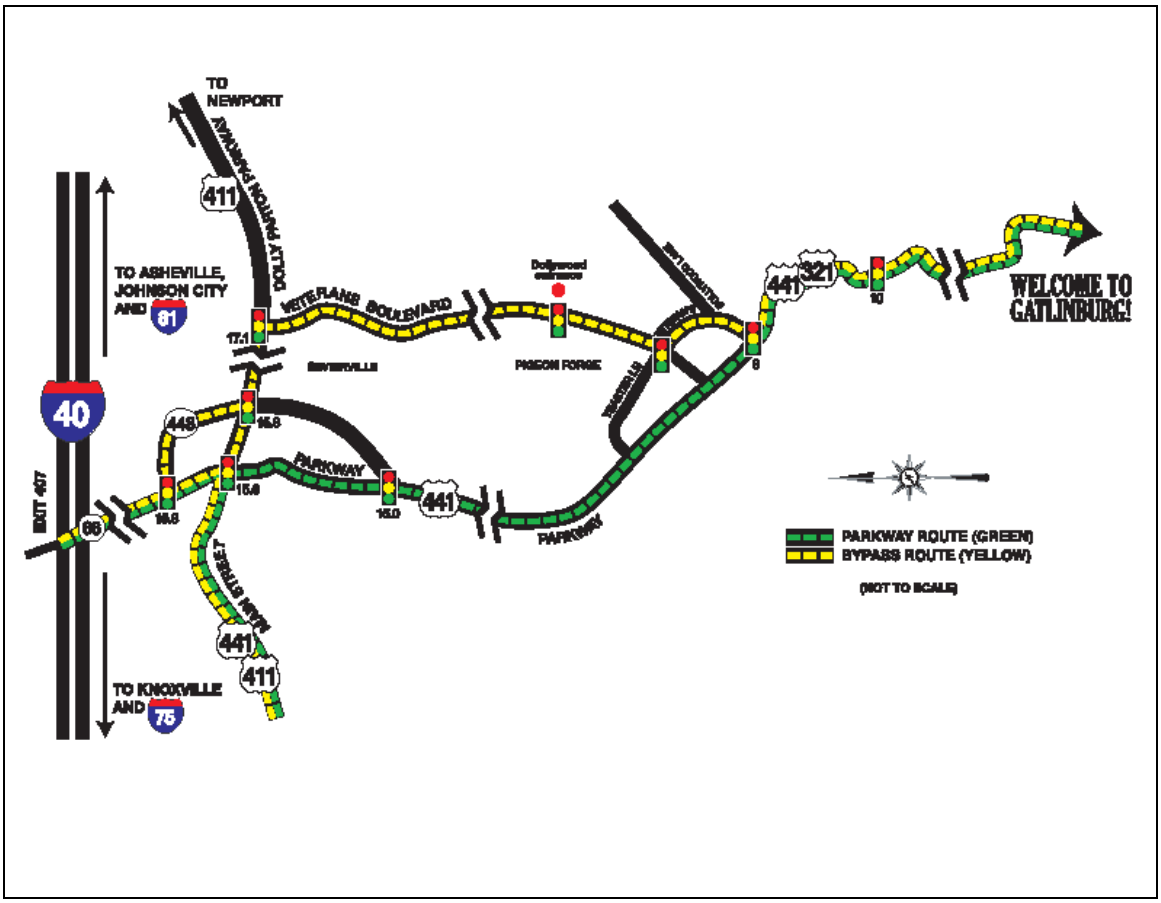


Figure 3. Gatlinburg, Tennessee alternate route map for tourist traffic.

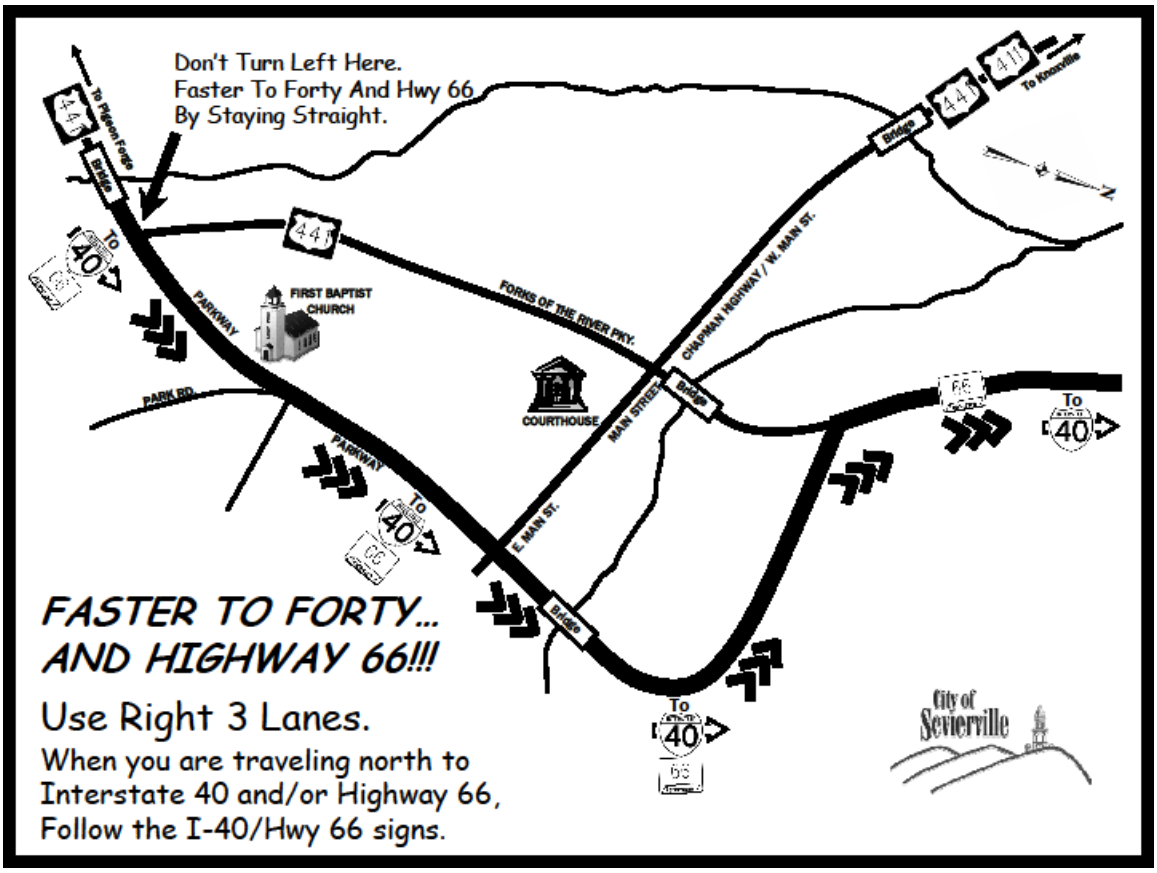


Figure 4. Gatlinburg/Sevierville, Tennessee tourism flyer advertising alternate routes.

Idaho Transportation Department (ITD)

ITD provides online and media outreach for most major construction projects on state highways, and often provides alternate route maps to detour traffic around construction sites.

Online Outreach. The ITD website projects page (http://itd.idaho.gov/Projects) provides links to separate pages for individual highway projects. The project pages in turn provide alternate route information and maps, as well as links to news releases about traveler impacts of the project. News updates pertaining to construction sites and traveler impacts are also shared with drivers via ITD's Twitter feed, e-mail "blasts" and Facebook. The Facebook page also posts alternate route maps.

Press/Media. ITD hosts media outreach events prior to the start of major projects; the events allow ITD representatives to talk to multiple media outlets in one targeted time period. Besides news releases, ITD purchases radio ads during morning and evening drive times.

Other Outreach Methods. Portable changeable message signs (PCMS) are used to reinforce online and radio messages about roadway obstructions and alternate routes. The signs are placed one to 1.5 miles ahead of the event site to remind drivers and direct them to an alternate route. Static signage is not generally used to designate or alert drivers to alternate routes, as ITD has found that drivers tend to "tune out" the signs before long.

Results and Lessons Learned. For a project on a section of Interstate 84 that affected a heavily-populated area of the state, ITD conducted pre- and post-project surveys asking drivers about the types of information that was most helpful and effective. The survey results found that drivers appreciated the advance notice of construction project and other traffic-impacting events that were provided by the media and the website, but also needed to be reminded of the event and alternate route option (if applicable) closer to the event itself. As a result, ITD now provides advance notice a few days before a particular lane closure or other event, and repeats the notice the morning that the closure will take place.

Iowa DOT

Online Outreach. The Iowa DOT maintains a blog for news releases at http://www.news.iowadot.gov. News stories issued by the DOT are also available via e-mail subscription, RSS feed, and Twitter. A separate blog, http://iowadotmedia.typepad.com/ provides 24-hour, 7-day-per-week reports on traffic incidents. The updates on this blog are also available via e-mail, RSS, and Twitter.

Dedicated websites provide information on major construction projects or events. The Council Bluffs Interstate Improvements website (http://www.iowadot.gov/cbinterstate/index.asp) includes project updates, information on construction-related road closures, and alternate route suggestions where applicable (see Figure 5). A separate webpage (http://www.iowadot.gov/floods/index.html) was developed to provide drivers with information during the Missouri River flooding in late 2011.

Other Outreach Methods. Newsletters and brochures are distributed to direct travelers to Iowa's 511 website and telephone service. Public information meetings provide information on upcoming projects. For the 2011 flooding, webinars addressing flood safety measures and traffic impacts were developed for presentation to regional Chambers of Commerce and to the local media.

Figure 5. Iowa DOT Council Bluff Interstate System Improvements webpage.

Kentucky Transportation Cabinet

Three roadway projects – Restore 64 in 2001, Revive 65 in 2009 (repaving/reconstruction projects on segments of Interstates 64 and 65), and the reconstruction of the Sherman-Minton Bridge on Interstate 64 (2011) – provide examples of the methods employed by the Kentucky Transportation Cabinet to advise drivers about construction-related travel delays and road closures.

Online Outreach. A page on the Kentucky Transportation Cabinet website (http://transportation.ky.gov/sherman-minton-bridge/Pages/default.aspx) provides an overview of the Sherman-Minton Bridge reconstruction, links to media stories about the project, and recommended alternate routes for travelers (see Figure 6). Separate route information and instructions are provided for commercial carriers with overweight or over-sized loads, which are not permitted on three of the bridges in the Louisville area. Updates about the project are posted, along with other transportation-related news, on the KTC Facebook page and Twitter feed. The TRIMARC traffic management center

website (http://www.trimarc.org) and Kentucky's 511 website (http://511.ky.gov/kyhb/main.jsf) are additional sources of incident and construction-related traveler information, including alternate route suggestions if roads are closed. The Revive the Drive website (http://transportation.ky.gov/revive-the-drive/Pages/default.aspx) provides similar updates for construction projects in Northern Kentucky.

Similar websites, no longer active, provided project and traffic information for Restore 64 and Revive 65. Twitter was first used in 2009 to provide updates on the Revive 65 project. The 2001 Restore 64 project disseminated updates via an e-mail list that was assembled over a series of KTC open houses prior to the start of construction.

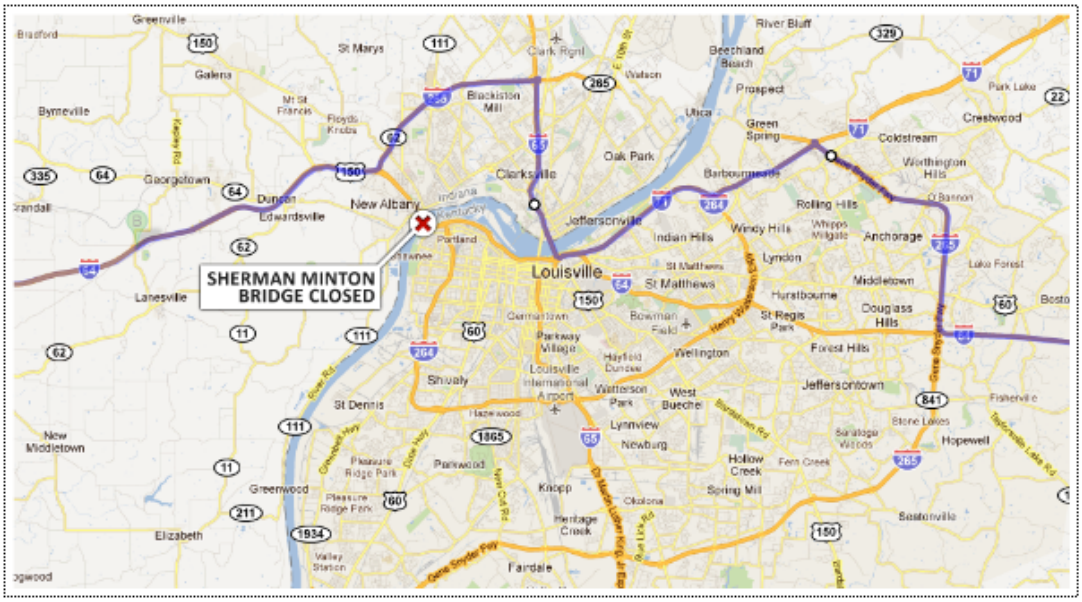
Recommendations regarding alternate routes have varied depending on the nature of each project. For Revive 65, only individual lanes were closed at any one time and only local roads were available for detours from the highway; to avoid overcrowding any particular road, the KTC did not recommend specific detour routes (unlike the routes that were specifically recommended for Restore 64 and the Sherman-Minton Bridge reconstruction.)

Press/Media. Press releases are regularly issued communicating information on upcoming road closures and providing links to alternate route maps when applicable. Because of the publicity surrounding the Sherman-Minton Bridge reconstruction, a paid media campaign has not been necessary; however, the Restore 64 and Revive 65 projects were advertised via newspapers and radio. Restore 64 was advertised on television in 2001, and information on that project was also provided at rest areas along I-64 and I-65 by means of flyers. The television ads were very expensive and have not been employed in more recent projects; radio advertisements have been more cost-effective.

Other Outreach Methods. Overhead DMS on the primary routes provide traffic updates and help to identify alternate routes. The TRIMARC system also provides, when possible, estimates of travel times on the primary route for display on the overhead DMS.

Results and Lessons Learned. While it has not been possible to quantify the number of vehicles diverting to alternate routes, periodic observations of the roadway network close to the Revive 65 and Sherman-Minton Bridge project sites have provided evidence that traffic congestion is considerably less than would be expected if drivers were not making use of the alternate routes.

The Kentucky Transportation Cabinet recommends the following alternate routes:



West on I-64 (alternate route via I-265 North - Gene Snyder Freeway)
Driving Directions

Start: I-64 W (outside I-265 loop)
1. Heading west on I-64 W.
2. Take exit 19B to merge onto I-265 N/KY-841 N/Gene Snyder Fwy for ~9.0 mi.
3. Continue onto KY-841 N for ~0.4 mi.
4. Take exit 35B to merge onto I-71 S toward Louisville for ~10.0 mi.
5. Keep left at the fork, follow signs for I-65 N/Indianapolis and merge onto I-65 N, entering Indiana.
6. Take exit 6B to merge onto I-265 W/IN-62 W toward I-64/New Albany.
7. Take exit 0 to merge onto I-64 W/IN-62 W toward IN-62 W/St Louis. Continue to follow I-64 W.
End: I-64 W

Figure 6. Kentucky Transportation Cabinet alternate route map.

Los Angeles Metro/Caltrans – I-405 Sepulveda Pass Improvements

Interstate 405 through the Sepulveda Pass in Los Angeles is the most traveled roadway in the United States, with an AADT of 374,000. I-405 provides a north-south connection between two other heavily-traveled freeways: Interstate 10 on the south and Interstate 101 on the north. The ongoing I-405 Sepulveda Pass Improvements project, a collaboration between Los Angeles Metro and Caltrans, is adding a ten-mile HOV lane to I-405, widening lanes on the freeway between I-10 and I-101, and improving associated highway infrastructure elements. The project began in 2010 and will be completed in 2013. Because the highway passes through the Sepulveda Pass (a valley), there are limited options for switching to alternate routes; if one or more of the bridges through the Pass is closed due to construction, it is imperative to notify drivers as soon as possible.

Online Outreach. In order to keep up with quickly-changing conditions, the vast majority of public information related to the Sepulveda Pass project is provided online. The project website (http://www.metro.net/projects/I-405) provides interactive maps of the project sites and of alternate

routes for affected highway segments (see Figure 7). Road/bridge closure information are posted to Twitter (Figure 8), Facebook (Figure 9), and Nixle, which is a Twitter-like social networking site primarily used by government agencies like police and fire departments. In a typical 24-hour period, three sets of updates are posted/Tweeted; each closure (as high as 47 separate closures in one day) is a separate Tweet/posting with a code identifying roadway segment and closure day(s). The codes are also used to build the "closures" page on the project website, which is updated daily, and are listed on the I-405 project website. Construction notices are also sent out via e-mail.

Press/Media. Press releases and advertising are employed to communicate information about major upcoming construction work (such as partial demolition of a bridge). The media outlets in the area also pick up Tweeted updates about construction and road closures. When the south side of the Mulholland Bridge was demolished, an outreach campaign reminded drivers to plan ahead for diminished roadway capacity.

Other Outreach Methods. DMS and other signage are required for all road work. Signs are posted to alert drivers to upcoming work areas and traffic slowdowns. Construction notices are hand-delivered to selected small areas/neighborhoods close to the affected area of I-405; however, in general print media such as newsletters and posters are not fast enough to deliver up-to-date information. An additional barrier to traditional media is the large percentage of highway users through the Sepulveda Pass that are not local residents.

Results and Lessons Learned. Metro's public information office is continually looking for ways to communicate messages more briefly, reducing announcements into fewer words while retaining the most important information for drivers. Initially, multiple road closure notices were combined in a single Tweet; however, it was realized later that each closure should have its own Tweet to facilitate the ease of searching for particular closure locations. The switch to one closure per Tweet led to a massive increase in online followers of the project's Twitter account (now numbering 3500), many of whom re-Tweet. It is not unusual for a single Tweet to have over 700,000 views.

Website views are monitored to track overall increases and decreases in website activity and online media, as well as to identify the most-visited pages and updates. When major roadway disruptions are reported, the numbers of website and online media views increase sharply.

An important lesson learned over the course of the project to date is the need for frequent information updates to keep drivers not only informed, but interested. Agencies should be willing to take chances on social media, and not be afraid of making mistakes or getting negative feedback. A common pitfall is developing a website or establishing a Facebook page or Twitter account, and then largely ignoring it. If an agency does not have the staff time to update daily or at least several times a week, online media is not going to be effective and agency credibility will suffer.

Messages should always contain an element of "what's in it for you, the driver/traveler?" -- time savings, less stressful trip, or a similar benefit. Phrase messages for the layman driver; avoid technical terms and use very few abbreviations, and present information in easy-to-absorb chunks. Post online information in color to increase visual interest. Keeping an online audience is a constant exercise in

"seduction" – if a site or information is difficult to find, difficult to understand, uninteresting to read, or out-of-date, viewers are less likely to come back.

Figure 7. Los Angeles Metro - alternate route map for Sepulveda Pass construction site.

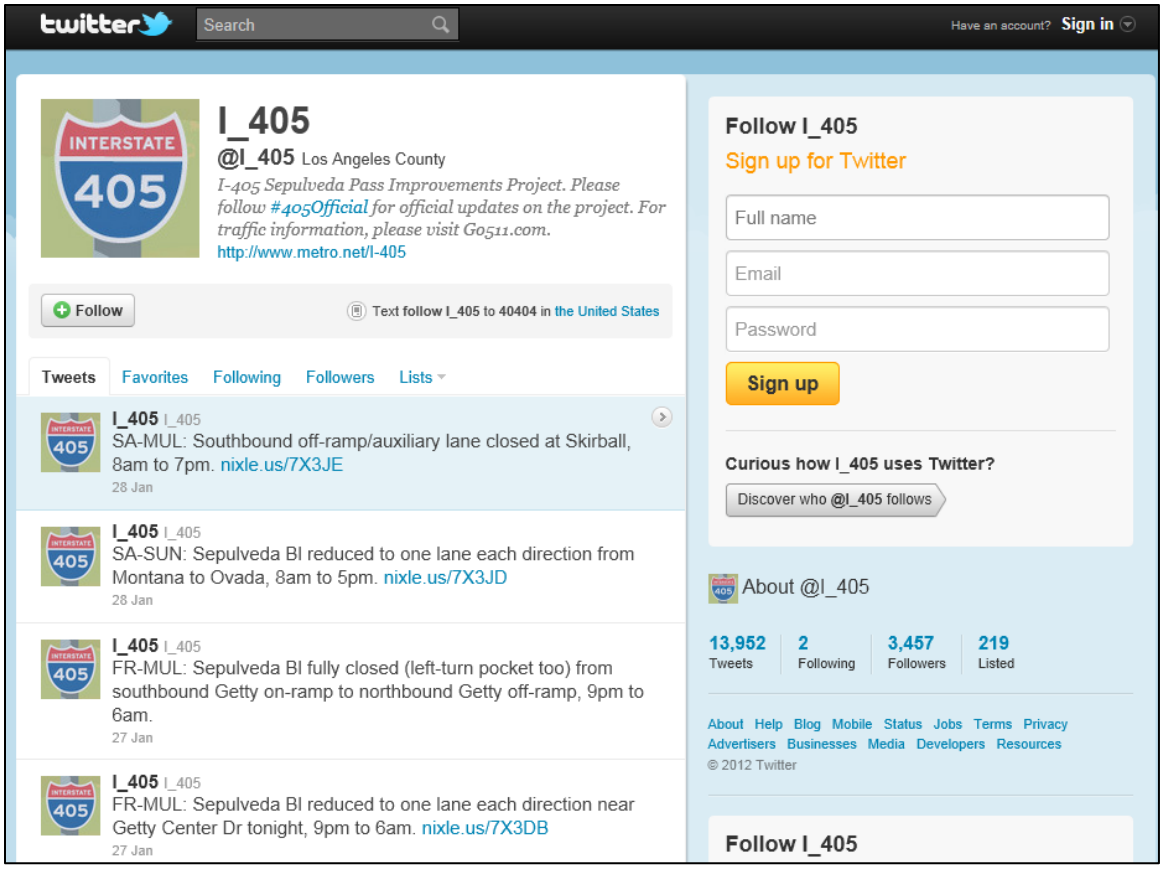


Figure 8. Los Angeles Metro - Sepulveda Pass project Twitter feed.

Figure 9. Los Angeles Metro Sepulveda Pass Facebook page.

Maine Department of Transportation (MaineDOT)

Public outreach campaigns have been conducted for several major highway construction projects, among them the reconstruction of Interstate 295 in 2009. For that project, Route 201 was designated by the Maine DOT as an alternate route for I-295 traffic. Depending on the project, public outreach messages may recommend particular alternate routes, provide comparative travel times for different roadways, or simply recommend that drivers seek unspecified alternate routes through affected areas.

Online Outreach. While the project website for the I-295 reconstruction is no longer active, a current webpage (http://www.maine.gov/mdot/i295portland/index.htm) provides updates on more recent work along I-295 in the Portland, Maine area, including news releases, camera views of traffic close to construction sites, and maps of project areas and alternate routes. A sample alternate route map is shown in Figure 10.

Drivers can subscribe to e-mail or RSS updates on road work and traffic impacts; these are provided via the GovDelivery digital communication service. MaineDOT also posts construction and traffic updates and other DOT news on Facebook. Twitter was used briefly as an outreach tool during one major project, but was discontinued after a local newspaper editorial which decried the potential to distract drivers by Tweeting real-time traffic information.

Press/Media. Radio ads are a major component of public outreach campaigns for highway projects. The ads are written to be conversational, reassuring, and often humorous, provide some basic information about the affected roadway – e.g. "I-295 is now closed from Gardner to Thompson; the Turnpike or Route 201 are your best bets for travel… " – and encourage listeners to go to the website for more information. Pop-up ads are placed on the Weather.com website, and appear on the page when a user enters a Maine ZIP code.

For big construction projects, the DOT holds a press conference to talk about the project, display project maps, and provide media outlets with a link to the project website. These press conferences are particularly helpful for explaining complex projects to the public, for instance a construction project that may have different effects on local traffic versus through traffic. Ongoing press releases throughout the project provide up-to-date advisories and information.

Other Outreach Methods. Dynamic and static signs are used to help guide drivers to alternate routes. Posters and flyers, like the media ads, direct drivers to the project website (see Figure 11). For the I-295 closures, a tourist-oriented map was developed which showed alternate ways to reach the L.L. Bean Flagship store in Freeport (a huge tourist draw for the area, normally served by I-295), as well as highlighting other tourist attractions in the area.

Results and Lessons Learned. The outreach efforts for the I-295 project were tremendously successful in changing public opinion about the construction. At the outset of the project, public opinion was extremely negative about the planned closures, and a local legislator was publically predicting disaster for the affected areas. MaineDOT put a lot of effort into the outreach campaign for the project, and by the end of the project was getting "glowing" letters from citizens and positive editorials in the media; even the legislator who had opposed the project wrote an editorial praising the DOT for its handling of the construction and the closures. MaineDOT won a communications award for this documented change in public opinion. It is not unusual for the DOT to receive letters and emails about the helpfulness of traveler information that is provided – or complaints if a driver finds the information to be unhelpful.

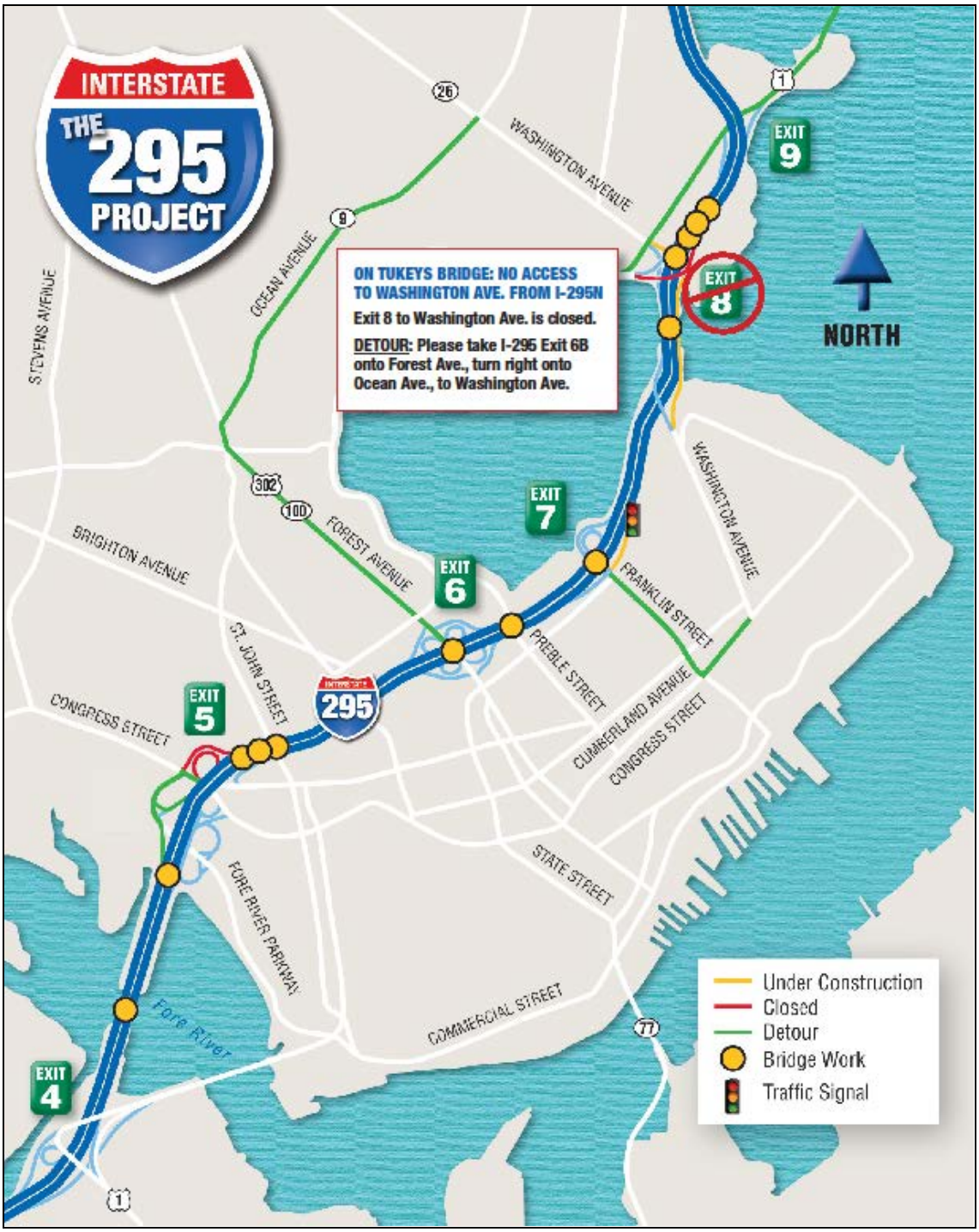


Figure 10. Maine DOT I-295 Project alternate route map.

Figure 11. MaineDOT flyer advertising alternate route.

Massachusetts DOT – "Fast 14" Bridge Replacement

The "Fast 14" Bridge Replacement Project in 2011 was part of an ongoing set of rebuilding and improvement projects along Interstate 93, beginning in Massachusetts and continuing northward into New Hampshire. Fourteen bridges were replaced along the interstate in ten weekends from June to August of that year; each replacement required that one side of the divided highway be closed, diverting both traffic directions to the open side of the highway. Closing lanes and ramps only on weekends helped to reduce the impact on traffic; to further minimize traffic congestion, MassDOT launched a multi-faceted outreach strategy.

Online Outreach. The Fast 14 Website (http://93fast14.dot.state.ma.us/) provided a comprehensive overview of the project, including maps of construction locations (see Figure 12), information about the location and duration of upcoming lane closures, and maps of detour routes to provide motorists with options for going around construction locations. Videos to raise awareness about the project and traffic impacts were posted on YouTube and Flickr, and DMS signs and work-zone cameras could also be viewed online in real time. MassDOT maximized online outreach by involving other local agencies and entities; in addition to the 511 webpage, local transportation management associations, convention centers, sports venues, and the MassRIDES transit agency also carried construction news and forecasts on their websites.

A network of over 2000 people, including key stakeholders in the area, received e-mails at least once per week with construction news and a link to alternate route maps on the website. One of those stakeholders was MassCommute, which represents 300,000 commuters in the state. Text message alerts for particular times of day were another subscription option, as well as a Twitter feed dedicated to Fast 14 construction updates. Monthly e-mail reminders were also sent out to FastLane tollway customers.

Press/Media. Press releases on the project were issued at least twice per week, typically broadcast by local stations as traffic alerts. Highway advisory radio (AM 1700) also provided construction and lane closure updates. No paid television or radio advertising was used. Print and outdoor media included the following:

- three MassDOT-owned billboards,
- posters on transit buses,
- stickers on toll booths,
- extra "toll tickets" with project information (handed to drivers at toll booths along with their actual toll ticket),
- signs at highway rest areas and visitor centers, and
- flyers distributed in local neighborhoods.

Other Outreach Methods. The greeting on the 511 telephone line provided information on Fast 14 updates. DMS communicated travel times on primary and alternate routes, using BlueTooth technology to collect real-time travel time information; if travel times increased to a certain level, the DMS signs were activated to show the comparative times on the primary versus alternate routes. Static signage was also provided to mark construction locations and detour routes.

MassDOT reached out to local elected officials with periodic meetings at the statehouse, providing information that the officials could then pass along to their constituencies through their own websites. MassDOT personnel also made presentations about the project at local elementary schools (whose students walk over some of the affected bridges) and put up poster displays at public libraries.

Results and Lessons Learned. The outreach efforts were successful; enough traffic was diverted from the construction-affected highway segments to minimize any construction-related delays. Anecdotal feedback from the public has been positive. A user survey and a road user cost analysis, sponsored through a Highways for Life grant, are underway to collect more feedback about the results of the Fast 14 outreach campaign.

Key to the success of the I-93 Fast 14 outreach campaign was the effort put into developing stakeholder networks. The e-mail subscriber list was recruited through over 80 stakeholder meetings, with special attention paid to including stakeholders like MassCommute, which multiplied the overall number of connections to drivers. Connections to other public and private entities also helped to expand the reach and visibility of Fast 14 traffic advisories. Also important were the constant updates on the project progress and traffic impacts provided to news media and through online channels; this kept the attention of drivers and ensured that the information provided to them was current and accurate.

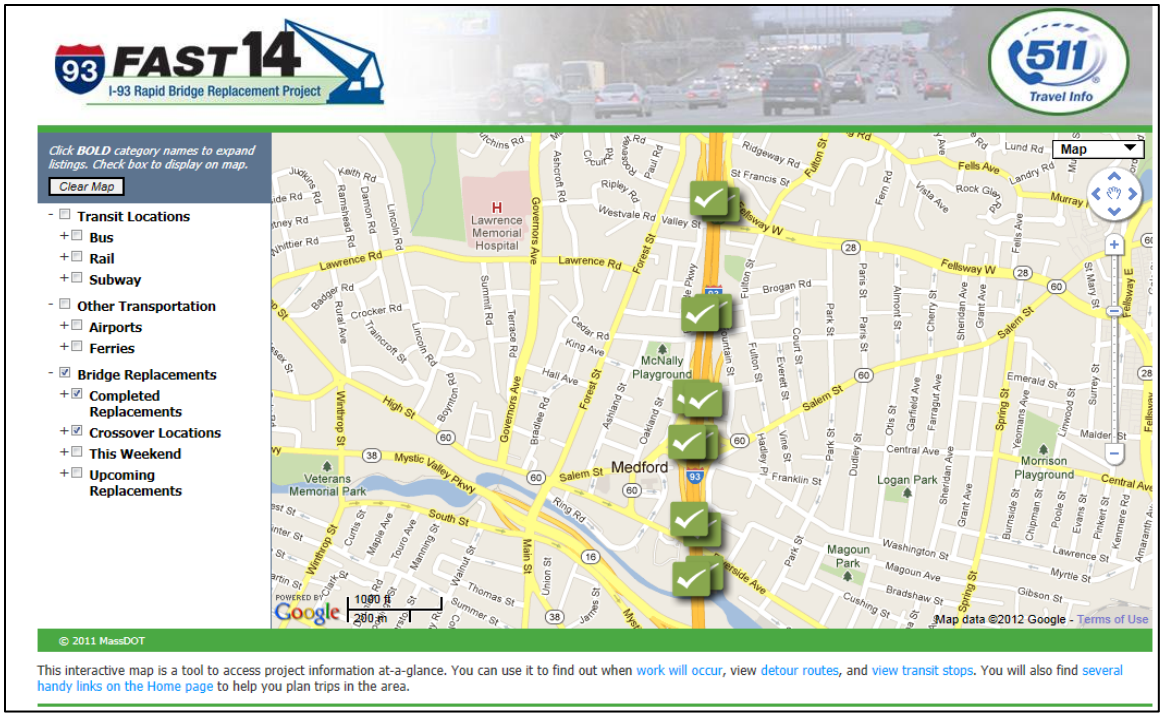


Figure 12. MassDOT "Fast 14 Bridge Replacement" Project Locations map.

Minnesota Department of Transportation (MnDOT)

The I-35 Mega Project in the Duluth area of Minnesota began in April 2011 and includes pavement replacement and bridge replacement and repairs along Interstate 35 within the city of Duluth.

Online Outreach. The project website, http://www.dot.state.mn.us/duluthmegaproject/maps.html , provides a project overview and schedule, links to view traffic cameras, and maps of alternate routes. MnDOT's YouTube video channel provides videos on numerous DOT issues; a video on alternate routes through construction areas was linked from the project website's homepage as of January 2012: http://www.youtube.com/watch?v=ykALKGKYDL0&list=UUJkXcazb32HwAihN9CGHO_Q&index=28&feature=plcp. A Facebook page (https://www.facebook.com/pages/Duluth-Mega-Project/116025121754371) and Twitter feed, as well as subscription e-mail and RSS services, provide project updates. A separate website, linked from the Duluth Mega Project website, provides information pertaining to road work south of Duluth (https://www.facebook.com/pages/Duluth-Mega-Project/116025121754371).

Press/Media. Press releases, newspaper advertisements, and flyers are all part of the outreach strategy.

Other Outreach Methods. Brochures and presentations (also linked from the project website) have been created to provide project information to local businesses.

Static signage is used to designate alternate routes. In 2010, an attempt was made to provide real-time travel times through work zones via DMS. The system did not provide accurate enough information, and

after a number of complaints were received, MnDOT darkened the signs beginning in mid-July and did not provide further real-time estimates. Seven similar signs are being installed in 2012 (four northbound and three southbound on I-35) that are expected to provide more accurate information.

Results and Lessons Learned. Before the Mega Project began, MnDOT developed travel models that suggested the possibility of regular three-mile backups during peak periods on I-35 in the Duluth area. These predicted backups rarely occurred; it is believed that the advance publicity provided about the project and the alternate routes played a significant role in alleviating traffic problems. MnDOT has also received positive comments and phone calls from drivers who were planning to or had used the recommended alternate routes.

New York Department of Transportation (NYDOT), Region 1

Alternate route information is part of the traveler outreach that the NYDOT regional offices provide during major roadway construction projects. For the 2010 bridge replacement on Interstate 87, Exit 6 in NYDOT's Region 1, a number of public outreach strategies were employed to keep motorists aware of traffic impacts and alternate routes for this portion of the interstate.

Online Outreach. A page on NYDOT Region 1's website (https://www.dot.ny.gov/regional-offices/region1/projects/i87-exit6) provided periodic updates on the project as a whole, including maps and descriptions of multiple alternate routes that were available to travelers. A dedicated website entitled "Exit6.org" was also established, but is no longer active. The 511NY website, linked from the project page on the Region 1 site, was used for real-time traffic, road closure, and alternate route updates; the 511 site also included real-time video feeds from seven traffic cameras around the construction area. Additionally, 511 users could (and still can) subscribe to real-time traffic alerts, personalized by region, to be delivered via e-mail or text message. RSS feeds for DOT-related press releases and/or regional roadwork forecasts are also available.

Press/Media. A media push at the beginning of the project helped to circulate the message to local media outlets about the upcoming disruption to traffic in the area of I-87. Ongoing press releases provided updates regarding project progress and associated traffic impacts and travel advisories.

Other Outreach Methods. Flyers were distributed to local businesses and to residents living in the immediate area of construction. A PowerPoint presentation, also available on the website, was developed to provide comprehensive information on the project to stakeholders and to detail the various ways to obtain traveler information throughout the project. DMS were positioned on the highway ahead of the construction site to warn travelers about the work zone and any associated ramp closures.

Results and Lessons Learned. While no formal data collection was conducted regarding traffic volumes on the primary and alternate routes during construction, the level of traffic congestion around the construction site was lower than had been predicted. The DOT has not received specific positive feedback about the project and the associated traffic impacts, but notably has not gotten negative feedback either. Providing information and recommendations for specific alternate routes associated with the Exit 6 Bridge Closure was a new approach for the DOT – the usual practice had been to advise

the public that construction and closures would be occurring in specific locations and recommend that drivers seek unspecified alternate routes.

Rhode Island Department of Transportation (RIDOT)

RIDOT provides online and media outreach for most major construction projects on state highways, often including information about and maps of recommended alternate routes. Among the projects currently under way is the repair and restoration of the Pawtucket River Bridge; while passenger vehicles and small, two-axle trucks are permitted to use the bridge during the repairs, multi-axle vehicles and vehicles over 18 tons must use alternate routes. RIDOT is therefore targeting outreach and information specifically to commercial drivers for this project.

Online Outreach. RIDOT maintains a "Community Updates" page on its website (http://www.dot.state.ri.us/travelri/communityupdates.asp) to provide travelers with updates on highway construction projects. The page is updated each week with new project briefs that describe current and upcoming construction activities, traffic impacts, and recommended alternate routes when applicable. (See Figure 13) Another webpage (http://www.dot.state.ri.us/travelri/detourmaps.asp) provides maps of recommended detours for all ongoing projects (see example map, Figure 14). Linked to this page is a dedicated page for the Pawtucket Bridge project, which describes the vehicle weight and axle restrictions for the bridge during the project, as well as recommended alternate routes for overweight vehicles (http://www.dot.state.ri.us/travelri/bridge550.asp). Static versions of four alternate routes (covering four different travel directions) are provided as graphics on the Pawtucket Bridge webpage; interactive "flyover" maps of the four alternate routes are also available for download, using the Google Earth interface.

RIDOT was an early adopter of social media, and for the past three years has communicated DOT news, traffic and travel updates (including detour/alternate route information when applicable) on Facebook (https://www.facebook.com/RIDOTNews), Twitter (http://twitter.com/#!/RIDOTnews), and MySpace(http://www.myspace.com/RIDOTNews), and a blog on the Blogspot website (http://ridotnews.blogspot.com/). The Twitter account is updated by a third-party contractor. E-mail updates are sent directly to local media; the "Community Updates" that appear on the webpage are e-mailed to police, schools, business groups, and others; anyone who is interested can join the e-mail distribution list.

Press/Media. As described above, press releases are regularly e-mailed to local media outlets providing updates on RIDOT projects and travel impacts. Paid media is not often used, due to the expense and difficulty of getting paid advertisements into rotation, particularly on television. Public service announcements regarding project updates and associated traffic impacts are included as part of local radio traffic reports, which are broadcast every to six to eight minutes. For projects and events that are particularly disruptive to traffic, RIDOT has distributed door hangers and flyers in person in affected areas.

Other Outreach Methods. Dynamic message signs (DMS) provide estimates of travel times on highways; static signs are used as trailblazers to direct travelers to alternate highway exits (when a particular exit is closed) and to mark alternate routes.

Results and Lessons Learned. While no quantitative data has been collected regarding traveler response to RIDOT's outreach strategies, the number of complaints from travelers to the department has decreased.

RIDOT

COMMUNITY UPDATE: SAKONNET RIVER BRIDGE #250

From March 6-11, 2012, the following operations will be in effect:

TIVERTON

- *Riverside Drive may be closed to through traffic from 6 a.m. to 4 p.m. for overhead deck form work. Detour in place.*
- *Central Avenue is closed to through traffic. Detour in place.*
- *Temporary road connecting Quaker Avenue to Main Road is operational.*
- *Temporary Tucker Avenue is closed, please use the Quaker Avenue Extension or Evans Avenue to access Tucker Avenue from either end.*
- *Ramp at Exit 5 from Route 24 North has been narrowed, new ramp alignment is in effect. Use caution, as construction vehicles are crossing from 7 a.m. to 3 p.m.*

PORTSMOUTH

- *Phase II of Hummocks Avenue Bridge work has started. Motorists using the on-ramp to Route 24 from Hummocks Avenue must come to a complete stop before merging with through traffic.*
- *Speed limit on Route 24 North, from Exit 2 (Boyds Lane) to the Sakonnet River Bridge, has been reduced to 40 mph.*

LOOKING AHEAD

- *Tucker Avenue is scheduled to open to through traffic in the near future.*
- *Concrete deck installation will continue.*

For more information, contact RIDOT Customer Service at customerservice@dot.ri.gov or call 222-2450 weekdays from 7:30 a.m. to 4 p.m. The above activities are weather-dependent, and are based on the best information available to RIDOT at the time of this update (March 1, 2012).

Figure 13. RIDOT Community Update brief.

Figure 14. RIDOT detour map example.

San Francisco Bay Bridge Seismic Safety Projects

The San Francisco Bay Bridge Seismic Safety Projects began in 2006 and will continue through 2013. To minimize the impacts on traffic during the construction projects, the Bay Bridge Public Information Office (PIO), representing partnering agencies Caltrans, the Bay Area Toll Authority and the California Transportation Commission, implemented a number of traditional and innovative outreach channels to provide ongoing information to the traveling public about the current status of the bridge, as well as computerized simulations of how sections of the bridge (and associated roadway/land alignments) will look once various project sites are completed.

Online Outreach. The project website, http://baybridgeinfo.org/ , includes an overview of the seismic safety projects, project newsletters, fact sheets (see Figure 15) and press releases about construction locations and alternate routes, and three-dimensional models of the bridge's alignment, presented as animated video clips. The models were not developed specifically for the outreach effort (and would have been very expensive to create for that purpose alone) but could be adapted into outreach tools that let drivers "drive" the new bridge alignments virtually before the alignments were complete in the real world. (See Figure 16) These models have also been turned into video games that are available as free smartphone applications on iTunes (see Figure 17).

Project updates are available on Facebook, Twitter, and RSS.

Press/Media. Press releases are e-mailed to local media outlets on a regular basis, including links to project fact sheets for more detailed information. The Bay Bridge PIO works closely with local media outlets, and news stories about the Bay Bridge projects (and related impacts on travelers) appear frequently. Paid ads and PSAs communicate major updates.

Other Outreach Methods. The PIO works with stakeholder agencies, youth groups, and community nonprofit organizations; "town crier" volunteers from these organizations help to distribute flyers to local businesses and neighborhoods. DMS has been a powerful tool to alert drivers to upcoming lane closures and detours; normally Caltrans does not begin displaying project-specific messages on DMS until a day or two prior to the onset of construction; for the Bay Bridge, the agency broke its own rule and began displaying construction information a couple of weeks before construction began, to raise public awareness of the upcoming project.

Results and Lessons Learned. It is difficult to break down the effectiveness of any individual outreach method, but the agency can observe when the flow of traffic changes by means of the traffic cameras. Analysis of traffic flows recorded by the cameras has shown more rapid learning curves as drivers adjust to new lane alignments – traffic jams that signal drivers' unfamiliarity with new traffic patterns (as construction projects progress) often clear now within a day, whereas in the past these traffic jams would last up to a week. Public feedback has been mostly favorable as well, as collected from comments on the website, through the smartphone applications, by telephone and occasionally in person.

It is vitally important for an agency to understand the audiences that it's trying to reach, and where those audiences go for their information. The communications industry is in a period of change, with

online communication becoming stronger every year, so your audience's preferred information sources are likely to evolve; as much as possible, keep up with the trends. If paid media will be used, a professional media buyer (on staff or third party) will be able to get more "bang for the buck." Create core information pieces that communicate the big picture about a project or event, such as a microsite that includes everything related to a particular location and a two-sided PDF factsheet that can also be distributed in person/offline.

THE SAN FRANCISCO-OAKLAND

BAY BRIDGE SEISMIC SAFETY PROJECTS

CALTRANS | BAY AREA TOLL AUTHORITY | CALIFORNIA TRANSPORTATION COMMISSION

SEISMIC SAFETY SOONER

PREVIOUS OPENING PLAN

The original Bay Bridge's westbound lanes are directly in the path of the eastbound lanes of the new East Span. Westbound motorists would have started driving on the new span while eastbound traffic would have stayed on the original bridge. Workers could then demolish the old westbound lanes and finish the new eastbound roadway during four to six months of construction.

OAKLAND TOUCHDOWN DETOUR

A plan to realign traffic lanes and build detours just west of the toll plaza will allow engineers and construction crews to complete those new eastbound lanes while work continues on the rest of the East Span; this approximately 1,000-foot-long stretch of the new Bay Bridge is called the Oakland Touchdown. By implementing these detours for the next two years, the entire bridge will open to the public earlier than previously scheduled. The detours will allow construction crews to work between the existing and new bridges to complete the new eastbound lanes, which is not possible without the traffic realignment. Eastbound traffic will begin using the detour in May 2011 while westbound will start in early 2012. More information will be provided prior to the traffic shifts.

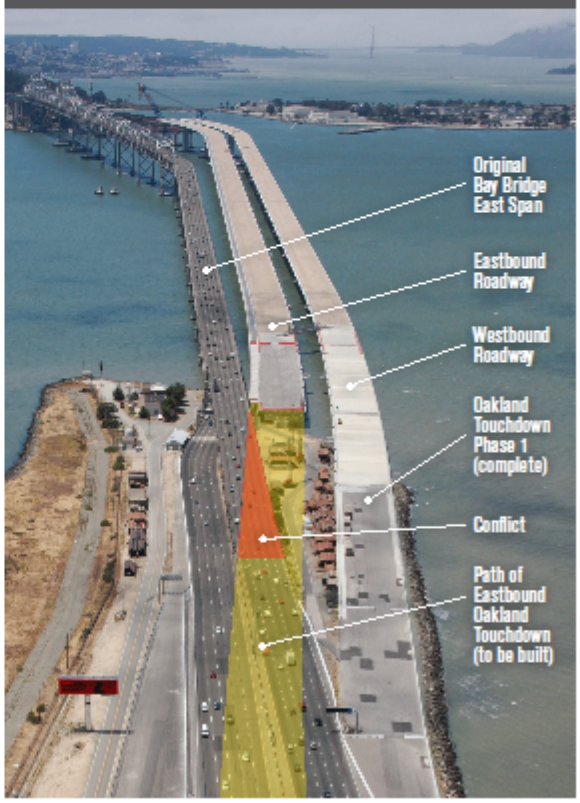
OAKLAND TOUCHDOWN PHASE I - COMPLETED

Much of the work on the Oakland Touchdown—which had always been designed to be built in two phases—has already been completed. The entire westbound deck and half of the eastbound deck have already been built; the eastbound lanes were always meant to be the final piece of the puzzle after all other construction work had been completed. Now the Oakland Touchdown will keep pace with the Self-Anchored Suspension Span and the Yerba Buena Island Transition Structure and will bring a seismically safe bridge to completion faster.

STAY INFORMED!

For the latest information, important lane closure details and animated simulations, visit ***BayBridgeInfo.org/OTD_Detour***.

Detours Will Allow Completion of Eastbound Roadway and Opening of Entire Bridge in 2013



FOLLOW US ON TWITTER (TWITTER.COM/BAYBRIDGEINFO)
AND FACEBOOK (FACEBOOK.COM/BAYBRIDGEINFO)

For more information, visit:
Para esta información en español, por favor visite:
BayBridgeInfo.org

FOR REAL-TIME TRAFFIC CONDITIONS AND PUBLIC TRANSIT ALTERNATIVES, VISIT 511.ORG OR CALL 511

Figure 15. Sample fact sheet, San Francisco Bay Bridge Seismic Safety Projects.

Figure 16. Screenshot from "Flythrough" simulation of Bay Bridge East Span's planned new alignment.

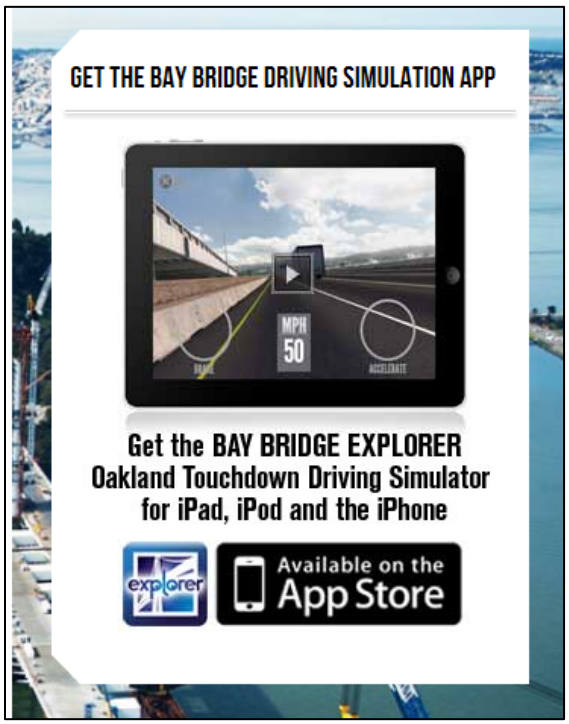


Figure 17. Link to download Bay Bridge Driving Simulation App on Baybridgeinfo.org website.

Utah Department of Transportation (UDOT) – I-15 CORE Project

The Interstate 15 Corridor Expansion (I-15 CORE) is a two-and-a-half year project that will add lanes, rebuild numerous interchanges and bridges, and repave the highway corridor within Utah County. The Utah DOT, anticipating the impacts that this project will have on traffic flow throughout the corridor, developed an outreach campaign to help manage traffic demand and guide travelers around the worst of the construction-related congestion. The UDOT outreach strategies provided the model for the traveler outreach campaign used by MassDOT for the Fast 14 Bridge Replacement Project.

Online Outreach. UDOT's agency website has a dedicated set of pages for the I-15 CORE project (http://www.udot.utah.gov/i15core), which provide fact sheets, progress reports, and project schedule information. The site's "Getting Around" page details anticipated closure and other traffic impacts at construction sites, and provides links to alternate route maps where applicable. (See Figure 18) The "Know Where Know Why" page of UDOT's site (featured as a tab on UDOT's main page http://www.udot.utah.gov/main/f?p=100:6:0::::V,T:,1, see Figure 19) and the CommuterLink website (http://www.utahcommuterlink.com) provide real-time updates and traveler alerts connected with construction, events, or incidents. Where applicable, construction alerts and updates contain a link to the I-15 CORE website for more detailed information. "UDOT Traffic" is a free mobile Web application for CommuterLink information.

Twitter, Facebook, an RSS feed, and e-mail alerts are all used for communicating information about incidents and disseminating construction information with alternate routes as applicable. For spontaneous incidents unrelated to construction, I-15 CORE's social media team may craft a Tweet or Facebook post recommending that drivers seek an (unspecified) alternate route and providing an estimated delay time and/or estimated queue length on the primary route. A recommended alternate route will often be specified if UDOT traffic engineers can adjust signal timing to make that route more efficient.

The UDOT YouTube channel offers videos on project updates, including animations of upcoming roadway improvements and changes to traffic patterns, as well as more general public outreach messages.

Press/Media. UDOT advertises the I-15 CORE project on radio and billboards. Most radio messages about traffic impacts and updates are "live reads," while produced/taped radio spots are developed for public education campaigns.

Because I-15 CORE has such an aggressive construction schedule, the outreach campaign has mostly avoided using newspaper ads. Construction activities change so frequently that an ad would often be out of date by the time it ran. Furthermore, UDOT's annual public opinion survey findings show that fewer people are using newspapers as a source of information. The most recent survey reported that 66 percent of those polled never use a newspaper as a construction information source. In place of newspaper ads, I-15 CORE produces a mailer which is published and distributed by the local newspaper. This flyer is sent to all residents in Utah County for project wide updates.

Other Outreach Methods. Dynamic Trail blazer signs are deployed on the freeway close to construction zones. These signs point to suggested alternate routes, and display the estimated travel time for those roadways to encourage drivers to use them as alternatives to the freeway.

Public Involvement Coordinators (PICs), appointed to specific segments of the I-15 CORE project area, work directly with businesses, residents, and municipalities. Their outreach activities and services include door-to-door information handouts, public meetings, and project "hotline" numbers and cell phone numbers that directly contact a PIC. The PICs, project hotlines, and project e-mails all provide opportunities for stakeholders to provide feedback or resolve issues, so the information flow is not only one-way.

Results and Lessons Learned. In the three most recent annual public opinion surveys conducted by UDOT, electronic roadway signs have been ranked as the most frequent source for road construction information, with radio second. The surveys also show the reported use of most media types decreasing, though respondents still report that they are getting all the construction information they want and need. A possible reason for the decrease is that drivers have picked just one or two preferred sources and get all their information from there (i.e., they follow updates on Twitter and listen to the radio, so do not feel the need to go to the website). Another possibility is that after two years of familiarity with the construction project and its impacts, the survey respondents don't feel the need for as much information. UDOT continues to maintain multiple channels to communicate to the public, allowing each traveler to "customize" how he or she gets construction and travel information.

Several recent incidents have illustrated the potential impact both of public outreach and of the public's recent travel experiences. In December of 2010, I-15 had to be reduced to only one lane of travel in each direction to fill potholes. The lane restrictions occurred with less than 24 hours' notice, and a five percent trip diversion/reduction rate was observed on I-15. A similar closure happened two weeks later, UDOT had more time to notify the public of the closure in advance, and the previous closure was still fresh on the public's mind. The second lane restriction resulted in a 30 percent trip diversion/reduction rate on I-15.

In the fall of 2011, a paving operation required the closure of one travel lane on the Interstate, leaving three general purpose lanes. The activity was approximately three weeks in duration, and the scheduling allowed UDOT plenty of time to prepare and notify the public. This resulted in about a 10 percent daily diversion/reduction in trips during the operation. For a specific event that coincided with this lane closure (university football game that typically attracts 60,000 people), I-15 CORE focused on a specific outreach message - "Stay and have dinner or be stuck in traffic." This resulted in a one-time 15 percent diversion/reduction directly after the football event.

Based on these outcomes, UDOT has learned to initiate public outreach early, to develop a defined message, and try to minimize the duration of traffic impacts for maximum effectiveness.

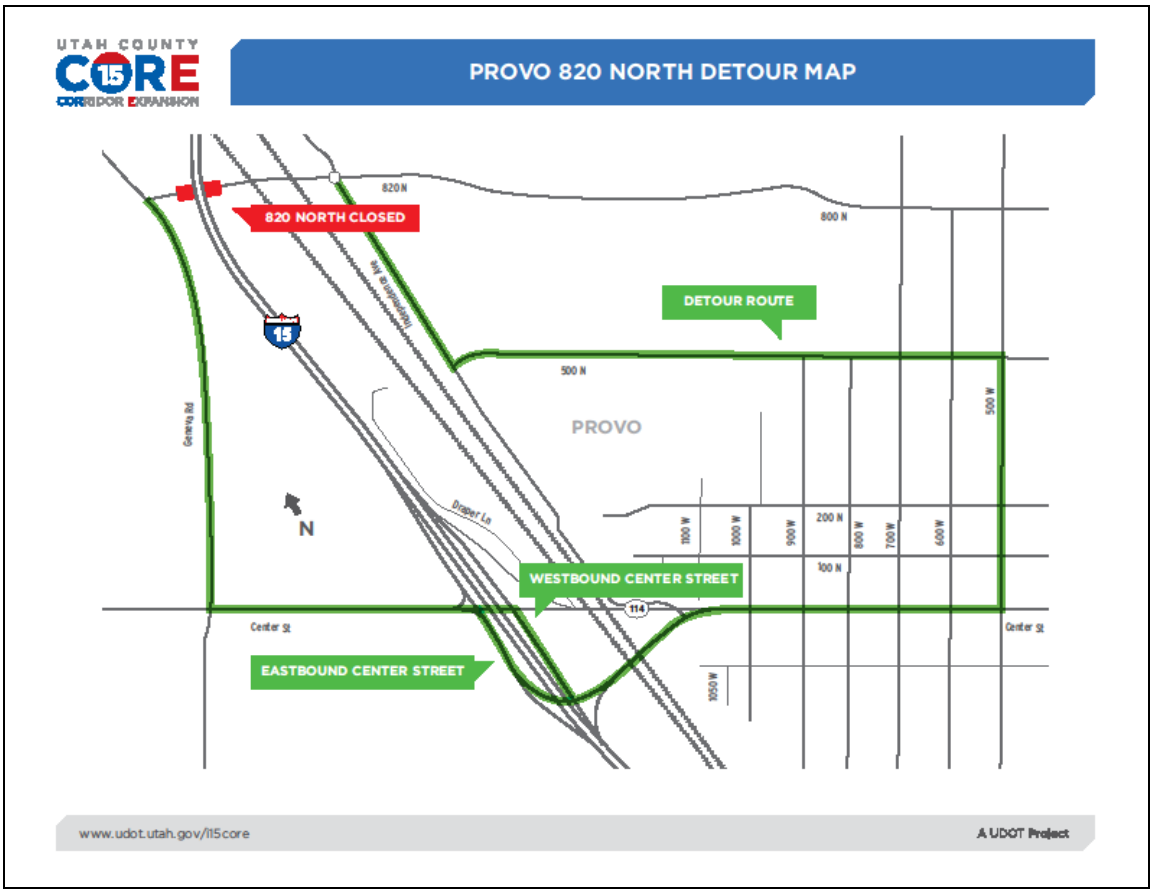


Figure 18. Utah DOT I-15 Corridor Expansion - alternate route map example.

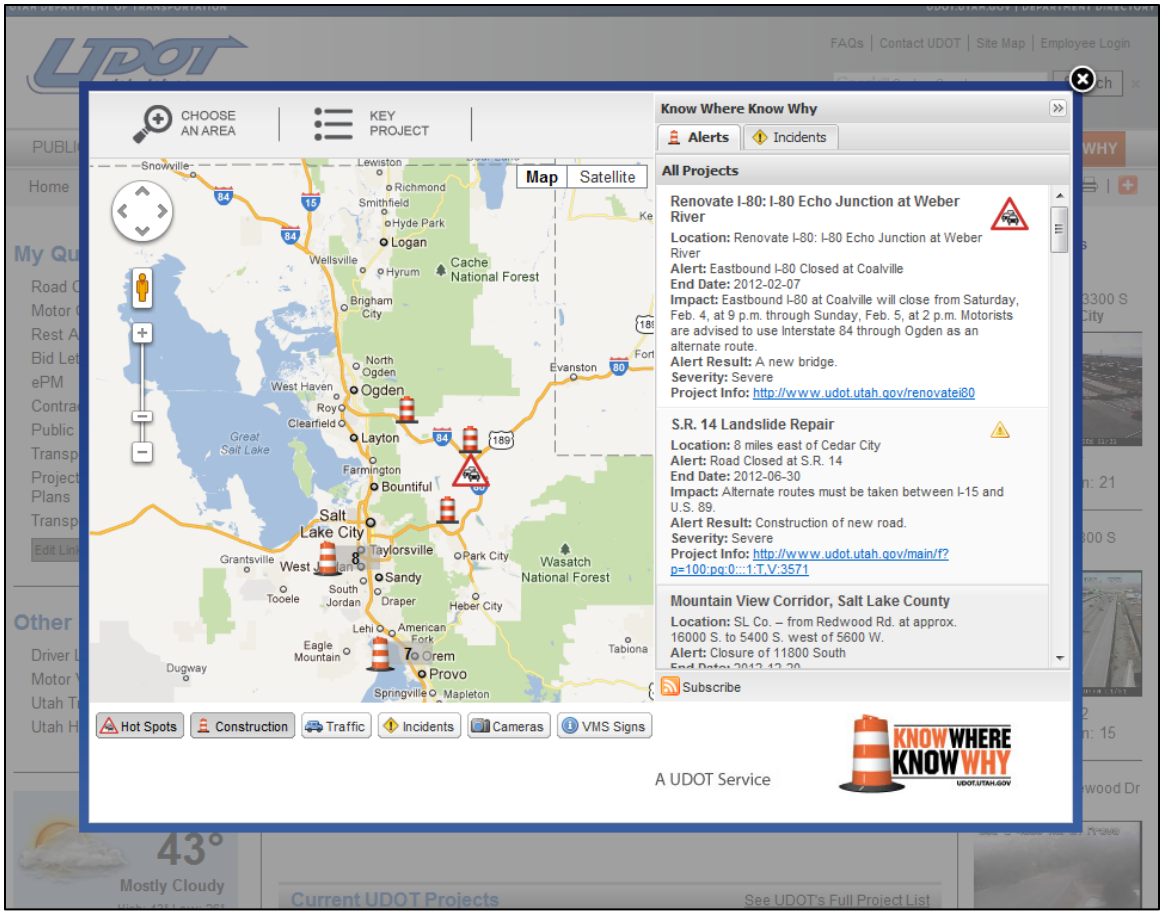


Figure 19. UDOT's "Know Where Know Why" webpage.

Virginia Department of Transportation (VDOT)

Virginia Beach's popularity as a tourist destination leads to heavy traffic through the Norfolk and Hampton, Virginia area. Particularly heavy traffic on Interstate 64 and the Hampton Roads Bridge Tunnel (HRBT) has meant heavy congestion and lengthy delays along this route to Virginia Beach and the Outer Banks throughout the tourist season. Virginia DOT's Travel Center has developed an outreach program to encourage travelers to use Interstate 664 and the Monitor Merrimac-Memorial Bridge-Tunnel (MMMBT), which adds approximately eleven miles to the trip compared to the I-64 route, but has a much lower average trip time due to the lack of traffic congestion.

Online Outreach. The Virginia Department of Transportation "Travel Center" webpage (http://www.virginiadot.org/travel/mmmbt_promotion.asp) provides a map of the I-664 alternate route to Virginia Beach, as well as route options from other travel directions. The color-code legend on the map (shown in Figure 20) labels the most-traveled I-64/Hampton Roads Bridge-Tunnel route as "Congested Route – Lengthy Delays." Besides the map, this webpage also provides a link to a table comparing the travel times of the two routes and a link to a YouTube video PSA produced by VDOT, "A Tale of Two Tunnels" (http://www.youtube.com/watch?v=8ZPT56IUwdc) which humorously "dramatizes" the travel time savings of using the alternate route.

In addition to the webpage for this particular roadway, VDOT communicates traffic and travel alerts for all state highways via Facebook, Twitter, and RSS. Twitter and RSS feeds are categorized by district and/or travel corridor. VDOT also maintains a Flickr page and a YouTube channel to provide additional public outreach and information (such as the PSA described above). The VDOT 511 page (http://www.511virginia.org/Home.aspx?r=6) provides real-time information on roadway conditions, links to traffic cameras on major roads, and trip-planning assistance.

Press/Media. VDOT does not purchase television or radio ad space, but the agency has developed a good relationship with local media outlets, and the Hampton Roads-area networks are particularly interested in traffic and roadway issues. A "media pager" system allows VDOT to communicate stories to all interested media outlets at once. In addition to news stories, some of the local television networks air a one-minute version of the "Tale of Two Tunnels" PSA without charge to VDOT. VDOT has purchased print ads, including an insert ad about the I-64/MMMBT alternate route on a state travel map. Two paid billboards, placed shortly before the exits to the alternate route for drivers coming both northbound and southbound on I-64, also advertise the alternate route.

Other Outreach Methods. Information about the Virginia Beach alternate route has been heavily promoted at Virginia Welcome Centers. VDOT has also worked extensively with the North Carolina Tourism Bureau, which has coordinated outreach about the Virginia Beach alternate route on its own website. The Virginia 511 telephone service will provide turn-by-turn directions for drivers, including advice on alternate routes when congestion is a factor. DMS are primarily used to communicate information about short-term, short-notice events such as bridge closures or other incidents.

Results and Lessons Learned. VDOT has received positive feedback from drivers about the Hampton Roads/Virginia Beach campaign, including comments from long-time Virginia residents who had not been aware of the alternate route to Virginia Beach on I-664 or had been reluctant to travel by that route because of the greater distance, not realizing the potential time savings. No formal studies of the traffic impact have yet been conducted.

Figure 20. Virginia DOT alternate route map to Virginia Beach.

CHAPTER 3. TRAVELERS' ROUTE DECISIONS – REVIEW OF THE LITERATURE

Introduction

A number of factors can influence a driver's pre-trip and en route driving decisions, including his or her decisions about an initial route choice and potential route deviations. The purpose of Task 2's literature review was to examine past studies of driver behavior and preferences pertaining to route selection and route deviation in order to identify segments of road users who are most likely to represent different decision-making subsets when confronted with a disruption to their expected route and with a potential alternate route. These identified road user segments guided the research team when recruiting participants for the focus groups and surveys in Task 3. The literature review results also guided the development of the focus group and interview discussion guides and the survey instruments.

Table 2 lists examples of trip characteristics, driver characteristics, roadway characteristics, and information characteristics that may affect driver decision-making about route choice and route deviation. The following sections summarize findings of previous research studies for each of these four categories.

Table 2. Characteristics That May Affect Traveler Decision-Making.

Travel characteristics	Driver characteristics	Highway characteristics	Information characteristics

• Trip purposes
• Trip origin and destination
• Time of day of trip
• Trip length/Average trip time
• Time constraints
• Flexibility of departure and arrival time
• Number of routes used
• Weather conditions
	• Age, gender, income, education
	• Familiarity with the highway system
	• Speed patterns
	• Past driving behaviors
	  o faced with lane restrictions
	  o faced with other traffic congestion/delays
	  o use of real-time traffic information
	• Familiarity with available alternative routes
	• Location/home address
	  o Large urban
	  o Small urban/suburban
	  o Rural
	• Familiarity with information technologies
	  o Internet traveler/ traffic information
	  o 511
	  o Mobile devices
	  ▪ Text messaging
	  ▪ Social media
	  ▪ Mobile web
	  ▪ GPS
		• Highway identification
		• Type of area (i.e. rural, urban)
		• Times of lane restrictions (weekend/weekday, daytime/night)
		• Number of lanes closed
		• Length and duration of closure
		• Geometry of restriction segment
		• Availability, proximity, and directness of alternative routes
		• Road type of alternative routes
		• Length and capacity of alternative routes
		• Number of stops/signalized intersections on alternative routes
		• Speed limit on alternative routes
		• Number of lanes on alternative routes
		• Marking on alternative routes
			<u>Pre-trip information</u>
			• TV, radio, newspaper, 511, traffic reports, project website, friends/relatives, etc.
			<u>En route information</u>
			• Anticipated delay on original route
			• Difference in travel time on original vs. alternative routes
			• Predictability of delay on original route
			• Anticipated speed on original vs. alternative routes
			• Distance to lane restriction segment
			• Availability of directions for alternative routes
			• Media to convey en route traffic information
			• Availability, location, and visibility of signs
			• Sign messages
			• User information needs and preferences
			<u>Perceived traffic condition</u>
			• Volume levels on original and alternative routes
			• Observable/anticipated queue length
			• Traffic mix on original and alternative routes
			• Number of other cars taking alternative routes

Travel and Trip Characteristics

The purpose, length, and time constraints of a trip can all affect a traveler's motivations and priorities in initial route selection, as well as his or her willingness to divert mid-trip to an alternate route. The purpose and conditions of a trip have also been shown to influence the types of roadway and traffic information that travelers find most useful.

Effects of Trip Purpose

There are several ways of categorizing trip purpose. In previous studies examining route decisions, trip purpose categories most often include commute trips, non-commute business trips, commercial/freight trips, and leisure/recreational trips.

Commute trips tend to have consistent origins and destinations and constrained arrival and departure times. Commuters, as a group, are likely to be familiar with the roadway network along their commute route, and thus are likely to be aware of at least one and perhaps several route alternatives. Travelers surveyed along I-94 in the Milwaukee urban area, of whom 67% were commuters or traveling on other business, were very likely to be aware of the work zone affecting that section of the highway prior to encountering it (95 percent of those surveyed) and to select an alternate route to circumvent it; 60 percent of respondents took an alternate route daily to avoid the work zone on the highway. (Liu, 2011) Commuters are also the most likely to be aware of one or more sources of local traffic/travel information such as news reports or local traffic websites. The types of travel information sought by commuters also tend to differ from the information sought by non-local business or leisure travelers. Among drivers surveyed in the Netherlands in 2005, commuters were more likely (vs. those traveling for recreation or other business) to want detailed information about unexpected traffic congestion along their route, such as the location, length, cause, and expected duration of the congestion. (Muizelaar & van Arem, 2006) Commuters surveyed in a 1993 Michigan study indicated that they valued information about the amount of delay time, the predictability of delay time, and the amount of congestion on the original route most highly out of 33 possible information elements. (Wallace & Streff, 1993)

Non-commute business trips often have time constraints similar to commute trips, but may involve roadways that are less familiar to a particular traveler; the traveler is therefore less likely to be aware of typical traffic and travel conditions on the primary route, or of the location and typical conditions of alternate routes. (FHWA, 2005) In the Netherlands survey mentioned above, people traveling for business (other than commutes) were the most likely to prefer advice regarding the fastest route. (Muizelaar & van Arem, 2006)

For **commercial/freight drivers**, the time constraints of a trip include not only the departure and arrival times for a particular shipment but also the maximum number of hours they are permitted by law to drive per duty shift and per week. Commercial drivers must also consider vehicle weight and height restrictions on particular roadways, as well as limitations pertaining to oversize or hazardous loads, when planning their routes. (FHWA, 2005) A study of nearly 250,000 truck movements and route choices in 10 U.S. metropolitan areas found that truckers tend to focus on minimizing the overall driving time of a given (often multi-day) trip, and make route decisions based in part on their perceptions of the overall travel speeds on each potential route. These perceptions may be based on factors such as knowledge about and past experience on a particular route, the time of day, and current traffic conditions. (Kornhauser, 2005)

Travelers taking **leisure/recreational trips** are the least likely to have strict constraints on travel times, the most likely to be unfamiliar with the roadway network in the area, and the most likely to be unfamiliar with local traveler information resources. In contrast to the drivers surveyed along I-94 in

Milwaukee, highway travelers surveyed near the towns of Tomah and Portage, Wisconsin were more likely to be leisure travelers (44% of respondents in Tomah and 72% of respondents in Portage); of those surveyed, just over half (58% in Tomah, 51% in Portage) were aware of work zones along I-94 and I-90 in those areas prior to encountering them, and only a handful had diverted off of the highway to avoid the work zones. In Portage (the location with the higher percentage of leisure travelers among the respondents), the most frequent reason given for continuing through the work zone was a lack of familiarity with potential alternate routes. (Liu, 2011) However, because of the greater flexibility of these types of trips, leisure travelers who do receive information about travel and roadway conditions may be more likely to respond to messages recommending a change to the timing, route, and even the destination (or intermediate destination) of a trip. (FHWA, 2005) Recreational travelers in the Netherlands study were most likely among those surveyed to prefer advice regarding scenic routes, alternate modes of travel, and parking information. (Muizelaar & van Arem, 2006)

Effects of Other Trip Characteristics

The origin and destination of a trip can influence a driver's decisions about diverting to an alternate route. The examples of origin/destination most often seen in previous studies are for commute trips. For example, travelers surveyed in Chicago were more likely to divert if they were traveling from home to work rather than the reverse. (Khattak, Schofer, & Koppelman, Commuters' Enroute Diversion and Return Decisions: Analysis and Implications for Advance Traveler Information Systems, 1993) This is consistent with a much earlier study of Chicago drivers' route diversion behaviors. (Heathington, Worrall, & Hoff, 1971) In contrast, Seattle drivers who expressed the most willingness to divert mid-trip to alternate routes were more likely to divert during the trip from work to home. (Conquest, Spyridakis, Haselkorn, & Barfield, 1993)

The time of day of a trip, which is likely to correlate with traffic levels and traffic congestion levels on the roadway network, can also play a part in route decisions. Of the Milwaukee drivers who took an alternate route to avoid work zones on I-94, 51% diverted to those alternate routes only during rush hour; this would be the time when many of the respondents would most frequently be on the road (since the largest proportion of this respondent pool was traveling for work) and when traffic on the highway would be heaviest and most prone to congestion. (Liu, 2011)

Diversion to an alternate route is more likely for longer overall trip lengths/times. This is largely because longer trips provide a greater opportunity to leave a preferred route and rejoin it further down the road. (Khattak, Schofer, & Koppelman, Commuters' Enroute Diversion and Return Decisions: Analysis and Implications for Advance Traveler Information Systems, 1993)

Extreme weather conditions have been identified as one of the few circumstances that can cause drivers to consider more than two alternate routes. (Kornhauser, 2005)

Driver Characteristics

Driver characteristics that can affect alternate route decisions include demographic characteristics (age, gender, income, education); the driver's familiarity with the roadway network, including his or her knowledge of available alternate routes; familiarity with available roadway information sources and

communication technologies; the driver's past experiences with traffic congestion and related trip disruptions; and his or her past use of travel or traffic information.

Demographic Characteristics

Several studies have found similar trends among certain driver demographics pertaining to route decisions and particularly to a driver's willingness to change from his or her usual or current route to an alternate route. These trends generally correspond to a driver's personal tolerance for risk-taking and to the value he or she places on saving travel time.

A survey of travelers in northern Indiana found that males, younger drivers, more affluent drivers, and drivers with higher levels of education are generally more likely to divert to alternate routes based on information about traffic conditions; females, older drivers, lower-income drivers, and drivers with lower levels of education are generally less likely to divert. (Peeta, Ramos, & Pasupathy, 2000) Two studies of Chicago-area commuters in the early 1990s found that drivers were more likely to divert from their current or preferred route to an alternate route if they were male, if they lived in a city as opposed to suburbs, and if their self-reported personality traits classified them as "risk-takers." (Khattak, Schofer, & Koppelman, Commuters' Enroute Diversion and Return Decisions: Analysis and Implications for Advance Traveler Information Systems, 1993)(Khattak, Koppelman, & Schofer, 1993)

A study of commuters in the Seattle, Washington area found similar results. Commuters who were most likely to divert to an alternate route mid-trip (based on either pre-trip or en route information) tended to be male, older, and higher-income. Interestingly, these demographics also predominated among the group of commuters who were not inclined to switch to an alternate route for any reason; the difference between these two commuter groups was in the personal value they placed on saving travel time. Females, younger drivers, and lower-income drivers were more likely to select an alternate route and/or an alternate departure time prior to starting a trip, but were less likely to change to an alternate route once the trip had begun. (Conquest, Spyridakis, Haselkorn, & Barfield, 1993)

A driving simulator study and associated survey conducted at Virginia Polytechnic Institute and State University found that younger participants, males, Caucasians, participants with higher education levels, participants with shorter driving experiences, and participants driving fewer annual miles were more likely to "experiment" with the two routes and adapt their route selection to the route that minimized their travel time. Females, non-Caucasian participants, older participants, participants with lower education levels, and participants with longer driving experiences were less likely to adapt their route choice based on travel times. (Tawfik, 2010)

A 2005 evaluation of Utah Department of Transportation's ATIS technologies found that educated middle-aged men with flexible schedules who drive at least 100 miles per week were the most likely to be aware of four main ATIS systems (VMS, HAR, 5111 and the CommuterLink website). It was also found that educated men with flexible schedules were the main users of at least one system. Awareness was higher of en-route systems (Martin, November 2005)

Familiarity with Roadway Network and Alternate Routes

In several studies, greater familiarity with alternate routes increased drivers' likelihood of changing to an alternate route based on en route traffic information. (Khattak, Koppelman, & Schofer, 1993)(Khattak, Schofer, & Koppelman, 1993)(Conquest, Spyridakis, Haselkorn, & Barfield, 1993) A 2010 stated-preference survey of Wisconsin drivers found that drivers who were not already familiar with a particular alternate route were less likely to divert onto it, even if they anticipated a significant time savings. An earlier study found similar results; for a given message advising a route diversion, drivers who were unfamiliar with the roadway network (and thus the prescribed alternate route) were about 10% less likely to comply with the message and divert, compared with familiar drivers. (Lappin & Bottom, 2001) If drivers are very familiar with an alternate route, they have a much stronger tendency to comply with information/messages on CMS advising them to divert, even when the predicted time savings is fairly small. (Lee, Ran, Yang, & Loh, 2010)

A traveler's level of familiarity with the roadway environment also defines his or her needs and preferences for traffic and route information. Drivers who are unfamiliar with the roadway network or unfamiliar with routes other than their usual/primary route are more likely to need and value basic information about the road network in general and about potential alternate routes, such as a map or specific route directions. A driver who is somewhat familiar with the roadway network may still be unfamiliar with the typical traffic patterns on portions of the network, including recurrent congestion/delays; these drivers are likely to need predictive and real-time information from sources like travel websites and radio. Finally, all drivers, whether or not they are familiar with the roadway network and with the usual traffic patterns, still need real-time information about unexpected delays or disruptions. Table 3 summarizes information types that are generally needed by familiar and unfamiliar drivers. (Muizelaar & van Arem, 2006)(Muizelaar & van Arem, Non-recurrent Traffic Situations and Traffic Information, 2005)

Table 3. Road Users and Their Expected Information Usage for Making a Trip. (Source: Muizelaar 2005)

		Road User	
		Familiar	*Unfamiliar*
Road Network		Knowledge, experience and standard information	Standard information (road map)
Traffic Situation	*Predictable*	Knowledge, experience and traffic information	Traffic information (RDS-TMC, radio)
	Unpredictable	Traffic information (differences from predicted situation)	

Familiarity with Information/Communication Technologies

Milwaukee drivers who were surveyed along I-94 in 2011 were asked about their sources for traffic information. Of the respondents who were familiar with the current I-94 work zone, television and radio were the most frequently cited information sources (45% each). Newspapers were cited as travel information sources by 17% of respondents; and the project website was mentioned by 15%. Only 1% of respondents had gotten their information from the 511 system. Radio (75%) and television (68%) were also the most frequently used sources that respondents had used in the past for traffic

information; the WisDOT website and specific project websites were the next most frequent (37% and 30% respectively); 5% had used the 511 website, and 1% had used the 511 telephone line. The large numbers of respondents who owned computers (85%), smart phones (49%), cell phones (41%), and GPS systems (35%) indicate potential for increased dissemination of traffic information via these media. (Liu, 2011)

Past Driving Experiences

Travelers' past experiences with roadway disruptions or congestion and with the use of real-time traffic information will affect their awareness of potential traffic situations that could cause delays, their awareness and perception of available alternate routes, and their awareness and perception of traffic information sources and messages. As mentioned previously, commercial truck drivers were observed to make decisions about potential routes based on their perceptions of the relative speeds and overall travel times on each route, based in part on their past experiences with various routes. (Kornhauser, 2005)

Past experience also influences drivers' use of travel information. Drivers tend to learn about the characteristics of available traveler information and to adapt their preferences based on their experiences with the information. (Karl & Bechervaise, 2003) The Seattle study found that travelers who do not customarily use ATIS tend to be more skeptical about its accuracy and benefits than travelers who regularly use it; the study recommended marketing efforts that are designed to encourage first-time use of ATIS information by non-users. (Conquest, Spyridakis, Haselkorn, & Barfield, 1993) Continued use of travel information, however, is also dependent on past experience; drivers who have used real-time traffic information and perceived it to be insufficiently accurate will be more likely to ignore that information in the future, while drivers who have had favorable experiences with traffic information are more likely to act on traffic information messages. (Kantowitz, Hanowski, & Kantowitz, Driver Acceptance of Unreliable Traffic Information in Familiar and Unfamiliar Settings, 1997a) (Kantowitz, Hanowski, & Kantowitz, 1997b)

Highway Characteristics

Highway or roadway characteristics can include the availability and number of potential route choices; roadway types, length, and surroundings; and elements ranging from traffic lights to work zones to traffic volumes that can affect travel time on the primary route and/or a potential alternate route.

Drivers surveyed in Chicago tended to be unwilling to divert to an alternate route if that route was unfamiliar to them, if it traveled through unsafe neighborhoods, or if it had traffic stops or traffic congestion that would make the trip longer or less convenient. (Khattak, Koppelman, & Schofer, 1993) Lappin & Bottom(2001) concluded, based on analysis of dozens of prior studies, that drivers overall tend to have a bias favoring the route they are currently following, making them reluctant to divert to a new route; this reluctance increases if the alternate route follows a significantly different path than the route they are already on. This review of prior studies also found that drivers who are advised by traveler information sources to switch routes are more likely to switch from a non-freeway roadway to a freeway than to switch from a freeway to a non-freeway.

Comparisons of drivers' behavioral responses to en route traffic information showed that drivers in Chicago tended to have more knowledge about alternate routes in their area and a higher propensity to divert to an alternate route, compared to those in San Francisco. These differences may be due in part to the greater number of potential alternate routes in Chicago's roadway network, as compared to the roadway network in San Francisco. (Khattak & Khattak, 1998)

In the three surveys of I-94 and I-90 travelers conducted by the University of Wisconsin-Milwaukee, the most frequent reasons given by respondents for using an alternate route to divert around highway work zones were an expectation of a long delay on the primary route, easy access to an alternate route, and expectation of the alternate route being faster. This was consistent across all three survey sites (Milwaukee, Tomah, and Portage), though only seven of the Portage respondents and one Tomah respondent answered this question. (Liu, 2011)

The most frequent reasons given by Milwaukee-area travelers (mostly local commuters) for choosing NOT to divert to an alternate route related to a too-small expected time savings associated with diverting; only 15% of survey respondents said they were unfamiliar with an alternate route, and 11% cited a lack of guidance on the alternate route(s). Responses among the Tomah-area respondents (mixture of commuters and leisure travelers) were similar, with 43% stating that speeds on the primary route were acceptable and 17% stating that they were unfamiliar with an alternate route. For the Portage respondents (mostly leisure travelers), unfamiliarity with an alternate route around the work zone was the most frequently stated reason (43% of respondents) for not diverting. (Liu, 2011)

A study of driver reactions to DMS messages in Richmond, Virginia found that major disruptions such as multiple lane closures and/or a major incident made the use of an alternate route more likely than a small incident or a single lane closure.(Schroeder & Demetsky, 2010)

Information Characteristics

A number of studies have examined the effects of various types of traveler information on a driver's propensity to divert. Most of the studies have found that drivers in general are most likely to respond to information describing significant delays on their primary route. However, some caveats apply. Information or messages that drivers do not find credible (because it is not supported by what they can see on the road, and/or because they did not find past information from the same source to be accurate) are likely to be ignored. Drivers are also more likely to act on traffic information and recommendations that address a nearby or immediate problem – such as an approaching congested area of the road they're traveling – rather than more vague recommendations about future driving actions. (Lappin & Bottom, 2001)

Pre-Trip Information

Studies of advanced traveler information preferences among drivers have concluded that drivers are more likely to use an alternate route if they receive pre-trip information about significant delays on their primary route. (Polydoropoulou, Ben-Akiva, Khattak, & Lauprete, 1996) (FHWA, 2005) An evaluation of the Washington State DOT's 511 travel information system in 2005 found that 21 percent of

respondents indicated willingness to change their original travel plans based on pre-trip travel time information. (PRR, Inc., 2005)

A study of travel information preferences among drivers in Michigan classified trips into three categories: commute trips, non-work trips in familiar areas, and travel in an unfamiliar area. In contrast to commuters, who valued information about delay times most highly, drivers making non-work trips in familiar areas were most interested in information about the condition and repair of a potential alternate route. Drivers traveling in unfamiliar areas were far more interested in the availability of directions for an alternate route, compared to the other two groups. (Wallace & Streff, 1993) While these types of information could conceivably be delivered as en route information, it is also likely that drivers who are interested in route directions and in the condition of a potential route might seek this type of information prior to departure.

En Route Information

A survey of 596 drivers in the Netherlands in 2005-2006 found that, in general, the top three types of travel information preferred were (1) advice about which route is likely to be fastest, (2) information about a traffic congestion event (location, length, cause of congestion, expected duration), and (3) expected time of arrival for a given route. (Muizelaar & van Arem, 2005)

Information on Delay and Time Savings. For many drivers, diverting to an alternate route is more likely if they receive information about long delays on their primary route. (Khattak, Schofer, & Koppelman, 1993) A closely related piece of travel information is the travel time that may be saved on an alternate route. In two surveys of Minnesota drivers (conducted after the collapse and subsequent rebuilding of a bridge on I-35 altered traffic patterns in the area), the two most frequently-stated reasons for changing to an alternate route were a shorter travel time on the alternate route or a more reliable travel time on the alternate route. The most frequent reasons for NOT changing from a current or preferred route were the driver's belief that alternate routes were not likely to be better, the time and effort needed to try alternate routes, and the absence of alternate routes that serve the driver's destination. (Carrion-Madera, Levinson, & Harder, 2011)

An evaluation of DMS messages at a "Smart Work Zone" on I-95 in North Carolina examined the percentage of drivers who diverted to an alternate route when various messages were displayed. The study found that drivers were more likely to divert to the alternate route when DMS messages included specific information about the amount of delay on I-95 and about the road to use as an alternate route , e.g. "Traffic Stopped Ahead; 30 Minute Delay; Use Exit 50 as Alt". (Bushman, Berthelot, & Chan, 2004)

Drivers tend to be more likely to divert if they receive information from radio reports about delays on their primary route, versus relying only on their own perception of delays from on-road observation. (Khattak, Schofer, & Koppelman, 1993) Lappin, et al (2001) concluded that "one minute of delay mentioned in a VMS message has the same effect, in terms of affecting path choice decisions, as 1.75 minutes of actual delay in driving time."

Additional Information: Cause of Delay and Alternate Route Recommendations. An evaluation of the effects of displaying travel times on freeways in the San Francisco Bay Area found that most drivers

would divert from their preferred route only for accidents, extraordinarily heavy traffic, or road closures – even when provided with travel time information via dynamic message signs (DMS). (Li, Ban, & Skabardonis, 2010) Delays due to an incident (non-recurring) were more likely to cause drivers to divert than delays due to recurrent traffic congestion in two Chicago studies. (Khattak, Koppelman, & Schofer, 1993)(Khattak, Schofer, & Koppelman, 1993)

A study of driver reactions to DMS messages in Richmond, Virginia resulted in similar findings: major disruptions such as multiple lane closures and/or a major incident made the use of an alternate route more likely than a small incident or a single lane closure. The Richmond, Virginia study also found the highest rate of diversions to an alternate route when DMS messages provided specific information on delays/travel times and the reason for the delay, as well as naming the roadway that could be used as an alternate route. This study also found that spelling out "alternate" produced more diversions to the alternate route than did the use of the abbreviation "ALT." (Schroeder & Demetsky, 2010)

Lappin et al concluded from a review of several prior route diversion studies that drivers are most likely to comply with sign or other messages that combine information about the expected delay plus a recommended action by the driver (e.g., to divert to an alternate route). The second highest driver compliance rate is for messages that provide information about delay or road conditions without specific recommendations, and the lowest rate is for messages that provide recommendations without supporting information. (Lappin & Bottom, 2001)

Traveler Information Preferences

Surveys in the late 1990s of both private and commercial drivers found that both groups valued alternate route information in the event of road construction, traffic incidents, or other congestion, provided the information was accurate and current. (Lappin & Bottom, 2001) Survey of drivers in Netherlands in 2005 showed that the preference for traffic information changes according to a driver's situation, travel motives, knowledge and personal characteristics. A substantial portion (40%) of drivers surveyed indicated that they would not seek out traffic information at all; for the 60% who would use traffic information to help make travel decisions (including route), the three factors that were ranked as most important to users about the information were the cost of obtaining the information, followed by the information's reliability, and then the information's timeliness. The same survey also indicated that three most-preferred types of traffic information are advice on the fastest route towards a given destination; the location, length, cause and expected duration of traffic jams on the overall roadway network; and the expected time of arrival along a given route with an error margin of 5%. These vary in importance according to trip purpose and various user characteristics. Therefore, the ability to personalize the traffic information according to user specifications is important. (Muizelaar & van Arem, Driver preferences for traffic information contents and characteristics., 2006)

Focus group discussions with truck and bus operators in 1991 found preferences for traffic information that reflect the particular travel concerns of these commercial drivers. In addition to information on construction, traffic incidents, lane and bridge closures that could affect travel times, the commercial drivers also wanted to know about the details of potential alternate routes that were legal and navigable for large vehicles (i.e. free of barriers such as low bridges and road weight restrictions).

Commercial drivers were also interested in information about severe weather, fog conditions, and potential black ice along their route. (Tsai, 1991)

Road User Segments

Based on the results of the literature review, the research team and the Technical Oversight Committee selected the following user segments to be recruited for Task 3 focus groups:

Commuters in both urban and rural areas of Wisconsin. Because the literature indicated that urban and rural residents differ in their decisions to divert to alternate routes, it was decided to conduct one focus group in the small town of Lake Mills and another in Waukesha, on the outskirts of the Milwaukee metropolitan area. Focus group recruiting would screen potential participants to include people who regularly drove on the state highway system. A balance of men and women and of older and younger drivers would be sought during recruiting, since past studies also show differences in route decision-making correlating to sex and age.

Recreational travelers in one of Wisconsin's resort areas. This focus group was planned in order to ask questions of travelers who would be likely to have recently traveled along an unfamiliar highway (or a less familiar highway than the one associated with their daily commute). The resort-area focus group proved to be infeasible, as it would have required the collaboration of resort owners and managers to recruit participants; the resorts that were contacted declined to participate. Instead, questions were added to the commuter focus group guide to address participants' decision processes when on vacation or other long trips that might involve unfamiliar roads.

Commercial drivers. Because both initial routing decisions and potential route diversions are much more complex for commercial drivers, a separate focus group was planned for this user group. The scheduled focus group had to be canceled unexpectedly due to an unforeseen conflict that affected many of the participants; instead, telephone and in-person interviews were conducted with a mix of drivers, driver supervisors, and logistics managers.

CHAPTER 4. FOCUS GROUPS AND COMMERCIAL DRIVER INTERVIEWS

The objective of Task 3 was to gather information about the kinds of travel information that Wisconsin travelers consider to be the most useful to their route planning and route diversion decisions, and the ways in which they would prefer to receive travel information both pre-trip and en route. Task 3 included focus group discussions with Wisconsin commuters in two cities, interviews with commercial drivers, and surveys of Wisconsin travelers and of commercial drivers. The focus group discussions and interviews are described in this chapter; the two surveys are the focus of Chapter 5.

Focus Group Results –Commuters

One commuter focus group was held in Lake Mills on the evening of July 11 and the second was held in Waukesha on the evening of July 12. The Lake Mills area was selected to represent a more rural setting; nearly all of the participants currently or formerly commuted regularly to either Madison or Milwaukee. The Lake Mills group included eight people; the Waukesha group included twelve. The Waukesha group was comprised of more urban commuters. More women than men volunteered to participate in both cities. Demographics of the two groups are summarized in Table 4.

Both groups discussed the criteria they use for selecting routes, their willingness to divert to alternate routes, and the information they use to make those decisions. The groups also discussed alternate routes that are recommended specifically by WisDOT, including those designated by alternate route signs; and their opinions regarding the information WisDOT currently provides concerning alternate routes/road conditions, as well as potential improvements to that information. The discussion guide used for the focus groups is included as Appendix A.

Table 4. Focus Group Demographics.

County of Residence	Gender	Age Group	Education Level	Smartphone	Regular Cell Phone	In-vehicle GPS
Lake Mills Focus Group						
Jefferson	F	21-30	Assoc. Degree	Y	N	N
Jefferson	F	21-30	College Graduate	Y	N	N
Rock	F	31-40	Adv. Degree	N	N	N
Jefferson	F	51-60	Assoc. Degree	N	Y	N
Jefferson	F	61-70	Adv. Degree	Y	N	Y
Jefferson	M	51-60	Adv. Degree	N	Y	N
Jefferson	M	61-70	Adv. Degree	Y	N	Y
Dane	M	70+	Voc. Degree	N	Y	Y
Waukesha Focus Group						
Milwaukee	F	18-20	GED	Y	N	N
Milwaukee	F	21-30	Adv. Degree	N	Y	N
Milwaukee	F	21-30	College graduate	Y	N	N
Milwaukee	F	31-40	College graduate	Y	N	N
Milwaukee	F	31-40	GED	Y	N	N
Waukesha	F	41-50	Adv. Degree	N	Y	N
Waukesha	F	51-60	Assoc. Degree	Y	N	N
Waukesha	F	51-60	College graduate	N	Y	Y
Waukesha	F	51-60	Tech Diploma	Y	N	N
Milwaukee	M	21-30	Adv. Degree	Y	Y	N
Milwaukee	M	31-40	College graduate	Y	N	N
Milwaukee	M	41-50	Some college	Y	N	Y

Route Selection for Commute Trips

Traffic congestion and travel speed were primary determining factors for route selection in both groups. Participants talked about finding the quickest way to work, and selecting routes and/or travel times that would help them to avoid traffic congestion. Most participants know more than one way to travel to work or other familiar destinations, and also have some familiarity with normal traffic patterns along their commute routes.

Safety is another major consideration, particularly with respect to winter weather conditions. Snow removal, safety in slippery/icy conditions, and likely traffic levels (particularly the likelihood of "dangerous drivers" on snow-covered roads) influences route choice. A few participants prefer

freeways to smaller roads because of the safety of a divided roadway or the presence of a wider roadway shoulder.

Over half the participants in each group will, regularly or occasionally, check roadway and traffic conditions before leaving for the office, and a few will check conditions before leaving the workplace for home. Information sources included the WisDOT website, television and radio traffic and weather reports, police scanners, CB radio, and smartphone apps.

Route Selection for Vacation/Long-Distance Trips

Route selection methods for long-distance and/or recreational trips varied across participants in both groups. Most participants use maps, an online mapping system, and/or an in-vehicle GPS system to plot out a route to an unfamiliar destination, though one older man in the Lake Mills group prefers to start driving and figure out a route along the way. A few participants will take the same route every time to a familiar vacation destination, but others enjoy varying the route.

Just under half the participants in both groups said that they will usually check their planned route for construction or weather-related problems before leaving. Sources for this information include the WisDOT website, radio stations, friends in other parts of the state, AAA, or local police departments. No one in either group had used the Wisconsin 511 website or phone number and only a few had heard about it.

Willingness to Take Alternate Routes

Overall, the Lake Mills participants expressed more willingness than the Waukesha participants to divert to an alternate route after a trip has begun. Part of this willingness may have to do with the relative availability of alternate routes; several Waukesha participants commented that they had fewer route options once they entered Milwaukee. Waukesha participants also appeared to be more accepting of congested traffic conditions, and less likely to assume that an alternate route would necessarily save time.

Both groups of participants were familiar with trailblazer signs designating alternate routes for Wisconsin highways, and distinguished between the orange alternate-route signs associated with construction and the “regular” alt-route trailblazers. One participant commented that it was sometimes too easy to miss a trailblazer sign and leave the alternate route without knowing it. Some in the Lake Mills group had seen the Madison-area “Blue Route” signs, but no one was sure what the signs meant; one participant said that during snowstorms, he has seen electronic message signs telling drivers to follow signs for the Blue Route. Likewise, no one in the Waukesha was sure what the “blue Route” signs designated.

Several participants in both groups commented that they might be more apt to find their own alternate route rather than follow a WisDOT designated route. Reasons included the concern that a recommended alternate route might become over-burdened with diverting traffic, uncertainty about where the route went in relation to a driver’s planned destination, and an assumption that a WisDOT-recommended route might be more circuitous than one a driver might choose, because of the need to accommodate commercial trucks.

Information Needs and Preferences

Nearly all participants expressed a desire to know about traffic, roadway, and weather conditions that could affect their trip. If encountering an unexpected delay en route, information that was considered important by most participants for deciding to divert to an alternate route included:

- the length of the expected delay on the original route,
- travel time on the original route (especially as compared to the normal travel time on that route),
- the time that the delay is expected to be resolved, and
- the cause of the delay, as a basis for judging the likely severity of the delay.

Other suggestions for useful information included the following:

- recommended exit numbers for diverting around a delay,
- one or more advance notifications prior to a diversion point,
- route planning assistance (pre-trip), and
- messages about special events that could affect traffic conditions.

Participants had varied responses to messages advising them to divert to a specified or unspecified alternate route. Some participants in both cities expressed a willingness to divert if advised, even without knowing anything specific about a potential alternate route. Others would require more information about a potential alternate route before diverting, such as the distance and/or endpoint of the alternate route, and the expected travel time on the alternate route (as compared to the travel time on the original route).

Some participants stated that advance publicity regarding upcoming construction will not substantially alter their route planning unless it's an unusually large/disruptive project over a short period of time; several commented that there is always lots of construction throughout the state during spring, summer and fall, and regard it as "business as usual." One Waukesha participant commented, however, that she will use information about large, heavily-advertised projects to plan out alternate routes in advance. Other participants noted past DOT efforts, including a postcard mail-out prior to a big project; one participant who works for a traffic engineering firm stated that he sends e-mails with project updates to a large list of subscribers, but the other participants in the group were unaware of this option.

Information Sources

All participants in both groups like the dynamic message signs (DMS) displaying travel times and incident information, and many would like to see even more of these signs along major roadways. Several participants also suggested additional messages (relating to several of the bulleted information requests above) to be displayed on DMS.

Several participants in both groups have seen road signs displaying Highway Advisory Radio (HAR) numbers. However, only one participant in each group had tuned in to HAR messages; the Lake Mills participant had turned to the station in response to a flashing HAR sign only to find the station's

recording malfunctioning, and the Waukesha participant felt that the recordings were difficult to understand, due to a poor "mechanical" voice and insufficient signal strength.

While no one in either group had used 511 services, several participants expressed interest in trying the 511 website or phone number after hearing a description of it. Similarly, the mention of smartphone traffic information apps and the WisDOT mobile website by one participant in the Lake Mills group and two participants in the Waukesha group sparked interest from other participants.

There was a mixed reaction to the suggestion of text messages as a means of delivering travel and traffic information. While some participants felt that it would be a useful way of receiving real-time updates, others were unwilling to risk the distraction of having messages "pushed" to them while they are on the road. One participant suggested a standardized number or numbers (perhaps a different number for each highway or area) to which a traveler could send a text and receive a traffic report on demand.

Commercial Driver Interviews

In lieu of a focus group representing commercial drivers, a series of in-person and telephone interviews were conducted with commercial shipping managers and owners, driver trainers, dispatch managers, and safety directors, most of whom are also current or former commercial drivers. A total of eight interviews were conducted.

Similar to the focus group discussions, the commercial driver interviews addressed the factors that commercial drivers consider when planning routes, information sources used pre-trip and en route, and information needed when considering a change to an alternate route. The full interview guide is included as Appendix B.

Route Selection

Interviewees were asked about the factors that commercial drivers consider when planning routes. The answers differed, as expected, depending on the nature of the load being carried.

Regular/Non-Permitted Loads. Drivers transporting standard-size, non-permitted loads tend to plan routes based primarily on cost-effectiveness, which usually translates to either the most direct route or a route that allows them to avoid traffic congestion or other obstructions. In many instances, companies have sophisticated software programs that provide their route planning. In these cases, very little deviation from the selected routes occurs.

If a load is time-sensitive, that can also affect route choice; for instance, a time-sensitive load may influence the selection of a toll road over a non-tolled facility. Drivers of company vehicles may also be more likely than owner-operators to select a tolled facility (since owner-operators have to pay tolls out of their profits for the trip). However, companies have been able to be more involved in route selection in recent years, due to the use of GPS; not only can GPS be used to confirm a shortest-distance route, it allows for more supervision of drivers while en route.

Drivers and dispatchers consider time of day, traffic patterns in major metropolitan areas, and construction. A driver that delivers to regular repeat customers will often develop "usual" routes and

will stick to them unless conditions dictate otherwise. A secondary route consideration is en route amenities for trucks, particularly for long-haul routes.

Oversize/Overweight/Permitted Loads. Route planning is a much more complex process for permitted loads. Depending on the oversize/overweight characteristics of the load, the driver and the shipping company must pre-determine a route that takes into account bridge heights, roadway weight limits, curve and cornering radii at roadway interchanges and intersections, lane widths, and other potential hazards or obstructions.

In some cases, a new route must be pre-driven in order for the driver or other company representative to survey the entire route and confirm that the permitted load will be able to navigate it. Among companies and drivers who carry both permitted and non-permitted loads, documentation of roadway suitability for permitted loads is sometimes performed while en route with non-permitted loads.

For loads that qualify under multi-use permits (and can be driven on any qualifying road), carriers are responsible for their own route planning. For loads that require a single-use permit, the exact route is specified as part of the permit and must be approved by WisDOT Motor Carrier Services.

Information Sources Used

Commercial drivers and trucking companies use a wide variety of information sources for route planning. Among the information sources mentioned by the interviewees were the following:

- state DOT websites, including the WisDOT website, for information about height/weight restrictions, road closures and construction, and real-time and historic traffic maps,
- state 511 systems, including Wi511, for construction news,
- computer-based tools for determining cost-effective routes,
- state DOT permitting departments, for recommendations and approval of routes for permitted loads,
- private-sector permitting firms/services, and
- other commercial drivers.

WisDOT's interactive webpage for oversize/overweight route planning (part of the OS/OW permit application site) was mentioned specifically by one interviewee as a useful tool; another commented that OS/OW information was not currently available online through WisDOT, so it is possible that not all commercial trucking companies are aware of this feature. Another interviewee commented on the usefulness of the Illinois DOT's map of bridge height and weight restrictions and construction locations, while noting that the Illinois DOT does not yet have information on all bridge heights along county roads in the state.

Individual drivers, as well as trucking companies, also make extensive use of past experience and knowledge about particular routes and route segments. New routes, including routes for permitted loads, are often initially "assembled" from roads and roadway segments that were used for previous similar trips and loads.

En Route Information and Alternate Routes

Trucks carrying regular size loads (no permit needed) and trucks traveling under multi-use permits generally can opt to change to an alternate route after a trip has begun; trucks traveling under a single-use permit do not usually have that option.

When drivers are legally able to divert to an alternate route (provided a suitable alternate route is available), they value en route information about traffic incidents or other delays, as long as news of a delay reaches them soon enough to allow a diversion. Commercial drivers frequently get real-time roadway information from other drivers; if one truck is caught up in congestion, the driver will often radio the news of the delay and location to dispatchers and to other drivers. Experienced drivers often know or can figure out potential alternate routes to get around roadway delays; inexperienced drivers will call in to dispatch offices for assistance. Dispatchers generally have access to the WisDOT and Wi511 websites and can advise drivers on potential alternate routes.

DMS are also useful sources of en route information, and some of the interviewees also mentioned the signs marking WisDOT's designated alternate routes. Traffic Incident Alerts are available from the Department of State Patrol (DSP), but currently no personalization/filtering by roadway name/number is possible, so a subscriber will get notifications from all over the state, sometimes up to 15 notifications per hour; for this reason, most commercial drivers do not subscribe to the notifications.

En route information is less valuable to drivers hauling permitted loads, since they have fewer (in the case of annual permits) or no options for diverting to an alternate route. Under a single-trip permit, if a delay is severe (i.e., a day or more), the driver or the company may consult WisDOT and/or the state patrol for possible detour options around the delay. In some cases, DSP officers may escort a permitted load on another road to get around an obstruction and back onto the permitted route. Otherwise, the driver will wait until the delay clears.

Information Needs and Preferred Sources

Interviewees commented favorably on the information that is currently provided by WisDOT's Motor Carrier Division, including the interactive routing information for permitted loads. One of the interviewees commented that the WisDOT website has become very useful and user-friendly, and that WisDOT's e-mail updates are also helpful.

Suggestions for other information that WisDOT could provide included the following:

- Up-to-date information on construction projects.
    - construction site dates, scheduling information and forecasts over next week to 10 days,
    - information on construction projects in adjacent states (would require coordination/communication between state DOTs about upcoming construction),
    - delay times associated with active projects,
    - maximum width dimensions on road construction sites (the interviewee who made this comment said that WisDOT already "does a pretty good job" providing this information on the website), and

    - more information on current and upcoming railroad crossing work, since those types of projects are likely to close smaller roads.
- Radio information and updates on roadway traffic and delays.
- Information about the expected length of delays (the cause of the delay was not considered to be as important).
- Bridge map or bridge log with height/weight restrictions, similar to the one provided by Illinois DOT.
- A commercial-driver section of the Wi511 website that would allow users to look up truck-related road restrictions and road conditions by area within the state. Drivers applying for load permits could input the areas in which they would be traveling to get a list of suitable roads.
- Online roadway information accessible via iPhone, iPad, and GPS systems.
- Real-time updates via text -to-voice messages (if text messaging is used at all).

Two categories of information – information on construction projects and roadway information specific to oversize/overweight trucks – were mentioned by at least one interviewee as being available on the WisDOT website, and were mentioned by others as information needs that are not currently provided by WisDOT.

CHAPTER 5. TRAVELER AND COMMERCIAL DRIVER SURVEYS

This chapter describes the two surveys conducted as the second part of Task 3 – one survey targeting Wisconsin travelers, and another targeting commercial drivers.

Traveler Survey - Procedures

Following the commuter focus groups, a survey was developed to further define the travel information sources that Wisconsin travelers currently use, the types of information they find most useful when planning routes and when considering alternate routes, and the ways in which they prefer to receive that information.

The survey was designed in both a hard-copy and an online format. TTI researchers conducted 250 surveys at three driver license offices in the Milwaukee area in August of 2012; 202 of these returned surveys were analyzed (48 of the returned surveys did not contain enough usable information to include in the analysis). The survey was also made available online from mid-August through mid-October, promoted via press releases and flyers; the online survey collected an additional 85 usable responses, for a total of 287.

Traveler Surveys - Results

The traveler survey was divided into five sections: demographic information, current general and travel-related information sources, travel information needs and preferences for familiar trips, travel information needs and preferences for unfamiliar trips, and potential future use of the Wisconsin 511 system. Table 5 provides an outline of the survey sections and questions. The complete survey is included as Appendix C.

Not every participant answered every question, so each question was first analyzed individually in order to consider the highest sample size per question. Further analysis was then conducted to compare results across selected questions, for example comparing current media usage across age groups. Survey results and analysis are summarized in this section; additional data tables are included in Appendix D.

During survey analysis, it was discovered that a portion of the responses to Questions 11, 12, 15, 16, 17, and 20 needed to be evaluated separately from the rest of the sample, due to anomalies in how some survey participants entered their responses. For these questions, both “conservative” and “expanded” scoring was conducted; the results summarized in the following sections focus on the conservative results for those six questions, and include descriptions of the conservative and expanded scoring methods. In general, the conservative and expanded results for these questions followed very similar trends. Both the conservative and expanded results are included in the data tables in Appendix D.

Table 5. Survey Outline.

Survey Section	Questions
Demographics	1. Sex (male/female) 2. Age range 3. State of residence
Current information sources	4. Use of communications/information media 5. Access to smartphone 6. Access to Internet 7. Knowledge of Wisconsin 511 system 8. Use of Wisconsin 511 system (online or telephone) 9. Frequency of 511 use 10. Current sources for travel information
Travel information needs and preferences for ***familiar*** trips	11. Useful roadway/delay information before trip* 12. Useful roadway/delay information en route* 13. Information needed to divert to an alternate route 14. Additional alternate route information (open-ended) 15. Preferred information sources*
Travel information needs and preferences for ***unfamiliar*** trips	16. Useful roadway/delay information before trip* 17. Useful roadway/delay information en route* 18. Information needed to divert to an alternate route 19. Additional alternate route information (open-ended) 20. Preferred information sources*
Future use of Wi511 system	21. Likelihood of using 511 for travel-related information 22. Likelihood of using 511 for alternate route information

**Conservative and expanded scoring conducted on responses to this question.*

Demographics and Information Source Usage

Questions 1 through 3 collected basic demographic information about the participants: age range, sex, and state of residence. Questions 4 through 10 asked respondents about their use of various types of information and communications media, their current sources of travel information, and their knowledge and use of Wisconsin's 511 service in particular.

Age and Sex. Of the 287 participants, approximately 56 percent were male, 43 percent were female, and one percent did not answer. The breakdown of participant ages is shown in Table 6.

Table 6. Survey Respondent Ages.

Age Range	% Male	% Female
18-30	13%	14%
31-40	11%	5%
41-50	16%	11%
51-60	11%	8%
61-70	6%	4%
71+	0%	1%

**2 participants did not respond*

State of Residence. Nearly all participants (280 out of the 284 who answered this question) are Wisconsin residents; other states that were represented in the sample included Illinois (one respondent), Pennsylvania (one respondent), and Minnesota (two respondents).

Use of Media. Respondents were asked about their use of various information and communications media in daily life. Response options were on a Likert scale from 1 (never) to 5 (all the time). E-mail and websites ranked the highest for frequent usage, averaging 4.0 across the 286 responses received for this question. Radio was next with a frequency rating of 3.9, followed by television (3.5), text messaging (3.4), newspapers and Facebook (average frequency rating of 2.8 for each). Twitter was least-frequently used, with an average frequency rating of 1.4. Figure 21 displays the average ratings for frequency of usage of the media/information sources named in the survey.

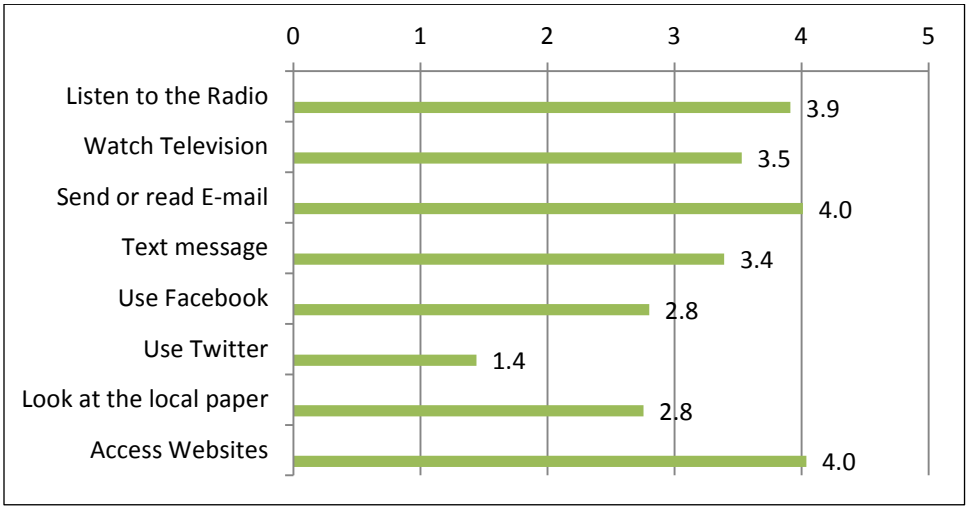


Figure 21. Respondents' average frequency of use of information sources (1="never" to 5="all the time").

Media use frequencies were then compared across five participant age groups (respondents aged 61-70 and 71+ were combined because of low numbers in these groups). When respondent age was taken into account, the following trends were observed in the average frequency of use reported by participants:

- "Listen to the Radio" – average frequency ratings remained nearly constant over all age groups, dipping only slightly for participants over 60.
- "Watch Television" -- average frequency ratings varied only slightly across age groups.

- "Send or read e-mail" – average frequency rating was somewhat lower for the youngest age group (3.94 for 18 to 30 year olds) than for the older groups (range from 4.27 to 4.48).
- "Text message" –frequency ratings for text-messaging differed significantly by age group, with 18-30 year olds averaging a frequency rating of 4.45. Average frequency ratings dropped to 3.52 for 31-40 year olds and 3.61 for 41-50 year olds, then decreased again to 2.96 for 51-60 year olds and to 1.91 for participants over 60.
- "Use Facebook" – similar to text messaging, average frequency ratings decreased with age of participants, with 18-30 year olds reporting the highest average rating (3.82) and participants over 60 reporting the lowest (2.09).
- "Use Twitter" – average frequency rating was low across all age groups, with 18-30 year olds reporting the highest average rating of 2.03; ratings for the other age groups ranged from 1.52 to 1.00.
- "Look at the local paper" – Average frequency ratings increased with participant age. Participants aged 18-30 averaged a frequency rating of 2.33, while the oldest participants (over 60) averaged a rating of 3.45.
- "Access websites" – Average ratings were high across all age groups, ranging from 4.00 (participants aged 41-50 and over 60) to 4.48 (18-30 year olds).

Radio, television, e-mail and websites are the media types that were most frequently used by all age groups. E-mail usage declined slightly among 18-30 year olds.

Figure 22 summarizes the average frequency ratings for radio, television, e-mail and websites across age groups; these are the media types that ranked relatively high across all age groups (with e-mail usage decreasing slightly among 18-30 year olds). Figure 23 summarizes the average frequency ratings for text messaging, Facebook, Twitter, and newspapers; these are the media types whose average ratings trended more sharply up or down with participant age.

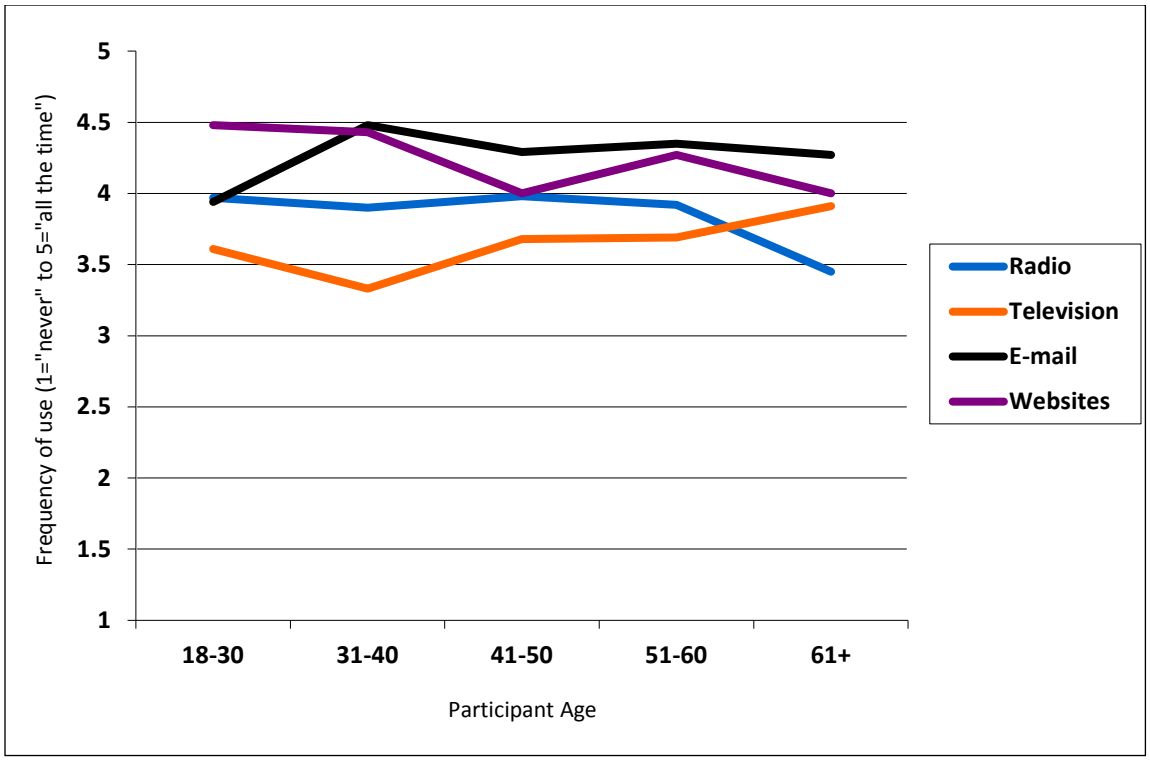


Figure 22. Frequency of use of radio, television, e-mail, websites across age groups.

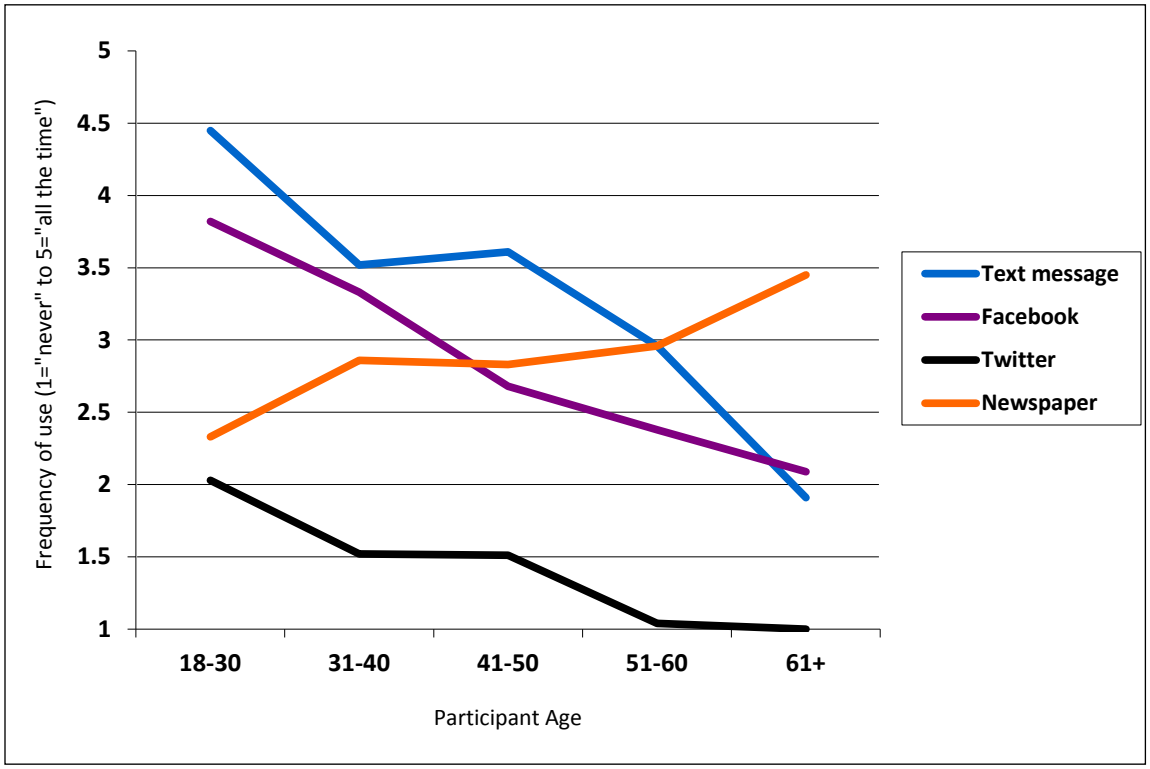


Figure 23. Frequency of use of text messaging, Facebook, Twitter, newspapers across age groups.

Online Access. Almost 60 percent of respondents indicated that they own a smartphone, and a total of 96 percent indicated that they have access to the Internet at home (28 percent), work (three percent), or both (64 percent). Figure 24 summarizes smartphone ownership by age group.

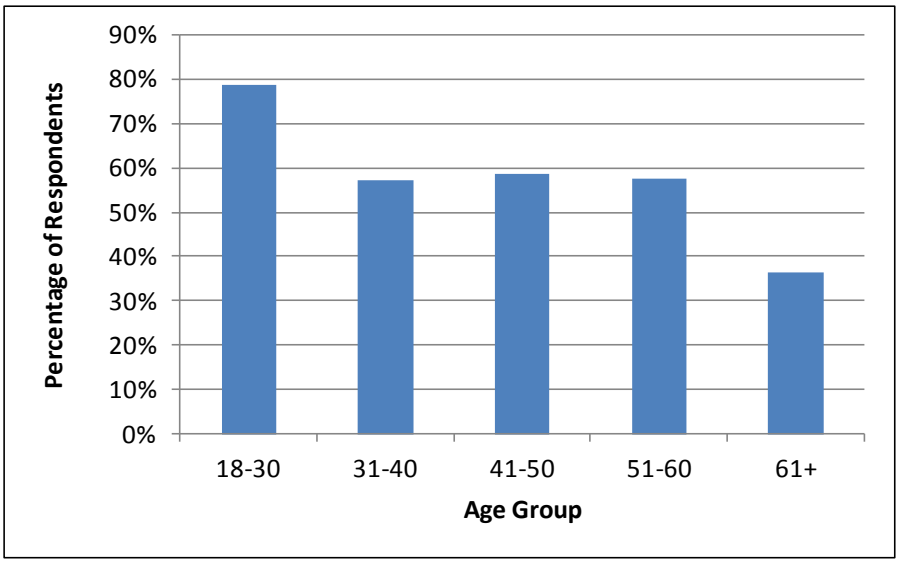


Figure 24. Smartphone ownership by age group.

Travel Information Sources

Participants were asked three questions about their current sources for travel and roadway information. The first two questions addressed respondents' knowledge of and use of Wisconsin's 511 website and telephone system. Approximately 32 percent of respondents had heard of Wi511, but only 14 percent had used either the Wi511 website or phone number, and among those who most often reported using 511, the reported frequency was generally once a month or less.

Participants were then asked to indicate all of the information sources they currently use to find travel information. The most common source used was travel websites other than the DOT or 511 website, followed by road signs. Approximately 49 percent of respondents selected "other source" as one of their answers, but only a few of these specified the source: nine respondents mentioned using a printed map or atlas and four respondents consult the American Automobile Association's (AAA) travel information services. The remaining "other" information sources mentioned, by one respondent each, were the National Weather Service, "word of mouth," roadway construction brochures, DOT-provided bicycle maps, and citizens-band (CB) radio. Figure 25 shows the percentages of respondents who indicated that they get travel information from each of the listed sources. Because respondents could select more than one response to this question, percentages total greater than 100.

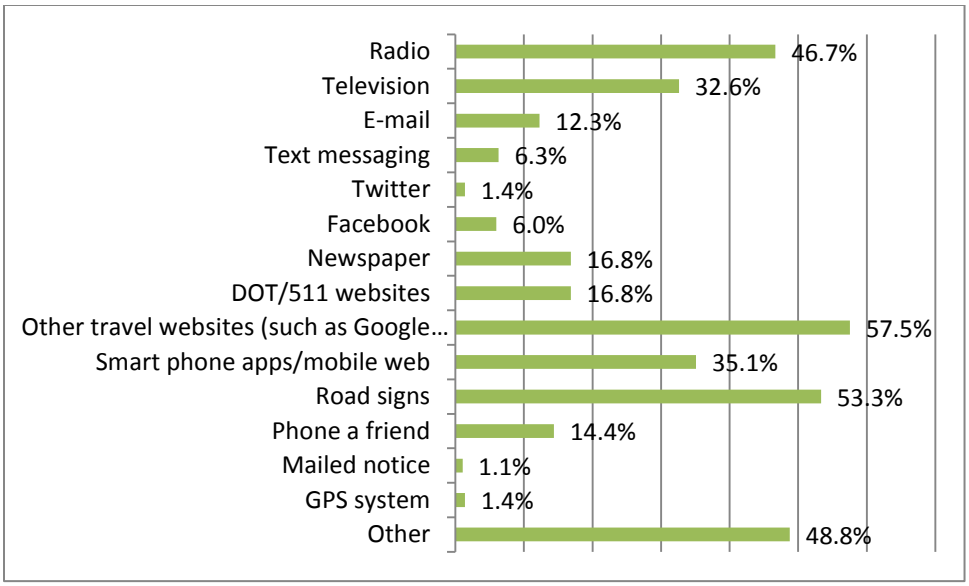


Figure 25. Respondents' Sources for Travel Information.

Some differences were seen when comparing current travel information sources used by men versus women, and by respondents who completed the survey online versus those who completed the survey on paper.

Notable differences in responses between men and women responding to the survey included the following:

- Women selected “other travel websites such as Google Maps or Mapquest” much more frequently than men did (69 percent of women, 48 percent of men).
- Men selected “DOT/511 websites” more frequently than women did (21 percent of men, 12 percent of women).
- Men were more likely to select “e-mail” (15 percent of men, 9 percent of women).
- Women were more likely to select “phone a friend” (18 percent of women, 12 percent of men).

Notable differences in responses between online respondents and on-paper respondents included the following:

- Online respondents were far more likely to select “DOT/511 websites” as a current travel information source (46 percent of online respondents versus 5 percent of on-paper respondents). Part of the reason for this difference may be the advertisement of the survey on the WisDOT website.
- On-paper survey respondents were more likely to select “smart-phone apps/mobile web” (39 percent of on-paper respondents versus 26 percent of online respondents).
- Online respondents selected “road signs” more frequently than on-paper respondents (61 percent of online respondents, 50 percent of on-paper respondents)
- On-paper respondents selected “phone a friend” more frequently than online respondents (18 percent of on-paper respondents, 7 percent of online respondents).

Travel Information Needs and Preferences

Questions 11 through 20 addressed participants' information needs pertaining to route planning and alternate routes, as well as their preferred sources for information. Questions 11 through 15 were identical to Questions 16 through 20, with the first group of questions addressing trips/routes that are familiar to respondents and the second group addressing trips/routes that are unfamiliar to respondents.

Prior to Question 11, the survey instrument provided participants with the following introduction to the section:

> *"For Questions 11 through 15, imagine that you're going to take a trip that you take frequently, in an area that you know well (for instance, a trip from home to work). For these questions, assume that you are **familiar** with the area in which you are traveling."*

Prior to Question 16, the survey instrument provided participants with another introductory paragraph:

> *"For Questions 16 through 20, imagine that you're going to take a trip to a destination that is **unfamiliar**, or that you don't travel to very often (such as a vacation trip to a different part of the state). These questions will be like the ones you answered in the previous section, but now imagine that you are **NOT familiar** with the area in which you are traveling."*

The results sections below will compare participants' answers to each of the five questions for familiar and unfamiliar trips.

What information do drivers want about a delay? Questions 11 (familiar trips) and 16 (unfamiliar trips) asked "If the route that you plan to take for your trip is going to be delayed because of traffic or roadway conditions, what information would be most useful to have BEFORE you start your trip?" Participants were asked to rank the following answer options from 1 to 6, with 1 being the most useful information and 6 being the least useful information:

- amount of delay on your usual route,
- travel time on your usual route,
- cause of delay on your usual route,
- message saying "Take an alternate route",
- recommendation of a specific alternate route, and
- travel time on a recommended alternate route.

The second question in each group presented the same answer options for ranking, but asked respondents what information would be most useful to have **after they had already started their trip.**

Question Scoring. For scoring purposes, each respondent's top-ranked information type was given six points, their second-ranked selection five points, and so on down to 1 point for their 6th-ranked selection.

Expanded Scoring. Some respondents who had completed the survey on paper (rather than online) had mistakenly rated the usefulness each of the six types of information separately on a scale of one to six, rather than ranking the list from most to least useful as instructed. In these cases, instead of each type of information receiving a different score from 1 to 6, "rated" lists of answers to these questions included multiples of one or more scoring values (e.g., the six types of information might be scored by a respondent as "6, 6, 3, 3, 1, 1" instead of a ranked "6, 5, 4, 3, 2, 1"). For this reason, two scoring calculations were conducted for these questions. "Conservative" scoring of the questions was based solely on responses in which respondents ranked the six types of information as instructed, with each information type receiving a different score from 1 to 6. "Expanded" scoring added the rated responses (in which two or more of the six options received the same numerical score) to the ranked responses and figured them into the average scores. Calculations based on expanded scoring followed the same general trends as those based on conservative scoring, with expanded and conservative average scores usually differing by no more than 0.2 points.

Figure 26 compares the average participant rankings of all six types of information for familiar and unfamiliar trips, pre-trip and en route, based on conservative scoring (responses to Questions 11, 12, 16, and 17). Overall, the information ranked as most useful by participants was "amount of delay on your usual route," followed closely by "message saying 'take an alternate route'" and "recommendation of a specific alternate route". These two types of information were ranked as marginally more important when participants were considering unfamiliar trips versus familiar trips.

Overall, the information ranked as most useful by participants was "amount of delay on your usual route," followed closely by "message saying 'take an alternate route'" and "recommendation of a specific alternate route".

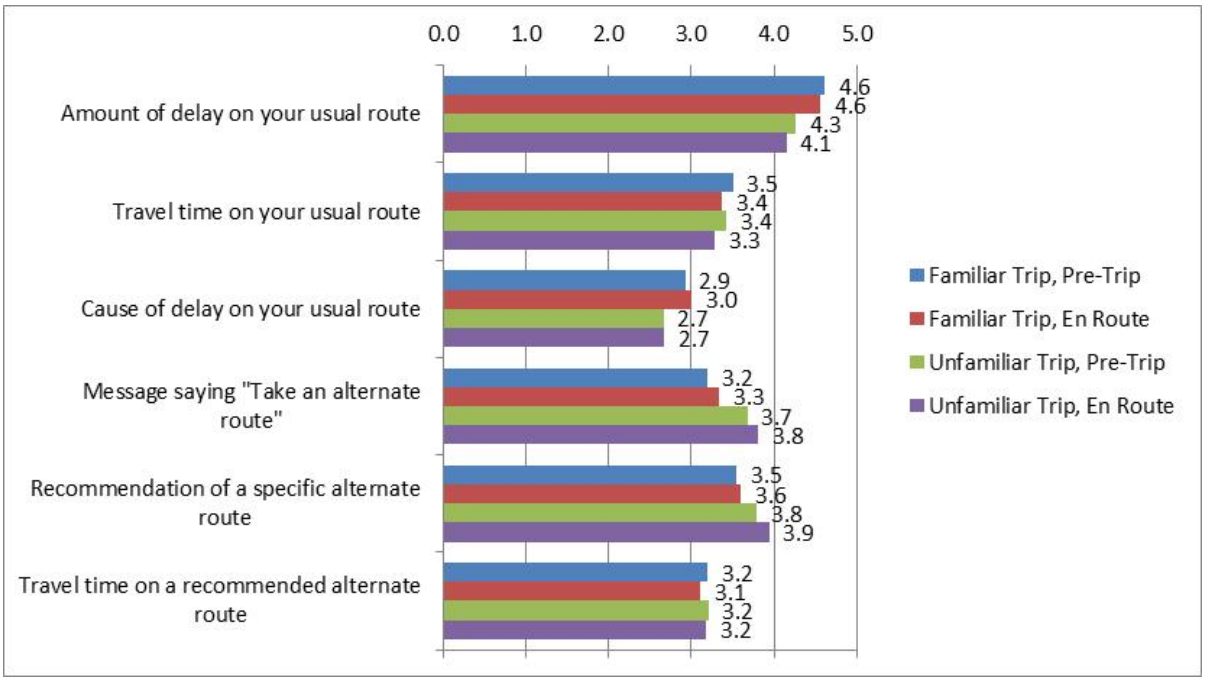


Figure 26. Travel delay and alternate route information preferences - average scores using conservative scoring.

What information do drivers want about an alternate route? The third question in each group asked for both "familiar" and "unfamiliar" trips (Questions 13 and 18) focused particularly on alternate routes. Respondents were presented with the following list and asked "what information must you have before you leave your usual route to take an alternate route?"

- name of road(s) included in the alternate route,
- distance of the alternate route,
- turn-by-turn directions for the alternate route,
- travel speed along the alternate route,
- map of the alternate route,
- travel time on the alternate route,
- gas stations, cities, other amenities along the alternate route,
- what the problem or cause of delay is on your usual route, where the problem is on your usual route, and
- how long the delay on your usual route will last.

Again, although the question instructed respondents to rank their top three choices from the list, some respondents who completed the survey on paper entered numbers or symbols other than "1, 2, 3" to indicate their selections.

Question Scoring. Responses to this question were given weights of three points for a first choice, two points for a second choice, and one point for a third choice. As with the previous ranking questions, some respondents did not provide answers in the prescribed format. "Conservative" scoring for the responses to this question considered only the responses with three or fewer ranked choices;

"expanded" scoring included responses in which all three choices were marked "1," as well as responses in which selections were marked with an "x" or other symbol (these were each given weights of three points if there was no other indication of preference order). Figure 27 summarizes the average points respondents gave to each type of alternate-route information.

Because participants were asked to choose only three types of information from a list of ten options, point averages across the possible responses are lower overall.

On familiar trips, the most important information when deciding whether to divert was "how long the delay on your usual route will last" and "travel time on the alternate route."

For familiar trips, "how long the delay on your usual route will last" and "travel time on the alternate route" received the two highest average scores (using both conservative and expanded scoring). For unfamiliar trips, the highest scores (again, using both conservative and expanded scoring) were for "turn-by-turn directions for the alternate route" and "map of the alternate route." For both familiar and unfamiliar trips, "travel time on the alternate route" and "distance of the alternate route" are considered more important on average than "travel speed along the alternate route." Table 7 compares the average scores (using the conservative scoring method) and overall preference rankings of alternate-route information needs for familiar versus unfamiliar trips.

On unfamiliar trips, the most important alternate route information was "turn-by-turn directions for the alternate route" and "map of the alternate route."

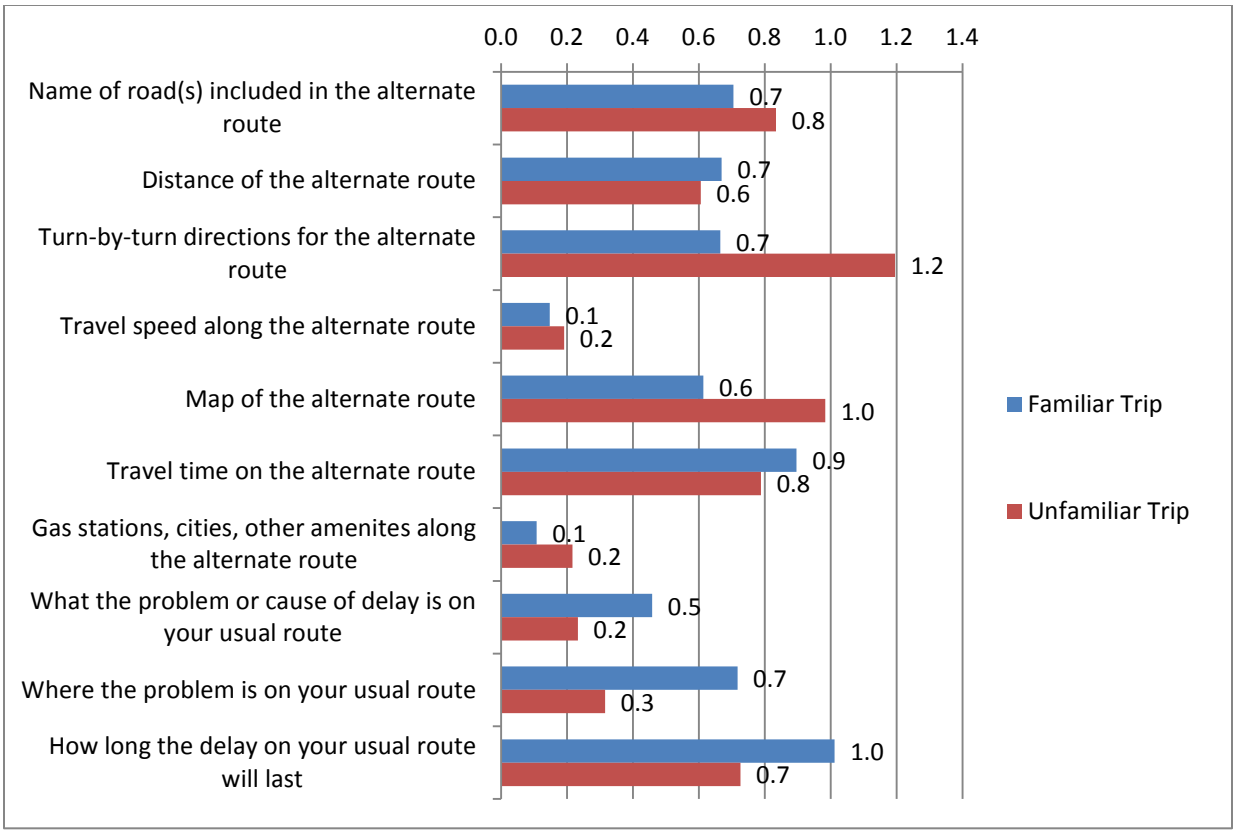


Figure 27. Average preference scores for alternate route information needs.

Table 7. Relative Rankings of Alternate Route Information Needs (Familiar vs. Unfamiliar Trips).

Familiar Trip	Avg Score	Unfamiliar Trip	Avg Score
How long the delay on your usual route will last	1.0	Turn-by-turn directions for the alternate route	1.2
Travel time on the alternate route	0.9	Map of the alternate route	1.0
Name of road(s) included in the alternate route	0.7	Name of road(s) included in the alternate route	0.8
Distance of the alternate route	0.7	Travel time on the alternate route	0.8
Turn-by-turn directions for the alternate route	0.7	How long the delay on your usual route will last	0.7
Where the problem is on your usual route	0.7	Distance of the alternate route	0.6
Map of the alternate route	0.6	Where the problem is on your usual route	0.3
What the problem or cause of delay is on your usual route	0.5	What the problem or cause of delay is on your usual route	0.2
Travel speed along the alternate route	0.1	Travel speed along the alternate route	0.2
Gas stations, cities, other amenities along the alternate route	0.1	Gas stations, cities, other amenities along the alternate route	0.2

When comparing responses to Question 13 (alternate route information needs for ***familiar*** trips) between the online and on-paper respondents, three differences stood out:

- On-paper respondents ranked "Turn-by-turn directions for the alternate route" higher than online respondents (0.9 on-paper versus 0.2 online).
- On-paper respondents ranked "What the problem or cause of delay is on your usual route" lower than online respondents (0.3 on-paper versus 0.7 online).
- On-paper respondents ranked "Where the problem is on your usual route" lower than online respondents (0.4 paper versus 1.3 online).

For ***unfamiliar*** trips, on-paper respondents ranked "Turn-by-turn directions for the alternate route" higher than online respondents, (1.4 versus 0.7); other responses were similar between the two groups.

Similar differences were seen between men and women (62 percent of online respondents were men, versus 53 percent of on-paper respondents, which may help to explain the parallel differences in responses):

- Women ranked "Turn-by-turn directions for the alternate route" higher than men for familiar trips (0.9 for women versus 0.2 for men) and for unfamiliar trips (1.4 for women versus 0.7 for men).
- Men ranked "Map of the alternate route" higher than women for familiar trips (0.7 for men, 0.4 for women).
- Men ranked "What the problem or cause of delay is on your usual route" slightly higher than women for familiar trips (0.6 for men versus 0.3 for women).

A fourth question (Question 14 in the "familiar trips" section and Question 19 in the "unfamiliar trips" section invited participants to add other suggestions for information they would like to have about a potential alternate route. Forty-three respondents provided open-ended responses to Question 14 (additional alternate route information for familiar trips) and 26 respondents provided answers to Question 19 (additional alternate route information for unfamiliar trips). Representative responses received to these questions are listed in Table 8.

Table 8. Additional Information about Alternate Routes - Open-Ended Responses.

Additional Information about an Alternate Route (Familiar Trips)	Additional Information about an Alternate Route (Unfamiliar Trips)
• Road conditions on the alternate route, including pavement type/quality, roadway width, speed limits, use of roundabouts, and traffic conditions • Where the alternate route starts and ends; i.e., where the alternate route leaves and returns to the original route • Whether there is more than one alternate route • Whether local traffic can use the alternate route • Available transit options • Visual cues and landmarks along the alternate route • Whether the route is residential or a thoroughfare • Travel times between major destinations • Where (at what intersection) the delay is occurring on the original route	• Whether more than one alternate route is available; "alternate" alternate route to recover from missed or wrong turns • Road conditions on the alternate route, including pavement type/quality, roadway width, speed limits, use of roundabouts, and traffic conditions • How far out of the way the alternate route will travel off of the original route • Where the alternate route starts and stops • Map showing the location of the problem/delay and the route options • Whether the route is safe and well lit, particularly in an urban area • Travel time to a named destination

What information source would be the best for different information types? Question 15 (familiar trips) and Question 20 (unfamiliar trips) listed the same six types of roadway information that

respondents had ranked in Questions 11, 12, 16, and 17, and asked respondents to select the source that would best provide each type of information before and during a trip. Table 24 through Table 29 in Appendix D present the percentage of respondents who selected each of the listed information sources as their preferred option for each type of information. Some respondents selected more than one preferred source for a given information type. For this question, "conservative" scoring includes only the first source listed by each respondent and "expanded" scoring includes any additional responses.

For most types of pre-trip information, participants tended to favor radio, television, and text-messaging. Radio, road signs, and information delivered via a GPS system were the most popular media for en route information.

(Example: if a respondent was asked "which information source would best provide the amount of delay on your current route?" and selected "DOT website, radio, television, and text messaging" in that order (indicated by the order in which they were entered into the open-ended answer blank in the survey instrument), conservative scoring would count only "DOT website" in the frequency percentages, while expanded scoring would count all four selections that were entered.) Tables summarizing responses regarding preferred information sources (familiar and unfamiliar trips, pre-trip and en route information) using both conservative and expanded scoring are included in Appendix D.

Pre-Trip. For most types of pre-trip information on travel delays and alternate routes, participants overall tended to favor radio, television, and text-messaging as communication media. Smartphone applications and travel websites were also favored by a number of participants, particularly for information regarding alternate routes on unfamiliar trips.

On-paper respondents, of whom 35 percent were 30 years of age or younger, were more likely to favor text messaging and smartphone applications for pre-trip information. Online respondents, who skewed slightly older, were more likely to favor television and websites for pre-trip information (with the exception of the "take an alternate route" message, where text messaging was the most popular medium for both groups). Differences between men and women regarding pre-trip media preferences were smaller and less consistent than the differences between on-paper and online respondents.

En Route. Radio, road signs, and information delivered via a GPS system were the most popular media for en route information, followed by smartphone applications and text messaging. On-paper respondents were more likely to favor GPS, while online respondents were more likely to favor road signs. There were few notable differences between men and women for en route information media.

Table 9 summarizes the most frequently preferred information sources for pre-trip information (based on conservative scoring). Table 10 summarizes the most frequently preferred information sources for en route information.

Table 9. Preferred Sources of Pre-Trip Information.

Information Type	Familiar Trips	Unfamiliar Trips
Amount of delay on your usual route	• Radio (21%) • Television (18%) • Text messaging (16%) • Other travel websites (e.g. Google Maps/Mapquest) (11%) • Smartphone apps/mobile web (11%)	• Radio (23%) • Text messaging (16%) • Television (15%) • Other travel websites (e.g. Google Maps/Mapquest) (13%) • Smartphone apps/mobile web (13%)
Travel time on your usual route	• Television (18%) • Radio (16%) • Text messaging (15%) • GPS system (14%) • Other travel websites (e.g. Google Maps/Mapquest) (11%)	• Text messaging (16%) • Radio (15%) • Television (15%) • Other travel websites (e.g. Google Maps/Mapquest) (14%) • GPS system (14%) • Smartphone apps/mobile web (13%)
Cause of delay on your usual route	• Television (24%) • Radio (18%) • Text messaging (15%) • DOT/511 website (9%) • Smartphone apps/mobile web (8%)	• Radio (18%) • Television (16%) • Text messaging (16%) • Smartphone apps/mobile web (13%) • Other travel websites (e.g. Google Maps/Mapquest) (10%)
Message saying "Take an alternate route"	• Text messaging (24%) • Television (15%) • Radio (13%) • Road signs (11%) • GPS system (9%) • E-mail (9%)	• Text messaging (21%) • Smartphone apps/mobile web (13%) • Road signs (12%) • GPS system (11%) • Radio (11%)
Recommendation of a specific alternate route	• Text messaging (19%) • Television (14%) • Radio (14%) • GPS system (13%) • Smartphone apps/mobile web (11%)	• Text messaging (17%) • Other travel websites (e.g. Google Maps/Mapquest) (16%) • Smartphone apps/mobile web (14%) • Radio (12%) • GPS system (11%) • Road signs (11%)
Travel time on a recommended alternate route	• Text messaging (16%) • Television (16%) • Radio (13%) • Smartphone apps/mobile web (12%) • Other travel websites (e.g. Google Maps/Mapquest) (11%)	• Text messaging (16%) • Smartphone apps/mobile web (15%) • Other travel websites (e.g. Google Maps/Mapquest) (15%) • GPS system (14%) • Radio (11%)

Table 10. Preferred Sources of En Route Information.

Information Type	Familiar Trips	Unfamiliar Trips
Amount of delay on your usual route	• Radio (43%) • Road signs (16%) • GPS system (16%) • Smartphone apps/mobile web (11%) • Text messaging (8%)	• Radio (39%) • Road signs (18%) • GPS system (17%) • Smartphone apps/mobile web (13%) • Text messaging (9%)
Travel time on your usual route	• Radio (38%) • GPS system (22%) • Road signs (16%) • Smartphone apps/mobile web (11%) • Text messaging (7%)	• Radio (32%) • GPS system (24%) • Road signs (15%) • Smartphone apps/mobile web (13%) • Text messaging (10%)
Cause of delay on your usual route	• Radio (43%) • Road signs (18%) • GPS system (11%) • Smartphone apps/mobile web (9%) • Text messaging (9%)	• Radio (39%) • Road signs (16%) • GPS system (14%) • Smartphone apps/mobile web (13%) • Text messaging (11%)
Message saying "Take an alternate route"	• Road signs (31%) • Radio (24%) • Text messaging (15%) • GPS system (15%) • Smartphone apps/mobile web (10%)	• Road signs (31%) • Radio (20%) • GPS system (17%) • Text messaging (15%) • Smartphone apps/mobile web (10%)
Recommendation of a specific alternate route	• Radio (28%) • GPS system (25%) • Road signs (22%) • Text messaging (10%) • Smartphone apps/mobile web (9%)	• GPS system (26%) • Radio (22%) • Road signs (22%) • Smartphone apps/mobile web (13%) • Text messaging (10%)
Travel time on a recommended alternate route	• Radio (27%) • GPS system (23%) • Road signs (23%) • Text messaging (10%) • Smartphone apps/mobile web (10%)	• GPS system (27%) • Radio (24%) • Road signs (19%) • Smartphone apps/mobile web (14%) • Text messaging (9%)

Future Use of 511 Sites

When shown a screen shot of the 511 website illustrating real time travel information on a map, participants indicated on a scale of 1 to 5 (with 1 being “not likely at all” and 5 being “very likely”) an average of 3.4 likelihood that they would use the website in the future to find travel-related information. Figure 28 displays the ratings for the 131 participants who answered this question, 50 of whom had indicated prior knowledge of the Wisconsin 511 system and 81 of whom had not known about Wi511 prior to the survey. On the same scale, when participants were shown a screen shot of the website showing a map of an alternate route for traveling around a roadway construction project,

participants indicated an average of 3.6 likelihood that they would use the site in the future to find information about alternate routes.

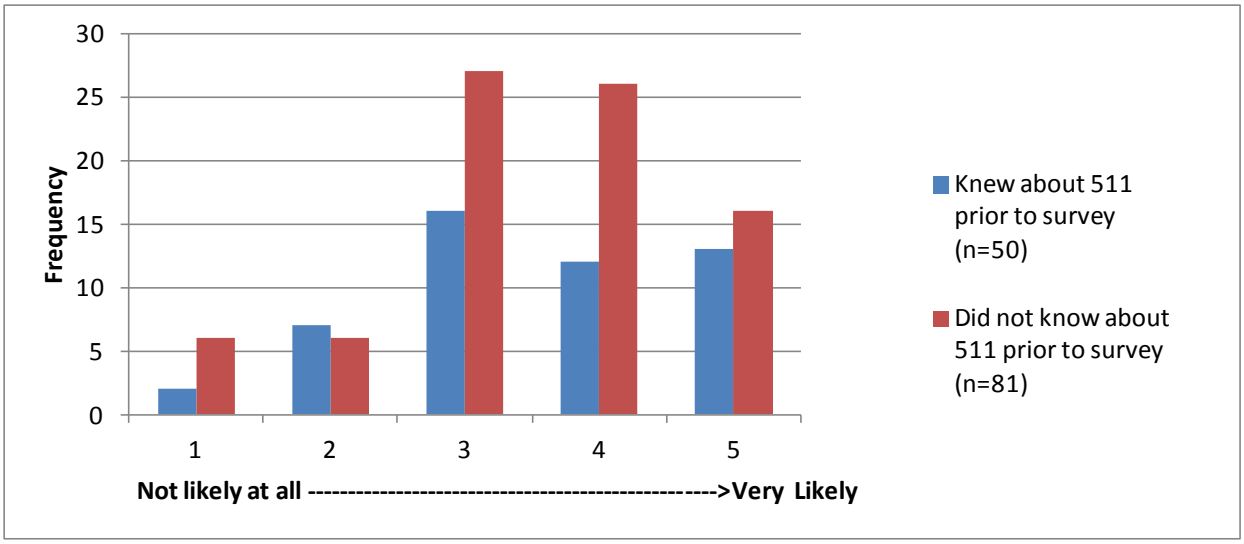


Figure 28. Future intent to use Wi511 for travel information.

Commercial Driver Survey- Procedures

A survey similar to the traveler information survey was developed for commercial drivers, modified to focus on routing methods and likely information needs that were discussed in the commercial driver interviews. Like the traveler survey, the commercial driver survey instrument was designed in both paper and online formats. Researchers collected 32 surveys on paper at the Waupun Truck-n-Show in August 2012, and the survey was made available online from mid-August through mid-October, promoted with press releases and flyers (which were also distributed at the Truck-n-Show) and via an announcement in the Wisconsin Motor Carrier Association newsletter. An additional seven surveys were collected online.

Of the 39 total surveys that were collected, three did not contain enough information to include in the analysis, so the analysis considered data from 36 participants. Because not every participant answered every question, each question was analyzed individually in order to consider the maximum possible sample size per question.

Commercial Driver Survey - Results

Table 11 provides an outline of the commercial driver survey questions. The complete survey is included as Appendix E. Survey results and analysis are summarized in this section; additional data tables for are included in Appendix F.

Table 11. Commercial Driver Survey Questions.

Survey Section	Questions
Demographics and media usage	1. Sex (male/female) 2. Age range 3. State of residence 4. What kinds of commercial driving do you do (or does your company do)? 5. What types of trips are most common? 6. Who determines the route? 7. Average route distance
Current information sources	8. Use of Wisconsin 511 traveler information system, or other WisDOT online information 9. Information obtained from WisDOT/511 websites 10. Current sources for travel information
Travel information needs and preferences	11. Useful roadway/delay information before trip* 12. Useful roadway/delay information en route* 13. Communication devices used 14. Information needed to divert to an alternate route 15. Additional alternate route information (open-ended) 16. Preferred information sources*

**Conservative and expanded scoring conducted on responses to this question.*

Demographics, Trip Characteristics, and Information Sources

Of the 36 participants, 34 identified themselves as male, one as female, and one did not specify gender. The breakdown in participant ages, for the 35 participants who answered this question, is shown in Table 12.

Table 12. Age Ranges of Commercial Driver Participants.

Age Breakdown	
18-30	8%
31-40	22%
41-50	28%
51-60	28%
61-70	8%
71+	6%

Twenty-four of the 36 participants identified Wisconsin as their state of residence. Eight participants are residents of Illinois, three are residents of Minnesota, and one is a resident of Florida.

Trip Characteristics. Question 4 asked participants to identify the types of commercial driving that they or their companies typically do: "superloads" or other permitted (oversize/overweight) loads, standard-

size long-haul loads, standard-size short haul loads, and/or local deliveries. Table 13 lists the percentages of participants who selected each of the response options. Because participants could select more than one response for this question, percentages total higher than 100.

Table 13. Commercial Driving Trip/Load Types.

What kinds of commercial driving do you do?	
Superloads/Permitted loads	22%
Standard long haul	67%
Standard short haul	64%
Local	36%

Question 5 further defined the types of commercial trips that participants typically drive by asking whether intra-city, intercity, or long-haul trips were most common for participants. This was intended to be a single-response answer (and the online participants were only able to select one answer to this question), but some participants who completed the survey on paper selected more than one answer. For this reason, the percentages in Table 14 do not add up to 100.

Table 14. Most Common Trips for Commercial Driver Participants.

What types of trips are the most common?	
Intra-city	22%
Inter-city	28%
Through/long-haul	75%

Question 6 asked whether the driver, the driver's company, or the driver and the company together determine the routes for commercial trips. Of the 35 participants who answered this question, 21 (60 percent) stated that the driver is responsible for choosing his/her route; eight answered that route selection is done primarily by the trucking company; and six answered that route planning is a mutual effort between the driver and the company. Table 15 summarizes the responses to this question.

Table 15. Route Selection Responsibility.

Who determines the route?	
The driver	60%
The driver's company	23%
The driver and his/her company	17%
n	35

Question 7 asked participants to estimate the average number of miles traveled per day on their usual commercial routes. Table 16 groups the 34 open-ended answers to this question into five distance categories.

Table 16. Average Distances Traveled.

Average Route Distance traveled per day	
0-100 miles	15%
101-500 miles	47%
501-1000 miles	18%
1001-2000 miles	12%
2000+ miles	9%
n	34

Travel Information Sources. Questions 8 and 9 addressed participants' current use of the Wisconsin 511 and WisDOT websites.

Fourteen of the 36 participants (39 percent) indicated that they use WisDOT's website and/or the Wi511 website for traffic or roadway information pertaining to their commercial routes. Table 17 summarizes the kinds of information that those participants reported obtaining from one of WisDOT's online sources. Because participants could select more than one answer, the percentages total more than 100.

Table 17. Information Accessed by Commercial Drivers on WisDOT or Wi511 Websites.

Information Accessed on WisDOT or Wi511 Website	
Map of truck routes	64%
Weigh station locations/contacts	21%
Information for OS/OW permits	36%
Seasonal weight restrictions	57%
Construction maps	79%
Traffic speed maps	50%
n	14

The travel information sources mentioned most frequently by commercial drivers were radio, road signs, the WisDOT/Wi511 website and other commercial drivers or dispatchers.

Question 10 asked participants about their current sources of route planning and travel information. Figure 29 summarizes the responses to this question. Because participants could select more than one answer, the percentages total more than 100. The travel information sources mentioned most frequently by survey participants were radio (56 percent of participants), road signs (47 percent), the WisDOT/Wi511 website (39 percent) and other commercial drivers or dispatchers (39 percent). GPS systems and other travel websites were mentioned by 36 percent and 33 percent of participants, respectively.

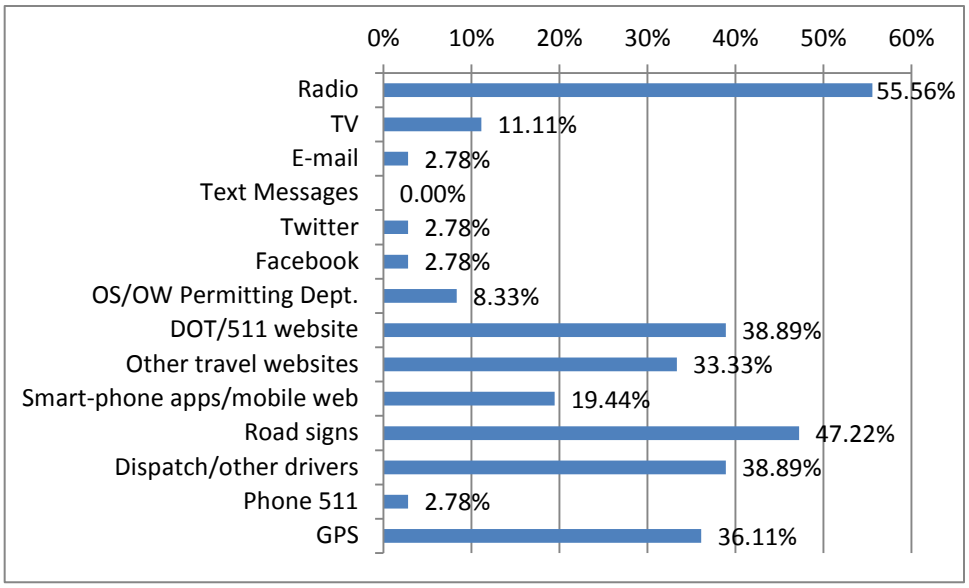


Figure 29. Travel Information Sources Used by Commercial Drivers.

As in the traveler survey, participants in the commercial driver survey were asked about communication devices that they normally use. Table 18 summarizes responses to this question (because participants could select more than answer, the percentages total more than 100).

Table 18. Communication Devices Used by Participants.

Which communication devices do you normally use? (select all that apply)	
Smart Phone	47%
Cell Phone	61%
Mobile Data Terminal/Mobile Computer	8%
Two-way Radio	53%
n	36

Travel Information Needs and Preferences—Commercial Drivers

What information do commercial drivers want about a delay? Question 12 asked "If the route that you plan to take for your trip is going to be delayed because of traffic or roadway conditions, what information would be most useful to have BEFORE you start your trip?" Participants were asked to rank the following answer options from 1 to 7, with 1 being the most useful information and 7 being the least useful information:

- amount of delay on your usual route,
- travel time on your usual route,
- cause of delay on your usual route,
- message saying "Take an alternate route",

- recommendation of a specific alternate route,
- travel time on a recommended alternate route, and
- truck restrictions on potential alternate route.

Question 13 presented the same answer options for ranking, but asked respondents what information would be most useful to have AFTER they had already started their trip.

Question Scoring. For scoring purposes, each respondent's top-ranked information type was given seven points, their second-ranked selection six points, and so on down to 1 point for their 7th-ranked selection.

Expanded Scoring. As in the travelers' survey, some respondents who completed the commercial drivers' survey on paper (rather than online) mistakenly rated the usefulness each of the six types of information separately on a scale of one to six, rather than ranking the list from most to least useful as instructed. In these cases, instead of each type of information receiving a different score from 1 to 7, "rated" lists of answers to these questions included multiples of one or more scoring values (e.g., the seven types of information might be scored by a respondent as "7, 7, 3, 3, 1, 1, 1" instead of a ranked "7, 6, 5, 4, 3, 2, 1"). For this reason, two scoring calculations were conducted for these questions. "Conservative" scoring of the questions was based solely on responses in which respondents ranked the seven types of information as instructed, with each information type receiving a different score from 1 to 7. "Expanded" scoring added the rated responses (in which two or more of the seven options received the same numerical score) to the ranked responses and figured them into the average scores. Average scores based on expanded scoring tended to run equal to or slightly higher than those based on conservative scoring but followed similar trends. There were two exceptions: expanded scoring for "travel time on a recommended alternate route," produced a slightly lower average rating compared to conservative scoring; and "recommendation of a specific alternate route" was rated over half a point higher on average (as both pre-trip and en-route information) when expanded scoring was used.

Overall, the types of information considered most useful by commercial drivers were "amount of delay on your usual route," "truck restriction on an alternate route," and "message saying 'take an alternate route."

Figure 30 compares the average pre-trip and en-route rankings of the seven types of information based on conservative scoring. Overall, the types of information considered most useful by survey participants were "amount of delay on your usual route," "truck restriction on an alternate route," and "message saying 'take an alternate route."

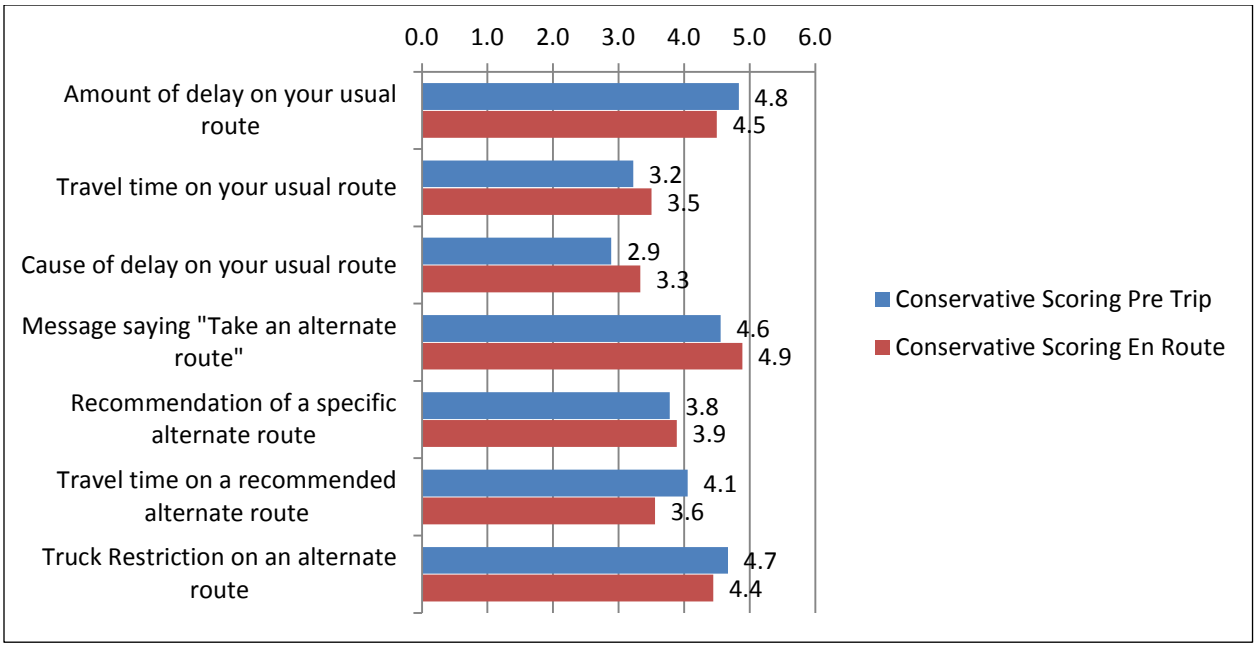


Figure 30. Average rankings of travel information by commercial drivers, pre-trip vs. en route.

What information do commercial drivers want about an alternate route?

Question 14 presented the following list and asked participants "what information must you have before you leave your usual route to take an alternate route?" Participants were asked to rank their top three information needs from the list.

- name of road(s) included in route,
- distance of the alternate route,
- turn-by-turn directions,
- travel speed along the alternate route,
- map of the alternate route,
- travel time on the alternate route,
- gas stations, cities, other amenities along the alternate route,
- what the problem or cause of delay is on your normal route,
- where the problem is on your normal route,
- how long the problem will cause a delay on your normal route,
- truck-related restrictions along the alternate route, and
- type of roadway on the alternate route (two-lane, four-lane, etc.).

Although the question instructed respondents to rank their top three choices from the list, some respondents who completed the survey on paper entered numbers or symbols other than "1, 2, 3" to indicate their selections.

Question Scoring. Responses to this question were given weights of three points for a first choice, two points for a second choice, and one point for a third choice. "Conservative" scoring for the responses to

this question considered only the responses with three or fewer ranked choices; "expanded" scoring included responses in which all three choices were marked "1," as well as responses in which selections were marked with an "x" or other symbol (these were each given weights of three points if there was no other indication of preference order). Figure 31 summarizes the average points respondents gave to each type of alternate-route information. Because participants were asked to choose only three types of information from a list of twelve options, point averages across the possible responses are lower overall.

"Truck restrictions along the alternate route" received the highest average score from participants, followed by "how long the problem will cause a delay on your normal route" and "name of road(s) included in the alternate route." "Map of the alternate route," "what the problem or cause of delay is on your usual route," and "where the problem is on your usual route" also scored relatively high on average. Low-ranked information options included "turn-by-turn directions for the alternate route," travel speed along the alternate route," and "gas stations, cities, other amenities along the alternate route." Table 19 lists the alternate route information types in descending order based on average ranking scores. Figure 31 compares the average scores (using the conservative scoring method) and overall preference rankings of alternate-route information needs.

The most important alternate route information was "truck restrictions along the alternate route," "how long the problem will cause a delay on your normal route," and "name of road(s) included in the alternate route."

Table 19. Relative Rankings of Alternate Route Information Needs (Commercial Drivers.)

Information Type	Avg. Score
Truck restrictions	1.08
How long the delay on your usual route will last	0.81
Name of road(s) included in the alternate route	0.73
Map of the alternate route	0.69
What the problem or cause of delay is on your usual route	0.69
Where the problem is on your usual route	0.65
Distance of the alternate route	0.50
Travel time on the alternate route	0.46
Type of road	0.31
Turn-by-turn directions for the alternate route	0.04
Travel speed along the alternate route	0.04
Gas stations, cities, other amenities along the alternate route	0.00

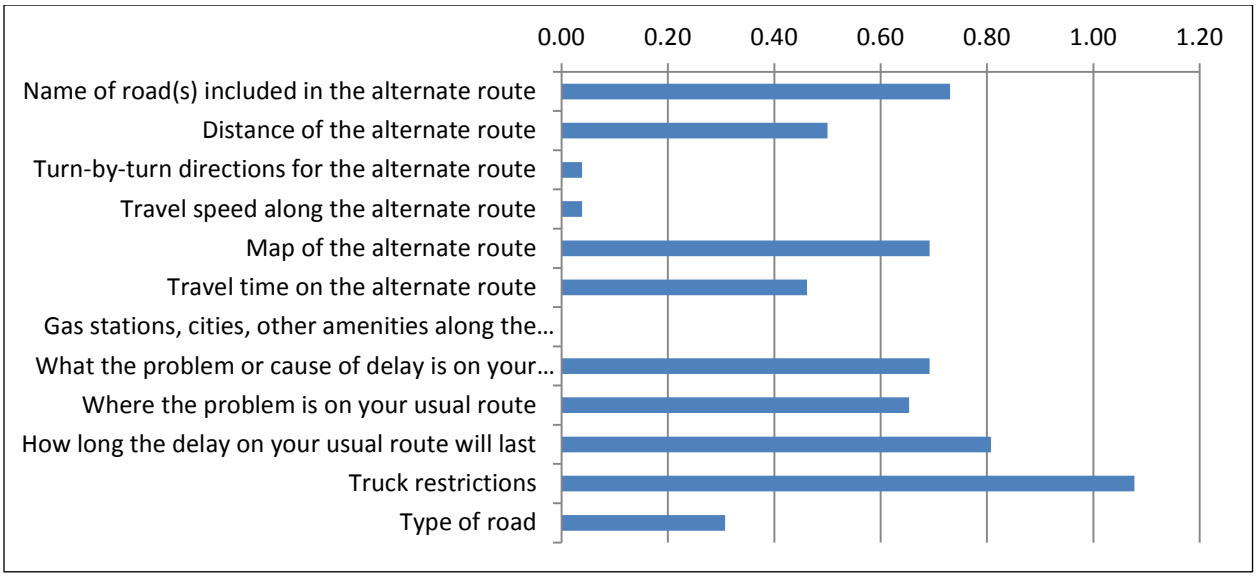


Figure 31. Average preference scores for alternate route information needs.

Question 15 invited participants to add other suggestions for information they would like to have about a potential alternate route. Twelve respondents provided open-ended responses to Question 15. Responses included the following information requests:

- information on closed roads,
- length-weight restrictions on a potential alternate route (more specific than overall truck restrictions),
- weather information,
- better truck-specific directions, including information on route signs indicating if an alternate route is a truck route,
- communication of information to highway patrol about alternate route suitability for trucks, so that law enforcement personnel at/close to a diversion point can properly direct trucks, and
- plenty of advance warning of potential problem and diversion point.

What information source would be the best for different information types? Question 16 listed six of the types of roadway information that respondents had ranked in Questions 12 and 13 (leaving out "recommendation to take an alternate route"), and asked respondents to select the source that would best provide each type of information before and during a trip. Table 33 through Table 38 in Appendix F present the percentage of respondents who selected each of the listed information sources as their preferred option for each type of information. Some respondents selected more than one preferred source for a given information type; for this question, "conservative" scoring includes only the first source listed by each respondent and "expanded" scoring includes any additional responses entered.

(Example: if a respondent was asked "which information source would best provide the amount of delay on your current route?" and selected "DOT website, radio, television, and text messaging" in that order (indicated by the order in which they were entered into the open-ended answer blank in the survey instrument), conservative scoring would count only "DOT website" in the frequency percentages,

while expanded scoring would count all four selections that were entered.) Tables summarizing responses regarding preferred information sources (familiar and unfamiliar trips, pre-trip and en route information) using both conservative and expanded scoring are included in Appendix F.

For most types of pre-trip and en route information, commercial drivers tended to favor radio, GPS systems, DOT/511 websites, smartphone apps/mobile web, and road signs as communication media.

For most types of pre-trip and en route information, participants tended to favor radio, GPS systems, DOT/511 websites, smartphone apps/mobile web, and road signs as communication media. Unlike participants in the travelers' survey, the commercial drivers did not tend to favor text-messaging as a medium. Dispatchers and other drivers were also favored sources for certain types of information, including current travel times and amounts and causes of delay.

Table 20 summarizes the most frequently preferred information sources for pre-trip and en route information (based on conservative scoring).

Table 20. Preferred Sources of Pre-Trip and En Route Travel Information – Commercial Drivers.

Information Type	Pre-Trip Preferred Sources (Commercial Drivers)	En Route Preferred Sources (Commercial Drivers)
Amount of delay on current route	• Radio (26%) • DOT/511 website (16%) • GPS system (11%) • Television (11%)	• Radio (37%) • Other commercial drivers (26%) • Smartphone apps/mobile web (16%) • GPS system (11%)
Travel time on current route	• Radio (26%) • GPS system (21%) • Road signs (16%) • Smartphone apps/mobile web (16%)	• GPS system (32%) • Radio (21%) • Road signs (21%) • Other commercial drivers (11%)
Cause of delay on your usual route	• Radio (37%) • DOT/511 website (11%) • Road signs (11%) • Smartphone apps/mobile web (11%) • Other commercial drivers (11%)	• Other commercial drivers (32%) • Radio (26%) • Road signs (16%) • GPS system (11%) • Smartphone apps/mobile web (11%)
Recommendation of a specific alternate route	• Other travel websites (Google/Mapquest et al) (21%) • Smartphone apps/mobile web (16%) • DOT/511 website (16%) • Radio (11%) • Road signs (11%) • Dispatcher (11%)	• GPS system (21%) • Smartphone apps/mobile web (11%) • DOT/511 website (11%) • Radio (11%) • Road signs (11%) • Dispatcher (11%)
Travel time on a recommended alternate route	• Radio (26%) • Smartphone apps/mobile web (21%) • DOT/511 website (11%) • Other travel websites (Google/Mapquest et al) (11%) • GPS system (11%)	• GPS system (21%) • Road signs (16%) • Radio (11%) • DOT/511 website (11%) • Smartphone apps/mobile web (11%) • Dispatcher (11%) • Truck routing software (11%)
Truck restrictions on a potential alternate route	• DOT/511 website (21%) • Other travel websites (Google/Mapquest et al) (16%) • Radio (11%) • Road signs (11%) • Dispatcher (11%)	• Smartphone apps/mobile web (21%) • DOT/511 website (16%) • Road signs (16%) • Dispatcher (16%) • GPS system (11% • Radio (11%)

CHAPTER 6. RECOMMENDATIONS FOR COMMUNICATIONS STRATEGIES

This "toolbox" of communication strategies draws on successful practices from other states and localities, as well as feedback from Wisconsin drivers on what factors influence their route decisions both prior to and during a given trip. The recommendations provided here are intended to maximize the effectiveness of WisDOT's current communications media, including the WisDOT and 511Wi websites, static and dynamic road signs, and Highway Advisory Radio (HAR), while offering ideas for new media such as smartphone applications.

Traveler Information Needs and Priorities

Commuters/Travelers

When deciding whether to select (pre-trip) or divert to an alternate route, commuters and other travelers who participated in the focus groups or survey prioritized the following information as the most useful:

- the length of the expected delay on the original route,
- recommendation of a specified alternate route OR recommendation to take a non-specified alternate route,
- travel time on the original route (especially as compared to the normal travel time on that route), and
- travel time on a potential alternate route.

Additional useful information identified by study participants includes the time that a roadway delay is expected to be resolved and the cause of the delay as a basis for judging its likely severity and duration.

When traveling in an unfamiliar area, travelers need additional information about a potential alternate route, most importantly the following:

- turn-by-turn directions for the alternate route,
- map of the route, and
- highway exit numbers associated with the alternate route (where to exit and where the alternate route reconnects with the highway).

Commercial Drivers

The type of load a commercial driver is carrying influences his or her route diversion decisions. Drivers hauling single-permit loads cannot divert from the pre-approved route without permission from WisDOT (or, in some circumstances, the state patrol). Drivers traveling under a multi-use permit may have the option to divert to an alternate route, but only if the alternate route meets all of the criteria for their load's height, weight, and length. Drivers carrying non-permitted loads will often divert to an alternate route if they have sufficient advance notice of a delay on their current route.

Suggestions for additional pre-trip information for commercial drivers (besides the information WisDOT already provides) included the following:

- up-to-date information on current and upcoming construction projects, including schedules for upcoming road work, expected delay times associated with construction sites, and maximum available road widths at construction sites,
- information and updates on roadway traffic and delays, including the expected length of current delays,
- statewide bridge map with height/weight restrictions, and
- truck-related road restrictions and road conditions by area within the state.

Preferred Information Sources

Commuters/Travelers:

For most types of pre-trip information about travel delays and alternate routes, travelers tended to prefer radio, television, and text-messaging. Smartphone applications and travel information websites were also favored by a number of participants, particularly for information regarding alternate routes on unfamiliar trips.

Radio, road signs, and GPS systems were the most popular media for en route information, followed by smartphone applications and text messaging.

Commercial Drivers:

Preferred pre-trip information sources included the WisDOT website, Wi511 and other state 511 systems, computer-based route planning tools (such as "PC*Miler") for determining cost-effective routes, state DOT permitting departments, private-sector permitting firms, and other commercial drivers.

Preferred en route information sources included radio; DMS and alternate route trailblazing signs; mobile websites accessible via smartphones, tablets, and GPS; and text-to-voice messaging. However, commercial drivers are also very likely to obtain en route information from dispatchers and other commercial drivers.

Recommendations Regarding Current WisDOT Information Practices

The following are general recommendations for improving the reach and effectiveness of WisDOT's current communication strategies pertaining to alternate routes. These recommendations are also incorporated into the individual media summaries later in this chapter.

1. **Increase promotion efforts on the www.511Wi.gov website.** The commuter focus groups and the traveler survey indicated that a majority of Wisconsin residents are unaware of this resource, but when made aware many indicated this would be a valuable tool.
2. **Use DMS to provide additional messages about delays and alternate routes.** Focus group and survey participants considered the DMS along Wisconsin's highways to be a valuable source of

travel time and incident information, and the survey results indicate that DMS could also be effective for additional messages about highway delays and route alternatives.

3. **Use MUTCD-approved signs for alternate route identification/trailblazing.** The custom-designed "Blue Route" signs that were used to designate alternate routes in the Madison area were not understood by focus group participants, while "ALT" or "ALTERNATE" placards added to highway route number signs were well understood.
4. **Update/improve HAR message delivery.** Few focus group or survey participants had made use of the HAR system for roadway information, and the focus group participants who had tuned to an HAR station found the automated messages difficult to understand. Potential improvements to HAR include upgrading the auditory quality of the messages by improving the clarity of computer-generated messages and/or by substituting an actual voice recording where feasible.

Recommendations for New and Expanded Messages

The following are recommendations for information and messages that may encourage travelers to take advantage of alternate routes; these recommendations are based on focus group and survey results indicating the types of information that Wisconsin travelers consider to be the most valuable when selecting routes or when making the decision to divert to an alternate route.

1. **Recommendation of a particular alternate route when feasible.** In the event of construction or other delay, survey participants indicated interest in receiving information about a recommended alternate route, including directions and/or a map of the recommended route. This was the case particularly for people traveling in an unfamiliar area. Brief messages (displayed on DMS or delivered via radio or text message) could indicate the name of the roadway and/or exit numbers associated with the beginning and end of the alternate route. For planned lane restrictions or closures, such as those associated with highway work zones, disseminating recommended alternate-route maps via 511Wi and through media channels would help to provide more detailed alternate-route information.
2. **Information about when a delay-causing event will end.** In addition to knowing the amount of delay to expect because of a lane restriction or closure, participants expressed interest in knowing more about the nature of the delay and how long it is likely to affect their current route. When feasible, messages indicating when the cause of the delay (road work, traffic incident, etc.) is likely to be resolved or completed may help drivers to decide whether diverting to an alternate route is in their best interest.

Media Summaries

This section summarizes study results and recommendations regarding media that WisDOT is currently using or could potentially employ for communicating roadway and alternate route information to travelers and commercial drivers.

Summaries include the current use of each medium by WisDOT and highlights of its use by other state and local transportation agencies, target audiences, travel and commercial driver preferences for

information or message types associated with the medium (as indicated by surveys and focus groups), and suggestions for implementation. Media included in this section include:

- websites (Table 21),
- mobile web (Table 22),
- smartphone applications (Table 23),
- social media (Table 24),
- text messaging (Table 25),
- e-mail (Table 26),
- commercial radio/television (Table 27),
- highway advisory radio and other DOT-sponsored radio (Table 28), and
- dynamic message signs (Table 29).

Table 21. Websites Summary.

Websites	
Current Use by WisDOT	The www.511Wi.gov website offers extensive real-time traffic and roadway information, information on current and upcoming construction projects, and maps of alternate routes (along with other travel information). The Wisconsin DOT's main website (www.dot.wisconsin.gov) includes a section dedicated to commercial truck travel, including links to WisDOT's motor carrier services, oversize/overweight permits, information about and a map of the state's truck routes, weight restriction programs, and locations of weigh stations.
Uses by Other Agencies	All of the fourteen state DOT and local agencies interviewed use 511 or other DOT-related websites to provide extensive information on traffic and roadway conditions, roadway delays and incidents, and alternate route information. RIDOT maintains a "Community Updates" website page to provide travelers with weekly updates on highway construction projects, including upcoming construction activities, traffic impacts, and recommended alternate routes when applicable.
Target Audiences	Just under 14 percent of respondents in the travelers' survey reported having used the www.511Wi.gov website or phone number; this relatively low percentage appears to be due at least in part to a lack of awareness, as only 32 percent of respondents had heard of the site. Over half of survey respondents indicated that they access travel information online from commercial mapping and traffic websites, and over half indicated that they would be likely or very likely to use *511Wi* in the future. Thirty-nine percent of commercial drivers surveyed use WisDOT's website for truck-specific travel information and services (including permitting for oversize/overweight loads). WisDOT's online information was favorably reviewed in several of the commercial driver interviews.

Websites (continued)

Information/ Message Types	. Only a small percentage of survey respondents had previously used the 511Wi or WisDOT websites for travel information, largely because a majority of these respondents were not aware of the websites. However, when shown examples of the information available on 511Wi, 50 percent of respondent s indicated that they were likely or very likely to use the website in the future for real-time travel information, and 57 percent indicated that they would be likely or very likely to seek out alternate-route information. Among commercial drivers, the WisDOT website is already considered a good source for information pertaining to route selection, including truck routes and restrictions, travel delay information, and alternate route recommendations. There is an interest in additional information regarding length and weight restrictions on potential alternate routes, a statewide bridge map showing height and weight restrictions, and regularly updated information regarding upcoming construction schedules and sites.
Issues/ Suggestions for Implementation	Increase promotion and marketing of the 511Wi, WisDOT Travel Information, and construction project websites. The commuter focus groups and the traveler survey indicated that a majority of Wisconsin residents are unaware of the 511Wi website, but when made aware many indicated that they would find the website to be a valuable tool. Potential low-cost options for expanding public awareness of 511Wi could include advertisements on the video screens at driver license offices and a re-design of the existing 511 informational flyers to increase conspicuity and visual appeal. Web-based advertisements are another marketing opportunity. Continue communication with and outreach to the motor carrier industry regarding online truck-specific roadway and alternate route information.

Table 22. Mobile Web Summary.

Mobile Web	
Current Use by WisDOT	The 511Wi website includes a version for mobile devices that provides several of the same travel and roadway information options as the full site: "Winter Road Conditions," "Traffic Events," "Message Signs," "Cameras," "Travel Times," "Transit," "Travel Services," and "Contact Us."
Uses by Other Agencies	Of the agencies interviewed, as of January 2013 the Delaware, Idaho, Iowa, Minnesota, New York, and Utah DOT have developed mobile web versions of their travel information websites.
Target Audiences	Approximately 35 percent of traveler survey respondents indicated that they currently get travel information from mobile websites and/or smartphone applications. This percentage was slightly higher among younger respondents, which corresponds to higher smartphone ownership among this demographic. Commercial drivers indicated an interest in mobile web information accessible via tablets and smartphones.
Information/ Message Types	For travelers and for commercial drivers, mobile web or smartphone applications were a preferred option for nearly all types of pre-trip and en route information concerning travel conditions, roadway delays and travel times, and alternate route recommendations.
Issues/ Suggestions for Implementation	Safety concerns should be considered; an advisory should be placed on the mobile web interface to warn drivers against using the mobile site while driving. An example disclaimer from the Utah DOT mobile web interface: "*Do NOT access UDOT Traffic mobile while operating a vehicle. Using any mobile device while driving can be a deadly distraction. Always pull over and stop your car or have a passenger use the device for you*."

Table 23. Smartphone Applications Summary.

Smartphone Applications	
Current Use by WisDOT	None
Uses by Other Agencies	DelDOT is developing mobile applications for travel information that are customizable according to users' preferences and locations. The agency sees smartphone development as an opportunity not only to disseminate but to gather information from roadway users. Applications are currently being developed for Apple and Android platforms; a goal is to make the mobile application voice-responsive to minimize visual distractions on the road. The San Francisco Bay Bridge Public Information Office presented existing three-dimensional models of the bridge's alignment as animated video clips, which allow users to view the upcoming new bridge alignments in a virtual driving simulation. These models have been turned into video games that are available as free smartphone applications on iTunes.
Target Audiences	Approximately 35 percent of survey respondents indicated that they currently get travel information from mobile websites and/or smartphone applications. This percentage was slightly higher among younger respondents, which corresponds to higher smartphone ownership among this demographic. Approximately 19 percent of commercial drivers indicated that they currently get travel information from mobile websites and/or smartphone applications, and both interviewed and surveyed commercial drivers indicated an interest in being able to access more roadway and route information via tablets and smartphones.
Information/ Message Types	For travelers and for commercial drivers, mobile web or smartphone applications were a preferred option for nearly all types of pre-trip and en route information concerning travel conditions, roadway delays and travel times, and alternate route recommendations. Smartphone or tablet applications might be an option for providing step-by-step alternate route directions or location-specific traffic information, using the devices' GPS-provided locations along with GIS information. This type of mobile application would likely be attractive to the travelers and commercial drivers who prefer a GPS system to provide them with en route travel times and alternate route information.

Smartphone Applications (continued)

Issues/ Suggestions for Implementation	Plan to develop mobile applications for multiple mobile device platforms (Apple, Android, Windows) to maximize the potential audience. (Heaton, 2013) Application development costs can range from $50,000 to $500,000, depending on the number and type of interactive features. (Lipowicz, 2011) Safety concerns should be considered; application interfaces should include an advisory warning drivers against reading or inputting information to the application while driving.

Table 24. Social Media Summary.

Social Media	
Current Use by WisDOT	As of January 2013, WisDOT uses Twitter to post alerts and updates for 511 traveler information, updates on the I-94 and US-41 construction projects, and updates on oversize-overweight activities and interstate registration activities for motor carriers. Facebook pages are active to provide updates on 511 information and four separate highway construction projects.
Uses by Other Agencies	Eight of the interviewed agencies post real-time traffic and roadway condition updates as Facebook messages, interspersed with other press releases and reports. Alternate route maps are sometimes posted on agency Facebook pages, though more often Facebook and other social media are used to "push" users back to the agency or project website for the maps and/or more complete information. In addition to Facebook, the Los Angeles Metro transportation agency broadcasts messages on Nixle, a social-media site that is used primarily by government agencies. The Iowa DOT maintains two blogs, one focusing on DOT news releases, the other on real-time traffic updates. Los Angeles Metro posts dozens of location-specific Tweets twice per day, seven days a week to provide updates on road closures along the Sepulveda Pass reconstruction project; some of Metro's Tweets receive over 700,000 views. In contrast, the Maine DOT introduced and then ceased travel updates via Twitter, after hearing concerns from Maine travelers about the potential for driver distraction.
Target Audiences	Use of Facebook in general is fairly high among young respondents (18-30 years) and declines for the older age groups. As a current source of travel information, it is not widely used. Twitter is not widely used among Wisconsin travelers and commercial drivers who responded to the surveys; participants 30 and younger were somewhat more likely to report using Twitter than older respondents (who were very likely to report seldom or never using this medium).
Information/ Message Types	While Twitter was generally not selected by survey respondents as a preferred medium for most pre-trip or en route messages, the message types it would likely be best suited for are similar to those for text-messaging. WisDOT's current use of Twitter messages to provide brief incident and construction notices, with a link to the 511Wi website for further information, is likely the most effective use of this medium.

Social Media (continued)

Issues/ Suggestions for Implementation	As with other media that are likely to be accessed via cell phones and other mobile devices, real-time traffic and travel information provided via social media has the potential to contribute to driver distraction, if the user chooses to read or search for information while on the road. Marketing and promotion of social media for travel and alternate route information should emphasize that these information sources are not safe to consult while driving. As with the 511Wi website, promotion of the Facebook pages and Twitter feeds at driver license offices and in WisDOT press releases may help to grow the audiences for these media.

Table 25. Text Messaging Summary.

Text Messaging	
Current Use by WisDOT	"My511" offers text message alerts, user-personalized by route(s) and alert type.
Uses by Other Agencies	Of the fourteen agencies interviewed, three (City of Gatlinburg, Tennessee; Massachusetts DOT, New York DOT) offer text messaging by subscription, similar to WisDOT's My511, to provide information updates regarding traffic incidents, other delays, and/or alternate routes.
Target Audiences	Among commuters and travelers, survey results showed text messaging to be one of the most frequently used media types by 18-to-30 year olds, with reported frequency of use declining among older demographics. Text messaging was reported by only six percent of survey respondents as a current source of travel information, but ranked approximately third (behind radio and television) across all respondents as a preferred potential source of pre-trip information and approximately fifth (behind radio, road signs, GPS systems, and smartphone applications) for en route information. Text messaging was NOT preferred as a communications medium by surveyed commercial drivers.
Information/ Message Types	In the traveler's survey, text messaging was the most frequently preferred communications medium for pre-trip messages advising travelers to take an alternate route, for recommendations of a specific alternate route, and for information about travel time on a recommended alternate route.
Issues/ Suggestions for Implementation	While text messaging shows promise as a communications medium for highway and alternate route information (particularly as the message subscriptions can be tailored to provide personalized information), the safety concerns surrounding distracted driving should be considered. If WisDOT chooses to employ text messages as a communication strategy for encouraging the use of alternate routes, marketing and promotion of this service should emphasize that the messages are not safe to read while driving. Text messaging is NOT a recommended strategy for communicating with commercial drivers.

Table 26. E-mail Summary.

E-mail	
Current Use by WisDOT	WisDOT maintains e-mail list-servs to keep subscribers informed on the progress of major projects, as well as to disseminate other types of project or service information.
Uses by Other Agencies	Ten of the 14 interviewed agencies use e-mail to communicate with the public and/or media outlets regarding traffic incidents, major construction projects, and alternate route recommendations. One example is the Rhode Island DOT, which sends e-mailed "Community Updates" to local media that provide weekly information on construction projects, traffic impacts, and sometimes recommended alternate routes. These updates are also e-mailed to police, schools, business groups, and any other interested party who chooses to join the e-mail distribution list, as well as posted on the project's website.
Target Audiences	E-mail is a frequently-used communications method for travelers in all age groups, though the youngest survey respondents (18-30 year olds) use e-mail slightly less frequently than older demographics. Approximately 12 percent of travelers reported e-mail as a source they currently use for travel information; men were more likely than women to list e-mail as a travel information source (15 percent vs. nine percent). Only three percent of commercial drivers listed e-mail as a current source of travel information.
Information/ Message Types	E-mail was not a frequently-preferred source among travelers or commercial drivers for travel time and delay information, but nine percent of traveler survey respondents preferred e-mail for messages advising the use of an alternate route.
Issues/ Suggestions for Implementation	Since WisDOT is currently using Twitter and text messaging for real-time traffic updates, the current practice of e-mail list-servs for specific project information is probably the best use of this medium. A dedicated e-mail list-serv for motor carriers might be a way to disseminate truck-specific construction project information and updates to dispatchers and drivers.

Table 27. Commercial Radio/Television Summary.

Radio/Television (Commercial)	
Current Use by WisDOT	WisDOT provides news releases to media outlets on major road construction projects (and associated traffic impacts), safety issues and reminders for drivers, and other DOT news. News releases pertaining to construction and road conditions usually contain the URL to the 511Wi website and/or to WisDOT's Twitter account for real-time updates.
Uses by Other Agencies	Due to the expense of paid advertising, only two of the interviewed agencies have used paid television ads in their traveler outreach campaigns; of those, one (the Kentucky Transportation Cabinet) last purchased television advertising in 2001. However, local media networks often disseminate agencies' press releases regarding traffic events and advisories, including alternate routes, as well as offering free/earned public service announcement (PSA) spots. Most of the interviewed agencies have cultivated relationships with the local media, conducting press conferences or similar media events at the start of major projects and providing regular press releases on project progress (in the case of construction projects) and traffic impacts. DelDOT's traffic management center provides traffic information free of charge to all local media outlets, and some local radio stations routinely refer to "our traffic cameras" on air.
Target Audiences	Nearly 47 percent of survey respondents currently get some travel-related information from commercial radio stations; just under 33 percent get travel information from television. Among commercial drivers, 56 percent list radio as a traffic information source; only 11 percent obtain travel information from television.
Information/ Message Types	Television and radio were both preferred options among travelers for most types of pre-trip information pertaining to travel/roadway conditions and alternate route recommendations. For en route information, not surprising, television dropped in preference and radio increased. Radio was the most-preferred option among survey respondents for most types of en route information. Among commercial drivers, radio actually was selected less often than other media (such as mobile online information) for en route information, though it was a frequently-selected choice for pre-trip information on travel times and highway delays.
Issues/ Suggestions for Implementation	WisDOT press releases and news stories, particularly those pertaining to roadway and traffic conditions or events, should continue to include the URL to the 511Wi website and links to WisDOT's social media. Local radio and television stations could be encouraged to end traffic reports by reminding listeners and viewers that further travel and traffic information can be found on the 511Wi website.

Table 28. HAR/DOT Radio Summary.

Highway Advisory Radio/DOT-Sponsored Radio	
Current Use by WisDOT	WisDOT uses Highway Advisory Radio (HAR) for localized information regarding roadway conditions. WisDOT also produces news stories for the WisDOT Radio Newsline, which are available as audio files online at http://www.dot.wi.gov/news/newsline.htm .
Uses by Other Agencies	Massachusetts DOT uses HAR to provide construction and lane closure updates during major construction projects, such as the recent Fast 14 Bridge Replacements. DelDOT owns a primary licensed radio station dedicated to traveler information, traffic and roadway conditions, and DOT news (WTMC, 1380 AM), which currently broadcasts over approximately half the state; the agency is gradually building repeater sites to expand the station's coverage to the rest of Delaware. The radio broadcast can also be accessed in real time through the DelDOT website.
Target Audiences	Most focus group participants have not accessed an HAR station; the few who have found the automated voice difficult to understand. However, "radio" in general (not specifically HAR) was one of the media types selected most frequently by survey participants as a preferred source of en route travel information.
Information/ Message Types	While survey participants were not asked specifically about specific message preferences for HAR radio (rather, they were asked about "radio" in general), it is likely that the most prevalent use of HAR broadcasts would be for en route travel and alternate route information. Other types of WisDOT-sponsored broadcasts (such as the WisDOT Radio Newsline stories) could potentially provide additional pre-trip and en route information about travel times, construction delays, and alternate route recommendations, for which many travelers and commercial drivers preferred radio as a medium.
Issues/ Suggestions for Implementation	Improving the sound quality and clarity of HAR messages may be the first necessary step to improve the overall effectiveness of this medium.

Table 29. Dynamic Message Signs Summary.

Dynamic Message Signs	
Current Use by WisDOT	Dynamic Message Signs (DMS) are used to provide travel time and delay information along highways. Both survey and focus group results indicate that the DMS information is valued by Wisconsin drivers.
Uses by Other Agencies	Eleven of the 14 interviewed agencies use DMS to provide travel time estimates, to identify upcoming work zones and lane/ramp closures, and/or to identify highway exits leading to alternate routes. Delaware DOT uses DMS to notify drivers to tune to DelDOT's radio station for traffic information. The California Department of Transportation (Caltrans) posts notices of upcoming construction on DMS, usually a day or two prior to a project's onset. For a large Bay Bridge construction project, notices were posted on DMS beginning two weeks prior to the start of the project to raise public awareness. During the "Fast 14" Bridge Replacement project in Massachusetts, DMS communicated comparative travel times on primary and alternate routes when travel times (as measured by BlueTooth technology) increased above a threshold level.
Target Audiences	Road signs were the second most frequently identified source of travel information currently used by Wisconsin travelers and by commercial drivers. Road signs were also one of the top three communications media (along with radio and GPS) preferred by respondents for en route travel information.
Information/ Message Types	Among travelers and commercial drivers, DMS were a preferred option for nearly any en route messages about travel times, delays, and alternate route recommendations. DMS were also one of the preferred media for pre-trip information about alternate routes (e.g., for notification of alternate routes connected with an upcoming construction project).
Issues/ Suggestions for Implementation	WisDOT's current use of DMS for travel time and delay messages is well-received by the travelers and commercial drivers who participated in focus groups and surveys, and requests from these participants included more DMS along roadways, as well as additional messages regarding the expected duration of a current roadway delay and advance notification of delays and potential alternate routes (e.g., recommendation of a highway exit number).

Media Preferences for Information Types

This section provides index tables for six types of travel information related to alternate route selection. Each table summarizes the media preferences of survey respondents for one type of information (e.g. "length of delay on highway"), both pre-trip and en route. The six information categories are as follows:

- length of delay on a highway (Table 30),
- travel time on a highway (Table 31),
- cause of delay on a highway (Table 32),
- message to take an unspecified alternate route (Table 33),
- message to take a specified/recommended alternate route (Table 34), and
- travel time on a specified/recommended alternate route (Table 35).

Media listed in the tables include:

- E-mail,
- Facebook,
- GPS System,
- Radio,
- Road signs,
- Smartphone apps/mobile web,
- Television,
- Text messaging,
- Twitter,
- Websites - 511Wi or WisDOT site,
- Websites – general, and
- Other.

The "other" category for travelers (both for familiar and unfamiliar trips) includes newspapers, phoning a friend, phoning 511, and mailed notices. The "other" category for commercial drivers includes dispatchers, other commercial drivers, phoning 511, commercial truck routing software, and OS/OW permitting departments or services.

For each pre-trip and en route information category, the communications medium preferred by the largest percentage of respondents is in bold print. In some information categories, a single medium received a large percentage of votes compared to all others; in others, user preferences are more evenly split across two or more media types, so the difference between the most preferred and the second- or third-most preferred options will not be as significant.

Table 30. Media Preferences - Length of Delay on Highway.

Information or Message Type	Timing of Message	Strategy/Media	Percent of Survey Respondents Preferring Medium for this Information/Message Type		
			Travelers (Familiar Trips)	Travelers (Unfamiliar Trips)	Commercial Drivers
Length of Delay on Highway	**Pre-Trip**	E-mail	6%	5%	5%
		Facebook	0%	0%	0%
		GPS System	7%	7%	11%
		Radio	**21%**	**23%**	**26%**
		Road signs	3%	3%	5%
		Smartphone apps/mobile web	11%	13%	5%
		Television	18%	13%	11%
		Text messaging	16%	15%	5%
		Twitter	0%	0%	0%
		Websites - 511Wi or WisDOT site	6%	5%	16%
		Websites - general	11%	13%	5%
		Other	2%	2%	10%
	En Route	E-mail	2%	1%	0%
		Facebook	0%	0%	0%
		GPS System	16%	17%	11%
		Radio	**42%**	**39%**	**37%**
		Road signs	16%	18%	0%
		Smartphone apps/mobile web	11%	13%	16%
		Television	1%	0%	0%
		Text messaging	8%	9%	0%
		Twitter	0%	0%	0%
		Websites - 511Wi or WisDOT site	0%	1%	5%
		Websites - general	3%	1%	0%
		Other	2%	1%	31%

Table 31. Media Preferences - Travel Time on Current Route.

Information or Message Type	Timing of Message	Strategy/Media	Percent of Survey Respondents Preferring Medium for this Information/Message Type		
			Travelers (Familiar Trips)	Travelers (Unfamiliar Trips)	Commercial Drivers
Travel Time on Current Route	**Pre-Trip**	E-mail	6%	5%	0%
		Facebook	0%	0%	0%
		GPS System	14%	14%	21%
		Radio	16%	15%	**26%**
		Road signs	5%	3%	16%
		Smartphone apps/mobile web	8%	13%	16%
		Television	**17%**	15%	0%
		Text messaging	15%	**16%**	5%
		Twitter	0%	0%	0%
		Websites - 511Wi or WisDOT site	8%	4%	5%
		Websites - general	11%	14%	0%
		Other	0%	1%	11%
	En Route	E-mail	2%	2%	0%
		Facebook	0%	0%	0%
		GPS System	22%	24%	**32%**
		Radio	**38%**	**32%**	21%
		Road signs	16%	15%	21%
		Smartphone apps/mobile web	11%	11%	11%
		Television	1%	2%	0%
		Text messaging	7%	10%	0%
		Twitter	0%	0%	0%
		Websites - 511Wi or WisDOT site	1%	1%	5%
		Websites - general	3%	2%	0%
		Other	1%	1%	10%

Table 32. Media Preferences - Cause of Delay on Highway.

Information or Message Type	Timing of Message	Strategy/Media	Percent of Survey Respondents Preferring Medium for this Information/Message Type		
			Travelers (Familiar Trips)	Travelers (Unfamiliar Trips)	Commercial Drivers
Cause of Delay on Highway	**Pre-Trip**	E-mail	7%	7%	0%
		Facebook	1%	0%	0%
		GPS System	5%	5%	5%
		Radio	17%	**18%**	**37%**
		Road signs	6%	5%	11%
		Smartphone apps/mobile web	**24%**	16%	11%
		Television	15%	16%	0%
		Text messaging	1%	0%	5%
		Twitter	8%	5%	0%
		Websites - 511Wi or WisDOT site	6%	10%	11%
		Websites - general	8%	13%	5%
		Other	2%	4%	16%
	En Route	E-mail	3%	2%	0%
		Facebook	0%	0%	0%
		GPS System	11%	14%	11%
		Radio	**43%**	**39%**	26%
		Road signs	18%	16%	16%
		Smartphone apps/mobile web	2%	1%	11%
		Television	8%	11%	0%
		Text messaging	0%	0%	0%
		Twitter	0%	1%	0%
		Websites - 511Wi or WisDOT site	1%	1%	5%
		Websites - general	9%	13%	0%
		Other	5%	4%	**32%**

Table 33. Media Preferences - Recommendation of an Unspecified Alternate Route.

Information or Message Type	Timing of Message	Strategy/Media	Percent of Survey Respondents Preferring Medium for this Information/Message Type		
			Travelers (Familiar Trips)	Travelers (Unfamiliar Trips)	Commercial Drivers
Take an Alternate Route (unspecified)	**Pre-Trip**	E-mail	8%	7%	0%
		Facebook	0%	0%	0%
		GPS System	8%	11%	5%
		Radio	13%	11%	11%
		Road signs	11%	12%	11%
		Smartphone apps/mobile web	7%	13%	16%
		Television	15%	8%	5%
		Text messaging	**24%**	**21%**	0%
		Twitter	0%	0%	0%
		Websites - 511Wi or WisDOT site	4%	4%	16%
		Websites - general	8%	11%	**21%**
		Other	1%	2%	16%
	En Route	E-mail	2%	2%	0%
		Facebook	0%	0%	0%
		GPS System	15%	17%	21%
		Radio	24%	20%	11%
		Road signs	**31%**	**31%**	11%
		Smartphone apps/mobile web	10%	10%	11%
		Television	1%	1%	0%
		Text messaging	15%	15%	5%
		Twitter	0%	0%	0%
		Websites - 511Wi or WisDOT site	0%	0%	11%
		Websites - general	1%	2%	5%
		Other	1%	2%	**26%**

Table 34. Media Preferences - Recommendation of a Specified Alternate Route.

Information or Message Type	Timing of Message	Strategy/Media	Percent of Survey Respondents Preferring Medium for this Information/Message Type		
			Travelers (Familiar Trips)	Travelers (Unfamiliar Trips)	Commercial Drivers
Take an Alternate Route (specified)	**Pre-Trip**	E-mail	6%	5%	0%
		Facebook	1%	0%	0%
		GPS System	13%	11%	11%
		Radio	14%	12%	**26%**
		Road signs	6%	11%	0%
		Smartphone apps/mobile web	11%	14%	21%
		Television	14%	8%	5%
		Text messaging	**19%**	**17%**	0%
		Twitter	1%	1%	0%
		Websites - 511Wi or WisDOT site	6%	4%	11%
		Websites - general	10%	16%	11%
		Other	1%	1%	16%
	En Route	E-mail	2%	1%	0%
		Facebook	0%	0%	0%
		GPS System	25%	**26%**	21%
		Radio	**28%**	22%	11%
		Road signs	22%	22%	16%
		Smartphone apps/mobile web	9%	13%	11%
		Television	1%	1%	0%
		Text messaging	10%	10%	0%
		Twitter	1%	1%	0%
		Websites - 511Wi or WisDOT site	1%	1%	11%
		Websites - general	2%	1%	0%
		Other	1%	2%	**32%**

Table 35. Media Preferences - Travel Time on a Specified Alternate Route.

Information or Message Type	Timing of Message	Strategy/Media	Percent of Survey Respondents Preferring Medium for this Information/Message Type		
			Travelers (Familiar Trips)	Travelers (Unfamiliar Trips)	Commercial Drivers
Travel Time on a Specified Alternate Route	**Pre-Trip**	E-mail	6%	5%	0%
		Facebook	1%	1%	0%
		GPS System	10%	14%	5%
		Radio	13%	11%	11%
		Road signs	10%	9%	11%
		Smartphone apps/mobile web	12%	15%	5%
		Television	**16%**	9%	5%
		Text messaging	**16%**	**16%**	0%
		Twitter	0%	0%	0%
		Websites - 511Wi or WisDOT site	5%	4%	21%
		Websites - general	11%	15%	16%
		Other	1%	2%	**26%**
	En Route	E-mail	2%	1%	0%
		Facebook	1%	1%	0%
		GPS System	23%	**27%**	11%
		Radio	**27%**	24%	11%
		Road signs	23%	18%	16%
		Smartphone apps/mobile web	10%	14%	21%
		Television	1%	1%	0%
		Text messaging	10%	9%	0%
		Twitter	0%	0%	0%
		Websites - 511Wi or WisDOT site	1%	0%	16%
		Websites - general	2%	2%	0%
		Other	2%	3%	**26%**

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APPENDIX A. COMMUTER FOCUS GROUP DISCUSSION GUIDE

1. Let's start by talking a bit about commuting trips. If you have a choice of roads or routes to use to get to and from work, what is most important to you when choosing which route you will take?
    - *Route/roads that are the fastest or most direct*
    - *Route/roads that have a predictable/reliable trip time*
    - *Roadway/facility types (prefer freeways, prefer arterial streets, other)*
    - *En route stops/intermediate destinations*

2. When you're getting ready to leave the house and go to work, how do you decide which route to take and what time to leave?
    - *I take the same route/leave at the same time every day*
    - *I know a couple of different ways to get to work, and will choose which route to take depending on the day/time, what I know about traffic, or some other reason*
    - *I check the news, traffic websites, or other source before leaving to decide when to leave, which way to drive*

3. Do you try to find out about roadway conditions before you start your commute?
    - If yes, how long before your trip?
    - Where do you go for that information?

4. Do you want to get information about any upcoming delays after you have started your trip?
    - Where/how do you usually get that type of information?
    - How else would you like to get that information?

5. What about when you're returning home after work? Is that a more complicated routing decision?
    - Deciding when to leave and what time to take:
        - *same route/leave at the same time every day, or leave when I finish work, whatever time that is*
        - *choose which route depending on the day/time, what I know about traffic, or some other reason*
        - *check the news, traffic websites, or other source to decide*
    - What is important to you for your route when returning home at the end of the day?
        - *Route/roads that are the fastest or most direct*
        - *Route/roads that have a predictable/reliable trip time*
        - *Roadway/facility types (prefer freeways, prefer arterial streets, other)*
        - *En route stops/intermediate destinations*

6. What about other routine trips that you make, like going shopping or visiting friends or relatives here in the local area? Do you choose a route for those trips the same way you do for work-related trips?

7. So suppose you're driving along the freeway going to or from work, and it turns out that there's an incident, or for some other reason the traffic conditions are worse than you expected.
    - Do you consider changing to a different route?
    - If not, why not?
        - *No alternate routes available or don't know of an alternate route*
        - *Alternate route would take too long*
        - *Alternate route has too many stoplights, stop signs, or other obstacles*
        - *Not sure where I could get back on my original route*
    - How bad does the delay have to be for you to consider exiting the freeway to take a different route?
    - What else might make you more willing or more interested in changing from your current to a different route in the middle of a trip?
        - *Safety*
        - *Convenience*
        - *Time*
        - *Cost/tolls*
        - *Familiarity*
        - *Roadway type(tollway, highway, arterial street, etc.)*
    - What kind of information would help you to make that decision?
        - *Location of the congestion*
        - *Travel time on current route*
        - *Travel speed on current route*
        - *Amount of delay*
        - *Cause of delay/congestion*
        - *Identification of alternate routes/how to get around congestion*
        - *Travel time/speed on alternate route*
    - Where would you expect or want to find that information?
        - *On the radio*
        - *On an electronic sign*
        - *From my GPS/Garmin, smartphone, etc.*

8. Currently there's a lot of road construction going on around here (or on the interstates), so let's talk for a few minutes about how construction affects your trips to and from work.
    - How do you usually find out about road construction projects?
        - *TV news*
        - *Radio news/PSAs*
        - *Newspaper*
        - *WisDOT website*
        - *Construction project's website*
        - *Other website(s)*
    - If a project involves a road you usually use to get to or from work, how does that affect your choice of routes and your departure time?
        - *I use a different road*
        - *I leave earlier than usual*
        - *I leave later than usual (to avoid rush hour)*
        - *I use a different mode (transit, walking, bicycling)*

- Does the amount and the timing of publicity about road construction projects affect your route decisions?
- Is there something that the various state and local highway agencies could do to help you select the best route when there's construction?
  - *Radio/tv reports about construction*
  - *Dynamic message signs*
    - *Messages about construction/delays on the road ahead*
    - *Messages naming alternate routes*
  - *Signs marking an alternate route*
  - *Website with construction and road closure information*
  - *Personalized information about my route or certain sections of the road*

9. During construction projects the state sometimes puts up alternate route signs. Have you ever followed one of those routes?
   - If yes:
     - Was it because the road was completely closed, or did you take the alternate route by choice?
     - How easy or difficult was it to follow the route?
   - If no:
     - What prevented you or made you unwilling to follow the alternate route?
       - *My current route was still open*
       - *Didn't know how long alternate route would take*
       - *Didn't know where alternate route went*

10. So far we've been talking about commuting and other trips you make fairly often. Now let's talk a bit about longer trips that you might make for recreation and tourism. Maybe you're going to a cabin up north, the Dells, a resort in Door County, visiting friends in a distant part of the state, or something like that. So for one of those trips, *how* and *when* would you decide what route to take and what time to leave?
    - *I would follow the route I've taken before when going to my destination*
    - *Get a recommendation from someone else who's traveled it*
    - *Use Google Maps, Mapquest, or other online mapping tool*
    - *Consult other websites, travel advisories, etc.*

11. Sometimes recreational trips are affected by construction:
    - How likely are you to know about road construction projects beyond the area where you live?
    - If you wanted to find out about road construction or other things that might affect the roads on your trip, where would you go for that information?
      - *TV news*
      - *Radio news/PSAs*
      - *Newspaper*
      - *WisDOT website*
      - *Construction project's website*
      - *Other website(s)*

- If you knew in advance that there would be construction, how would it affect your routing and departure time decisions?
    - *I would use a different road*
    - *I would leave at a different time*
- Is there something that the various state and local highway agencies could do to help you select the best route?
    - *Radio/tv reports about construction*
    - *Dynamic message signs*
        - *Messages about construction/delays on the road ahead*
        - *Messages about alternate routes*
    - *Signs marking an alternate route around construction*
    - *Website with construction and road closure information*
    - *Information at tourist centers, rest stops, hotels*

12. Suppose you're on the way to your destination for a recreational trip and you encounter unexpected congestion:
    - Would you consider changing to a different route?
    - If not, why not?
        - *Easier to stay on my original route*
        - *Not sure how long it would take to go around/use an alternate route*
        - *Might not know an alternate route*
    - How bad does the delay have to be for you to exit the freeway and take a different route?
    - What kind of information would help you to make that decision?
        - *Location of the congestion*
        - *Travel time on current route*
        - *Travel speed on current route*
        - *Amount of delay*
        - *Cause of delay/congestion*
        - *Identification of alternate routes/how to get around congestion*
        - *Travel time/speed on alternate route*

APPENDIX B. COMMERCIAL DRIVER INTERVIEW GUIDE

1. What types of factors (e.g. roadway types, route length, route speed, oversize restrictions, current roadway conditions, construction, etc.) are considered when planning commercial truck routes? Which tend to be the most important?

2. Where do you normally find the information that you need to plan commercial routes?

3. Is there information that the Wisconsin DOT could provide (that it's not currently providing) to help you plan good routes within and through the state? Where and how would you like that information made available?

4. How do you usually find out about ongoing or planned road construction projects? If a project involves a road you usually use, how does that affect routes and/or departure time choices?

5. If unexpected congestion/delays occur during a trip, how likely are drivers to switch to an alternate route?

    a. What information would they need/want about potential alternate routes and how would be they be most likely to obtain that information? (And again, is there information that WisDOT could be providing that would be helpful to drivers or dispatchers?)

APPENDIX C. TRAVELER'S INFORMATION SURVEY

1. Are you: ☐ **Male** ☐ **Female**

2. Please select your age range:

- ☐ 18-30
- ☐ 31-40
- ☐ 41-50
- ☐ 51-60
- ☐ 61-70
- ☐ 71+

3. What is your state of residence? _____

4. In general, how often do you do the following in your daily life?

Circle your answer on a scale of 1 to 5, with 1 being "never," and 5 being "all the time":

	Never				All the time
Listen to Radio	1	2	3	4	5
Watch Television	1	2	3	4	5
Send or read E-mail	1	2	3	4	5
Text message	1	2	3	4	5
Use Facebook	1	2	3	4	5
Use Twitter	1	2	3	4	5
Read the local paper	1	2	3	4	5
Access Websites	1	2	3	4	5

5. Do you have a smartphone?

- ☐ Yes
- ☐ No

6. Do you have internet access at:

- ☐ Home
- ☐ Work
- ☐ Both
- ☐ Neither

7. Have you heard of the Wisconsin 511 travel information system?

- ☐ Yes
- ☐ No

8. Have you used the 511 website (*511Wi.gov*) or 511 telephone assistance?

- ☐ Website only
- ☐ Telephone assistance only
- ☐ Both
- ☐ Neither *(skip to Question 10)*

9. If you have used Wisconsin's 511 service, how often?

- ☐ Daily
- ☐ Less than daily but at least once a week
- ☐ Less than once a week but at least once a month
- ☐ Less than once a month but at least once a year
- ☐ Less than once a year

10. Which of the following sources are you currently using to find travel information?
Check all that apply:

- ☐ Radio
- ☐ Television
- ☐ E-mail
- ☐ Text messaging
- ☐ Twitter
- ☐ Facebook
- ☐ Newspaper
- ☐ Department of Transportation or 511 websites
- ☐ Other travel websites (such as Google Maps or Mapquest)
- ☐ Smartphone apps/mobile web
- ☐ Road signs
- ☐ Phone a friend
- ☐ Phone 511
- ☐ Mailed notice
- ☐ GPS system
- ☐ Other (please specify):_____

Travel Information for Familiar/Frequent Trips

For Questions 11 through 15, imagine that you're going to take a trip that you take frequently, in an area that you know well (for instance, a trip from home to work). For these questions, assume that you are ***familiar*** with the area in which you are traveling.

11. If the route that you usually take is going to be delayed because of traffic or roadway conditions, what information would be most useful to have *BEFORE* you start your trip?

Rank the following from 1 to 6 with 1 being the MOST useful information and 6 being the LEAST useful:

___ Amount of delay on your usual route

___ Travel time on your usual route

___ Cause of delay on your usual route

___ Message saying "Take an alternate route"

___ Recommendation of a specific alternate route

___ Travel time on a recommended alternate route

12. If the route that you usually take is delayed because of traffic or roadway conditions, what information would be most useful to have *ONCE YOU HAVE ALREADY STARTED* your trip?

Rank the following from 1 to 6 with 1 being the most useful information and 6 being the least useful:

___ Amount of delay on your usual route

___ Travel time on your usual route

___ Cause of delay on your usual route

___ Message saying "Take an alternate route"

___ Recommendation of a specific alternate route

___ Travel time on a recommended alternate route

13. What information *MUST* you have before you would leave your usual route to take an alternate route (assuming you are familiar with the area)?

Rank your top 3 choices with 1 being your top choice:

___ Name of road(s) included in the alternate route

___ Distance of the alternate route

___ Turn-by-turn directions for the alternate route

___ Travel speed along the alternate route

___ Map of the alternate route

___ Travel time on the alternate route

___ Gas stations, cities, other amenities along the alternate route

___ What the problem or cause of delay is on your usual route

___ Where the problem is on your usual route

___ How long the delay on your usual route will last

14. Is there anything else you would want to know about a potential alternate route (assuming you are familiar with the area)?

15. Which information source (of those lettered below) would best provide the types of information listed in the table, both *before* and *once you have started* your trip? Again, this is for frequent, *familiar* trips.

Fill in the letter for the best source option for both before your trip and once you have started your trip: (you can select the same source multiple times and you can select the same source for both the before and during option)

A. Radio
B. Television
C. E-mail
D. Text messaging
E. Twitter
F. Facebook
G. Newspaper
H. Department of Transportation or 511 website
I. Other travel websites (such as Google Maps or Mapquest)
J. Smartphone apps/mobile web
K. Road signs
L. Phone a friend
M. Phone 511
N. Mailed notice
O. GPS system
P. Other (please specify): _____

Information Type	Before you leave for your trip	Once you have already started your trip
Amount of delay on current route	_____	_____
Travel time on current route	_____	_____
Cause of delay on current route	_____	_____
Message saying "Take an alternate route."	_____	_____
Recommendation of a specific alternate route	_____	_____
Travel time on a recommended alternate route	_____	_____

Travel Information for Unfamiliar Trips

For Questions 16 through 20, imagine that you're going to take a trip to a destination that is ***unfamiliar***, or that you don't travel to very often (such as a vacation trip to a different part of the state). These questions will be like the ones you answered in the previous section, but now imagine that you are ***NOT familiar*** with the area in which you are traveling.

16. If the route that you plan to take for your trip is going to be delayed because of traffic or roadway conditions, what information would be most useful to have *BEFORE* you start your trip?

Rank the following from 1 to 6 with 1 being the MOST useful information and 6 being the LEAST useful:

___ Amount of delay on your usual route

___ Travel time on your usual route

___ Cause of delay on your usual route

___ Message saying "Take an alternate route"

___ Recommendation of a specific alternate route

___ Travel time on a recommended alternate route

17. If the route that you plan to take for your trip is delayed because of traffic or roadway conditions, what information would be most useful to have *ONCE YOU HAVE ALREADY STARTED* your trip?

Rank the following from 1 to 6 with 1 being the most useful information and 6 being the least useful:

___ Amount of delay on your usual route

___ Travel time on your usual route

___ Cause of delay on your usual route

___ Message saying "Take an alternate route"

___ Recommendation of a specific alternate route

___ Travel time on a recommended alternate route

18. What information *MUST* you have before you would leave your usual route to take an alternate route (assuming you are *NOT FAMILIAR* with the area)?

Rank your top 3 choices with 1 being your top choice:

___ Name of road(s) included in the alternate route

___ Distance of the alternate route

___ Turn-by-turn directions for the alternate route

___ Travel speed along the alternate route

___ Map of the alternate route

___ Travel time on the alternate route

___ Gas stations, cities, other amenities along the alternate route

___ What the problem or cause of delay is on your usual route

___ Where the problem is on your usual route

___ How long the delay on your usual route will last

19. Is there anything else you would want to know about a potential alternate route (assuming you are NOT familiar with the area)?

20. Which information source (of those lettered below) would best provide the types of information listed in the table, both *before* and *once you have started* your trip to an unfamiliar area?

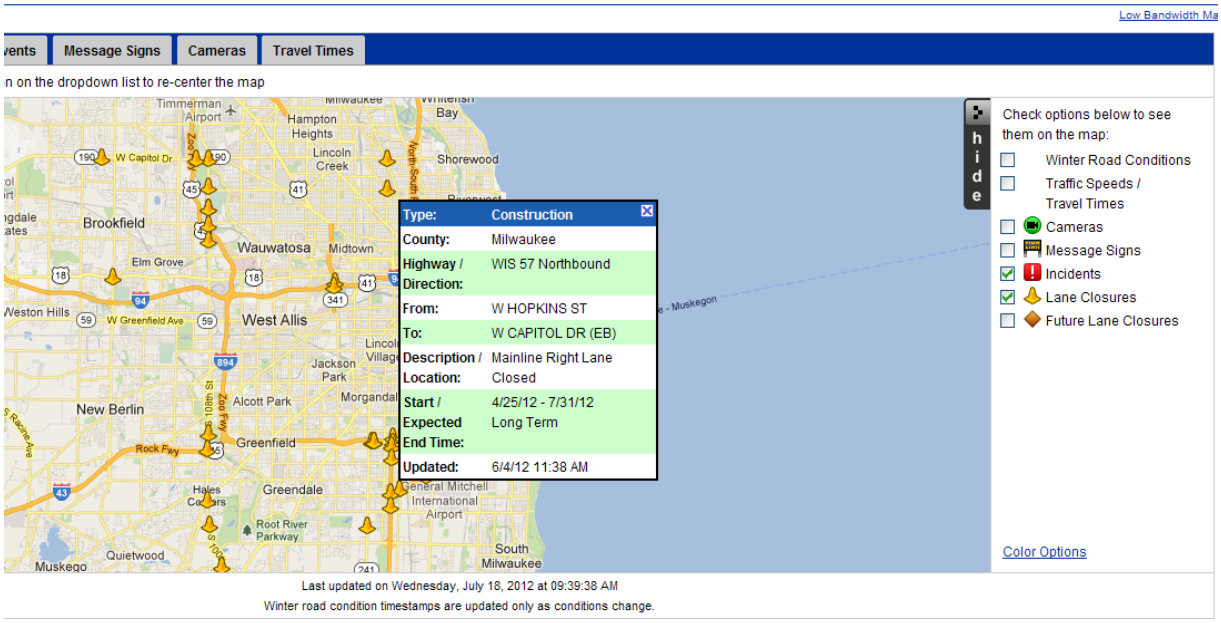
Fill in the letter for the best source option for both before your trip and once you have started your trip: you can select the same source multiple times and you can select the same source for both the before and during option.

A. Radio
B. Television
C. E-mail
D. Text messaging
E. Twitter
F. Facebook
G. Newspaper
H. Department of Transportation or 511 website
I. Other travel websites (such as Google Maps or Mapquest)
J. Smartphone apps/mobile web
K. Road signs
L. Phone a friend
M. Phone 511
N. Mailed notice
O. GPS system
P. Other (please specify): _____

Information Type	Before you leave for your trip	Once you have already started your trip
Amount of delay on current route	_____	_____
Travel time on current route	_____	_____
Cause of delay on current route	_____	_____
Message saying "Take an alternate route."	_____	_____
Recommendation of a specific alternate route	_____	_____
Travel time on a recommended alternate route	_____	_____

Travel Information Examples

Below is an example of information you can find on the Wisconsin 511 website. On the right, you can turn on and off various types of information, and if you click on the icons on the map you can view additional information such as the Construction box you see open. You can also view ALERTS scrolling at the top of the map in red.

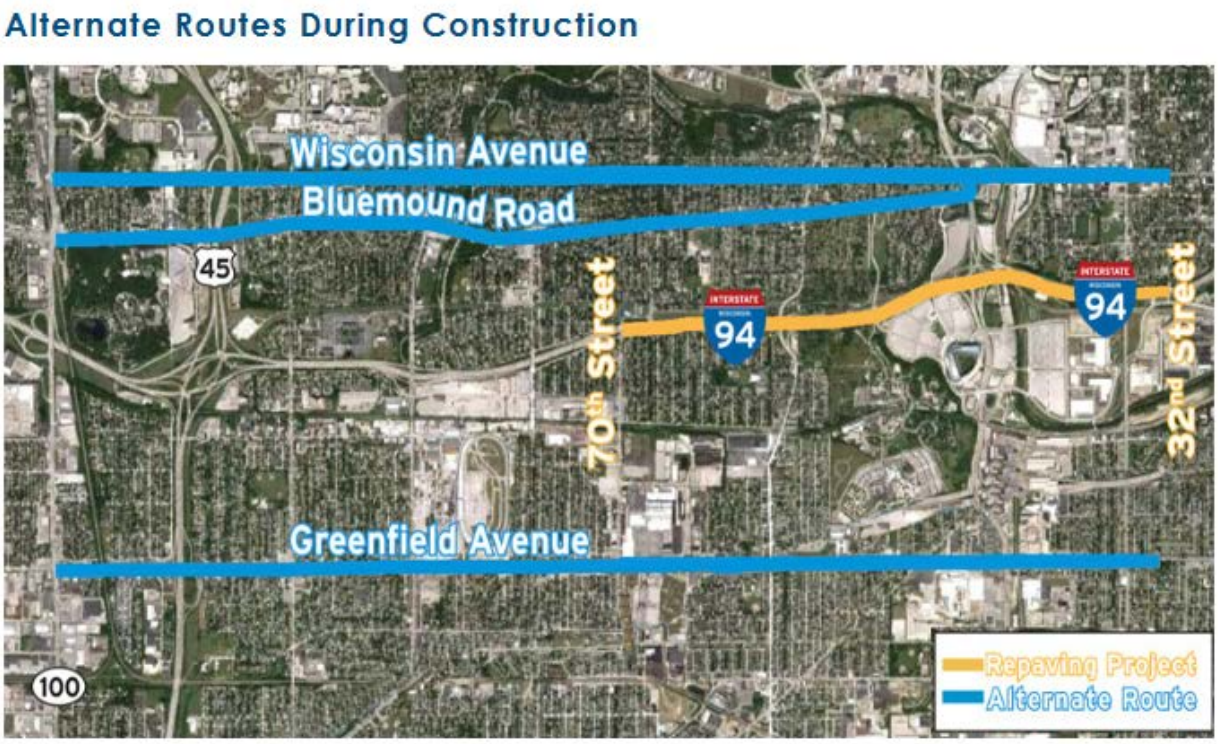


21. How likely on a scale of 1 to 5 are you to use this site in the future to find travel-related information?

<u>Circle</u> your answer on a scale of 1 to 5, with 1 being not likely at all, and 5 being very likely:

Not likely at all				Very likely
1	2	3	4	5

Elsewhere on the 511 site is some information about highway construction projects (such as construction on I-94), including alternate route information, such as the alternate route map shown below.



22. How likely on a scale of 1 to 5 are you to use this site in the future to find information about alternate routes?

<u>Circle</u> your answer on a scale of 1 to 5, with 1 being not likely at all, and 5 being very likely:

Not likely at all				Very likely
1	2	3	4	5

This is the end of the survey.
Thank you for your participation!

APPENDIX D. ADDITIONAL RESULTS TABLES FOR TRAVELER SURVEY

Table 36. Travel Information Sources Used by Travelers (Question 10).

Which of the following sources are you currently using to find travel information?	
Information Source	**Percent of Respondents**
Radio	46.7%
Television	32.6%
E-mail	12.3%
Text messaging	6.3%
Twitter	1.4%
Facebook	6.0%
Newspaper	16.8%
DOT/511 websites	16.8%
Other travel websites (such as Google Maps or Mapquest)	57.5%
Smart phone apps/mobile web	35.1%
Road signs	53.3%
Phone a friend	14.4%
Mailed notice	1.1%
GPS system	1.4%
Other	48.8%
n	285

Table 37. Travel Delay Information Preferences - Average Scores (Questions 11, 12, 16 and 17).

If the route is going to be delayed because of traffic or roadway conditions, what information would be the most useful? (scored between 1 and 6, with 6 receiving the most useful score)								
	Conservative Scoring				Expanded Scoring			
	Familiar		Unfamiliar		Familiar		Unfamiliar	
Types of Information	Pre Trip	En Route	Pre Trip	En Route	Pre Trip	En Route	Pre Trip	En Route
Amount of delay on your usual route	4.6	4.6	4.3	4.1	4.5	4.4	4.2	4.1
Travel time on your usual route	3.5	3.4	3.4	3.3	3.6	3.4	3.5	3.3
Cause of delay on your usual route	2.9	3.0	2.7	2.7	3.0	3.0	2.7	2.7
Message saying "Take an alternate route"	3.2	3.3	3.7	3.8	3.3	3.4	3.7	3.8
Recommendation of a specific alternate route	3.5	3.6	3.8	3.9	3.6	3.7	3.9	3.9
Travel time on a recommended alternate route	3.2	3.1	3.2	3.2	3.3	3.2	3.3	3.2
n		230		216		281		247

Table 38. Alternate Route Information Preferences - Average Scores (Questions 13 and 18).

What information must you have before you leave your usual route to take an alternate route? (top 3 choices ranked, with 3 receiving the top score**)				
Types of Information	Conservative Scoring		Expanded Scoring	
	Familiar	Unfamiliar	Familiar	Unfamiliar
Name of road(s) included in the alternate route	0.7	0.8	0.8	0.9
Distance of the alternate route	0.7	0.6	0.7	0.7
Turn-by-turn directions for the alternate route	0.7	1.2	0.8	1.2
Travel speed along the alternate route	0.1	0.2	0.2	0.2
Map of the alternate route	0.6	1.0	0.8	1.0
Travel time on the alternate route	0.9	0.8	0.9	0.8
Gas stations, cities, other amenities along the alternate route	0.1	0.2	0.2	0.3
What the problem or cause of delay is on your usual route	0.5	0.2	0.5	0.3
Where the problem is on your usual route	0.7	0.3	0.8	0.4
How long the delay on your usual route will last	1.0	0.7	1.0	0.8
n	251	241	280	255

***scores are shifted down b/c the n is kept the same even though only the top 3 answer choices are considered*

Table 39. Preferred Information Source for the Amount of Delay on Current Route (Questions 15 and 20).

Which information source would best provide the amount of delay on your current route?								
	Conservative Scoring				Expanded Scoring			
	Familiar		Unfamiliar		Familiar		Unfamiliar	
Information Source	Pre Trip	En Route	Pre Trip	En Route	Pre Trip	En Route	Pre Trip*	En Route
Radio	21.2%	42.3%	22.8%	38.6%	20.7%	40.7%	20.4%	34.8%
Television	18.0%	0.5%	13.0%	0.0%	18.6%	0.4%	13.2%	0.0%
E-mail	6.3%	1.6%	5.4%	1.1%	5.4%	1.1%	6.4%	0.7%
Text messaging	15.9%	7.9%	15.2%	9.2%	15.4%	8.4%	13.9%	10.3%
Twitter	0.0%	0.0%	0.0%	0.0%	0.4%	0.0%	0.7%	0.4%
Facebook	0.0%	0.0%	0.0%	0.0%	0.0%	0.4%	0.0%	0.4%
Newspaper	0.5%	0.0%	1.1%	0.5%	2.5%	0.0%	2.5%	0.4%
Department of Transportation or 511 site	5.8%	0.0%	5.4%	0.5%	6.1%	0.0%	7.5%	0.7%
Other travel websites (such as Google Maps or Mapquest)	10.6%	2.6%	13.0%	1.1%	10.0%	2.6%	12.5%	1.8%
Smartphone apps/mobile web	10.6%	10.6%	13.0%	13.0%	10.0%	10.3%	12.1%	12.1%
Road signs	3.2%	16.4%	3.3%	17.9%	3.2%	18.7%	2.9%	19.8%
Phone a friend	1.1%	1.1%	0.0%	0.0%	1.1%	1.5%	0.4%	0.4%
Phone 511	0.0%	0.5%	0.5%	0.5%	0.0%	1.1%	1.1%	1.5%
Mailed notice	0.0%	0.0%	0.0%	0.0%	0.4%	0.0%	0.0%	0.0%
GPS system	6.9%	16.4%	7.1%	17.4%	6.1%	14.7%	6.1%	16.5%
Other	0.0%	0.0%	0.0%	0.0%	0.4%	0.4%	0.0%	0.4%
n		189		184		232		225

Table 40. Preferred Information Source for the Travel Time on a Current Route (Questions 15 and 20).

Which information source would best provide the travel time on a current route?								
	Conservative Scoring				Expanded Scoring			
	Familiar		Unfamiliar		Familiar		Unfamiliar	
Information Source	Pre Trip	En Route	Pre Trip	En Route	Pre Trip	En Route	Pre Trip	En Route
Radio	15.9%	37.6%	15.2%	32.1%	17.8%	36.2%	15.0%	31.3%
Television	17.5%	0.5%	14.7%	1.6%	17.8%	0.4%	13.9%	1.1%
E-mail	5.8%	2.1%	5.4%	1.6%	5.0%	1.4%	5.9%	1.1%
Text messaging	15.3%	7.4%	16.3%	10.3%	14.6%	7.2%	15.4%	10.4%
Twitter	0.0%	0.0%	0.0%	0.0%	0.4%	0.0%	0.4%	0.4%
Facebook	0.0%	0.0%	0.0%	0.0%	0.0%	0.4%	0.0%	0.4%
Newspaper	0.0%	0.0%	0.5%	0.0%	2.1%	0.0%	1.1%	0.0%
Department of Transportation or 511 site	7.9%	0.5%	3.8%	0.5%	7.5%	0.7%	6.6%	0.7%
Other travel websites (such as Google Maps or Mapquest)	10.6%	2.6%	14.1%	2.2%	9.6%	2.9%	13.9%	2.6%
Smartphone apps/mobile web	7.9%	10.6%	13.0%	11.4%	8.2%	10.5%	12.5%	11.2%
Road signs	5.3%	16.4%	2.7%	15.2%	5.0%	18.8%	2.6%	17.5%
Phone a friend	0.0%	0.5%	0.0%	0.0%	0.4%	1.1%	0.4%	0.7%
Phone 511	0.0%	0.0%	0.5%	0.5%	0.0%	1.1%	1.1%	1.1%
Mailed notice	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
GPS system	13.8%	21.7%	13.6%	23.9%	11.4%	18.8%	11.0%	20.5%
Other	0.0%	0.0%	0.0%	0.5%	0.4%	0.4%	0.4%	0.7%
n		189		184		232		225

Table 41. Preferred Information Source for the Cause of Delay on a Current Route (Questions 15 and 20).

Which information source would best provide the cause of delay on current route?								
	Conservative Scoring				Expanded Scoring			
	Familiar		Unfamiliar		Familiar		Unfamiliar	
Information Source	Pre Trip	En Route	Pre Trip	En Route	Pre Trip	En Route	Pre Trip	En Route
Radio	17.5%	42.9%	17.9%	39.1%	19.3%	40.9%	17.9%	36.4%
Television	24.3%	2.1%	16.3%	0.5%	22.5%	1.8%	16.4%	0.4%
E-mail	6.9%	2.6%	6.5%	1.6%	6.2%	2.2%	6.6%	1.1%
Text messaging	15.3%	8.5%	16.3%	10.9%	14.9%	8.8%	15.3%	10.8%
Twitter	0.5%	0.0%	0.0%	0.0%	0.7%	0.0%	0.4%	0.4%
Facebook	0.5%	0.0%	0.0%	0.0%	0.7%	0.4%	0.0%	0.4%
Newspaper	1.1%	1.1%	2.7%	1.1%	3.3%	0.7%	3.3%	0.7%
Department of Transportation or 511 site	8.5%	0.0%	5.4%	1.1%	7.3%	0.4%	7.7%	1.1%
Other travel websites (such as Google Maps or Mapquest)	5.8%	1.1%	10.3%	0.5%	5.8%	1.5%	10.2%	1.5%
Smartphone apps/mobile web	7.9%	9.0%	13.0%	12.5%	8.4%	9.1%	11.7%	11.9%
Road signs	5.8%	18.0%	4.9%	15.8%	5.5%	19.0%	4.4%	18.6%
Phone a friend	0.0%	0.0%	0.0%	0.0%	0.4%	0.4%	0.4%	0.4%
Phone 511	0.0%	1.1%	0.5%	1.1%	0.0%	2.2%	1.1%	1.5%
Mailed notice	0.0%	0.5%	0.0%	1.1%	0.0%	0.4%	0.0%	0.7%
GPS system	4.8%	11.1%	5.4%	13.6%	4.4%	10.2%	4.4%	12.6%
Other	0.0%	0.0%	0.0%	0.0%	0.7%	2.2%	0.4%	1.5%
n		189		184		232		225

Table 42. Preferred Information Source for the Message Saying "Take an Alternate Route" (Questions 15 and 20).

Which information source would best provide the message saying "Take an alternate route"?								
	Conservative Scoring				Expanded Scoring			
	Familiar		Unfamiliar		Familiar		Unfamiliar	
Information Source	Pre Trip	En Route	Pre Trip	En Route	Pre Trip	En Route	Pre Trip	En Route
Radio	12.7%	24.3%	10.9%	20.1%	14.9%	23.3%	11.7%	21.0%
Television	14.8%	0.5%	8.2%	0.5%	16.7%	0.4%	9.9%	0.4%
E-mail	8.5%	1.6%	6.5%	1.6%	6.9%	1.1%	6.9%	1.1%
Text messaging	24.3%	15.3%	20.7%	15.2%	22.1%	14.4%	18.6%	14.0%
Twitter	0.0%	0.0%	0.0%	0.0%	0.7%	0.0%	0.4%	0.4%
Facebook	0.0%	0.0%	0.0%	0.0%	0.0%	0.4%	0.0%	0.4%
Newspaper	1.1%	0.0%	0.5%	0.5%	2.2%	0.0%	1.5%	0.4%
Department of Transportation or 511 site	4.2%	0.0%	4.3%	0.0%	5.1%	0.4%	6.6%	0.4%
Other travel websites (such as Google Maps or Mapquest)	7.9%	1.1%	11.4%	1.6%	7.2%	2.6%	11.3%	2.2%
Smartphone apps/mobile web	6.9%	10.1%	12.5%	10.3%	7.2%	10.0%	11.7%	11.0%
Road signs	11.1%	30.7%	12.0%	31.0%	9.4%	30.4%	9.9%	29.8%
Phone a friend	0.0%	0.5%	0.0%	0.0%	0.4%	0.7%	0.4%	0.4%
Phone 511	0.0%	0.0%	1.6%	1.6%	0.0%	0.7%	1.8%	1.8%
Mailed notice	0.0%	0.5%	0.0%	0.0%	0.0%	0.4%	0.4%	0.0%
GPS system	8.5%	15.3%	11.4%	17.4%	7.2%	14.4%	9.1%	16.2%
Other	0.0%	0.0%	0.0%	0.0%	0.0%	0.7%	0.0%	0.7%
n		189		184		232		225

Table 43. Preferred Information Source for the Recommendation of a Specific Alternate Route (Questions 15 and 20).

Which information source would best provide the recommendation of a specific alternate route?								
	Conservative Scoring				Expanded Scoring			
	Familiar		Unfamiliar		Familiar		Unfamiliar	
Information Source	Pre Trip	En Route	Pre Trip	En Route	Pre Trip	En Route	Pre Trip	En Route
Radio	13.8%	27.5%	12.0%	22.3%	14.9%	26.8%	12.5%	22.5%
Television	14.3%	0.5%	7.6%	1.1%	15.6%	0.7%	9.3%	0.7%
E-mail	6.3%	1.6%	5.4%	1.1%	5.2%	1.1%	6.4%	0.7%
Text messaging	18.5%	10.1%	17.4%	10.3%	16.6%	10.1%	15.7%	10.2%
Twitter	0.5%	0.5%	0.5%	0.5%	0.7%	0.4%	0.7%	0.7%
Facebook	0.5%	0.0%	0.0%	0.0%	0.3%	0.4%	0.0%	0.4%
Newspaper	0.5%	0.0%	0.0%	0.0%	2.4%	0.0%	1.1%	0.0%
Department of Transportation or 511 site	5.8%	1.1%	4.3%	1.1%	6.6%	1.1%	6.1%	0.7%
Other travel websites (such as Google Maps or Mapquest)	9.5%	1.6%	15.8%	1.1%	9.3%	2.5%	14.3%	2.2%
Smartphone apps/mobile web	10.6%	9.0%	13.6%	13.0%	10.0%	9.1%	13.6%	13.1%
Road signs	6.3%	21.7%	10.9%	21.7%	6.2%	23.6%	8.9%	23.6%
Phone a friend	0.5%	0.0%	0.0%	0.5%	0.7%	0.4%	0.4%	0.7%
Phone 511	0.0%	1.1%	1.1%	1.1%	0.3%	1.8%	1.4%	1.5%
Mailed notice	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
GPS system	12.7%	25.4%	11.4%	26.1%	11.1%	21.7%	9.3%	22.5%
Other	0.0%	0.0%	0.0%	0.0%	0.0%	0.4%	0.4%	0.4%
n		189		184		232		225

Table 44. Preferred Information Source for the Travel Time on a Recommended Alternate Route (Questions 15 and 20).

Which information source would best provide the travel time on a recommended alternate route?								
	Conservative Scoring				Expanded Scoring			
	Familiar		Unfamiliar		Familiar		Unfamiliar	
Information Source	Pre Trip	En Route	Pre Trip	En Route	Pre Trip	En Route	Pre Trip	En Route
Radio	12.7%	27.0%	10.9%	23.9%	14.3%	27.7%	12.1%	24.5%
Television	15.9%	0.5%	9.2%	0.5%	17.5%	0.4%	10.4%	0.4%
E-mail	6.3%	1.6%	4.9%	1.1%	5.0%	1.1%	5.7%	0.7%
Text messaging	16.4%	10.1%	15.8%	9.2%	15.4%	10.1%	15.7%	9.7%
Twitter	0.0%	0.0%	0.0%	0.0%	0.4%	0.0%	0.4%	0.4%
Facebook	0.5%	0.5%	0.5%	0.5%	0.4%	0.7%	0.4%	0.7%
Newspaper	0.0%	0.0%	0.0%	0.5%	1.8%	0.0%	1.1%	0.4%
Department of Transportation or 511 site	4.8%	0.5%	4.3%	0.0%	6.1%	0.7%	6.1%	0.0%
Other travel websites (such as Google Maps or Mapquest)	10.6%	1.6%	14.7%	2.2%	9.6%	2.5%	13.2%	2.5%
Smartphone apps/mobile web	11.6%	10.1%	15.2%	14.1%	10.4%	10.1%	13.9%	13.7%
Road signs	10.1%	22.8%	8.7%	18.5%	8.6%	23.4%	7.5%	20.9%
Phone a friend	0.5%	0.0%	0.0%	0.5%	0.7%	0.4%	0.4%	0.7%
Phone 511	0.0%	1.1%	0.5%	0.5%	0.4%	2.2%	1.1%	1.1%
Mailed notice	0.0%	0.0%	0.5%	0.5%	0.0%	0.0%	0.4%	0.4%
GPS system	10.1%	23.3%	14.1%	26.6%	9.3%	19.8%	11.1%	22.7%
Other	0.5%	1.1%	0.5%	1.1%	0.4%	1.1%	0.7%	1.4%
n		189		184		232		225

APPENDIX E. COMMERCIAL DRIVER TRAVEL INFORMATION SURVEY

1. **Are you:** ☐ **Male** ☐ **Female**

2. **Please select your age range:**

   ☐ 18-30
   ☐ 31-40
   ☐ 41-50
   ☐ 51-60
   ☐ 61-70
   ☐ 71+

3. **What is your state of residence? _____**

4. **What kinds of commercial driving do you do (or does your company do)? (select all that apply)**

   ☐ Superloads/Permitted loads (OS/OW)
   ☐ Standard-size loads – long haul
   ☐ Standard-size loads – short haul
   ☐ Local deliveries
   ☐ Other (specify)

5. **What types of trips are most common?**

   a. intra-city
   b. inter-city
   c. through/long-haul

6. **Who determines the route?**

   a. I determine my own route
   b. My company determines the route
   c. I confer with my company to pick a route

7. **What is the average route distance?**

   _____ *miles*

8. **Do you (or does your company) use traffic and roadway information from the Wisconsin 511 traveler information system, or other online information provided by the Wisconsin Department of Transportation?**

   a. Yes
   b. No

9. **If so, what information do you use?** *(Check all that apply.)*
   - ☐ Map of truck routes
   - ☐ Weigh station locations/contacts
   - ☐ Information for oversize/overweight permits (bridge height/weight limits, permitting regulations,etc.)
   - ☐ Seasonal weight restrictions
   - ☐ Construction maps
   - ☐ Traffic speed maps
   - ☐ Other (specify)

10. **Which of the following sources are you currently using to find travel information for your commercial routes?** *Check all that apply:*

   - ☐ Radio news
   - ☐ Television
   - ☐ E-mail
   - ☐ Text messaging
   - ☐ Twitter
   - ☐ Facebook
   - ☐ OS/OW Permitting Dept. or Service
   - ☐ Department of Transportation or 511 websites
   - ☐ Other travel websites (such as Google Maps or Mapquest)
   - ☐ Smartphone apps/mobile web
   - ☐ Electronic road signs
   - ☐ Other commercial drivers/dispatch
   - ☐ Phone 511
   - ☐ GPS system
   - ☐ Other (please specify

   _____

11. If your route is going to be delayed, what information would be most useful to have *BEFORE* you start your trip?

Rank the following from 1 to 7 with 1 being the MOST useful information and 7 being the LEAST useful:

___ Amount of delay on your usual route

___ Travel time on your usual route

___ Cause of delay on your usual route

___ Message saying "Take an alternate route"

___ Recommendation of a specific alternate route

___ Travel time on a recommended alternate route

___ Truck restrictions on potential alternate route(s)

12. If your route is going to be delayed, what information would be most useful to have *ONCE YOU HAVE ALREADY STARTED* your trip?

Rank the following from 1 to 7 with 1 being the MOST useful information and 7 being the LEAST useful:

___ Amount of delay on your usual route

___ Travel time on your usual route

___ Cause of delay on your usual route

___ Message saying "Take an alternate route"

___ Recommendation of a specific alternate route

___ Travel time on a recommended alternate route

___ Truck restrictions on potential alternate route(s)

13. Which of the following communication devices do you normally use? *(Check all that apply.)*

- ☐ Smartphone
- ☐ Cell phone/PDA
- ☐ Mobile data terminal/mobile computer
- ☐ Two-way radio

14. What information *MUST* you have before you would leave your usual route to take an alternate route (assuming you could legally switch to an alternate route mid-trip)?

<u>Rank</u> your top three choices with 1 being your top choice:

___ Name of road(s) included in route

___ Distance of the alternate route

___ Turn-by-turn directions

___ Travel speed along the alternate route

___ Map of the alternate route

___ Travel time on the alternate route

___ Gas stations, cities, other amenities along the alternate route

___ What the problem or cause of delay is on your normal route

___ Where the problem is on your normal route

___ How long the problem will cause a delay on your normal route

___ Truck-related restrictions along the alternate route

___ Type of roadway on the alternate route *(two-lane, four-lane, etc.)*

15. Is there any other information you would want the Wisconsin DOT to provide regarding route conditions or alternate routes for commercial vehicles?

16. Which information source (of those lettered below) would best provide the types of information listed in the table, both *before* and *once you have started* your trip?

Fill in the letter for the best source option for both before your trip and once you have started your trip: (you can select the same source multiple times and you can select the same source for both the before and during option)

Q. Radio

R. Television

S. E-mail

T. Text messaging

U. Twitter

V. Facebook

W. Department of Transportation or 511 website

X. Other travel websites (such as Google Maps or Mapquest)

Y. Smartphone apps/mobile web

Z. Road signs

AA. Dispatcher

BB. Other commercial drivers

CC. Phone 511

DD. GPS system

EE. Truck routing software

FF. OS/OW Permitting Dept. or Service

GG. Other (please specify):

_____

Information Type	Before you leave for your trip	Once you have already started your trip
Amount of delay on current route	_____	_____
Travel time on current route	_____	_____
Cause of delay on current route	_____	_____
Recommendation of a specific alternate route	_____	_____
Travel time on a recommended alternate route	_____	_____
Truck restrictions (if any) on an alternate route	_____	_____

This is the end of the survey.
Thank you for your participation!

APPENDIX F. ADDITIONAL RESULTS TABLES FOR COMMERCIAL DRIVER SURVEY

Table 45. Travel Information Sources Used by Commercial Drivers (Question 10).

What sources are you currently using?	
Radio	56%
TV	11%
E-mail	3%
Text Messages	0%
Twitter	3%
Facebook	3%
OS/OW Permitting Dept.	8%
DOT/511 website	39%
Other travel websites	33%
Smart-phone apps/mobile web	19%
Road signs	47%
Dispatch/other drivers	39%
Phone 511	3%
GPS	36%

Note: Participants were allowed to pick more than one answer

Table 46. Pre-trip and En Route Information Rankings by Commercial Drivers (Questions 11 and 12).

If the route is going to be delayed because of traffic or roadway conditions, what information would be the most useful? (scored between 1 and 6, with 6 receiving the most useful score)				
	Conservative Scoring		Expanded Scoring	
Types of Information	Pre Trip	En Route	Pre Trip	En Route
Amount of delay on your usual route	4.8	4.5	5.2	4.7
Travel time on your usual route	3.2	3.5	3.3	3.5
Cause of delay on your usual route	2.9	3.3	3.2	3.3
Message saying "Take an alternate route"	4.6	4.9	4.9	4.9
Recommendation of a specific alternate route	3.8	3.9	4.5	4.5
Travel time on a recommended alternate route	4.1	3.6	3.7	3.5
Truck Restriction on an alternate route	4.7	4.4	4.9	4.8
n	18		30	

Table 47. Alternate Route Information Preferences - Average Scores (Question 14).

What information must you have before you leave your usual route to take an alternate route? (top 3 choices ranked, with 3 receiving the top score**)		
Types of Information	Conservative Scoring	Expanded Scoring
Name of road(s) included in the alternate route	0.73	0.74
Distance of the alternate route	0.50	0.65
Turn-by-turn directions for the alternate route	0.04	0.24
Travel speed along the alternate route	0.04	0.15
Map of the alternate route	0.69	0.88
Travel time on the alternate route	0.46	0.38
Gas stations, cities, other amenities along the alternate route	0.00	0.15
What the problem or cause of delay is on your usual route	0.69	0.74
Where the problem is on your usual route	0.65	0.82
How long the delay on your usual route will last	0.81	0.79
Truck restrictions	1.08	1.18
Type of road	0.31	0.32
n	26	34

***scores are shifted down b/c the n is kept the same even though only the top 3 answer choices are considered*

Table 48. Preferred Information Source for the Amount of Delay on Current Route (Question 16).

Which information source would best provide the amount of delay on current route?				
	Conservative Scoring		Expanded Scoring	
Information Source	Pre Trip	En Route	Pre Trip	En Route
Radio	26.3%	36.8%	25.7%	28.2%
Television	10.5%	0.0%	8.6%	0.0%
E-mail	5.3%	0.0%	2.9%	0.0%
Text messaging	5.3%	0.0%	5.7%	2.6%
Twitter	0.0%	0.0%	0.0%	0.0%
Facebook	0.0%	0.0%	2.9%	2.6%
Department of Transportation or 511 site	15.8%	5.3%	11.4%	5.1%
Other travel websites (such as Google Maps or Mapquest)	5.3%	0.0%	5.7%	2.6%
Smartphone apps/mobile web	5.3%	15.8%	5.7%	12.8%
Road signs	5.3%	0.0%	5.7%	10.3%
Dispatcher	5.3%	5.3%	11.4%	5.1%
Other commercial drivers	0.0%	26.3%	2.9%	23.1%
Phone 511	0.0%	0.0%	0.0%	0.0%
GPS system	10.5%	10.5%	8.6%	7.7%
Truck routing software	5.3%	0.0%	2.9%	0.0%
OS/OW Permitting Dept. or Service	0.0%	0.0%	0.0%	0.0%
n		19		27

Table 49. Preferred Information Source for the Travel Time on a Current Route (Question 16).

Which information source would best provide the travel time on a current route?				
	Conservative Scoring		Expanded Scoring	
Information Source	Pre Trip	En Route	Pre Trip	En Route
Radio	26.3%	21.1%	21.9%	16.7%
Television	0.0%	0.0%	6.3%	0.0%
E-mail	0.0%	0.0%	0.0%	0.0%
Text messaging	5.3%	0.0%	3.1%	2.8%
Twitter	0.0%	0.0%	0.0%	0.0%
Facebook	0.0%	0.0%	3.1%	2.8%
Department of Transportation or 511 site	5.3%	5.3%	6.3%	2.8%
Other travel websites (such as Google Maps or Mapquest)	0.0%	0.0%	3.1%	2.8%
Smartphone apps/mobile web	15.8%	10.5%	12.5%	8.3%
Road signs	15.8%	21.1%	12.5%	22.2%
Dispatcher	0.0%	0.0%	6.3%	8.3%
Other commercial drivers	0.0%	10.5%	6.3%	13.9%
Phone 511	5.3%	0.0%	3.1%	0.0%
GPS system	21.1%	31.6%	12.5%	19.4%
Truck routing software	5.3%	0.0%	3.1%	0.0%
OS/OW Permitting Dept. or Service	0.0%	0.0%	0.0%	0.0%
n		19		27

Table 50. Preferred Information Source for the Cause of Delay on Current Route (Question 16).

Which information source would best provide the cause of delay on current route?				
	Conservative Scoring		Expanded Scoring	
Information Source	Pre Trip	En Route	Pre Trip	En Route
Radio	36.8%	26.3%	28.2%	23.1%
Television	0.0%	0.0%	7.7%	2.6%
E-mail	0.0%	0.0%	0.0%	0.0%
Text messaging	5.3%	0.0%	5.1%	2.6%
Twitter	0.0%	0.0%	0.0%	0.0%
Facebook	0.0%	0.0%	2.6%	2.6%
Department of Transportation or 511 site	10.5%	5.3%	5.1%	2.6%
Other travel websites (such as Google Maps or Mapquest)	5.3%	0.0%	7.7%	2.6%
Smartphone apps/mobile web	10.5%	10.5%	7.7%	7.7%
Road signs	10.5%	15.8%	7.7%	15.4%
Dispatcher	5.3%	0.0%	10.3%	7.7%
Other commercial drivers	10.5%	31.6%	12.8%	25.6%
Phone 511	0.0%	0.0%	0.0%	0.0%
GPS system	5.3%	10.5%	5.1%	7.7%
Truck routing software	0.0%	0.0%	0.0%	0.0%
OS/OW Permitting Dept. or Service	0.0%	0.0%	0.0%	0.0%
n		19		27

Table 51. Preferred Information Source for the Message Saying "Take an Alternate Route" (Question 16).

Which information source would best provide the message saying "Take an alternate route"?				
	Conservative Scoring		Expanded Scoring	
Information Source	Pre Trip	En Route	Pre Trip	En Route
Radio	10.5%	10.5%	13.5%	13.5%
Television	5.3%	0.0%	8.1%	0.0%
E-mail	0.0%	0.0%	0.0%	0.0%
Text messaging	0.0%	5.3%	2.7%	5.4%
Twitter	0.0%	0.0%	0.0%	0.0%
Facebook	0.0%	0.0%	2.7%	2.7%
Department of Transportation or 511 site	15.8%	10.5%	10.8%	5.4%
Other travel websites (such as Google Maps or Mapquest)	21.1%	5.3%	13.5%	2.7%
Smartphone apps/mobile web	15.8%	10.5%	10.8%	8.1%
Road signs	10.5%	10.5%	8.1%	13.5%
Dispatcher	10.5%	10.5%	10.8%	13.5%
Other commercial drivers	5.3%	5.3%	10.8%	13.5%
Phone 511	0.0%	5.3%	2.7%	5.4%
GPS system	5.3%	21.1%	5.4%	13.5%
Truck routing software	0.0%	5.3%	0.0%	2.7%
OS/OW Permitting Dept. or Service	0.0%	0.0%	0.0%	0.0%
n		19		27

Table 52. Preferred Information Source for the Recommendation of a Specific Alternate Route (Question 16).

Which information source would best provide the recommendation of a specific alternate route?				
	Conservative Scoring		Expanded Scoring	
Information Source	Pre Trip	En Route	Pre Trip	En Route
Radio	26.3%	10.5%	23.5%	14.3%
Television	5.3%	0.0%	8.8%	0.0%
E-mail	0.0%	0.0%	0.0%	0.0%
Text messaging	0.0%	0.0%	2.9%	2.9%
Twitter	0.0%	0.0%	0.0%	0.0%
Facebook	0.0%	0.0%	2.9%	2.9%
Department of Transportation or 511 site	10.5%	10.5%	5.9%	5.7%
Other travel websites (such as Google Maps or Mapquest)	10.5%	0.0%	8.8%	2.9%
Smartphone apps/mobile web	21.1%	10.5%	14.7%	8.6%
Road signs	0.0%	15.8%	2.9%	17.1%
Dispatcher	5.3%	10.5%	8.8%	11.4%
Other commercial drivers	5.3%	5.3%	8.8%	11.4%
Phone 511	0.0%	5.3%	0.0%	2.9%
GPS system	10.5%	21.1%	8.8%	14.3%
Truck routing software	5.3%	10.5%	2.9%	5.7%
OS/OW Permitting Dept. or Service	0.0%	0.0%	0.0%	0.0%
n		19		27

Table 53. Preferred Information Source for the Travel Time on a Recommended Alternate Route (Question 16).

Which information source would best provide the travel time on a recommended alternate route?				
	Conservative Scoring		Expanded Scoring	
Information Source	Pre Trip	En Route	Pre Trip	En Route
Radio	10.5%	10.5%	16.2%	10.8%
Television	5.3%	0.0%	8.1%	0.0%
E-mail	0.0%	0.0%	0.0%	0.0%
Text messaging	0.0%	0.0%	2.7%	2.7%
Twitter	0.0%	0.0%	0.0%	0.0%
Facebook	0.0%	0.0%	2.7%	2.7%
Department of Transportation or 511 site	21.1%	15.8%	10.8%	8.1%
Other travel websites (such as Google Maps or Mapquest)	15.8%	0.0%	10.8%	2.7%
Smartphone apps/mobile web	5.3%	21.1%	5.4%	13.5%
Road signs	10.5%	15.8%	10.8%	18.9%
Dispatcher	10.5%	15.8%	10.8%	13.5%
Other commercial drivers	5.3%	5.3%	8.1%	10.8%
Phone 511	0.0%	5.3%	2.7%	5.4%
GPS system	5.3%	10.5%	5.4%	10.8%
Truck routing software	5.3%	0.0%	2.7%	0.0%
OS/OW Permitting Dept. or Service	5.3%	0.0%	2.7%	0.0%
n		19		27