



Final Report of the FORETELL Consortium Operational Test: Weather Information for Surface Transportation

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**Final Report of the Evaluation of the FORETELL Consortium
Operational Test: Weather Information for Surface Transportation**

**FORETELL Consortium Operational Test:
Weather Information for Surface Transportation
(WIST)**

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TABLE OF CONTENTS

	<u>Page</u>
EXECUTIVE SUMMARY	viii
ES.1 FORETELL System	viii
ES.2 Evaluation Approach	ix
ES.3 Evaluation Results	xi
ES.4 Caveats.....	xi
 1.0 INTRODUCTION	 1-1
1.1 Mission	1-1
1.2 What is FORETELL?	1-2
1.3 Evaluation Scope	1-3
 2.0 EVALUATION PROCESS.....	 2-1
2.1 Weather Conditions	2-6
2.2 User Access	2-7
 3.0 EVALUATION RESULTS	 3-1
3.1 Highway Maintenance Operators	3-2
3.1.1 User Group Overview	3-2
3.1.2 Information Used	3-3
3.1.3 User Acceptance	3-7
3.1.4 Decision Effectiveness.....	3-14
3.1.5 Other Factors	3-20
3.1.6 Conclusions	3-21
3.2 Other User Groups.....	3-21
3.2.1 Commercial Vehicle Operators	3-22
3.2.1.1 User Group Overview	3-22
3.2.1.2 Information Used	3-25
3.2.1.3 User Acceptance	3-29
3.2.1.4 Decision Effectiveness.....	3-33
3.2.1.5 Other Factors	3-35
3.2.1.6 Summary of CVO Results	3-38
3.2.2 Highway Patrol	3-38
3.2.2.1 User Group Overview	3-38
3.2.2.2 Information Used	3-41
3.2.2.3 User Acceptance	3-44
3.2.2.4 Decision Effectiveness.....	3-49
3.2.2.5 Other Factors	3-51
3.2.2.6 Summary of Highway Patrol Results	3-53
3.2.3 School Administrators	3-54
3.2.3.1 User Group Overview	3-54
3.2.3.2 Information Used	3-54
3.2.3.3 User Acceptance	3-55
3.2.3.4 Decision Effectiveness.....	3-55
3.2.3.5 Other Factors	3-56
3.2.3.6 Summary of School Administrator Results	3-56
3.2.4 Transit Operators.....	3-57
3.2.4.1 User Group Overview	3-57

3.2.4.2	Information Used	3-57
3.2.4.3	User Acceptance/Decision Effectiveness	3-57
3.2.4.4	Summary of Transit Agency Results	3-58
3.2.5	Traffic Managers	3-58
3.2.5.1	User Group Overview	3-58
3.2.5.2	Information Used	3-59
3.2.5.3	User Acceptance	3-59
3.2.5.4	Decision Effectiveness	3-59
3.2.5.5	Other Factors	3-60
3.2.5.6	Summary of Traffic Manager Results	3-60
3.3.	Comparison across User Groups	3-60
3.3.1	Information Used	3-61
3.3.2	User Acceptance	3-64
3.3.3	Decision Effectiveness	3-65
3.3.4	Summary of Results across All Respondents	3-66
4.0	EXTERNAL FACTORS	4-1
4.1	Weather Analysis	4-1
4.2	System Performance	4-9
4.3	Institutional Performance	4-9
5.0	OBSERVATIONS AND RECOMMENDATIONS	5-1
5.1	Observations	5-1
5.2	Recommendations	5-3
6.0	BIBLIOGRAPHY/REFERENCES	6-1
APPENDIX A: HIGHWAY MAINTENANCE OPERATORS - DATA COLLECTION		
	INSTRUMENT AND SUMMARY TABLE	A-1
APPENDIX B: COMMERCIAL VEHICLE OPERATORS - DATA COLLECTION		
	INSTRUMENT AND SUMMARY TABLE	B-1
APPENDIX C: HIGHWAY PATROL PERSONNEL - DATA COLLECTION INSTRUMENT AND		
	SUMMARY TABLE	C-1
APPENDIX D: SCHOOL ADMINISTRATORS - DATA COLLECTION INSTRUMENT		
	AND SUMMARY TABLE	D-1
APPENDIX E: TRANSIT OPERATORS - DATA COLLECTION INSTRUMENT		
	AND SUMMARY TABLE	E-1
APPENDIX F: TRAFFIC MANAGERS - DATA COLLECTION INSTRUMENT AND		
	SUMMARY	F-1
APPENDIX G: FORETELL USER MANUAL AND TRAINING GUIDE		
		G-1

List of Tables

Table 2.1	Evaluation Goals and Decision Areas	2-3
Table 2.2	User Group Evaluation Participation and Data Collection Approach	2-5
Table 3.1	Comparison of Responses to Similar FORETELL Interview/Survey	
	Questions Among the User Groups	3-67
Table 4.1	Activity/Weather Log Summary Table - 1999-2000	4-1
Table 4.2	Activity/Weather Log Summary Table - 2000-2001	4-2
Table 4.3	Activity/Weather Log Summary Table - 2001-2002	4-2

List of Figures

Figure 2.1	Evaluation Goals	2-2
Figure 2.2	Average Temperatures in Iowa for the Period Nov-Apr, 1971-2002 (Average: 31.0 degF) and Nov-Apr, 1971-2002 (Trend = 0.8 degF)	2-7
Figure 2.3	Average Precipitation in Iowa for the Period Nov-Apr, 1971-2002 (Average: 10.85 Inches) and Nov-Apr, 1971-2002 (Trend = 0.45 Inches).....	2-7
Figure 2.4	Number of FORETELL Website Logins by User Group by Month and Evaluation Year (Y2 = Winter of 2000-2001, Y3 = Winter of 2001-2002)	2-8
Figure 2.5	Number of FORETELL Website Logins by User Group (excluding HMOs) by Month and Evaluation Year (Y2 = Winter of 2000-2001, Y3 = Winter of 2001-2002).	2-9
Figure 2.6	Number of FORETELL Website Logins per Person by User Group by Month and Evaluation Year (Y2 = Winter of 2000-2001, Y3 = Winter of 2001-2002)	2-10
Figure 3.1	Percent of Highway Maintenance Operators who Indicated Using a Forecasted and/or Actual Type of Weather Information	3-4
Figure 3.2	Percent of Highway Maintenance Operators who Indicated Using the FORETELL System for each Type of Weather Information.....	3-5
Figure 3.3	Percent of Highway Maintenance Operators who Indicated How Often Weather Information was Obtained	3-6
Figure 3.4	Percent of Highway Maintenance Operators who Indicated How Helpful Weather Information was for Employing Snow and Ice Control Strategies.....	3-7
Figure 3.5a	Percent of Highway Maintenance Operator Users who Agree with Certain Characteristics Associated with Wind Speed/Direction Information	3-8
Figure 3.5b	Percent of Highway Maintenance Operator Users who Agree with Certain Characteristics Associated with Precipitation Information	3-9
Figure 3.5c	Percent of Highway Maintenance Operator Users who Agree with Certain Characteristics Associated with Atmospheric Temperature Information.	3-9
Figure 3.5d	Percent of Highway Maintenance Operator Users who Agree with Certain Characteristics Associated with Pavement Temperature Information	3-10
Figure 3.5e	Percent of Highway Maintenance Operator Users who Agree with Certain Characteristics Associated with Pavement Condition Information	3-11
Figure 3.5f	Percent of Highway Maintenance Operator Users who Agree with Certain Characteristics Associated with Dewpoint Information	3-12
Figure 3.6	Percent of Highway Maintenance Operator Users who Agree with Overall Qualities of Weather/FORETELL Information	3-13
Figure 3.7a	Percent of Highway Maintenance Operators who Use Wind Speed/Direction Information in Road Surface Treatment Decisions.....	3-14
Figure 3.7b	Percent of Highway Maintenance Operators who Use Precipitation Information in Road Surface Treatment Decisions.....	3-15
Figure 3.7c	Percent of Highway Maintenance Operators who Use Atmospheric Temperature Information in Road Surface Treatment Decisions.....	3-15
Figure 3.7d	Percent of Highway Maintenance Operators who Use Pavement Temperature Information in Road Surface Treatment Decisions.....	3-16
Figure 3.7e	Percent of Highway Maintenance Operators who Use Pavement Condition Information in Road Surface Treatment Decisions.....	3-16
Figure 3.7f	Percent of Highway Maintenance Operators who Use Dewpoint Information in Road Surface Treatment Decisions.....	3-17
Figure 3.8	Percent of Highway Maintenance Operators who Indicated Changing a Decision Based on FORETELL Information	3-18

Figure 3.9	Percent of Highway Maintenance Operators who Agreed to Improved Job Performance Using FORETELL Information.....	3-19
Figure 3.10	Percent of Highway Maintenance Operators who Perceived an Improvement in Safety and/or Environmental Concerns When using FORETELL Information	3-20
Figure 3.11	Number of Commercial Vehicle Operators Completing Interviews, by Company Size	3-23
Figure 3.12	Percent of Commercial Vehicle Operators who Received Training Material and the Usefulness of that Material, by Company Size	3-24
Figure 3.13	Percent of Commercial Vehicle Operators who Indicated Using Various Weather-Related Information from Sources Other than FORETELL	3-25
Figure 3.14	Percent of Commercial Vehicle Operators who Indicated Other Sources of Weather Information were Available to Them and How Often Each Source was Used	3-26
Figure 3.15	Percent of Commercial Vehicle Operators who Indicated Using Various Types of FORETELL Information.....	3-27
Figure 3.16	Percent of Commercial Vehicle Operators who Indicated Using the Internet to Gather Weather-Related Information, by Company Size	3-28
Figure 3.17	Percent of Commercial Vehicle Operators who Indicated Agreement with Certain Characteristics of Weather Information They Received from Sources Other Than FORETELL.....	3-29
Figure 3.18	Percent of Commercial Vehicle Operators who Indicated Agreement with Certain Characteristics of FORETELL Information.....	3-30
Figure 3.19	Percent of Commercial Vehicle Operators who Indicated Use of FORETELL Information at Various Time Intervals	3-31
Figure 3.20	Number of Times Commercial Vehicle Operators Accessed the FORETELL Website, According to FORETELL System Records	3-32
Figure 3.21	Percent of Commercial Vehicle Operators who Indicated the Weather Information from Sources Other than FORETELL Made an Improvement in Their Jobs.	3-33
Figure 3.22	Percent of Commercial Vehicle Operators who Indicated the FORETELL Information Made an Improvement in Their Jobs	3-34
Figure 3.23	Percent of Commercial Vehicle Operators who Think Information from Sources Other than FORETELL Increases Safety or Reduces Accidents.....	3-35
Figure 3.24	Percent of Commercial Vehicle Operators who Think FORETELL System Information Increases Safety or Reduces Accidents	3-36
Figure 3.25	Percent of Commercial Vehicle Operators who Indicated a Willingness to Continue Using FORETELL in the Future.....	3-37
Figure 3.26	Number of Highway Patrol Personnel Completing Interviews, by State.	3-39
Figure 3.27	Percent of Highway Patrol Personnel who Received Some Form of Training about the FORETELL System.....	3-40
Figure 3.28	Percent of Highway Patrol Personnel who Indicated Using Various Types of Weather Information	3-41
Figure 3.29	Percent of Highway Patrol Personnel who Indicated Other Sources of Weather Information Were Available to Them and How Often Each Source Was Used	3-42
Figure 3.30	Percent of Highway Patrol Personnel who Indicated Using the Internet to Gather Weather-Related Information, by State	3-43
Figure 3.31	Percent of Highway Patrol Personnel who Indicated Agreement with Certain Characteristics of Weather Information They Received.....	3-44
Figure 3.32	Percent of Highway Patrol Personnel who Indicated Agreement with Certain Characteristics of FORETELL Information	3-45
Figure 3.33	Percent of Highway Patrol Personnel who Indicated Use of FORETELL Information at Various Time Intervals	3-46

Figure 3.34	Percent of Highway Patrol Personnel who Indicated Using Various Types of FORETELL Information.....	3-47
Figure 3.35	Number of Times Highway Patrol Personnel Accessed the FORETELL Website, According to FORETELL System Records	3-48
Figure 3.36	Percent of Highway Patrol Personnel who Indicated Having Weather Information Was Helpful in Their Jobs	3-49
Figure 3.37	Percent of Highway Patrol Personnel who Agreed to Improved Job Performance Using FORETELL Information.....	3-50
Figure 3.38	Percent of Highway Patrol Personnel who Think FORETELL System Information Increases Safety or Reduces Accidents, by State	3-51
Figure 3.39	Percent of Highway Patrol Personnel who Indicated a Willingness to Continue Using FORETELL in the Future, by State	3-52
Figure 3.40	Percent of Respondents Indicating Use of Various Types of Information in Making Weather-Related Decisions, by User Group.....	3-61
Figure 3.41	Percent of Respondents Who Indicated Obtaining Various Types of Information from FORETELL, by User Group	3-62
Figure 3.42	Percent of Respondents Indicating How Often FORETELL Information was Obtained, by User Group	3-63
Figure 3.43	Percent of Respondents Indicating Agreement with Certain Characteristics Associated with FORETELL Information, by User Group	3-64
Figure 3.44	Percent of Respondents Indicating Agreement with Decision Effectiveness Aspects of FORETELL Information, by User Group.....	3-65
Figure 3.45	Percent of Respondents Indicating General FORETELL Experience and Future FORETELL Intentions, by User Group.....	3-66
Figure 4.1	The Number of Activity/Weather Logs Completed by Evaluation Year.....	4-3
Figure 4.2	The Percentage of Weather Events Reported to Have Various Types of Precipitation	4-4
Figure 4.3	The Average Low and Average High Temperatures per Reported Weather Event	4-5
Figure 4.4	Percent of Events Reporting Various Worst and Targeted Pavement Conditions for Evaluation Year 1 (1999-2000).....	4-6
Figure 4.5	Percent of Events Reporting Various Worst and Targeted Pavement Conditions for Evaluation Year 2 (2000-2001).....	4-7
Figure 4.6	Percent of Events Reporting Various Worst and Targeted Pavement Conditions for Evaluation Year 3 (2001-2002).....	4-7
Figure 4.7	Percent of Events Reporting Various Snow and Ice Control Measures Being Utilized by Evaluation Year.....	4-8

EXECUTIVE SUMMARY

Accurate weather information is a critical element in the daily lives of most Americans. In many cases, weather information helps determine when and if to take a trip, the route, and expected travel time. It guides the actions of state departments of transportation (DOTs) that maintain the interstates and state highways. It also affects how and when commerce is transported.

When weather turns wintry with snow and ice, it cannot only change daily habits, it can be deadly. Over 17 percent of all fatal crashes occur during winter weather conditions. Of those, 60 percent happen in rural areas (most on non-interstate roadways). The Federal Highway Administration (FHWA) Intelligent Transportation System (ITS) Joint Program Office and the recently formed Road Weather Management Program support the supposition that more accurate and accessible weather information could improve road maintenance and decrease fatal crashes. FHWA awarded a rural ITS Operational Test (OT) to the FORETELL™ Consortium (Castle Rock Consultants, Iowa, Wisconsin, and Missouri DOTs) in 1997 to develop an operational test of a multi-regional road and weather forecasting/dissemination system, in partnership with the National Weather Service (NWS) and Environment Canada (EC).

ES.1 FORETELL System

A market analysis conducted by FORETELL indicated significant deficiencies with the current weather and road condition information development, production, and dissemination approaches. These deficiencies included:

- Lack of information and geographic coverage
- Insufficient timeliness
- Inaccuracies that result in lack of confidence in making decisions
- Lack of necessary detail
- Difficulties in acquiring information and the high cost of acquiring it

In response to these apparent deficiencies in the current system, FORETELL proposed to provide both nowcasts and forecasts of weather information and road conditions to highway maintenance operations staff, commercial vehicle operators, highway patrol, school administrators, transit operators, traffic managers, emergency medical units, and commuters and leisure travelers.

FORETELL planned to establish an Intelligent Transportation System (ITS) Service Center to provide an interface between the raw weather data and ITS users to deploy the weather information. The fundamental functions of the service center were to: use NWS and EC data sources and models for providing nowcasts and forecasts; use transfer energy balance models developed in Europe along with solar gain and snow drift algorithms for pavement condition forecasts; adjust weather forecast and pavement condition predictions using real time field sensor information from stationary and mobile road weather information systems (RWIS); disseminate value-added tailored information to state DOT highway maintenance personnel, travelers, and others using available/emerging commercial and ITS traveler information media.

FORETELL was a multi-state initiative bringing ITS together with advanced weather prediction systems to create operational highway maintenance management and traveler information systems throughout North America. FORETELL participants envisioned:

- a self-sustaining weather and road condition information system fully integrated within a wider basket of ITS services;
- a reduction in winter-condition related road deaths by at least 15 percent; and
- creation of a viable weather and road condition information network across the continent.

The FORETELL Consortium's mission was to deliver the benefits of advanced weather prediction systems and ITS technologies to travelers, shippers and transportation system operators. The program envisions a widely accessible real-time weather and road condition information system that would support seamless information sharing for travelers and highway maintenance operators (HMOs).¹ Major partners in FORETELL included state governments, private entities, Canadian agencies, and the U.S. Department of Transportation (U.S. DOT).

The FORETELL Consortium prepared a proprietary System Design Concept (SDC) document, which defined the goals and objectives of the program, the deficiencies in weather information within the transportation system, the FORETELL approaches to address these deficiencies, and the system configuration designed to achieve these goals. Rather than obtaining the information through multiple sources, FORETELL planned to provide a one-stop-shopping approach to obtaining the required data. The information was slated to be disseminated via the following methods:

- | | |
|---------------------------|---------------------|
| • Internet/World Wide Web | • Digital Messaging |
| • E-mail | • Pagers |
| • Fax | • Fiber Optics |
| • Phone/Cell Phone | • Satellite |

The FORETELL system has been constantly evolving since its conception. At the time of the evaluation, the FORETELL system was primarily an Internet website that displayed weather and road condition information for Iowa, Missouri, and Wisconsin. In addition, users of the website needed a username and password to gain access.

ES.2 Evaluation Approach

As with all ITS Operational Tests, FHWA funded an independent evaluation of the project. In 1998, Battelle was selected to perform the evaluation. The purpose of the independent evaluation was to assess the effectiveness of the FORETELL operational test in achieving its goals and objectives. One of the goals of the evaluation process was to determine

¹ During the course of the FORETELL evaluation, the phrase "highway maintenance operators (HMOs)" evolved into the term "winter maintenance managers (WMMs)." According to the U.S. Department of Transportation's Road Weather Management web site, "Winter maintenance managers monitor weather and road conditions to determine when and where to dispatch crews to plow or apply materials (e.g., chemicals, abrasives) to road surfaces." For consistency with previous reports, the phrase "highway maintenance operators (HMOs)" is retained in the final report.

the feasibility of the FORETELL system and the possibility of widespread deployment. The following fundamental principles guided the evaluation team's conduct of the project evaluation:

- Extensive integration with FORETELL to ensure continuity and consistency
- Strategy consistent with and supportive of Advanced Rural Transportation Systems (ARTS) Strategic Plan goals
- Focus on user decisions and operational improvements
- Use of sound technical evaluation approaches (simple, meaningful, and achievable)
- Comprehensive in scope, but selective in practice (consistent with budget allocations)

A major goal of the evaluation was to address the following questions:

- Is the FORETELL information adding value to users beyond what they can obtain from existing sources?
- Is the new information changing users' behavior and how?
- What impact will this program have on ARTS goals and objectives (outcomes)?

The FORETELL evaluation focused on six user groups over three winter seasons. Each of these user groups had different needs and potential uses for the weather and pavement condition information. Each had different decisions and processes they aimed to impact with this new information. To some the information was new and packaged in a different format: the Internet. It was determined by the FORETELL Consortium that during the first year of operations only highway maintenance operators (HMOs) would have access to the website. The capacity of the servers hosting the website and the reliability and accuracy of the information would be initially assessed by HMOs. The system became operational during the winter of 2000-2001. In the fall of 1999, the evaluation team surveyed the HMOs to set up a baseline to compare their weather-related activities before and after FORETELL. Since the Consortium had no funds to market FORETELL to the general public, and it was uncertain whether the servers hosting the website could handle the potential high volume of hits simultaneously, five other user groups were selected and provided access to FORETELL during the second year of operation. The following additional user groups were surveyed after the winter of 2001-2002:

- Commercial Vehicle Operator (CVO) Personnel
- Highway Patrol Personnel
- School Administrators
- Transit Operators
- Traffic Managers

These user groups were selected because they needed weather and road condition information and they were interested in participating.

The HMOs were the largest user group surveyed. They were asked to evaluate the FORETELL system before it became operational and for two years after it became operational. Much of the information that was available through FORETELL was also available from a variety of sources. FORETELL brought the information from these many sources together in a single website and provided special features to assist users in viewing the information.

ES.3 Evaluation Results

Many of the users were familiar with most of the information provided by FORETELL, but some of the information was new and/or presented in a new format. For example, one new item that was noted by the HMOs that was of great value to them was the dewpoint temperature. Other elements such as detailed weather forecasts, pavement temperature, and pavement conditions were among the highlighted new items across user groups. Although each user group had varying information needs, generally they thought the information packaged on a website was easy to obtain and useable, with a high percentage of them mentioning that they appreciated the special features such as the animation of the information over a specified time period. However, the survey results indicated both positive and negative aspects of the FORETELL system. ***Approximately 30-40 percent of the HMOs said that they changed their decisions based on FORETELL information, and greater than 50 percent of users said they want to continue using it in the future. However, less than 20 percent were willing to pay for the service.*** These numbers are significant given the challenges that were faced by the program.

The evaluation team believes that a changed decision based on FORETELL information was the true measure of the system's value. In this case, results among the users were mixed. ***The fact that 30-40 percent of HMO respondents indicated that they changed their decision based on this new information was significant,*** given the natural reluctance to accept something new. However, the other users did not respond as favorably. In the case of the commercial vehicle operators, they appreciated the FORETELL information but did not think it would change their key decisions (when to go, if to go, where to go). The drive to get the products to their market destination was the most important decision criteria. However, it was interesting that the HMOs were less confident in their decisions using FORETELL, probably because of earlier problems they encountered with the system, while the other users were more confident (but less likely to change their decisions).

It is of some significance to report that the majority of all users stated that they want to use FORETELL in the future. This may be the result of two primary interests on the part of the users. First, they found value in the information and were interested in using it for future winter seasons. Second, they did not have an opportunity to fully test the FORETELL system during a mild winter but saw enough promise to want to continue using the system and data. On the other hand, very few of these same users were willing to pay for the information and expected to continue receiving it at no cost. The confounding factors of the "institutional" issues and weather conditions mentioned make these results interesting but may not represent the true attitudes of the user group populations.

ES.4 Caveats

FORETELL was the first in the industry to bring this much information together on a single website. Most first time endeavors of this magnitude are fraught with challenges. FORETELL was no different. The FORETELL program dealt with major partner changes, reluctant users (to changing the way they have done things in the past), schedule delays, information inaccuracy, and computer system and server issues that sometimes negatively affected the delivery of the information in a timely manner. Although unfortunate, these issues

were not unexpected for a project of this type. These “institutional” issues had an effect on how the system was perceived by some of the users and may have tainted their responses to surveys and phone interviews. In some instances, these issues may have impacted whether they used the system at all or were willing to participate in the evaluation.

Like any new tool provided to an operator (e.g., HMOs), FORETELL suffered from users’ reluctance to use and accept something new. The evaluation team believes this resistance had a direct impact on the data collected from HMOs after the website became operational. In many cases, respondents to survey and phone interviews would not commit to agree or disagree with how they used or liked the system. This may be related to the fact that they did not really have a chance to use the system and did not feel comfortable responding one way or the other.

Weather conditions also were a major factor that affected the evaluation of the FORETELL system. This was especially true for the other users (highway patrol, commercial vehicle operators, transit operators, school superintendents, and traffic managers), who only used the system one season (winter of 2001-2002). Comparing the overall weather of the evaluation winters with previous years indicates that the evaluation winters were extremely light, resulting in a diminished need for weather information. This situation affected the number of people willing to participate in the evaluation and the responses of those who did. Only 15 of the 34 CVOs, 5 of the 9 school administrators, and 3 of the 14 transit operators actually completed surveys or interviews. Almost all of the “other” users that were interviewed expressed concern that they had not had an opportunity to fully use and evaluate the system because of the mild winter. Also, the use of the FORETELL system by HMOs was significantly reduced during the final evaluation period compared to the prior season (where the data indicated they had a typical winter season). The evaluation team believes this reduced reliance on FORETELL was due in most part to the mild winter of 2001-2002.

Evaluating a new system that was still under development was a difficult task. Many users initially were reluctant to use a new system because its accuracy and reliability were unknown. However, users expressed an interest and perceived value in the FORETELL system and the weather/pavement condition information it provided. With continued system development, and enhancements to the system to improve accuracy and avoid system downtime, as well as to add some functionality, the changes could significantly affect future user perceptions of the FORETELL system. These potential enhancements could encourage continued use of the system, which could lead to expanded user acceptance and eventual changed behaviors of the user groups. ***Only after the FORETELL system is fully functional, reliable, tested for accuracy, made available to a wider user population, and marketed to a significant segment of user groups can a comprehensive evaluation be conducted.*** Therefore, additional evaluation activities in future years are required to fully evaluate the FORETELL system.

1.0 INTRODUCTION

The FORETELL™ program is a multi-state initiative integrating Intelligent Transportation Systems (ITS) with advanced weather prediction systems. The overall goals of the project include reducing accidents related to winter road conditions and creating a viable weather and road condition information network across North America. Improved weather information—specifically as it relates to road conditions—is expected to result in better public-agency response and traveler response to adverse winter weather.

The FORETELL program was initiated by the Federal Highway Administration's Road Weather Management Program as part of a Rural ITS program. The FORETELL Consortium consisted of state DOTs from Iowa, Missouri, and Wisconsin, which were supported by Castle Rock Consultants (formerly Castle Rock Services). Environment Canada and the Ministry of Transportation of Ontario were also initially part of the consortium.

As detailed below, FORETELL collected and combined raw weather information from many sources to provide the most recent and accurate weather data available. Advanced technology is used to link transportation systems and surface weather information systems. The power of the Internet is then used to disseminate road weather information on demand to a larger audience. The FORETELL System Design Concept (SDC) document (a proprietary report) defines in detail the information to be provided by FORETELL and how that information was generated.

FORETELL uses several weather sources to generate 24-hour weather forecasts as well as continuously updated current weather conditions. The FORETELL system also uses advanced temperature and heat exchange models to calculate road surface temperature and predict future road conditions. The FORETELL system gathered its weather information from a variety of sources, including the National Weather Service (NWS) models, agricultural sensors, airport weather sensor sites, and road weather information system (RWIS) sensors. Users have access to recent local data and forecasts on precipitation intensities, pavement conditions, wind speed and direction, and other road- and weather-related parameters.

1.1 Mission

FORETELL is one aspect of a U.S. DOT effort whose long-term plan was to provide accurate weather and road condition information to travelers in the general public, shippers, and transportation system operators. As a starting point toward this goal, an Operational Test focusing on three initial partner states, Iowa, Missouri, and Wisconsin, was conducted from 1998 to 2002.

As an ITS Operational Test, the FORETELL program included an evaluation effort to assess the ability of the system to meet the goals of providing both current and forecast weather and road condition information to highway operations and maintenance staff, commercial vehicle operators, highway patrol personnel, school administrators, transit operators, and traffic managers. The FORETELL Evaluation Plan (Battelle, 2001) was developed to describe how this

evaluation would be conducted and was used to guide the evaluation team in the data collection, compilation, and analysis steps.

This document presents the results of the FORETELL Evaluation. It reflects the evaluation team's understanding of the responses by various user groups who used the system during the evaluation period. More specifically, however, the team looked at how the FORETELL system was accessed and used by a variety of users and how the information from the FORETELL website aided these groups in managing transportation infrastructure. Data were collected through surveys and discussions with individuals in each of the user groups as well as by reviewing records of user access to the FORETELL system website. The team's mission was to effectively collect and analyze the data, objectively evaluate the results, and report on the effectiveness of the FORETELL system at disseminating weather and road condition information to make improvements in operations for the various user groups.

On a larger scale, the evaluation team was interested in understanding how the improved information would impact the goals and objectives of the Advanced Rural Transportation System (ARTS) Strategic Plan (Safety, Efficiency, Environment, Mobility, and Economic Vitality). The FORETELL evaluation initially did a careful assessment of the resources available to evaluate each of the ARTS goals. It was determined that only the safety goal was feasible to evaluate. The evaluation team demonstrated that it was possible to evaluate a decrease of at least 15 percent in weather-related fatal crashes, assuming that the FORETELL system was utilized by the highway maintenance personnel in Iowa and Missouri over three years, and that the Fatality Analysis Reporting System (FARS) data were available for analysis over this same time period. Unfortunately, the system was only fully operational during one winter, 2001-2002, and once operational, the system was not available to a wide enough audience to make a major comprehensive rural impact. Utilization of the FORETELL system over one winter was not sufficient to assess the safety impact of FORETELL. Therefore, the ARTS safety goal was not evaluated and efforts were concentrated on evaluating the different user groups.

The evaluation team initially planned to perform a comprehensive evaluation of all major potential user groups of FORETELL: highway maintenance operators (HMOs), commercial vehicle operators (CVOs), state patrol, emergency services, traffic managers, travelers, transit/paratransit operators, and school administrators. The evaluation team was successful in evaluating the target user group (HMOs) and, given the circumstances, did as much as possible to collect information from the other user groups. Travelers and commuters could not be evaluated because neither Castle Rock Consultants nor the states had funds to advertise the FORETELL website to these populations. Even if the FORETELL system were advertised, Castle Rock Consultants indicated that the FORETELL website could not handle the potential additional traffic.

1.2 What is FORETELL?

The FORETELL effort began with a concept of providing a single source for transportation-related weather information. Development of the system continued during the evaluation period. The resulting Internet-based system developed by Castle Rock Consultants provides both nowcast (near-term, 0 to 6 hours) and forecast (6 to 30 hours) weather and road condition information including the following:

Weather Information

- Wind Speed and Direction
- Cloud Thickness
- Precipitation
- Air Temperature
- Dewpoint and Humidity
- Radar Depiction

Road Information

- Overall Road Condition
- Pavement Temperature
- Pavement Condition
- Road Dewpoint
- Road Freeze Point
- Road Snow Depth.

The FORETELL system provides this information for Iowa, Wisconsin, and Missouri. It is a map-based system that allows the user to select weather parameters for an area within these states or pavement parameters for highways within the FORETELL coverage area. The nowcast information is updated once an hour, while the forecasts are renewed every 6 hours.

During the evaluation period, access to the password-protected website was made available to the user groups by issuing a unique username and password to each user. This allowed tracking of access for evaluation purposes.

1.3 Evaluation Scope

The objective of the evaluation was to determine user acceptance of and decision outcomes from a new technology for obtaining weather information for surface transportation. The evaluation focused on assessing how the various user groups perceived the value of the information provided by FORETELL. The user groups were identified based upon their perceived need for weather and road condition information. The evaluation team actively participated in the identification of the user groups and selection of the specific potential users. The user groups were asked to access the system for weather information primarily during the winters of 2000-2001 and 2001-2002, with most user groups participating only during the latter season. After the winter season, they were then asked specifically about their use of and experience with the system.

The FORETELL Consortium did not promote or market the system to the potential users beyond notifying them that the system was available and explaining to them what information the FORETELL system disseminates. Furthermore, the evaluation team was careful not to make statements regarding the accuracy or specific benefits of the system. The team was not responsible for assessing system accuracy, but rather tried to collect the users' assessments of the accuracy and comprehensiveness of the information being provided, as well as the benefits of the information for each user group.

The evaluation team was tasked with data collection from the users and from access records, as well as compilation and analysis of the data. The details of the data collection are provided in Section 2, Evaluation Process, while the results of the analysis are provided in Section 3, Evaluation Results. In addition, Section 4, External Factors, provides information regarding the specific weather conditions that may have affected the outcomes, and issues associated with the system and institutional performance. Section 5, Observations and

Recommendations, provides a discussion of issues that effected the evaluation, along with suggestions for future evaluations.

The purpose of the independent evaluation was to assess the effectiveness of the FORETELL program in achieving its goals and objectives and, secondly, to determine how it might possibly impact the ARTS goals. The primary goal of the evaluation was to determine the feasibility of the FORETELL program and the possibility of widespread deployment. Specifically, the evaluation attempted to address some fundamental questions:

- Is the FORETELL information providing added value to users beyond what they can obtain from existing sources?
- Is the new information changing user behavior and, if so, how?
- What impact will FORETELL have on ARTS outcomes relative to its goals and objectives?

The evaluation was designed to measure two types of success: outputs and outcomes. The output measures evaluate the FORETELL program system performance, information dissemination, and user decisions. The outcome measures evaluate the operational improvements achieved through the use of weather and road condition information from the FORETELL system. Both types of measures are valid and important to the success of the evaluation. The evaluation outcomes relate directly to the ARTS goals. The ARTS goals are:

- Safety;
- Efficiency;
- Environment;
- Mobility; and
- Economic vitality.

2.0 EVALUATION PROCESS

The evaluation effort began with the development of the FORETELL Evaluation Strategy (JPO, 1998). The strategy document framed the goals of FORETELL and outlined how the evaluation would assess those goals. After the evaluation strategy was approved by FHWA, the evaluation team developed the FORETELL Evaluation Plan, which documented in more detail the goals and objectives of the evaluation and provided a guide for the specific evaluation activities to assess each user group. The evaluation strategy discussed the importance of evaluating certain user groups. The evaluation plan described how each of those groups would be evaluated. The development of the evaluation plan also was used to ensure that all parties involved in the FORETELL program understood and agreed on the concepts being used to evaluate the system. This document provided the necessary guidance for later development of the individual test plans.

The initial plan was to concentrate primarily on the evaluation of output measures associated with the different primary user groups. In particular, the evaluation was to assess acceptance of the FORETELL information by highway maintenance operators and determine how the information affected their decision processes. The evaluation team was also requested to assess transportation improvements (outcomes) that may result from the user decisions and actions. In the evaluation plan, the evaluation team established an overall approach to measure the impacts of the FORETELL program on the user decisions and, in turn, the transportation systems. However, as mentioned earlier, it was not possible to determine whether the FORETELL information had a measurable impact on fatal crashes in Iowa or Missouri. The evaluation team, therefore, focused attention on gathering survey information from as many members of each user group as possible.

From 1999 to 2001, during the development of the evaluation plan and user group test plans, the evaluation team held a number of teleconferences with state [John Whited (IADOT), Bill Stone (MODOT) and Mike Adams (WIDOT)] and FHWA (Paul Pisano) participants, and occasionally with Castle Rock Consultants representatives. During these meetings, the participants discussed how and who would contact members of the different user groups (highway maintenance operators, school superintendents, state patrols, traffic managers, transit operators, and commercial vehicle dispatchers), how to inform the users of the FORETELL website and gain access, and determine if they would participate in the evaluation. Participation in the evaluation was limited by the number of people who had access to the FORETELL system and were willing to participate in the FORETELL evaluation. The states, FHWA, and Castle Rock Consultants wanted a significant number of users to be aware of the FORETELL website, but the constraints on budgets to fund public awareness of the website, and the fact that several users who had access never used the site because of the relatively mild winters, precluded an extensive participation within user groups in the evaluation.

Figure 2.1 identifies the major goal areas of the evaluation as System Performance (Castle Rock Consultants), User Acceptance (evaluation team), Decision Effectiveness (evaluation team), Operational Improvements (evaluation team), and Institutional Performance. The latter goal was added near the end of the evaluation due to the impact it had on the evaluation results.

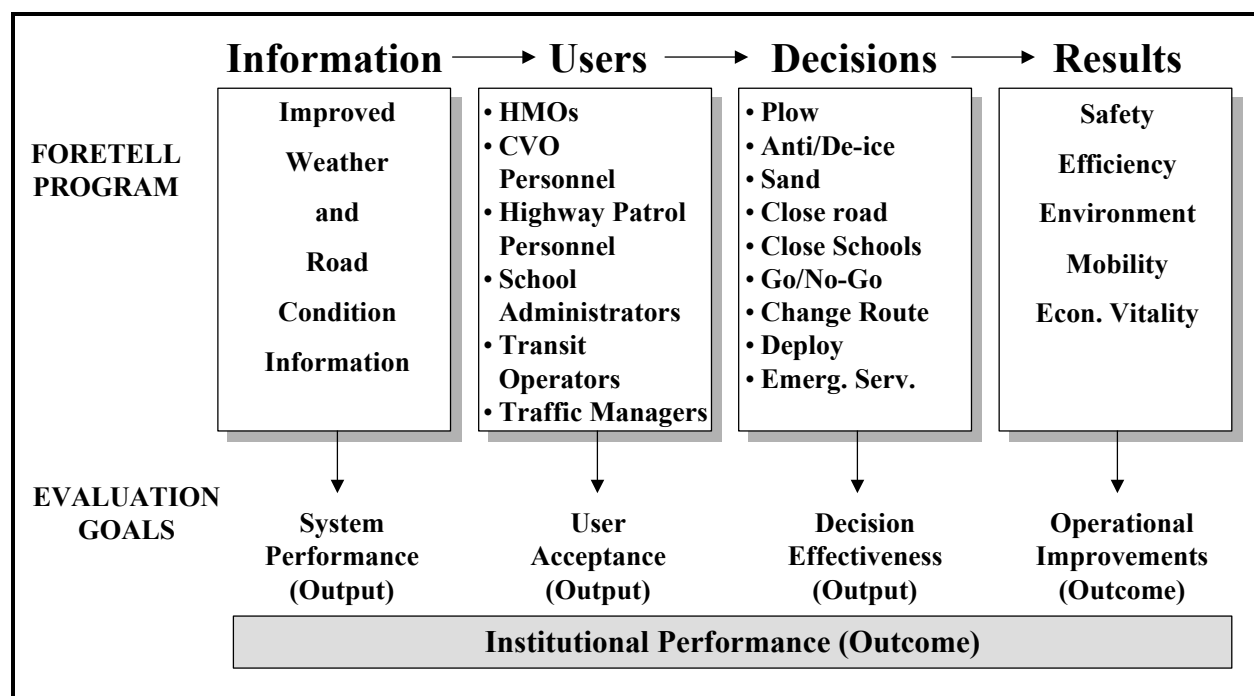


Figure 2.1 Evaluation Goals

The primary focus of the evaluation was an assessment of user acceptance and decision effectiveness. System performance was monitored and reported by Castle Rock Consultants with assistance from the states. An assessment of the accuracy of the information was provided to the states in a report by Castle Rock Consultants. As noted earlier, institutional performance was also outside the primary focus area, though several institutional performance issues are covered in this report because they had a significant impact on the results that are reported.

The primary “outcomes” measure was initially planned to be the Fatality Analysis Reporting System (FARS) data from the three states. The evaluation team was interested in determining if use of the FORETELL system might be associated with a reduction of at least 15 percent in winter weather-related fatal crashes on the highway. The FARS data are generally made available a year after they are collected. Unfortunately, the planned evaluation period was abbreviated (as explained later), and comparing only one winter where FORETELL was utilized against the previous years was determined to be an insufficient amount of time to assess a change in weather-related fatal crashes. The evaluation originally intended to include this safety component (weather-related fatal crashes) of the operational improvements area. However, the system was not in place for a sufficient length of time to make valid comparisons.

The approach to evaluating the FORETELL program was first to identify a set of hypotheses to test each of the user groups and decision areas shown in Table 2.1 for the evaluation team's initial goals: user acceptance and decision effectiveness. Next, it was determined that the best method to obtain the needed information to assess the evaluation goals was to survey and interview identified user groups. The third step was developing individual test plans to collect the data. Finally, the data were analyzed and the results presented in this report.

Following the approval of the evaluation plan, the details of conducting the evaluation were developed and documented in six individual test plans (one for each user group).

Table 2.1 Evaluation Goals and Decision Areas

Evaluation Goal	User Groups	Decision Area
User Acceptance	HMOs	Receipt of information
	CVOs	Perceived value
	State Highway Patrol	Use of information
	Schools Administrators	Perceived value
	Transit/Paratransit	Behavior change
	Traffic Managers	Use of information
Decision Effectiveness	HMOs	Traffic operations
		Highway maintenance
	CVOs	Trip delay
		Route changes
		Operational parameters
	State Highway Patrol	Road closure
	Schools Administrators	Delayed school start
		Early release
		School closure
		Children transport
	Transit/Paratransit	Trip delay
		Route changes
		Operational parameters
		Modal diversion
	Traffic Managers	Traffic monitors
		Traffic operations
		Road closure
		Disseminate traveler information

Originally, the schedule of evaluation activities coincided with the implementation of the FORETELL website development and included the following five opportunities for data collection and reporting:

- winter of 1998-1999: Develop evaluation plan and individual test plans. Collect baseline data.
- winter of 1999-2000: FORETELL operational. First evaluation data collection (i.e., first follow-up).
- winter of 2000-2001: Second evaluation data collection (i.e., second follow-up).
- winter of 2001-2002: Third and final evaluation data collection (i.e., third follow-up).
- summer and fall of 2002: Preparation of evaluation reports, dissemination of results.

During the first intended data collection period (winter of 1998-1999), it was determined that FORETELL would not become operational until the winter of 2000-2001. The evaluation plan and some of the test plans were developed, but the baseline data collection was delayed until the winter of 1999. This delay in implementing the system resulted in the elimination of one data collection period. The revised schedule is shown below:

- winter of 1998-1999: Develop evaluation plan and individual test plans.
- winter of 1999-2000: Baseline data collection.
- winter of 2000-2001: FORETELL operational. First evaluation data collection (i.e., first follow-up).
- winter of 2001-2002: Second evaluation data collection (i.e., second follow-up).
- summer and fall of 2002: Preparation of evaluation reports, dissemination of results.

After the FORETELL website became operational, it was determined by the FORETELL Consortium that during the first year of operations only highway maintenance operators would have access to the website. The capacity of the servers hosting the website and the perceived reliability and accuracy of the information would be initially assessed by this user group. Since there were no funds available to market FORETELL to the general public and it was uncertain whether the servers hosting the website could handle the potential high volume of hits simultaneously, only five other user groups were provided access to FORETELL. The entire list of user groups is shown below:

- Highway Maintenance Operators (HMOs)
- Commercial Vehicle Operator (CVO) Personnel
- Highway Patrol Personnel
- School Administrators
- Transit Operators
- Traffic Managers.

These user groups were selected based on their need for weather and road condition information and the ability to collect feedback from them. Once these user groups were identified, the team needed to select and contact potential users within each group. The initial contacts were used, in part, to gauge the likelihood that given individuals would need the information being offered by the FORETELL system and to solicit participation in the evaluation.

Test plans were then developed for each user group using the evaluation plan as guidance and tailoring the details and evaluation methods to each group. The test plans identified the

specific approach to be used for each group. They included surveys and/or interview guides as necessary with specific questions targeted toward the individual user group's operations. The data collection approach ultimately used with each user group is shown in Table 2.2.

Table 2.2 User Group Evaluation Participation and Data Collection Approach

User Group	Participation Years	Number of Participants	Data Collection Approach
Highway Maintenance Operators	Fall of 1999(baseline)	66	Survey & Activity/Weather Logs
	Winter of 2000-2001	87	Survey & Activity/Weather Logs
	Winter of 2001-2002	47	Survey & Activity/Weather Logs
Other			
Commercial Vehicle Operator Personnel	Winter of 2001-2002	15	Telephone Interview
Highway Patrol Personnel	Winter of 2001-2002	16	Telephone Interview
School Administrators	Winter of 2001-2002	5	Survey & Activity/Weather Logs
Transit Operators	Winter of 2001-2002	3	Survey
Traffic Managers	Winter of 2001-2002	1	Telephone Interview

Each user group identified had a unique set of requirements and, therefore, used the information in different ways to best serve their needs. The evaluation team was interested in determining how each user group utilized the FORETELL information. The evaluation focused primarily on the HMOs in the three targeted states. The results reported herein are presented in two groups: HMOs and Other Users. While the other user groups are discussed individually, they have been separated from the HMO user group. There are several reasons for the focus on the HMO user group and for the use of this reporting approach.

First, true baseline data were only collected for the HMO user group. The other user groups did not participate in the FORETELL evaluation until 2001 for a variety of reasons that are related to accuracy and reliability issues of the FORETELL website. The other user groups were asked questions regarding their weather information collection prior to FORETELL only after they had been provided access to the FORETELL website. These user groups were primarily provided access to the FORETELL website during the winter of 2001-2002. They were surveyed only once, in the spring of 2002.

Second, including the baseline year, three successive years of data were collected from the HMO user group. This allowed the evaluation team to develop a detailed survey instrument and a web-based survey for the first and second follow-up. Members of the evaluation team attended some HMO training sessions and over time developed a working relationship with this user group. These factors contributed to the fact that the HMO users represent over 90 percent of respondents surveyed.

Finally, the HMO user group was targeted due to their responsibility to take action during many adverse weather events. Compared to the other groups, HMOs depend very heavily on accurate and timely weather information in order to perform their primary functions.

The following sub-sections discuss key components having an impact on the evaluation results: weather conditions and user group access.

2.1 Weather Conditions

Given that FORETELL is a transportation-related weather information system, the success of the evaluation ultimately depends on the weather conditions requiring the need to obtain weather information. The evaluation of FORETELL began with the baseline HMO surveys in the winter of 1999-2000. The evaluation then continued through the winters of 2000-2001 and 2001-2002.

To ensure a meaningful evaluation of activities dependent on weather information, it is important to have a significant number of weather events during the evaluation. It is also important to be able to compare one winter to another so that outcomes from one winter can be compared to outcomes of another winter.

Figures 2.2 and 2.3 show climatological data for Iowa for temperature and precipitation, respectively, for the months of November through April, which was essentially the evaluation period. The data contain the climatological normal period from 1971 through 2002.²

The data show that when compared to normal, the winters of 1999-2000 and 2001-2002 were significantly warmer and drier than normal. In fact, of the 32 seasons, these winters were the two warmest. In addition, these same winters were the fourth and tenth driest. In contrast, the winter of 2000-2001 was the third coldest and had above-normal precipitation. Data for Missouri and Wisconsin show similar trends.

One would expect that there could be a significant number of winter weather events during the winter of 2000-2001 and fewer in the next winter. Thus, one could also expect a significant number of evaluation inputs for the first winter evaluation period following the baseline year, and less inputs for the next (last evaluation) winter.

Section 4.1 discusses results from data collected by the evaluation team that provide insight to the actual weather events observed by the HMOs.

² One way of comparing weather over periods of time is to use a weather index. Research in Iowa resulted in an Iowa-specific weather index that could be used for inter-annual or inter-seasonal analyses (Temeyer, 2001). Unfortunately, that index was not available until after the evaluation was completed. Therefore, the evaluation team used standard climatological data available from the National Climate Data Center to compare the winters of the evaluation for the three-state evaluation area.

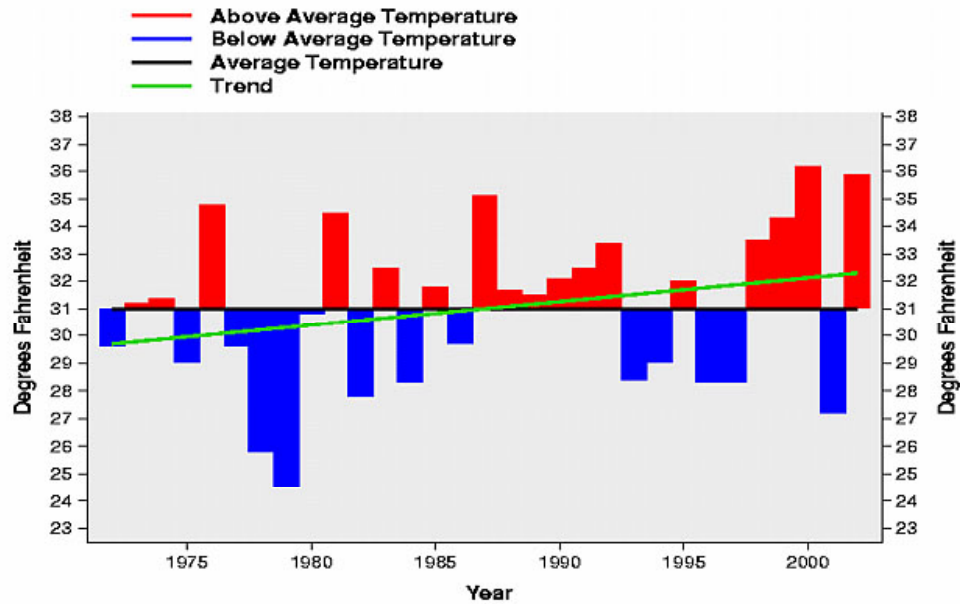


Figure 2.2 Average Temperatures in Iowa for the Period Nov-Apr, 1971-2002 (Average: 31.0 degF) and Nov-Apr, 1971-2002 (Trend = 0.8 degF).

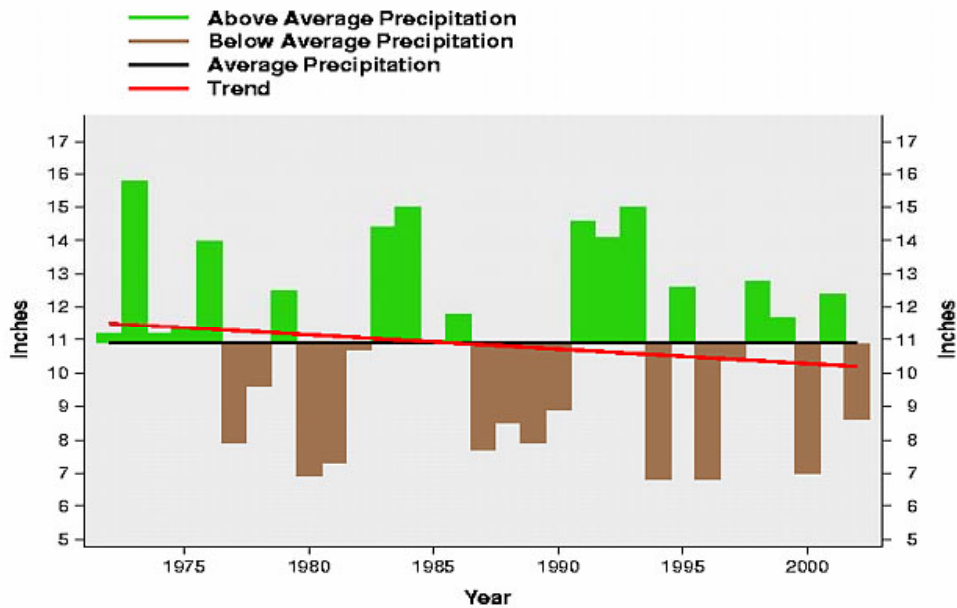


Figure 2.3 Average Precipitation in Iowa for the Period Nov-Apr, 1971-2002 (Average: 10.85 Inches) and Nov-Apr, 1971-2002 (Trend = 0.45 Inches).

2.2 User Access

In addition to the data collected by the evaluation team through surveys and discussions with individuals in each of the user groups, Castle Rock Consultants collected data on user access to the FORETELL website during the winter months (October through April) of

2000-2001 (Evaluation Year 2) and 2001-2002 (Evaluation Year 3). User access data were collected to provide information regarding who accessed the FORETELL system, what activities they undertook, and which variables were used most. All operations and keystrokes performed by users at the FORETELL website were recorded and logged. The totals do not include any activity performed by Castle Rock Consultants. A summary of the number of users in each group and the number of times the site was accessed, as well as the various types of data accessed, is presented below. The data may not be consistent with the survey and interview responses due to users sharing IDs and to varying viewpoints among users who responded to the surveys/interviews and those who did not. For example, while precipitation may have been the most accessed weather choice for all users, those responding to the surveys/interviews may have indicated using temperature more often.

Over the winters of 2000-2001 (Year 2) and 2001-2002 (Year 3), FORETELL was accessed 10,764 times by HMOs, highway patrol, CVOs, traffic managers, transit operators, and school administration personnel. Figure 2.4 presents the number of logins for each user group by month for the winters of 2000-2001 and 2001-2002. There were more than twice as many logins by HMOs during Year 2 than during Year 3. FORETELL was accessed 7,393 times by 199 individuals from the HMO user group in Year 2 and 2,770 times by 162 individuals in Year 3. Some of the decrease may be attributable to the mild weather conditions during Year 3. Other reasons may include a turnover in staff or a dissatisfaction with FORETELL.

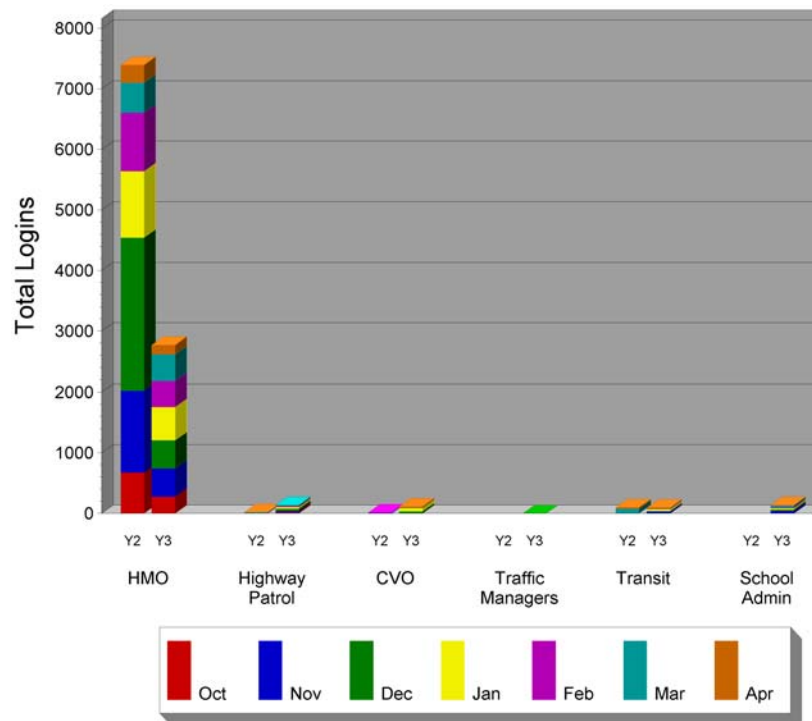


Figure 2.4 Number of FORETELL Website Logins by User Group by Month and Evaluation Year (Y2 = Winter of 2000-2001, Y3 = Winter of 2001-2002)

While the number of logins by HMOs decreased from Year 2 to Year 3, total logins for the other user groups increased during that time. Figure 2.5 presents in greater detail the number of logins by month and by year for highway patrol personnel, CVOs, traffic managers, transit operators, and school administrators. During Year 2, FORETELL was accessed 131 times by 2 highway patrol personnel, 2 CVOs, and 7 transit operators. During Year 3, FORETELL was accessed 471 times by 18 highway patrol personnel, 29 CVOs, 1 traffic manager, 4 transit operators, and 9 school administrators.

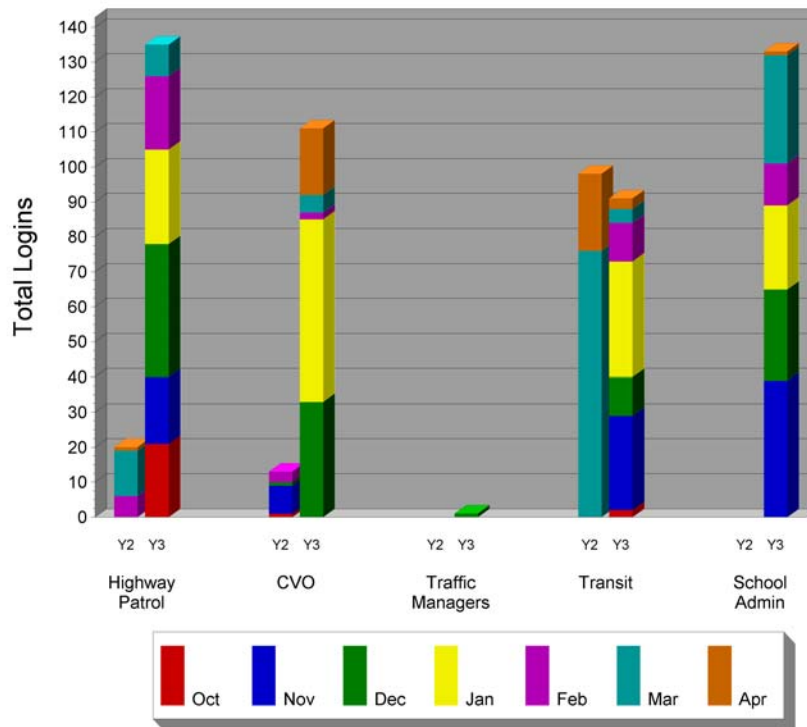


Figure 2.5 Number of FORETELL Website Logins by User Group (excluding HMOs) by Month and Evaluation Year (Y2 = Winter of 2000-2001, Y3 = Winter of 2001-2002).

Year 3 was the focus of the evaluation for non-HMO user groups. The Year 2 logins for these groups may or may not contain logins by the Year 3 survey/interview participants.

Even though the total number of logins increased for all user groups (except HMOs) from Year 2 to Year 3, there is a relative decrease in the use per person for the HMOs, the highway patrol personnel, and CVOs. Figure 2.6 shows the number of logins per person by evaluation year for each user group.

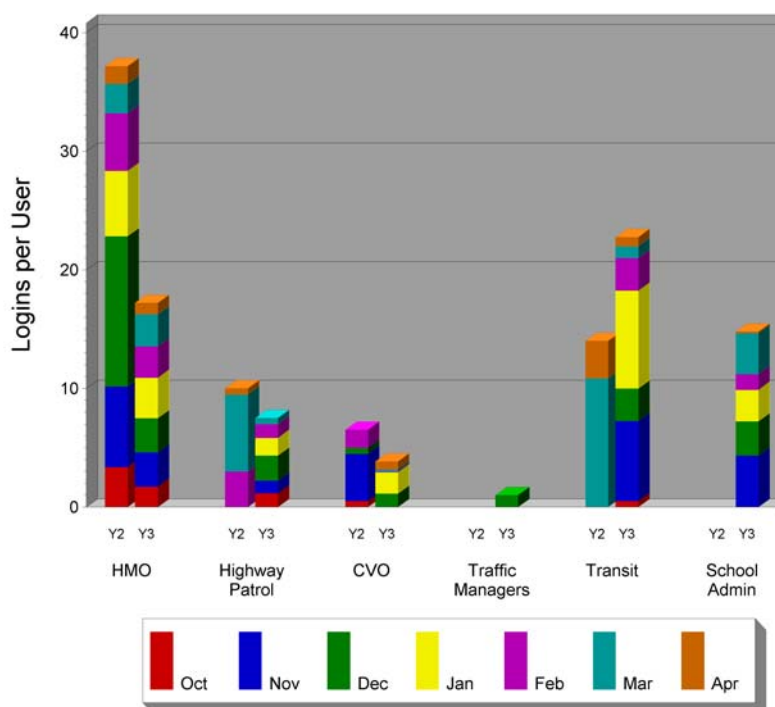


Figure 2.6 Number of FORETELL Website Logins per Person by User Group by Month and Evaluation Year (Y2 = Winter of 2000-2001, Y3 = Winter of 2001-2002).

Users accessed all weather choice options offered by FORETELL: clouds, dewpoint, frozen accumulation, humidity, precipitation, precipitation accumulation, pressure, radar, temperature, measured accumulation, combined precipitation and temperature, and wind speed and direction. However, the weather choices most selected by users over both winters were precipitation, temperature, and radar.³ Users also accessed all road choice options offered by FORETELL: road condition, road decision support, road dewpoint, road freeze point, road pavement frost, road pavement temperature, road snow depth, road snow drift, and road temperature. Of these, road condition, road pavement temperature, and road temperature were the most selected choices over both winters.³

The Frame Choice selector at the top of the FORETELL website allows users to view forecasts up to 30 hours into the future. In general, the 6 to 12-hour and 30-hour forecasts were most often selected over both winters.³ The 30-hour forecast time period was most often selected by users to be specifically reviewed, with nearly double the number of page views than

³ Not including conditions selected by users who accessed the FORETELL site using the non-Java WebFT user ID.

any other time period. However, it should be noted that FORETELL added a new feature to display live radar data for Year 3, and that FORETELL does not have the ability to record information that distinguishes between time periods selected for forecast data and live radar data.

The animate function (a slow motion time-lapsed view of how conditions will change) was the most frequently used FORETELL feature. However, during the evaluation period, the FORETELL software was improved to recall the last feature selected for display by the user and to open the next session with this feature. With this improvement, the system recalls the last display when the user logs in, and the default login choice is no longer tracked.

FORETELL allows users to display data in a graphical manner. Over both winters, temperature and precipitation accumulation were the graphed conditions most often selected by users.⁴

While user access data provide meaningful information on the use of the system by all users, the evaluation results presented in subsequent sections of this report are based on data collected by the evaluation team through surveys and discussions with individuals representing each of the user groups. Conclusions are based on the survey and interview data.

⁴ Not including conditions selected by users who accessed the FORETELL site using the non-Java WebFT user ID.

3.0 EVALUATION RESULTS

The results from each survey/interview are summarized in Section 3.1 for HMOs and Section 3.2 for the other five user groups. One set of questions was common across all surveys. These questions had to do with where the user usually obtained weather information and the usefulness of the information from FORETELL. The results of these cross-cutting questions are summarized in Section 3.3.

Overall, the results from the surveyed user groups indicate that FORETELL was a useful website for weather information for surface transportation. However, there are still a number of outstanding issues associated with user acceptance of the information and accuracy of the nowcast and pavement temperature predictions. Limited use due to mild winter conditions in the Midwest during two of the three evaluation years was another issue. One positive aspect of FORETELL was the development of a website that integrated weather and transportation system data into a one-stop-shop of actual weather reports and forecasts of weather and pavement conditions. State maps showed major interstate and state highways superimposed along with detailed weather conditions. The weather information was primarily focused on transportation issues. The FORETELL site also included several innovative features, such as meso-scale (a few kilometers to some tens of kilometers) models using NWS data (Geer, 1996), the integration of several sources of existing data, and data that were accessible to a wide audience. FORETELL also provided some information not found elsewhere, such as forecasted dewpoint and pavement condition information. Another indirect benefit of the FORETELL website was the additional training that was provided to HMOs to instruct them on how to best utilize the site. During the training, there were several discussions that related to highway winter maintenance strategies (e.g., plowing, spreading abrasives, applying anti-icing/deicing chemicals). HMOs were educated on how to obtain the appropriate information from the FORETELL website to better make road treatment decisions.

A key component of the evaluation was to test the assumption that the FORETELL website provided information that changed users' decision effectiveness. It was determined that the training associated with the use of the FORETELL website and other weather information sources that was provided to HMOs significantly increased their use of dewpoint information. On the other hand, CVO actions were generally not affected by the information because they needed to make their deliveries regardless of weather conditions. In general, users' confidence in weather-related decisions was increased by the use of FORETELL. Nearly one-third of all users indicated that FORETELL changed their actions. Over half of all users want to continue using FORETELL in the future. However, less than 20 percent indicated that they would be willing to pay for access to the FORETELL website in the future.

Several school administrators and state patrol attended the FORETELL training provided to the HMOs. The remaining user groups were provided a user manual and training guide in lieu of a focused training program. The user manual and training guide, developed by Castle Rock Consultants, is provided in Appendix G. Once they consented to participate, the CVOs, highway patrol personnel, transit operators, and traffic managers were given an access username, password, and the training materials developed by Castle Rock Consultants. These users for the most part only had access to the FORETELL website for the winter of 2001-2002, and the

weather was considered very mild compared to previous years, so the number of times they needed to access the FORETELL website was limited.

3.1 Highway Maintenance Operators

This section presents the results of the data collection effort for HMOs, the primary user group evaluated. This section presents an overview of the data collection effort and describes the types of weather-related information used by HMOs, HMOs' acceptance of the FORETELL system, the impact of FORETELL information on HMOs' decision processes, and the effect of FORETELL information on other factors such as safety and environmental conservation. Conclusions are offered on the basis of the data collected from HMO surveys.

3.1.1 User Group Overview

To measure the impacts of the FORETELL program on the decision-making of HMOs, three sets of survey information were obtained: baseline information and follow-up information from two subsequent winter seasons. In addition, HMOs completed activity/weather logs following each weather event in order to characterize the use of FORETELL information on a per-event basis. The logs collected data characterizing the weather events and the decisions made during these events, as well as the information used and the sources from which the information was obtained.

The baseline survey was conducted in November 1999. Self-administered questionnaires were mailed to 85 HMOs in Iowa, Missouri, and Wisconsin. Activity/weather logs were mailed to the same operators in Iowa and Missouri. Operators in Wisconsin did not complete activity/weather logs because they already complete a similar log as part of their job. In addition, contractually, Wisconsin could not request this of their operators. Sixty-six of the HMOs completed the baseline survey, while 37 operators returned a total of 224 logs during the baseline winter of 1999-2000. The Wisconsin log data were not incorporated into the analysis results because the data were unavailable.

The two follow-up surveys and activity/weather log data collections were conducted during and following the winters of 2000-2001 and 2001-2002. Each of the follow-up surveys was conducted using an Internet-based survey located on a secure website. Eighty-seven HMOs completed the first follow-up survey in 2001, and 47 completed the second follow-up survey in 2002. A total of 229 logs were returned by 28 operators during the winter of 2000-2001, while 136 logs were returned by 14 operators during the final evaluation year.

The response rate (the number of completed surveys/number of solicited surveys) for each survey was: 78 percent for the baseline survey, approximately 75 percent for the first follow-up survey, and approximately 71 percent for the second follow-up survey. A similar calculation cannot be made for the activity/weather logs since the completion of a log is dependent upon a weather event actually occurring. As noted earlier in Section 2.1, the severity of the weather generally declined from the first to second follow-up data collection. Section 4.1 provides a summary of the data collected from the activity/weather logs.

The following sections describe the results of the HMO survey and activity/weather log data analysis. The results are grouped by Information Used, User Acceptance, Decision Effectiveness, and Other Factors. In addition to the information presented here, Appendix A contains the data collection instruments along with summary tables of the data collected. Tables A-1 and A-2 describe the information collected from the activity/weather logs. Tables A-3 through A-6 summarize the HMO survey data for all states combined and by each state individually. Each table in Appendix A displays the number and percentage of responses to the questions from the baseline, first follow-up, and second follow-up surveys. In addition, a Chi-Square test was conducted to test for a change in the distribution of responses between surveys, taking into account repeated responses from the same respondent over a multi-year period. The p-values (i.e., observed statistical significance level) computed from the Chi-Square test are presented in the tables as well. Due to sparse data, responses from questions using the 5-point Likert Scale (e.g., Strongly Disagree to Strongly Agree) were collapsed into positive and non-positive categories. For instance, Strongly Agree and Agree were considered positive responses, while Strongly Disagree, Disagree, and Neutral were considered non-positive responses. If the response categories could not be dichotomized into positive/non-positive responses, the test was not performed. In addition, the test could not be performed if one of the response categories contained a zero frequency. Each special case is indicated in the tables.

The following sections summarize the most pertinent information found in Table A-3. Figures describing the data collected across the surveys are also included below. In all figures, “Y1” represents the baseline survey (Evaluation Year 1, 1999-2000), “Y2” corresponds to the first follow-up survey (Evaluation Year 2, 2000-2001), and “Y3” corresponds to the second follow-up survey (Evaluation Year 3, 2001-2002).

3.1.2 Information Used

Information Used refers to the types of weather-related data HMOs use in their road treatment decisions. They were asked which of the following types of weather information they used in making weather-related decisions: wind speed/direction, precipitation, atmospheric temperature, pavement temperature, pavement condition, and dewpoint. For each type of weather information used, they were asked whether they used actual readings, forecasted readings, or both.

As can be seen in Figure 3.1, HMOs tended to rely on both actual and forecasted information when a particular weather source was used.

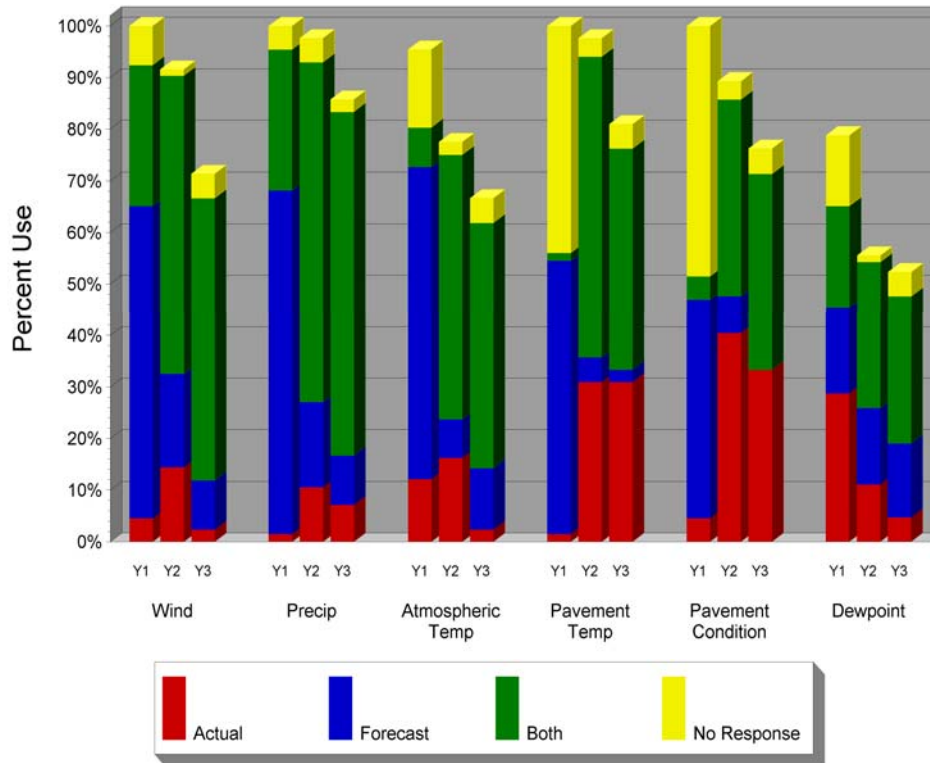


Figure 3.1 Percent of Highway Maintenance Operators who Indicated Using a Forecasted and/or Actual Type of Weather Information.

Fewer HMOs depended on forecast information for wind speed/direction, precipitation, atmospheric temperature, pavement temperature, and pavement condition in the evaluation years compared to the baseline year. There was a general decline in the percentage of HMOs that used each type of weather information from the baseline to the second evaluation year. Dewpoint was used the least of all weather information being utilized. However, it was still used by more than half of the HMOs during the course of the evaluation.

The follow-up surveys asked HMOs to indicate which sources of weather information they obtained from FORETELL. Figure 3.2 shows that roughly 50 percent of the operators surveyed obtained wind speed or direction, precipitation, and atmospheric temperature information from FORETELL. Between 30 percent and 50 percent of HMOs utilized FORETELL-supplied information on pavement temperature, pavement condition, and dewpoint. With the exception of atmospheric temperature and dewpoint, there was a slight decline in the percentage of HMOs that obtained information from FORETELL between the first follow-up and the second follow-up surveys. However, there were no statistically significant differences over time in the percentage of HMOs that obtained any type of weather information from FORETELL, which suggests that the use of FORETELL remained consistent across the evaluation, at least for the components covered in the surveys.

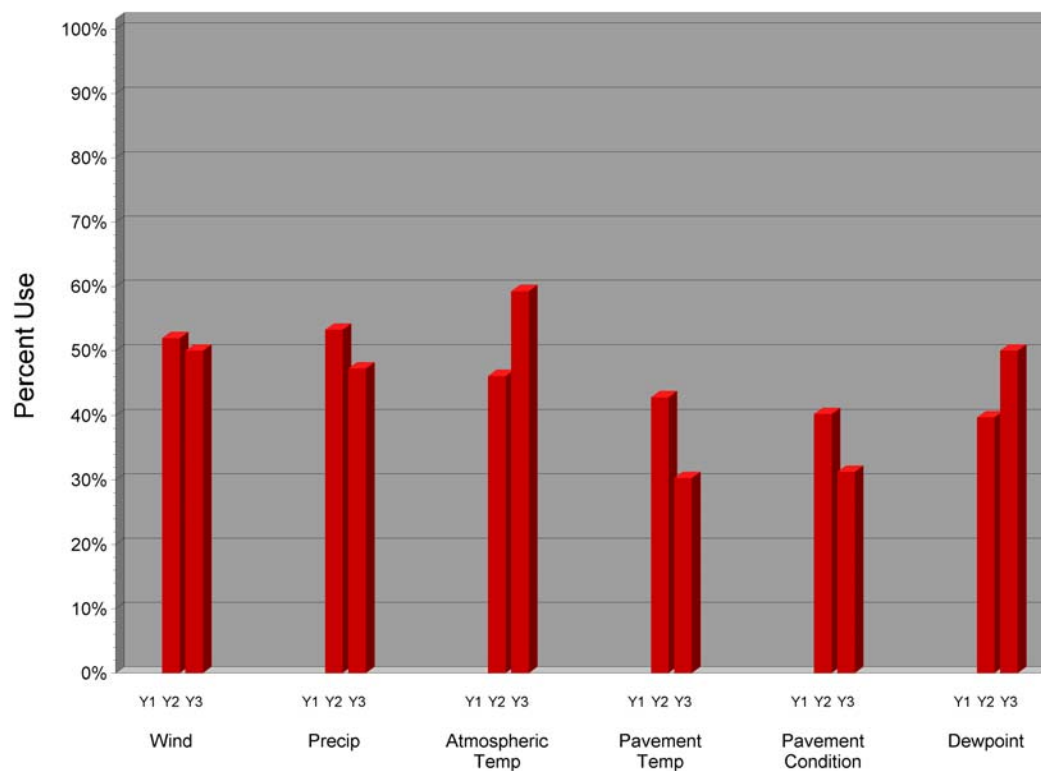


Figure 3.2 Percent of Highway Maintenance Operators who Indicated Using the FORETELL System for each Type of Weather Information.

Figure 3.3 illustrates the percentage of HMOs who used weather information daily, weekly, before a weather event, during a weather event, or after a weather event, along with the breakdown of how often. The baseline survey asked about weather information in general, while the evaluation periods refer specifically to information obtained from the FORETELL system. As can be seen in the figure, information was obtained at roughly the same rate before and during an event, with greater emphasis on obtaining the information hourly during a weather event. There was less frequent collection of weather information after a weather event occurred. This type of use is consistent with HMOs mobilizing before and during a weather event and then returning to routine monitoring after the event has occurred.

The declines, from the baseline survey to both follow-up surveys, in the percentage of HMOs using weather/FORETELL information daily and before, during, and after an event are statistically significant. However, the declines from the first follow-up to the second follow-up are not statistically significant. Several factors could explain these results. For instance, the mild winter during the second follow-up portion of the evaluation could account for some of the decline in use of weather information in general (see Figure 3.1). Another potential explanation is that the information from FORETELL was sufficient for the operators to decrease their frequency of access.

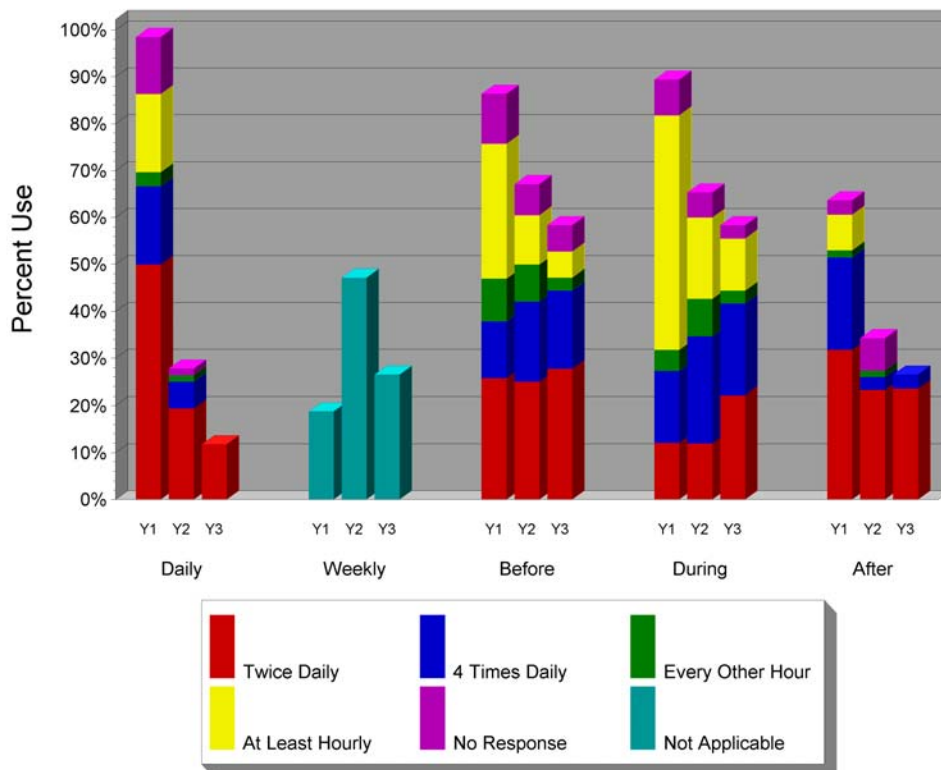


Figure 3.3 Percent of Highway Maintenance Operators who Indicated How Often Weather Information was Obtained.

3.1.3 User Acceptance

In this context, User Acceptance refers to the opinions of the HMOs who actually used FORETELL and the value they place on the FORETELL information they receive. For example, HMOs were asked how helpful the general weather information (baseline) or FORETELL information (follow-up) was to them in determining which snow and ice control strategies of anti-icing, de-icing, traction enhancement, and mechanical removal to employ. Figure 3.4 shows that the relative percentage of HMOs who found the information helpful (magenta and yellow sections combined) for their strategies was significantly higher, statistically, in the baseline year than in the two evaluation years. One possible explanation could be that HMOs were not using the technology once the novelty had worn off, but another possible explanation could be that the second evaluation winter (2001-2002) was much milder, so weather information was less of a factor during that time.

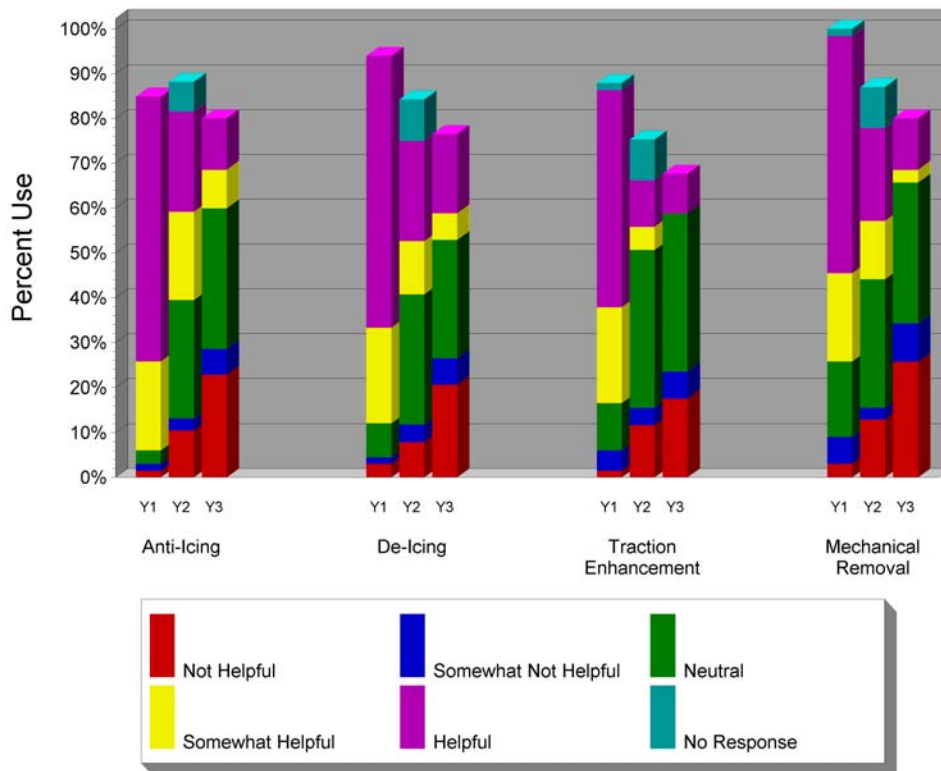


Figure 3.4 Percent of Highway Maintenance Operators who Indicated How Helpful Weather Information was for Employing Snow and Ice Control Strategies.

HMOs were also asked how understandable, usable, easily obtainable, accurate, and useful each type of weather information was to them. Recall that the baseline survey asked these questions about general weather information, while the follow-up surveys asked about FORETELL information specifically. Figures 3.5a through 3.5f illustrate the results of these quality assessments for each type of weather information for the HMOs who reported using FORETELL.

Approximately 40 percent of HMO users perceived that the wind speed/direction information provided by FORETELL was accurate (see Figure 3.5a). A very high percentage of HMO users, ranging between 50 percent and 90 percent, found the information provided by FORETELL to be understandable, usable, easily obtainable, and useful. Over time there appeared to be a decrease in the percentage of HMOs who agreed that the FORETELL information was understandable, usable, easily obtainable, and useful. However, only the decline from baseline to second follow-up information was statistically significant when judging how easily the weather/FORETELL information was obtained. This result may indicate a frustration with accessing information via the Internet, given the available resources for doing so (see Section 4.3). Figures 3.5b and 3.5c show similar results for precipitation and atmospheric temperature information.

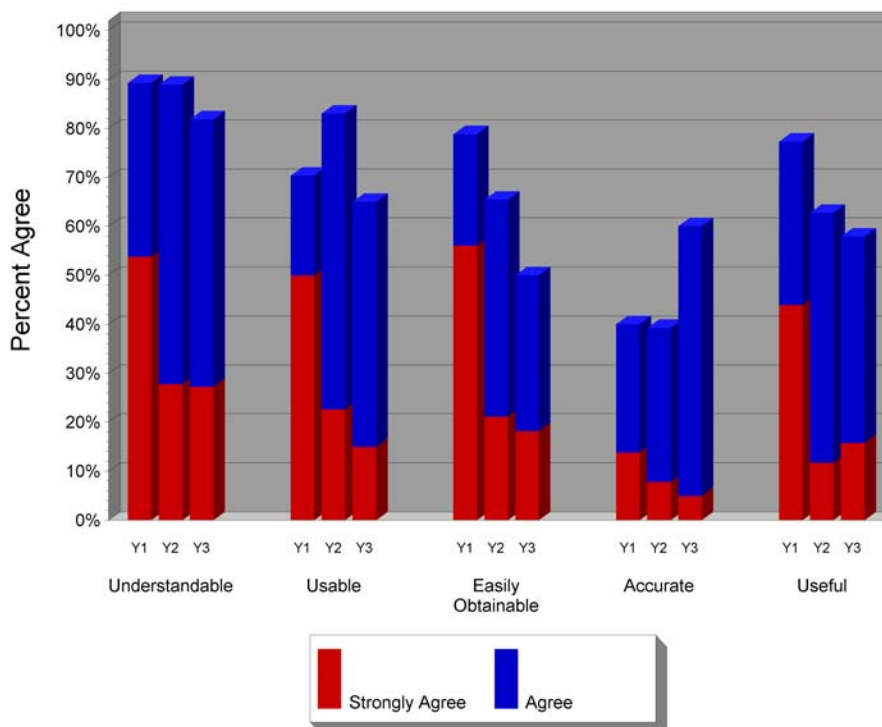


Figure 3.5a Percent of Highway Maintenance Operator Users who Agree with Certain Characteristics Associated with Wind Speed/Direction Information.

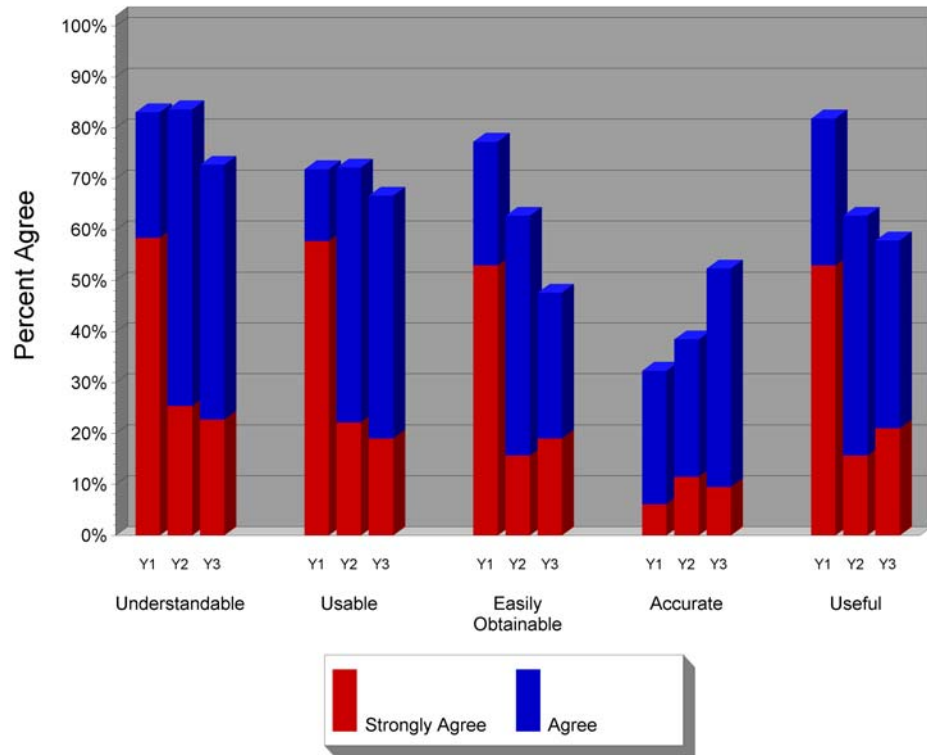


Figure 3.5b Percent of Highway Maintenance Operator Users who Agree with Certain Characteristics Associated with Precipitation Information.

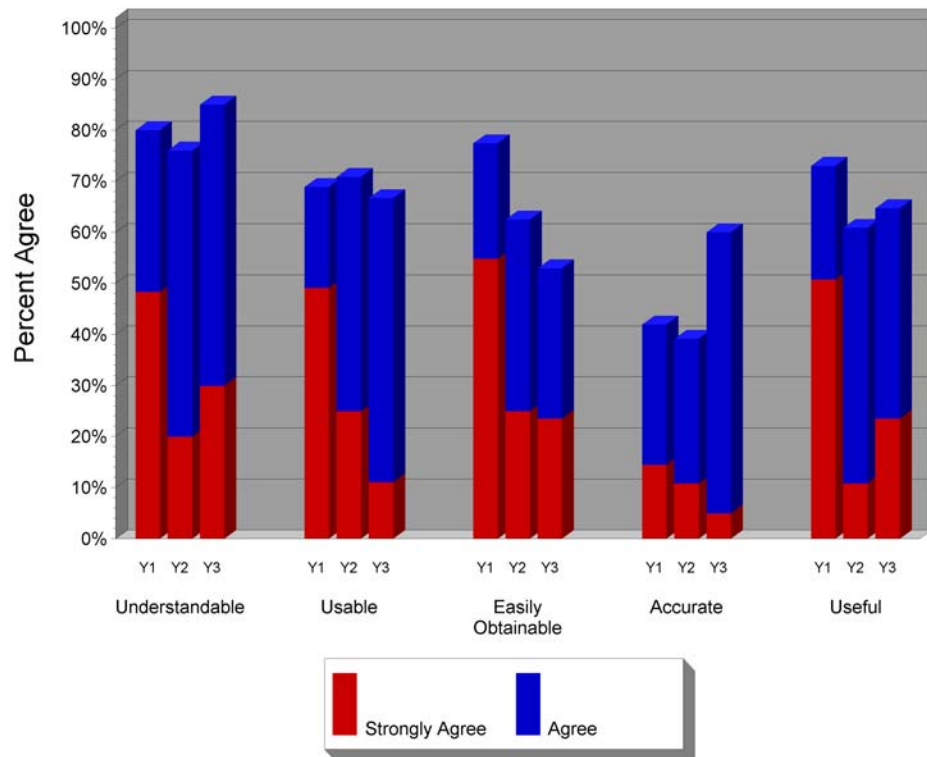


Figure 3.5c Percent of Highway Maintenance Operator Users who Agree with Certain Characteristics Associated with Atmospheric Temperature Information.

Figure 3.5d illustrates that pavement temperature information showed a much sharper decline in agreement from the baseline to the follow-up results than other weather information over time. This could be a result of pavement temperature being more variable than others or possibly being harder to predict. Overall, greater than 40 percent of HMOs using FORETELL found the pavement temperature information to be understandable, usable, easily obtainable, and useful. There were statistically significant differences in how understandable and usable the pavement temperature information was when the baseline and second follow-up surveys are compared, as well as when the first follow-up and second follow-up surveys are compared. There were also statistically significant differences in how easily obtainable and accurate the information was perceived to be between the baseline and each of the two follow-up surveys.

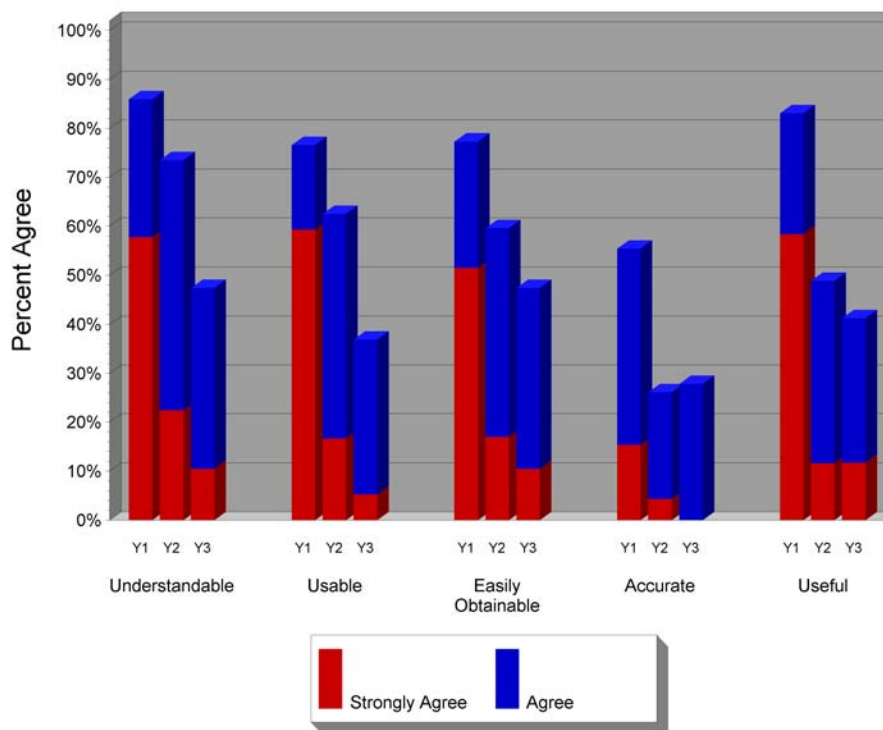


Figure 3.5d Percent of Highway Maintenance Operator Users who Agree with Certain Characteristics Associated with Pavement Temperature Information.

In the baseline and first follow-up year, more than 60 percent of HMOs using FORETELL responded that the pavement condition information was understandable, usable, and easily obtainable (see Figure 3.5e). However, less than 40 percent of HMOs surveyed in the second evaluation year found the pavement condition information to be understandable, usable, easily obtainable, accurate, and useful, which represents a statistically significant decrease for understandability and usability. The percentage of HMO users who indicated that they agreed that pavement condition information was easily obtainable was significantly lower, statistically, in the second follow-up than in the baseline year. Also, the perception of usefulness was lower in both follow-up years than in the baseline year. No other differences were statistically significant.

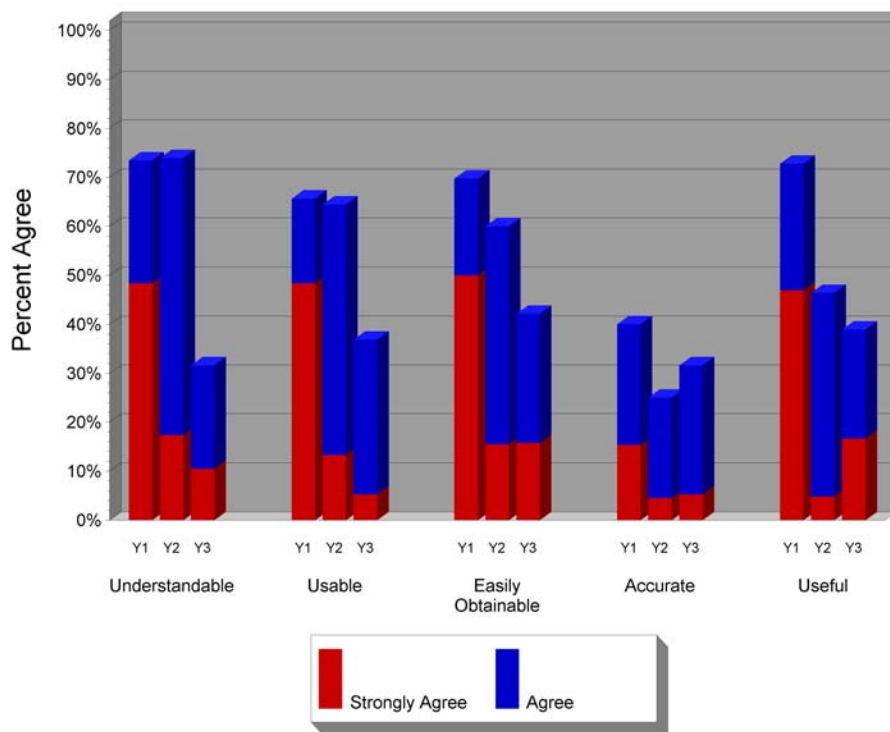


Figure 3.5e Percent of Highway Maintenance Operator Users who Agree with Certain Characteristics Associated with Pavement Condition Information.

The results for dewpoint information, as shown in Figure 3.5f, generally show much lower HMO agreement toward the usability, accuracy, and usefulness of the dewpoint information compared to wind speed/direction, precipitation, and atmospheric temperature. However, more than 50 percent of all HMOs using FORETELL found the dewpoint information to be understandable and easily obtainable. The results showed an increase over time in HMOs' perception of usability. Also, there was a statistically significant increase in the perceived accuracy of the information when the baseline and first follow-up surveys are compared to the second follow-up survey. There was also a statistically significant increase in the usefulness of dewpoint information from the first to the second evaluation year. No other comparisons were significantly different, statistically.

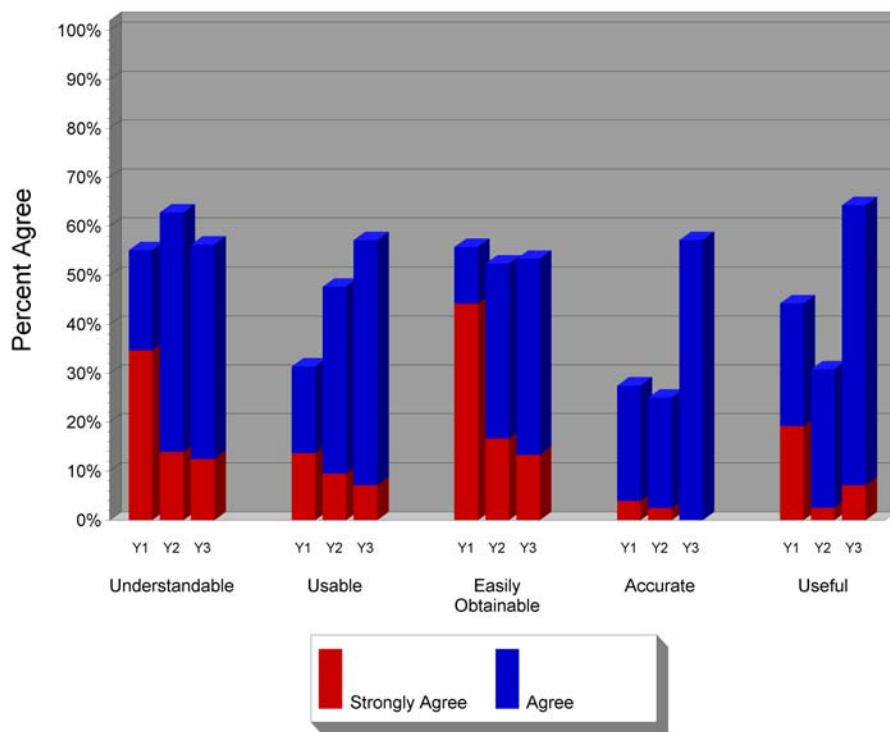


Figure 3.5f Percent of Highway Maintenance Operator Users who Agree with Certain Characteristics Associated with Dewpoint Information.

More than 30 percent of surveyed HMOs using FORETELL agreed that FORETELL information (general weather information in the baseline survey) was sufficient for making weather-related decisions, that it makes their jobs easier, and that FORETELL provides valuable information not available from other sources (see Figure 3.6).

Approximately 40 percent of all surveyed HMOs who used FORETELL in the second evaluation year, as compared to 30 percent in the third evaluation year, found FORETELL information to be valuable and unique. These percentages are not significantly different, statistically. However, there was a statistically significant decline from the baseline survey (91%) to both follow-up surveys (38% and 29%, respectively) in the percentage of HMOs who indicated that weather/FORETELL information made their jobs easier. The mild winter may have made weather information in general, including FORETELL, less important to job performance during the winter of 2001-2002.

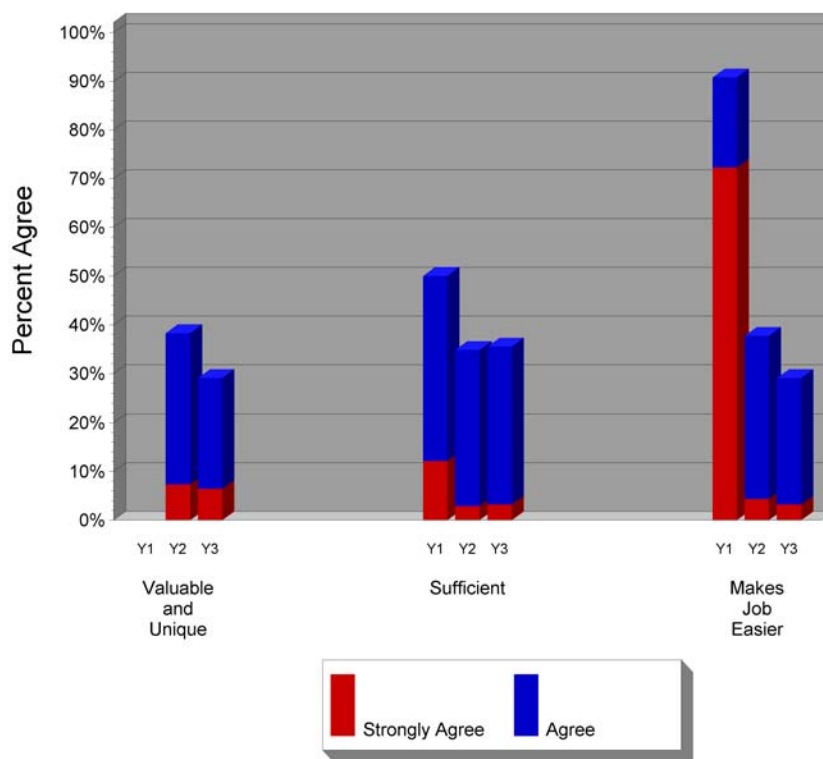


Figure 3.6 Percent of Highway Maintenance Operator Users who Agree with Overall Qualities of Weather/FORETELL Information.

3.1.4 Decision Effectiveness

Decision Effectiveness characterizes the impact FORETELL information had on the HMOs' weather-related decisions. Figures 3.7a through 3.7f present the percentage of HMOs who use weather/FORETELL information to determine what road surface treatments to apply and when and where to apply them for each of the types of weather information included in the surveys (wind speed/direction, precipitation, atmospheric temperature, pavement temperature, pavement condition, and dewpoint).

Each of the figures displays a similar pattern: a high percentage of operators in the baseline survey indicating use of the information for all three purposes (what, when, where), with a somewhat lower, yet still large percentage, indicating use of the information from FORETELL in the follow-up surveys. The notable exceptions are atmospheric temperature (Figure 3.7c) and dewpoint (Figure 3.7f). These figures show a lower overall percentage of respondents indicating use of the information for road surface treatment decisions. Figure 3.7f shows a statistically significant increase in the use of dewpoint information in road surface treatment decisions, particularly in what treatments to apply. This could indicate that FORETELL provided HMOs with a useful piece of information that they did not have access to before.

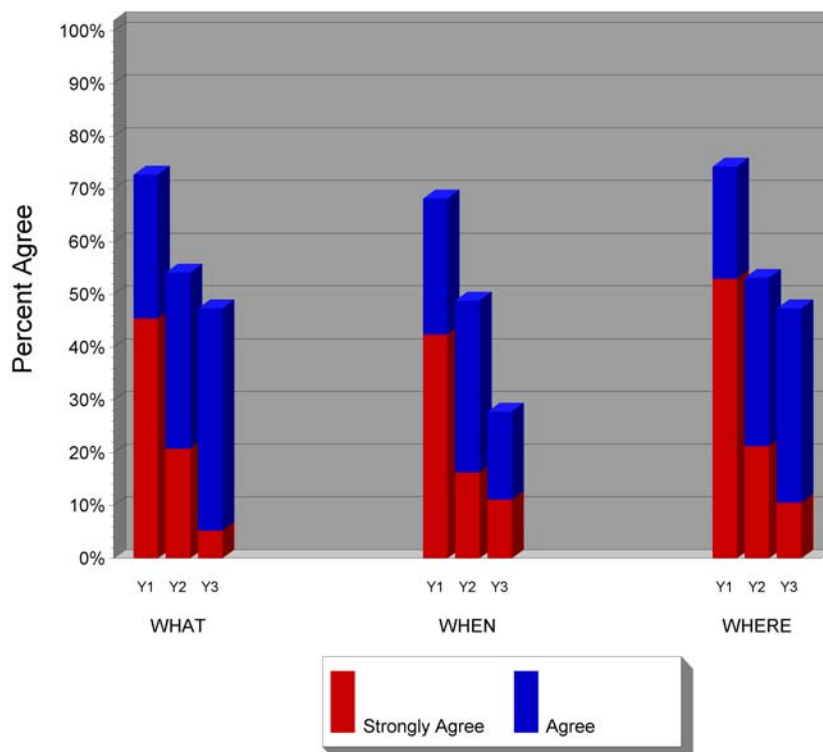


Figure 3.7a Percent of Highway Maintenance Operators who Use Wind Speed/Direction Information in Road Surface Treatment Decisions.

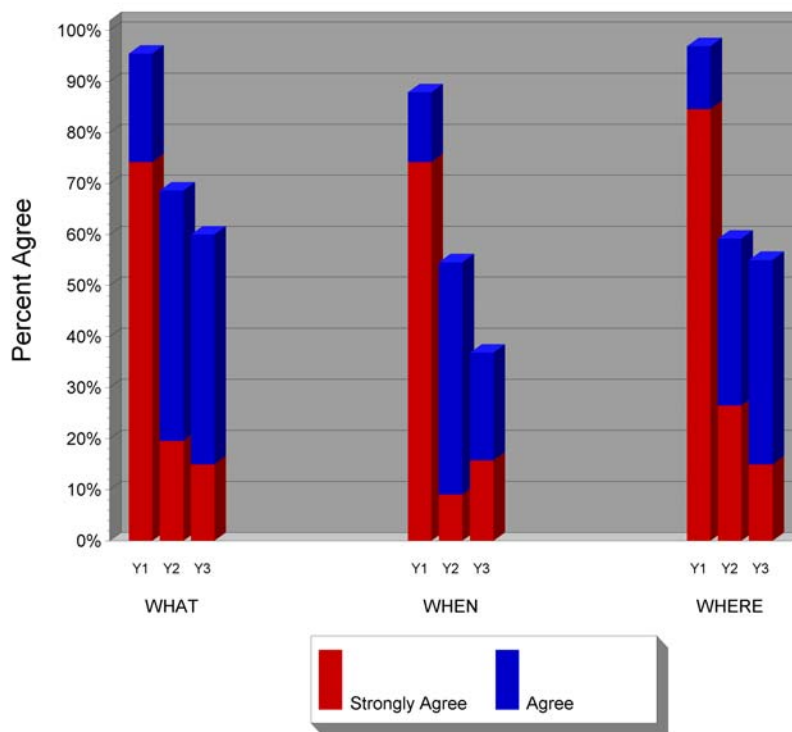


Figure 3.7b Percent of Highway Maintenance Operators who Use Precipitation Information in Road Surface Treatment Decisions.

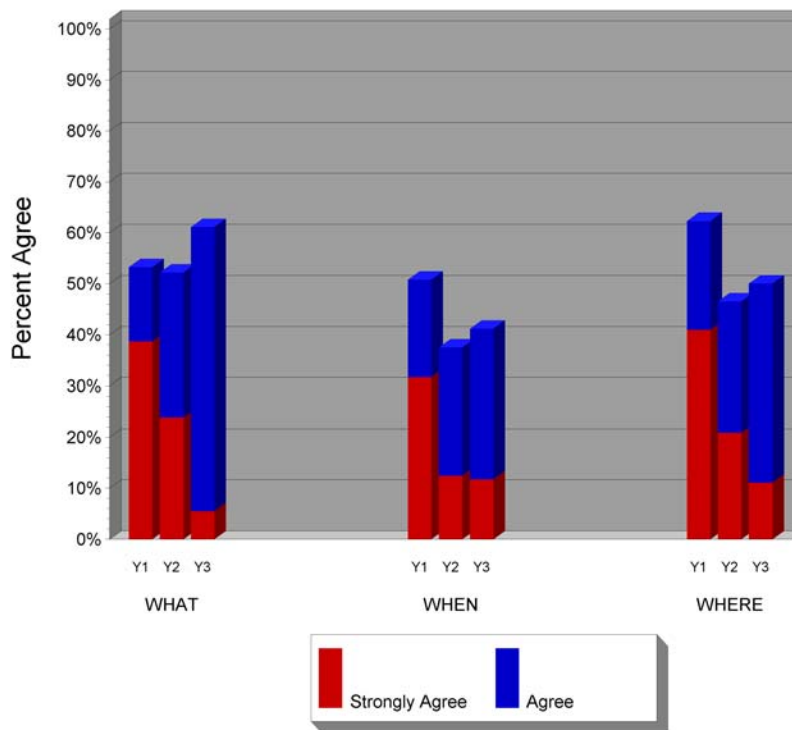


Figure 3.7c Percent of Highway Maintenance Operators who Use Atmospheric Temperature Information in Road Surface Treatment Decisions.

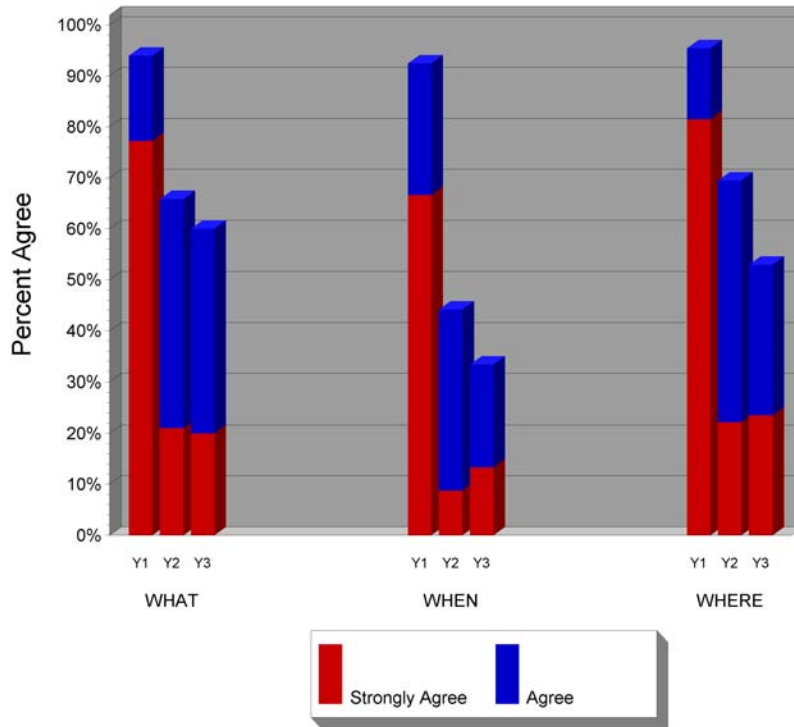


Figure 3.7d Percent of Highway Maintenance Operators who Use Pavement Temperature Information in Road Surface Treatment Decisions.

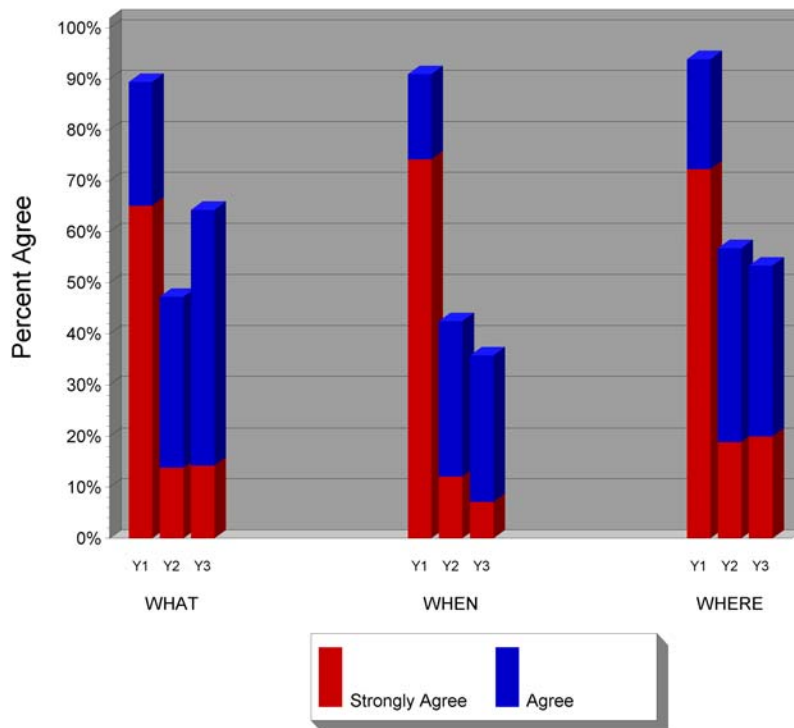


Figure 3.7e Percent of Highway Maintenance Operators who Use Pavement Condition Information in Road Surface Treatment Decisions.

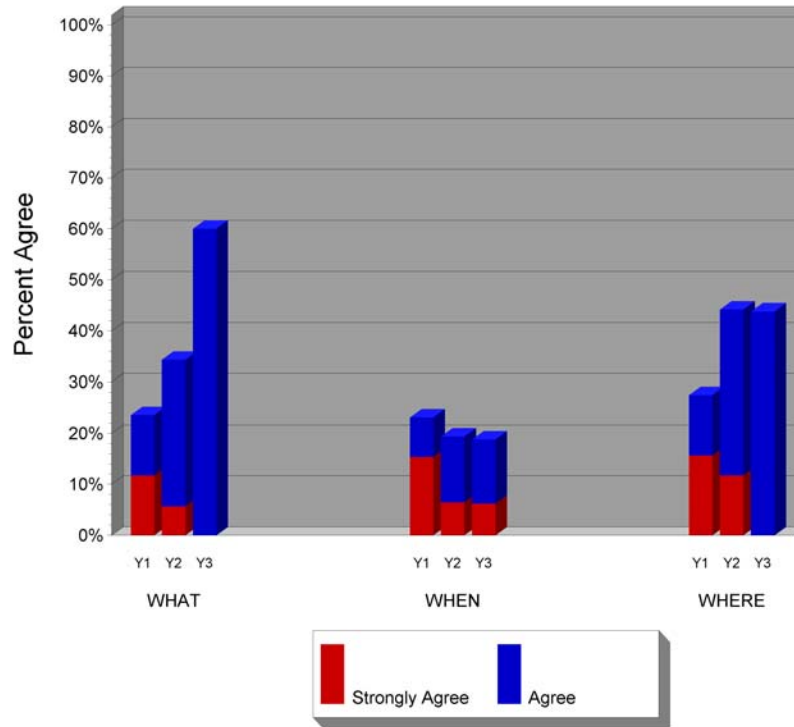


Figure 3.7f Percent of Highway Maintenance Operators who Use Dewpoint Information in Road Surface Treatment Decisions.

Figure 3.8 illustrates that roughly between 20 percent and 30 percent of the HMOs changed their decisions based on wind, precipitation, atmospheric temperature, pavement temperature, pavement condition, or dewpoint information obtained from FORETELL. A slightly higher percentage of HMOs indicated changing a decision using precipitation information in the first follow-up survey, and a much lower percentage indicated changing a decision using dewpoint information in the first follow-up survey. Figure 3.8 indicates that FORETELL has successfully provided information that is used in the decision-making process.

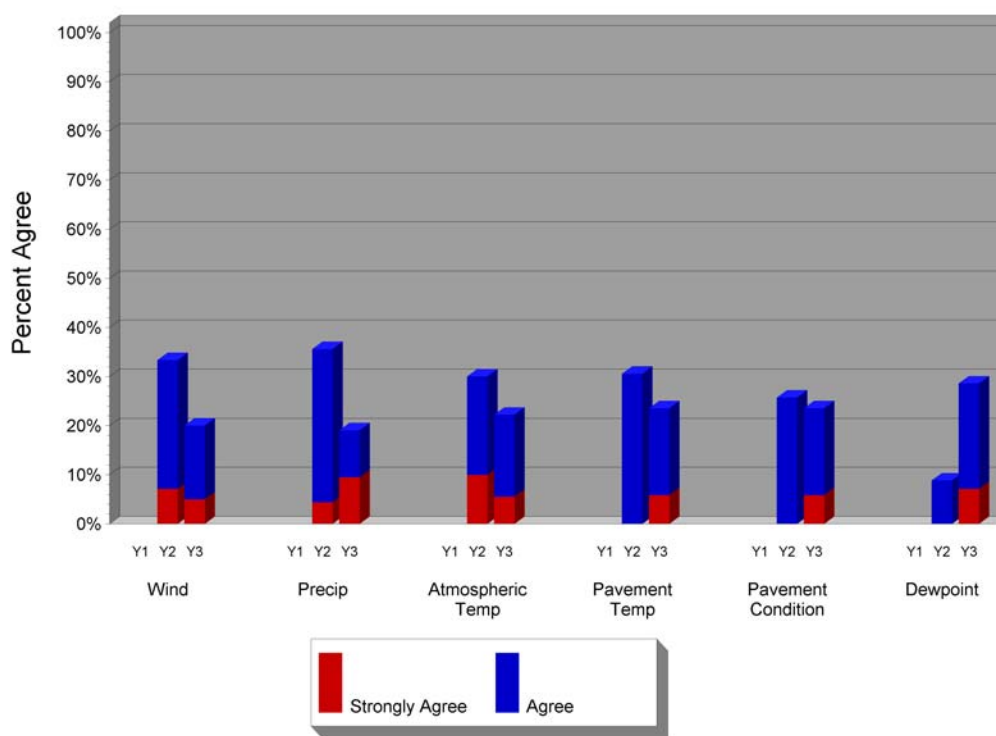


Figure 3.8 Percent of Highway Maintenance Operators who Indicated Changing a Decision Based on FORETELL Information.

Overall, with all categories of information combined, 40 percent of HMO users in the first follow-up survey and 32 percent of HMO users in the second follow-up survey indicated changing a decision based on some type of FORETELL information.

Figure 3.9 shows similar results for the questions of improving traffic efficiency (e.g., traffic flow, roadway mobility, roadway level of service), targeting snow and ice control measures, conducting highway maintenance activities, deploying staff, the timeliness of FORETELL information for making decisions, and the confidence in those decisions. The figure shows that even though there are statistically significant decreases from the baseline survey to the follow-up surveys in the percent of HMOs that perceive these improvements, still 20 to 30 percent do perceive some change for the better.

Just under 20 percent of the surveyed HMOs who used FORETELL indicated a willingness to pay for FORETELL information, yet 88 percent in the first follow-up survey and 53 percent in the second follow-up survey indicated a desire to continue using it in the future.

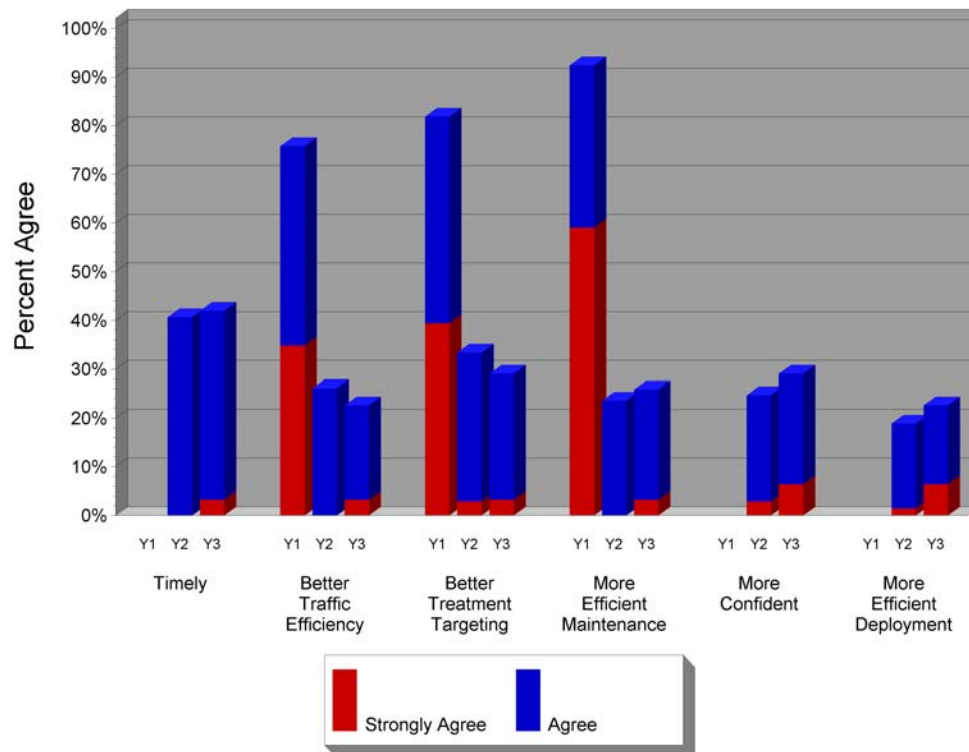


Figure 3.9 Percent of Highway Maintenance Operators who Agreed to Improved Job Performance Using FORETELL Information.

3.1.5 Other Factors

The evaluation effort aimed to answer questions of improved safety and less environmental contamination with the use of FORETELL information. Results are shown in Figure 3.10 below. Approximately 20 percent of the HMOs indicated that using information provided by FORETELL resulted in a quicker return of the roadways to a targeted level of service, an increase in the safety of their own workers, and a reduction in the amount of chemical applications needed. No other information was available for assessing these issues.

The activity/weather log information collected from the HMOs during each weather event was intended to characterize the weather conditions during the evaluation period, as well as summarize the impact FORETELL information had on each weather event. Unfortunately, only the former assessment was possible (see Section 4.1 for details). An attempt was made to develop a statistical model that would characterize the time to return to a targeted pavement condition in terms of other event-specific information such as amount and type of precipitation, worst pavement condition, and whether or not FORETELL information was used for decisions. A total of 589 logs were returned, with 98 logs indicating the use of FORETELL information. This small amount of information was not sufficient to support the development of planned models.

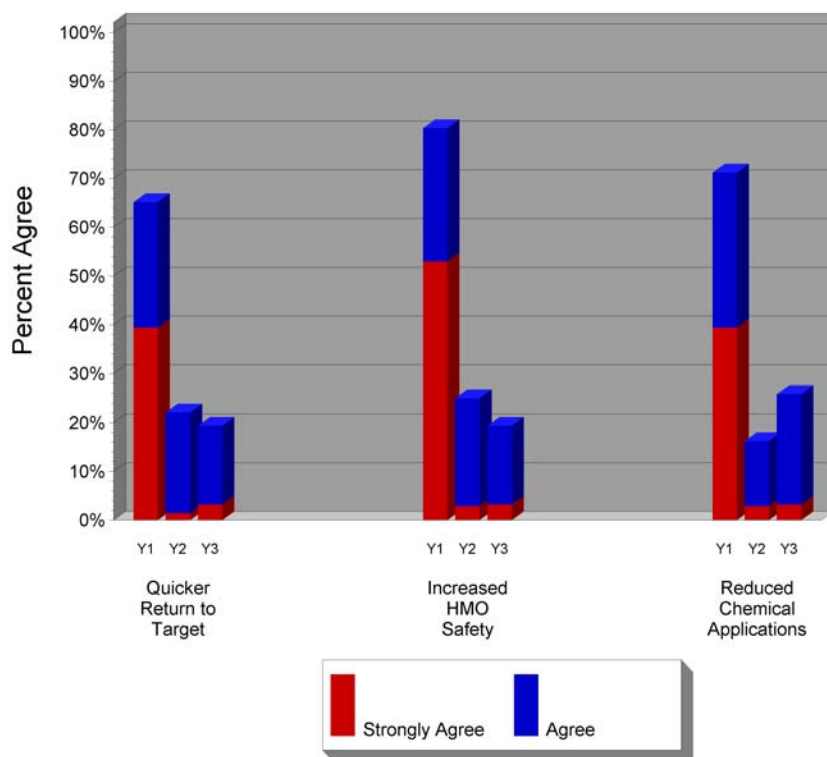


Figure 3.10 Percent of Highway Maintenance Operators who Perceived an Improvement in Safety and/or Environmental Concerns When using FORETELL Information.

Another potential contributor to the results of this evaluation is the amount of FORETELL training received by the participants. It is not known exactly how many of the responding HMOs received training on the use of the FORETELL system; however, it was offered in all three states on at least two occasions with reasonably good attendance. The difference in survey responses by HMOs who received training and those who did not is a potentially confounding effect that cannot be measured.

3.1.6 Conclusions

The results of the HMO surveys indicate some success of the FORETELL system within this user group:

- Anywhere from 30 percent to 60 percent of the respondents used FORETELL information.
- More users found the information helpful than not helpful in snow and ice control decisions.
- A very high percentage of HMO users, ranging between 50 percent and 90 percent, found FORETELL information to be understandable, usable, easily obtainable, accurate, and useful (for all categories of information combined).
- Approximately 30 percent to 40 percent of HMOs who used FORETELL found FORETELL information to be valuable and sufficient and to make their jobs easier.
- Between 30 and 40 percent of the respondents who used FORETELL changed their decisions based on FORETELL information.
- More than 50 percent of the respondents who used FORETELL want to continue using FORETELL in the future.
- Just under 20 percent of the HMOs who used FORETELL would be willing to pay for FORETELL information.

In general the survey results show positive feedback about FORETELL from the HMOs. While the results do not provide an obvious argument for the continuation of FORETELL, there are several factors that could be influencing that result, most importantly, the weather. Unfortunately, too few of the HMO survey respondents also completed activity/weather logs. Therefore, it was not possible to combine the weather information collected from the logs with the actual survey responses.

3.2 Other User Groups

This section presents the results of the data collection effort for CVOs, highway patrol, school administrators, transit operators, and traffic managers. For each user group, an overview of the data collection effort is presented, along with a description of the types of weather-related

information used, users' acceptance of the FORETELL system, the impact of FORETELL information on users' decision processes, the effect of FORETELL information on other factors such as safety and environmental conservation, and conclusions that may be drawn from the data collected.

3.2.1 Commercial Vehicle Operators

3.2.1.1 User Group Overview

CVO personnel include truck drivers, dispatchers, terminal managers, safety coordinators, as well as vice presidents, presidents, and owners of trucking companies. This user group makes decisions in routing, schedules, and other operational parameters resulting from weather conditions to ensure the efficiency and safety of their operations. CVOs in the states involved in the FORETELL test accessed the FORETELL website in hopes of better understanding winter road conditions and making decisions regarding operations (e.g., trip deferral, departure time, route choice).

The effectiveness of the FORETELL website at disseminating relevant information to CVOs was evaluated through telephone interviews and records of their access to the website. Telephone interviews were conducted to assess the extent to which CVOs used FORETELL information (user acceptance) and to measure their ability to improve weather-event decisions (decision effectiveness), reduce exposure to unsafe road conditions (safety and security), and reduce delay (efficiency). An interview guide was developed to assist in conducting the telephone interviews. The guide provided consistency in the interviews while allowing information suitable for the analysis to be collected. Appendix B contains the interview guide used during the interviews, along with a summary of the responses to each question.

A 2000-2001 directory/list of 1,063 CVOs traveling in or through Iowa, Wisconsin, and/or Missouri was obtained. Due to time and resource constraints, nearly 100 randomly selected CVOs were contacted to gauge their level of interest and determine whether they had access to the Internet. Only 34 companies agreed to participate, and these therefore became a convenience sample of CVOs in the three test states. Some identified participants made use of the FORETELL website during the winter months of 2001-2002 to obtain road surface and weather condition information.

The evaluation team interviewed the potential evaluation participants, via telephone, about their use of the FORETELL system, how well the system worked (system acceptance), the purpose the information was used (e.g., routing or timing alterations/planning – decision effectiveness), and whether it provided improvements in safety, mobility, and operation.

The participating CVOs were divided into categories based on the number of drivers, as an indicator of the company size. Three categories of CVOs were developed for analysis:

- Smaller Companies – 1 to 24 drivers
- Medium Companies – 25 to 50 drivers
- Larger Companies – 51 to 900 drivers

As shown in Figure 3.11, 15 of the 34 CVOs completed interviews. They represent 487 drivers that travel in the three test states, as well as throughout the continental United States.

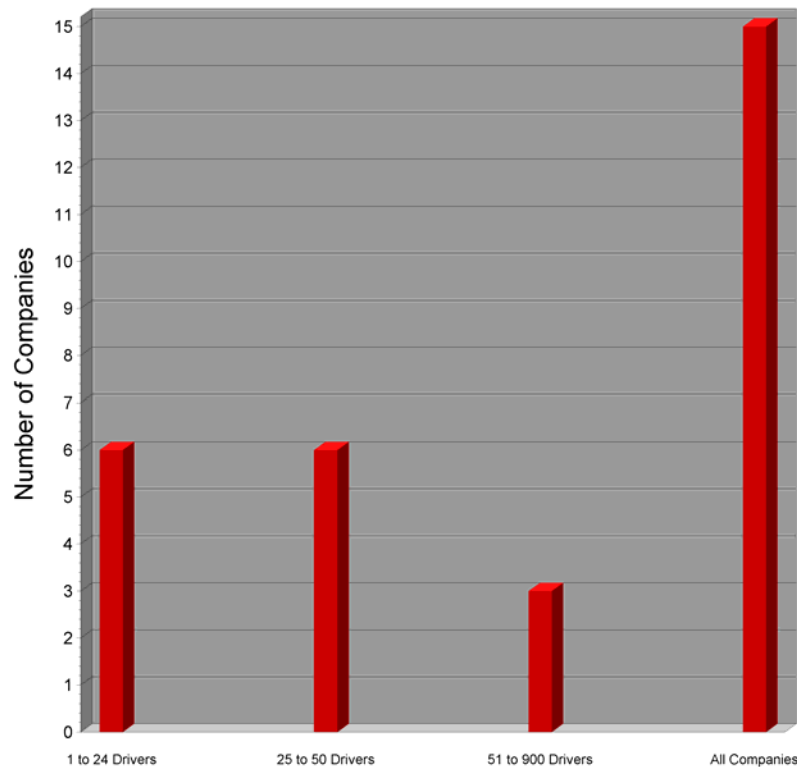


Figure 3.11 Number of Commercial Vehicle Operators Completing Interviews, by Company Size.

The interview questions strived to understand whether CVOs accepted weather and road condition information, if the information assisted in the effectiveness of their decisions, and if the information improved operations and safety. These questions were asked under the scenarios of “before knowing of FORETELL” and “after being introduced to FORETELL.” Respondents may have differed in their responses to questions because they were uncertain whether the questions assumed that they would replace all other information sources with the FORETELL system or add the FORETELL system to their existing information sources.

Training materials, with assigned usernames and passwords, were sent to personnel willing to participate in the evaluation. Figure 3.12 identifies the percent of CVOs interviewed from each category that received training material and, of those, who felt the training material received was useful. The figure shows that many operators in the small- and medium-sized companies received the training material.

Some larger CVOs indicated that they did not find the training material to be useful. Companies that found the training material to be useful indicated during the interview that it was only useful in logging onto the website.

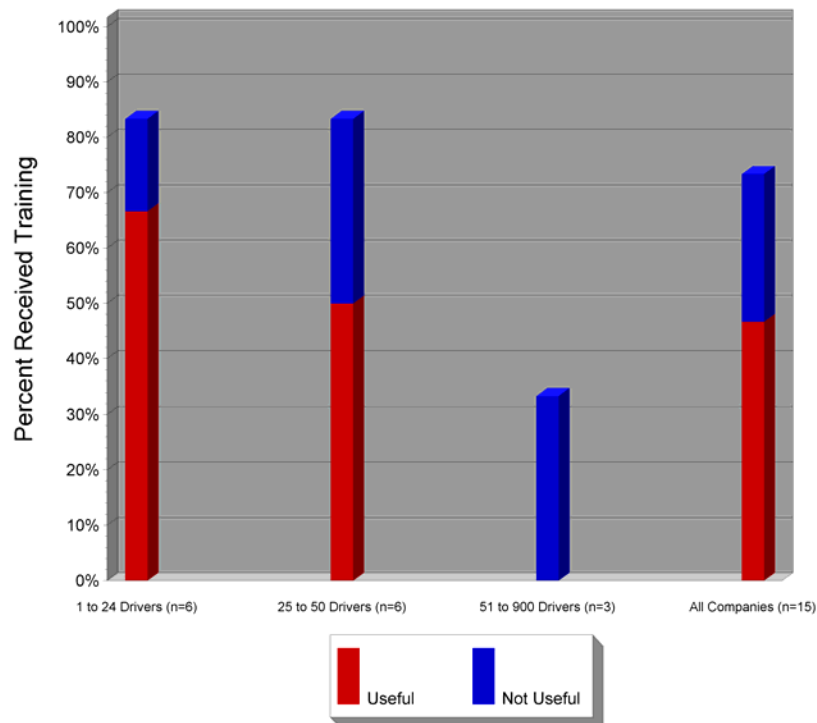


Figure 3.12 Percent of Commercial Vehicle Operators who Received Training Material and the Usefulness of that Material, by Company Size.

3.2.1.2 Information Used

The first part of the telephone interview concentrated on finding out what weather and road condition information CVOs sought and from what sources the information had been obtained before the users had knowledge of the FORETELL system. Figure 3.13 shows the types of weather-related information sought by CVOs and whether they used actual and/or forecasted information.

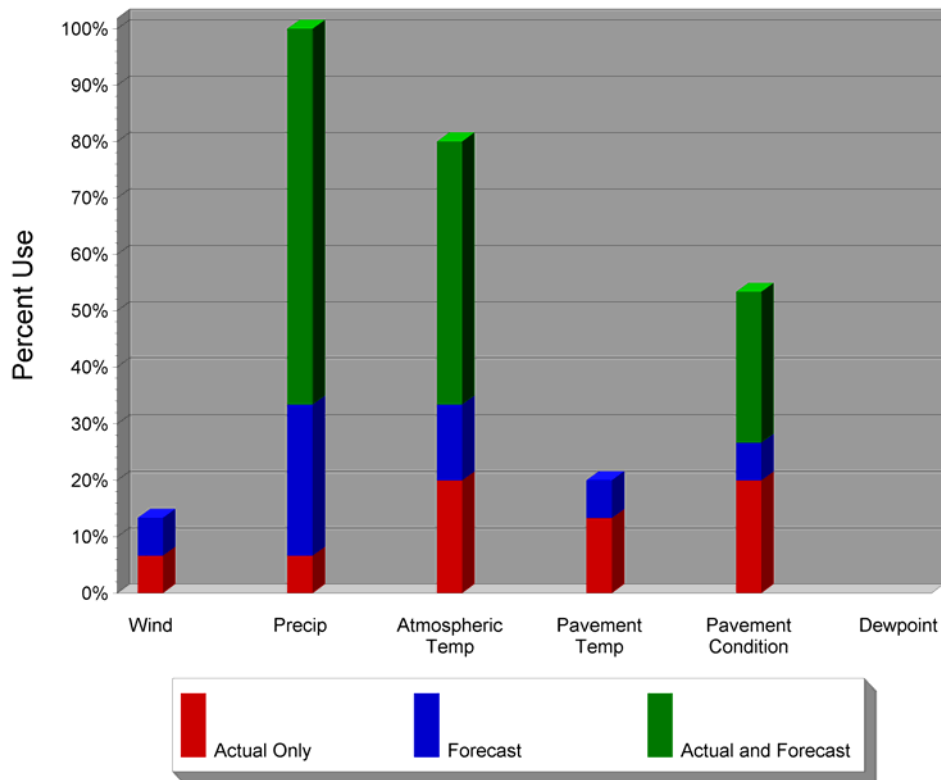


Figure 3.13 Percent of Commercial Vehicle Operators who Indicated Using Various Weather-Related Information from Sources Other than FORETELL.

Based on the information collected from this interview process, CVOs do not readily seek wind information, actual or forecasted. Companies favor information on precipitation, temperature, and pavement conditions. Perhaps viable wind, pavement temperature, and dewpoint information is not available among accessible sources. Available sources used to obtain the needed weather and road surface information are presented in Figure 3.14.

The CVO community has a variety of information sources providing current and forecasted weather and road condition information. However, the readily available, accessible, and en-route sources are those used frequently by CVOs. Figure 3.14 shows that the CVOs utilize AM/FM radios, private forecasting service, CB radios, television, cellular telephones, the Internet, and word of mouth to obtain weather and road condition information. Word of mouth (e.g., CVOs talking with each other at rest stops) is the most popular source, because it provides current, en-route information from very viable sources. Due to growing popularity, CVOs are installing, learning, and obtaining more information from the Internet.

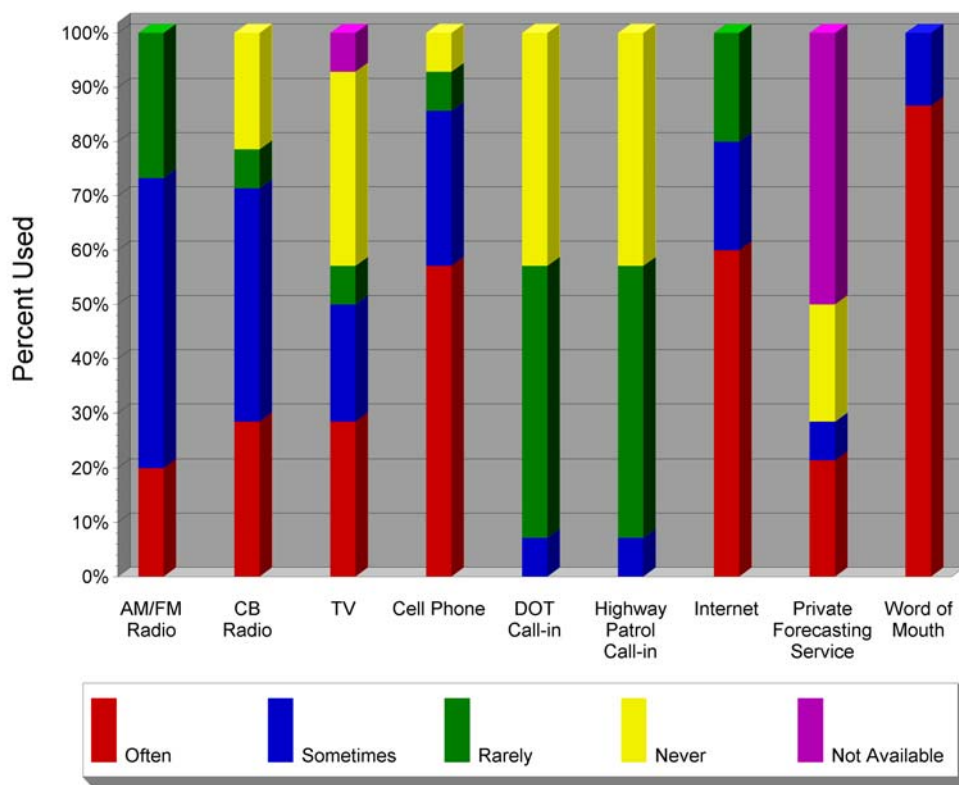


Figure 3.14 Percent of Commercial Vehicle Operators who Indicated Other Sources of Weather Information were Available to Them and How Often Each Source was Used.

Figure 3.15 shows FORETELL information accessed by CVOs. They accessed wind, pavement temperature, and dewpoint information from the FORETELL system, in contrast to the case before FORETELL (see Figure 3.13). FORETELL's interactive displays and maps captured CVOs' interest, according to respondents. CVOs did take time to view wind and pavement temperature information that, when using previous sources, they had not. Also notable was their interest in pavement temperature and condition. It is possible that FORETELL offered this information which was not obtainable from other sources.

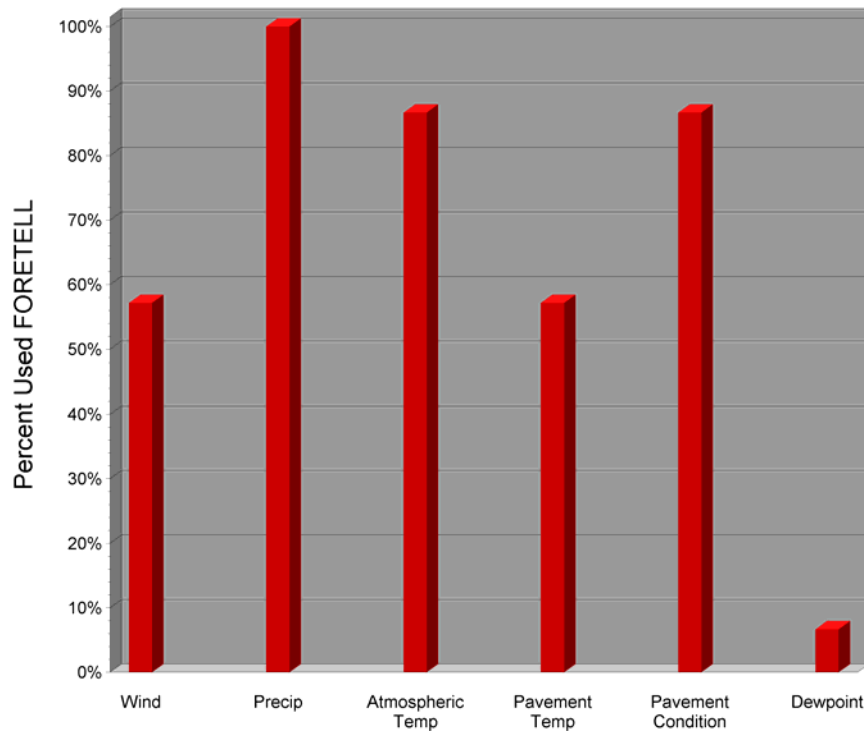


Figure 3.15 Percent of Commercial Vehicle Operators who Indicated Using Various Types of FORETELL Information.

Because the FORETELL system is an Internet website, analysis was completed to discover how many of the CVOs already used the Internet to visit sites providing weather and road condition information before having knowledge of the FORETELL system. The results are shown in Figure 3.16. As would be expected, the three largest companies utilize the Internet more than the other companies. Nearly 60 percent of all companies utilize the Internet often for weather and road condition information.

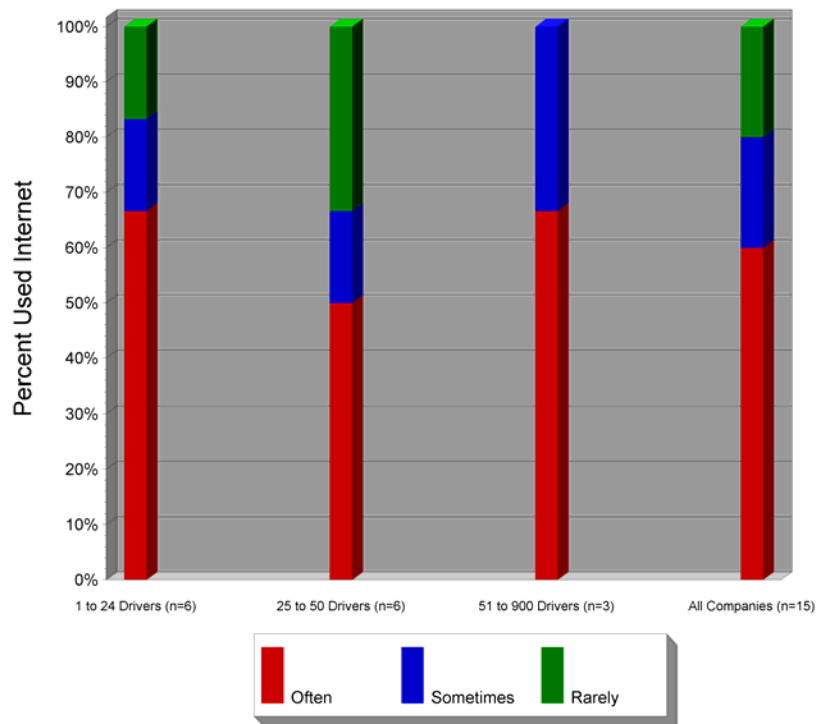


Figure 3.16 Percent of Commercial Vehicle Operators who Indicated Using the Internet to Gather Weather-Related Information, by Company Size.

3.2.1.3 User Acceptance

In both the “before knowing of FORETELL” and “after being introduced to FORETELL” scenarios, telephone interview questions strived to understand whether CVO personnel accepted weather and road condition information. Figure 3.17 shows how well CVOs accepted the information obtained from sources other than FORETELL. With questions ranging from source availability to data accuracy, approximately one-half of the CVO respondents agreed or strongly agreed that the information was acceptable.

The last column of Figure 3.17 (“The obtained information is very useful for the organization’s operations”) shows that CVOs indicated that they were very divided or unsure whether weather and road condition information was useful to their operations. Thirty-three percent of the CVOs responded “Neither Agree nor Disagree” when asked this question about the usefulness of other information sources. Approximately one-half of the respondents neither agreed nor disagreed that the weather and road condition information was accurate (47%) or up to date (40%). However, 87 percent agreed or strongly agreed that the information was easy to access and readily available.

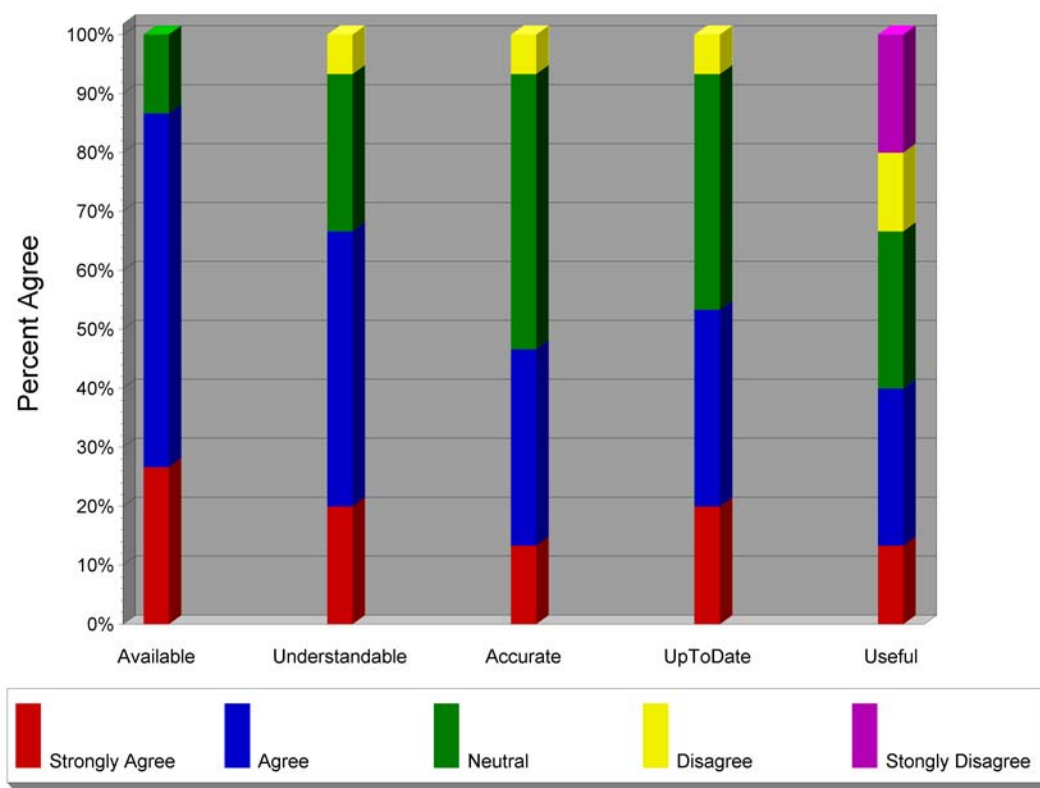


Figure 3.17 Percent of Commercial Vehicle Operators who Indicated Agreement with Certain Characteristics of Weather Information They Received from Sources Other Than FORETELL.

Figure 3.18 illustrates the interview responses concerning CVO acceptance of the FORETELL system information. The difference between the results of the “before” and “after” scenarios is not statistically significant. In both scenarios, CVO personnel found the information to be accessible and easily obtainable. However, when users were asked if the information was easy to understand, 67 percent of the CVOs reported they agreed or strongly agreed that the “before” source information was easy to understand versus 47 percent of CVO users understanding FORETELL information. Many CVOs replied that they neither agreed nor disagreed for both scenarios, which could mean that they did not access the information or they did not rely heavily on weather and road condition information sources to make decisions. The uncertainty may suggest minimal use of weather and road condition information sources during the mild winter season. However, a majority of the companies did accept the FORETELL information.

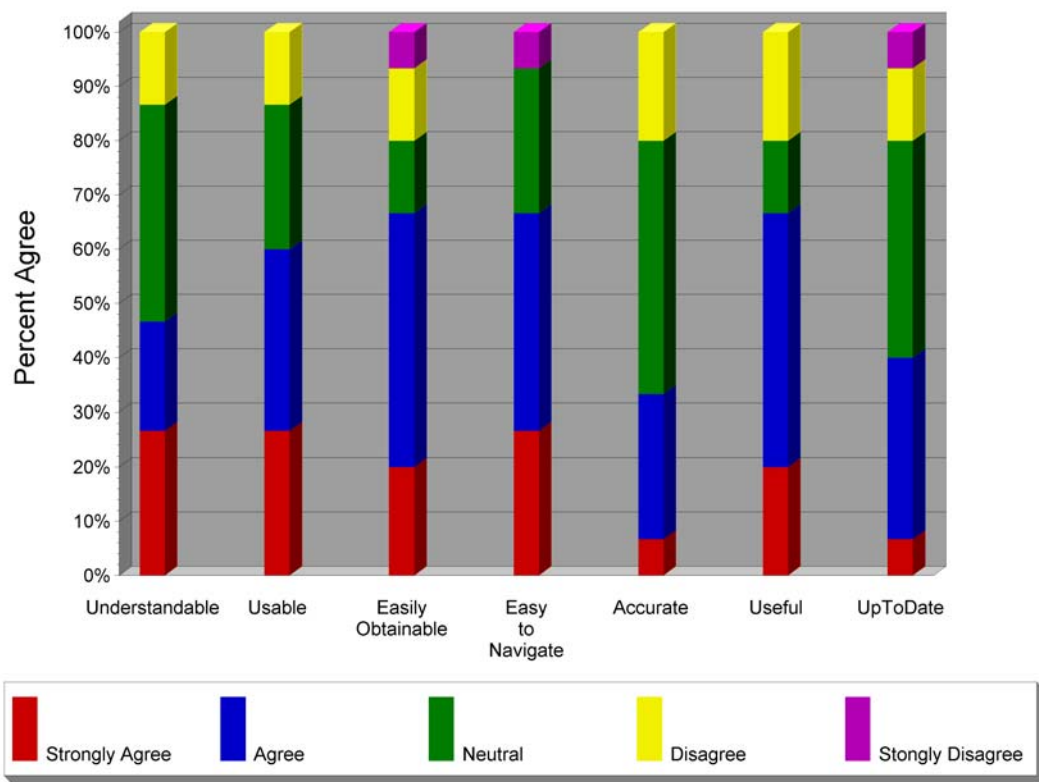


Figure 3.18 Percent of Commercial Vehicle Operators who Indicated Agreement with Certain Characteristics of FORETELL Information.

Questions on the telephone interview guide probed into the frequency of FORETELL use by CVOs and how their use correlated with weather events. Figure 3.19 shows the respondents' frequency of use of the FORETELL system. Of the CVOs responding, approximately 30 percent reported daily use and about 80 percent of the respondents used the system twice daily just before, during, or after a weather event. Although not shown in the graph, 41 percent of the respondents reported using the FORETELL system a "couple of times" during the winter season.

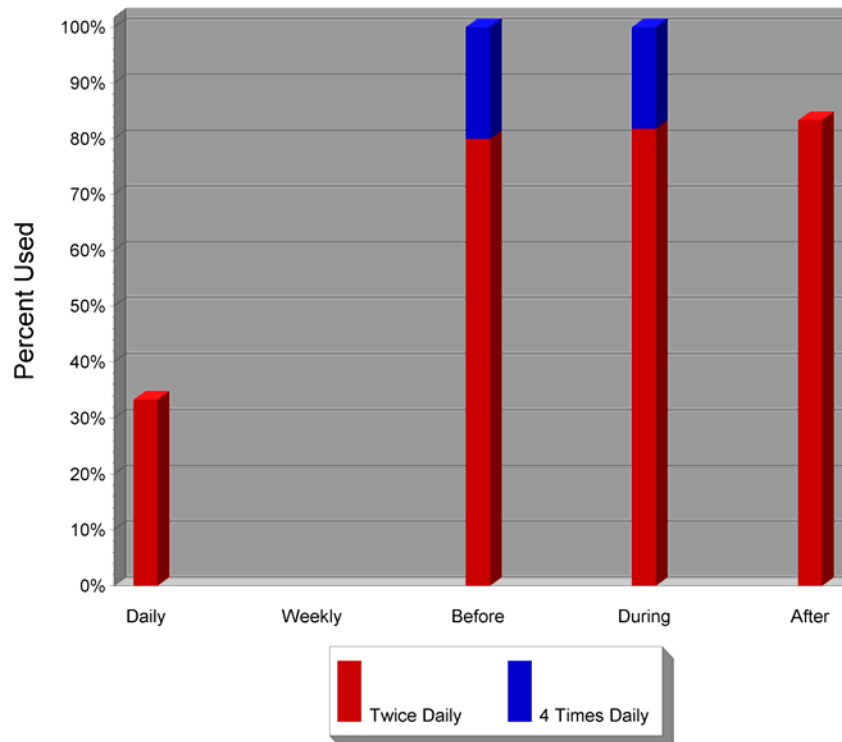


Figure 3.19 Percent of Commercial Vehicle Operators who Indicated Use of FORETELL Information at Various Time Intervals.

While responding to the frequency of use questions in the telephone interview, some CVOs expressed uncertainty in the number of times they had actually used the FORETELL system. Therefore, FORETELL's system records were accessed and logins to the system were determined by looking specifically at CVO-assigned usernames and passwords. Figure 3.20 displays the number of times CVOs accessed the FORETELL system, by month, during October 2001 through April 2002.

Figure 3.20, based on system records, shows that use of FORETELL was highest in January (the yellow portion) after a very slow start (little use in October or November). Use sharply declined thereafter. Figure 3.20 clearly shows that medium and larger companies accessed the FORETELL system more often than smaller companies. There were some discrepancies between what CVOs reported through the telephone interview and what the system records showed. The infrequency of use demonstrated in Figures 3.19 and 3.20 supports the statements by respondents that the mildness of this test winter led to a lack of familiarity with the FORETELL system.

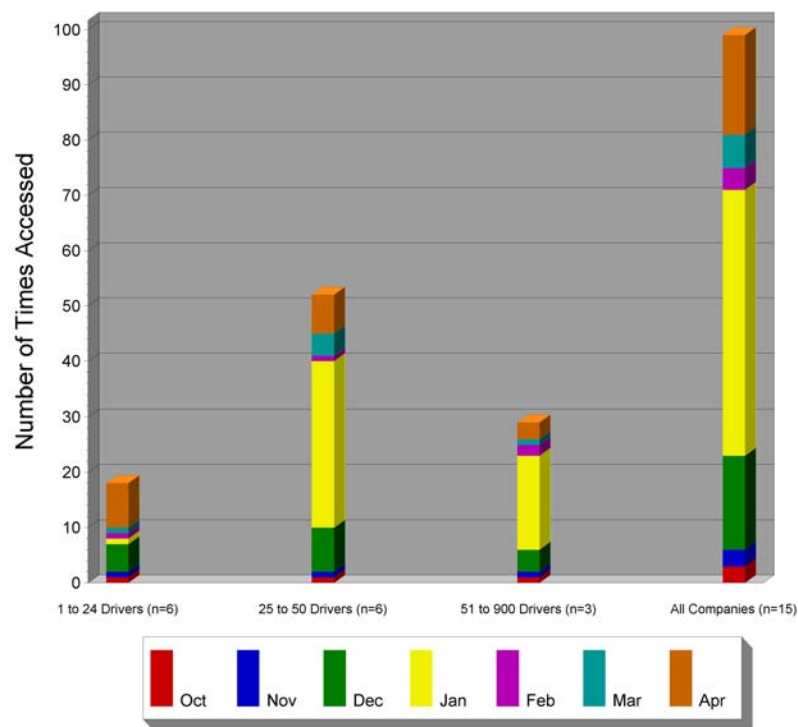


Figure 3.20 Number of Times Commercial Vehicle Operators Accessed the FORETELL Website, According to FORETELL System Records.

3.2.1.4 Decision Effectiveness

Figure 3.21 shows the results of how the “before” information used by CVOs assisted in their perception of their decision effectiveness. CVOs’ responses to the decision effectiveness questions show many responses in the “Neither Agree Nor Disagree” category. This is an indication that CVOs did not access the information or they did not rely heavily on weather and road condition information sources to make decisions. The uncertainty may suggest minimal use of weather and road condition information sources during the mild winter season. Fifty-three percent of respondents did agree that information from other sources assisted them during a weather event in overall operational efficiency. In addition, 60 percent indicated that when they used the weather information they were more confident in their decisions.

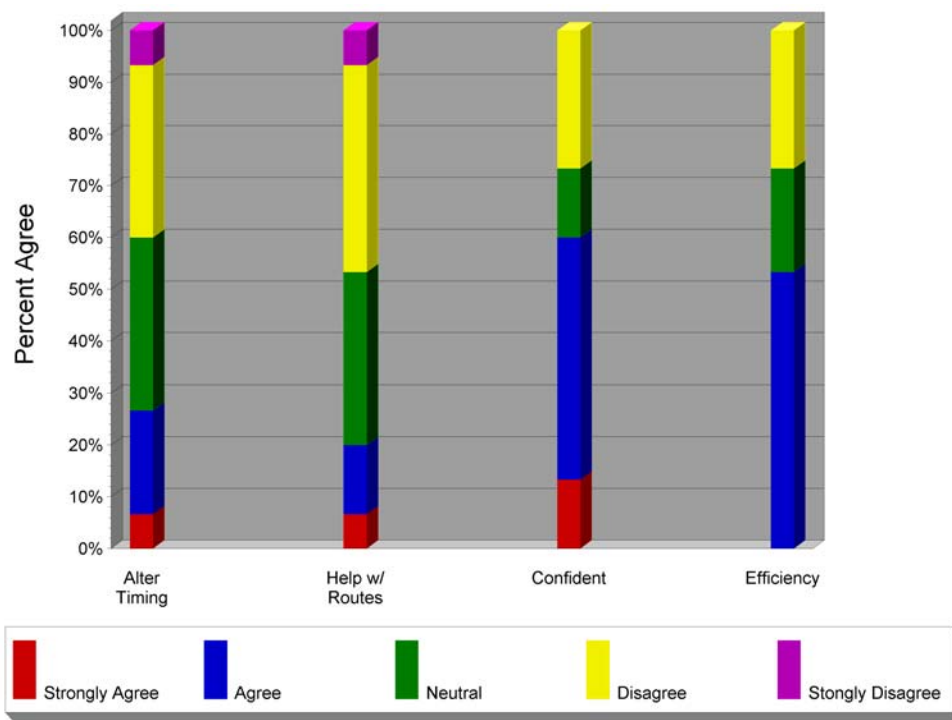


Figure 3.21 Percent of Commercial Vehicle Operators who Indicated the Weather Information from Sources Other than FORETELL Made an Improvement in Their Jobs.

Figure 3.22 shows the responses to similar questions asked regarding information from FORETELL. During the interview process, the majority of CVOs stated that they did not use FORETELL information to alter trip routes (60%) or trip timing (53%). However, more than 50 percent of the respondents felt that the information was timely and that they felt confident in making decisions using FORETELL information. In addition, 40 percent of the respondents indicated that FORETELL information improved the overall efficiency of their operations. A majority of the respondents indicated an acceptance of some aspects of FORETELL information as presented, and 20 percent to 60 percent of the respondents perceived the information to offer an improvement in their operations.

The results of the “before” and “after” scenarios do not vary significantly, statistically speaking; 60 percent and 67 percent of CVOs reported that the “before” and “after” information, respectively, increased confidence in their decisions. Fewer respondents agreed that having FORETELL information improved operational efficiency. Again, these results may be related to their lack of familiarity with the system due to insufficient use during a mild winter.

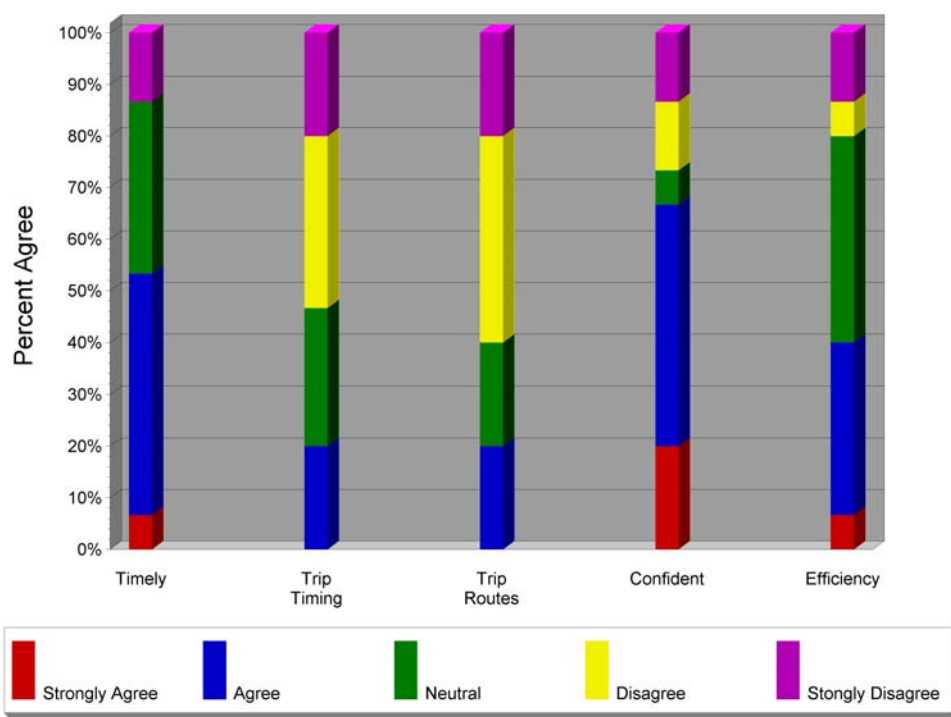


Figure 3.22 Percent of Commercial Vehicle Operators who Indicated the FORETELL Information Made an Improvement in Their Jobs.

3.2.1.5 Other Factors

Figure 3.23 illustrates, for each company size category, whether information from the “before” sources increased safety or reduced accidents. The opinions vary by category. All six of the medium-sized companies felt that weather and road condition information increased safety. Larger companies indicated that they have the flexibility to haul their goods in the southern states during severe weather conditions or stay on the interstates. Thus, two of the three larger companies agreed that having the information increased safety. The small CVOs were divided in their responses to the question of increased safety from the use of weather information.

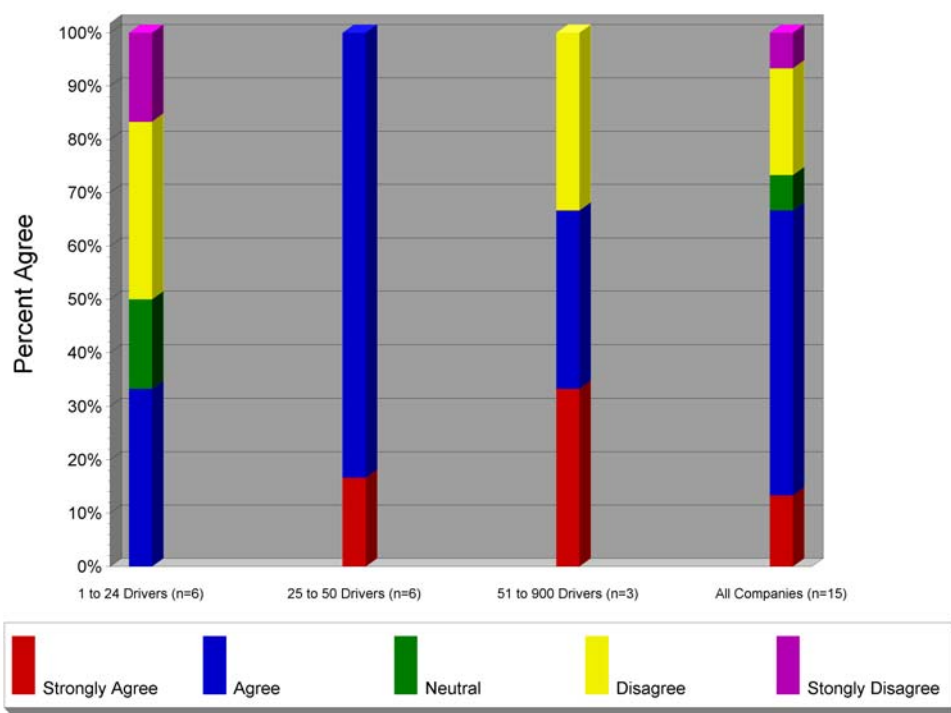


Figure 3.23 Percent of Commercial Vehicle Operators who Think Information from Sources Other than FORETELL Increases Safety or Reduces Accidents.

Figure 3.24 indicates whether CVOs felt having information from the FORETELL system increased safety or reduced accidents. Again, many of the CVOs expressed no opinion and felt they had not utilized the system sufficiently to voice an opinion on whether the FORETELL information enhanced safety. Overall, 40 percent of CVOs in all size categories responded “Neither Agree Nor Disagree.” However, two of the three larger CVOs responded that information increased safety and reduced accidents. Three of the medium-sized companies did not perceive increased safety as a result of using FORETELL information.

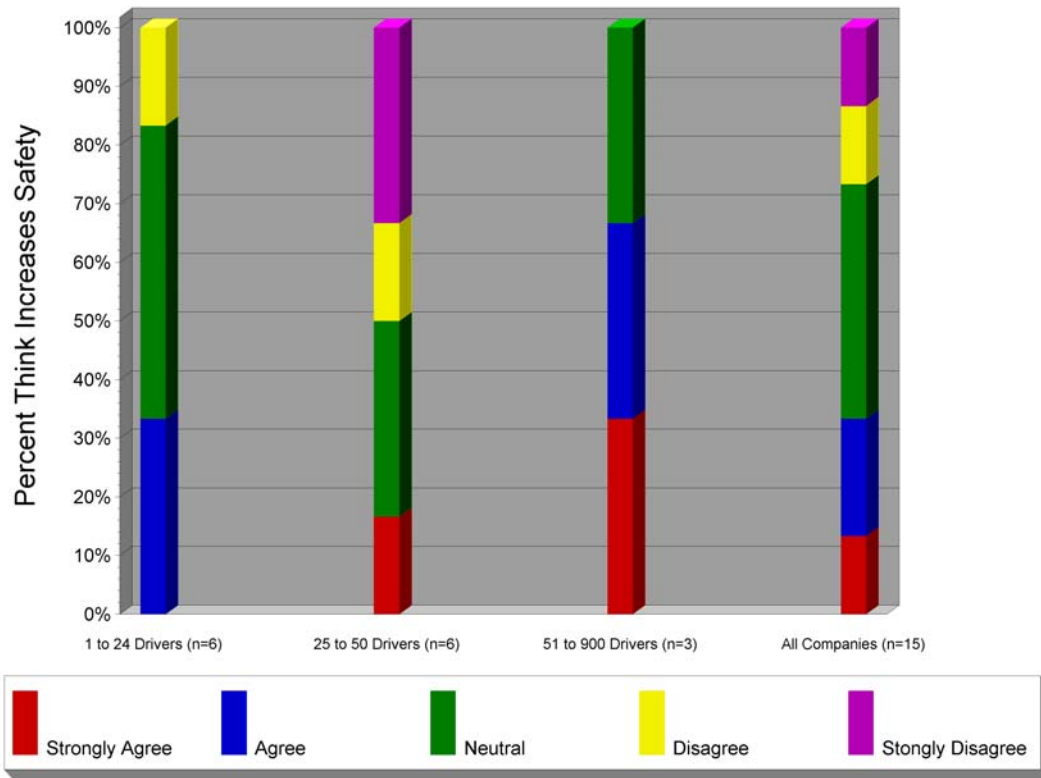


Figure 3.24 Percent of Commercial Vehicle Operators who Think FORETELL System Information Increases Safety or Reduces Accidents.

The final question asked if the CVOs would continue to access information from the FORETELL system. Figure 3.25 shows the general responses to this question by company size. Overall, more than 50 percent of the CVOs indicated a willingness to use FORETELL information in the future. However, three of the 12 CVOs responding from small- and medium-sized companies were not willing to use the system in the future. Overall, 20 percent of the CVOs opted to neither agree nor disagree to the continued use of FORETELL.

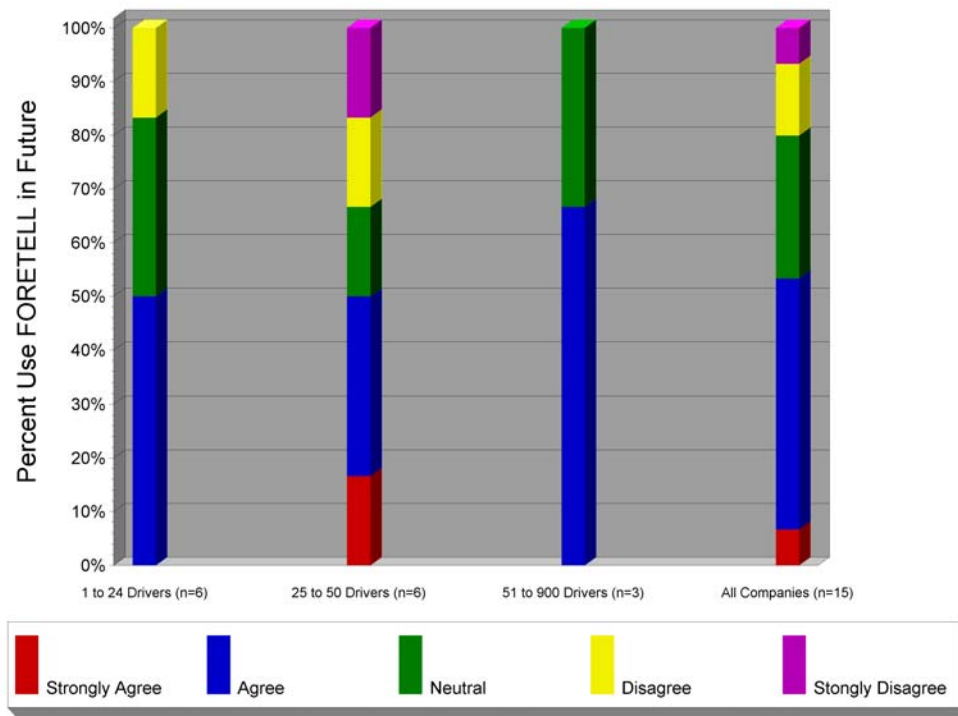


Figure 3.25 Percent of Commercial Vehicle Operators who Indicated a Willingness to Continue Using FORETELL in the Future.

3.2.1.6 Summary of CVO Results

Key comments and results of the analysis learned from the telephone interview responses are listed below:

- The number of respondents is not sufficient to draw statistically significant conclusions.
- Many personnel suggested that they needed training and a harsher winter to fully take advantage of and test the FORETELL system.
- Through specific comments, CVOs stated that FORETELL information lacked coverage of their entire travel area. However, personnel liked the technology and animation.
- More than 65 percent of CVOs in every size category utilize the Internet for weather and road condition information.
- More than 50 percent of CVOs indicated a willingness to use FORETELL information in the future.

3.2.2 Highway Patrol

3.2.2.1 User Group Overview

Highway patrol personnel make decisions that frequently must take into account the current and projected weather and pavement conditions. Thus, highway patrol communication personnel from Iowa, Wisconsin, and Missouri were involved in the FORETELL evaluation and made use of the FORETELL website during the winter months of 2001-2002 to better understand winter road surface and weather conditions. The FORETELL system proposed assisting the highway patrol user group in meeting their respective needs with better and more timely weather information.

The effectiveness of FORETELL at disseminating this information to highway patrol officers was evaluated through telephone interviews and records of their access to the FORETELL website. Telephone interviews were conducted to assess the extent of highway patrol use of FORETELL information (user acceptance) and to measure users' ability to improve weather event decisions (decision effectiveness), reduce exposure to unsafe road conditions (safety and security), and reduce delay (efficiency). An interview guide, contained in Appendix C, was developed to assist in conducting the telephone interviews. The guide provided consistency in the interviews while allowing information suitable for analysis to be collected.

The telephone interviews were conducted to gather data evaluating who used the FORETELL system, how well the system worked (system acceptance), for what purpose the

information was used (e.g., officer route or time assignments/planning – decision effectiveness), and whether it provided improvements in safety, mobility, and operation.

Nineteen highway patrol personnel were contacted and agreed to participate in the evaluation. Interviews were completed with information collected from 16 of the 19 highway patrol personnel (7 in Iowa, 2 in Missouri, and 7 in Wisconsin) as shown in Figure 3.26. Low participation by the Missouri highway patrol was apparently due to a lack of Internet access in their district communication offices. (As discussed in Section 4.3, Missouri's headquarters is the only office currently with Internet access.) Where there were multiple FORETELL system users in a single dispatch or communication center, a representative (usually the center manager) for all office personnel completed the interview.

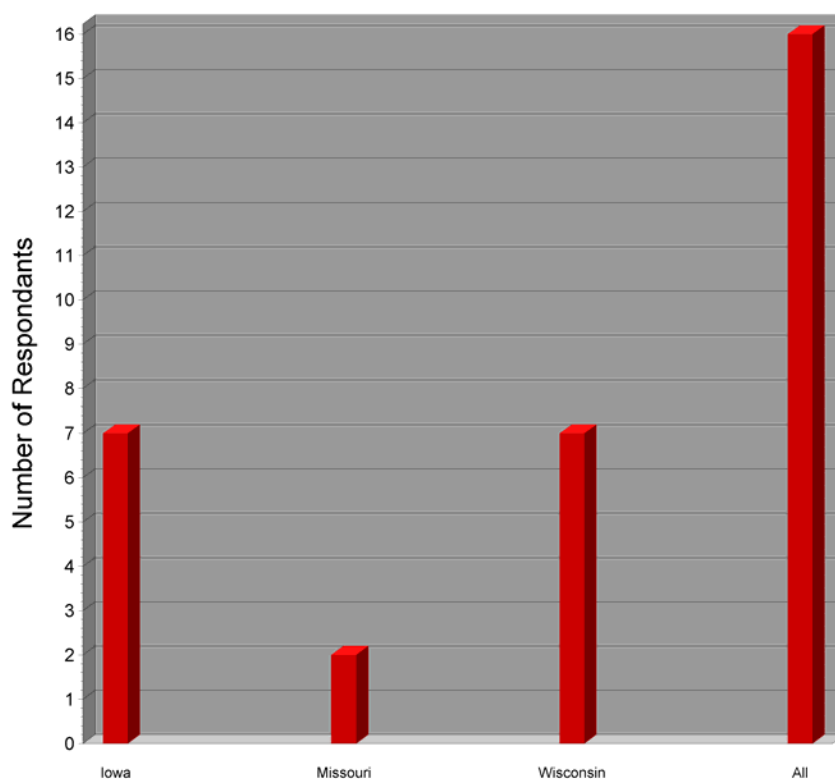


Figure 3.26 Number of Highway Patrol Personnel Completing Interviews, by State.

Training materials, including assignments of usernames and passwords, were developed and sent to personnel willing to participate in the evaluation. Figure 3.27 identifies, by state, the percent of highway patrol personnel interviewed who received some kind of FORETELL training material or participated in a training course. The figure also indicates whether personnel found the training to be helpful. A majority of the highway patrol personnel received training or training material; of those, most found it to be useful.

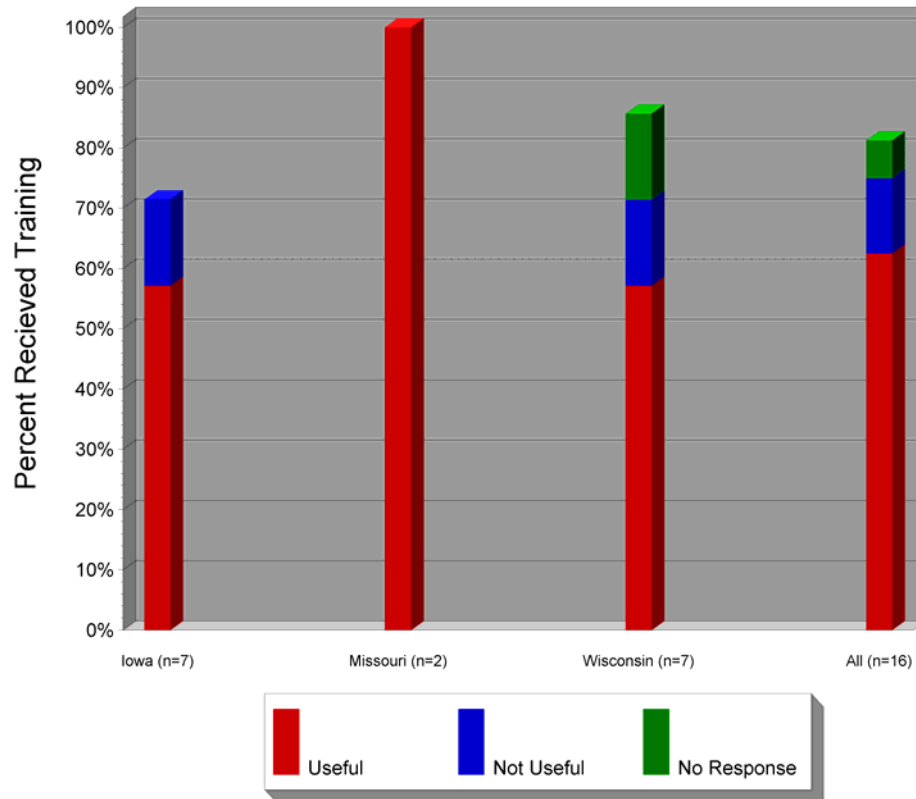


Figure 3.27 Percent of Highway Patrol Personnel who Received Some Form of Training about the FORETELL System.

As with CVOs, the highway patrol interview questions strived to understand whether highway patrol personnel accepted weather and road condition information, if the information assisted in the effectiveness of their decisions, and if the information improved operations and safety. These questions were asked under the scenarios of “before knowing of FORETELL” and “after being introduced to FORETELL.” Respondents may have differed in their responses to questions because they were uncertain whether the questions assumed that they would replace all other information sources with the FORETELL system or add the FORETELL system to their existing information sources.

3.2.2.2 Information Used

The first part of the telephone interview concentrated on determining the type of information sought by highway patrol personnel and the sources of that information prior to their knowledge of FORETELL. Figure 3.28 shows the types of information desired by highway patrol personnel for performing their duties. Highway patrol personnel were asked to indicate whether the information obtained was actual or forecasted. Figure 3.28 shows that both actual and forecasted data were sought by users. According to interview responses, actual data were of most interest because users found that forecasted data were often unavailable or inaccurate.

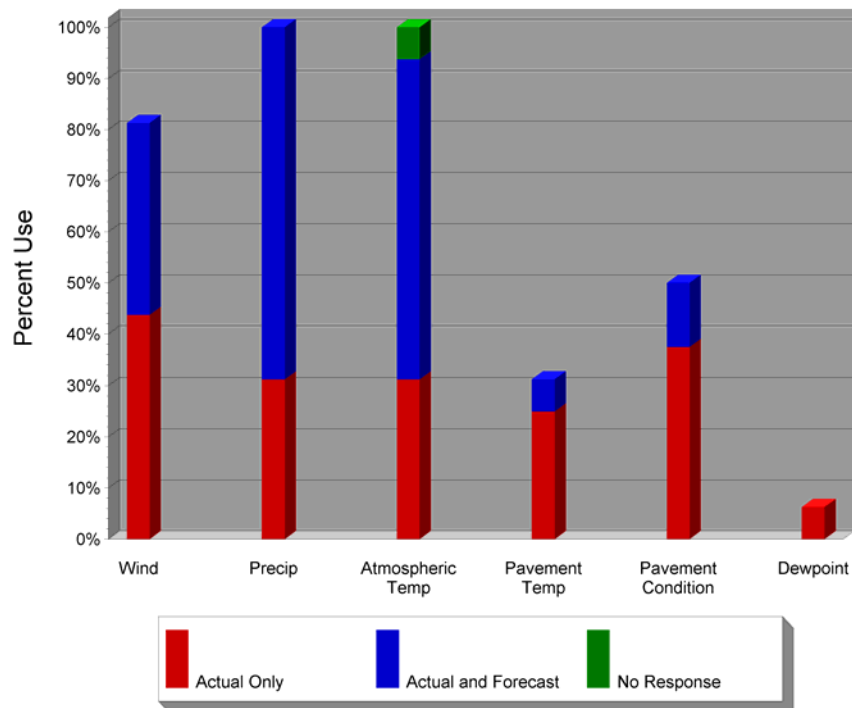


Figure 3.28 Percent of Highway Patrol Personnel who Indicated Using Various Types of Weather Information.

Sources (other than FORETELL) used by highway patrol personnel to obtain the needed weather and road condition information are presented in Figure 3.29. The figure also illustrates how often the information was used.

Of the highway patrol personnel who responded to the interview, 68 percent reported using the collected weather and road condition information for highway patrol operations and 39 percent reported that the information was also used for dissemination purposes.

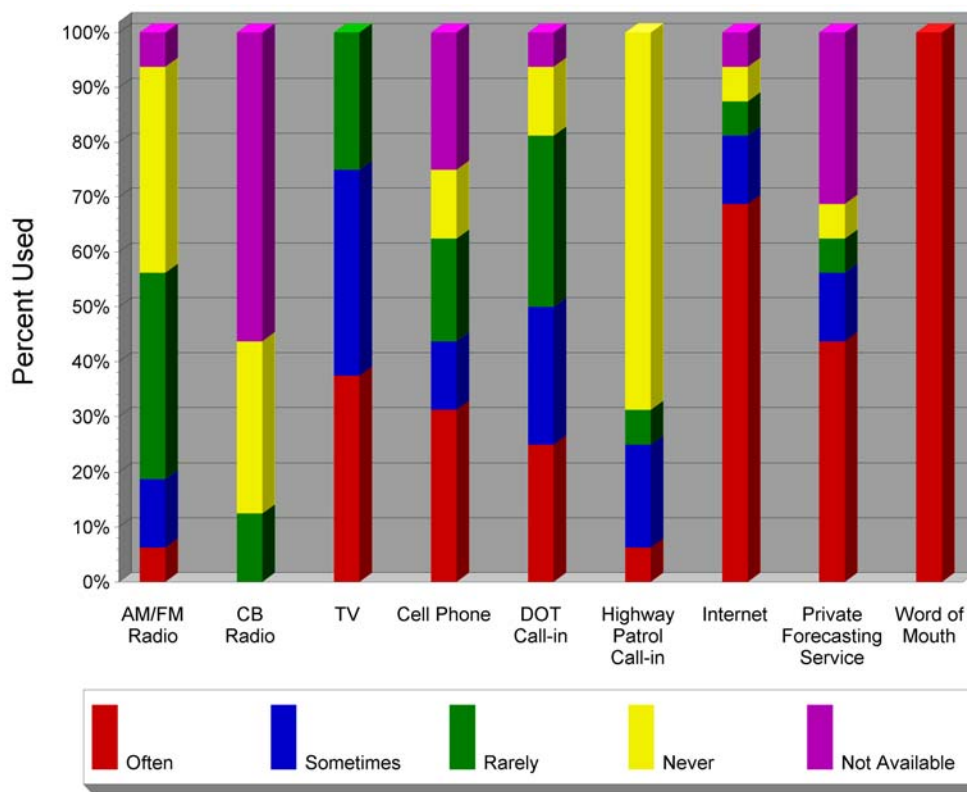


Figure 3.29 Percent of Highway Patrol Personnel who Indicated Other Sources of Weather Information Were Available to Them and How Often Each Source Was Used.

Because the FORETELL system is an Internet website, highway patrol personnel were asked if they used the Internet to visit sites providing weather and road condition information before they were introduced to the FORETELL system. Their Internet use is shown in Figure 3.30, by state. Iowa and Wisconsin personnel regularly use the Internet for obtaining needed information. However, Missouri provides Internet access only for upper management. Thus, Missouri's responses to the telephone interview show one of the two respondents using the Internet for weather-related information.

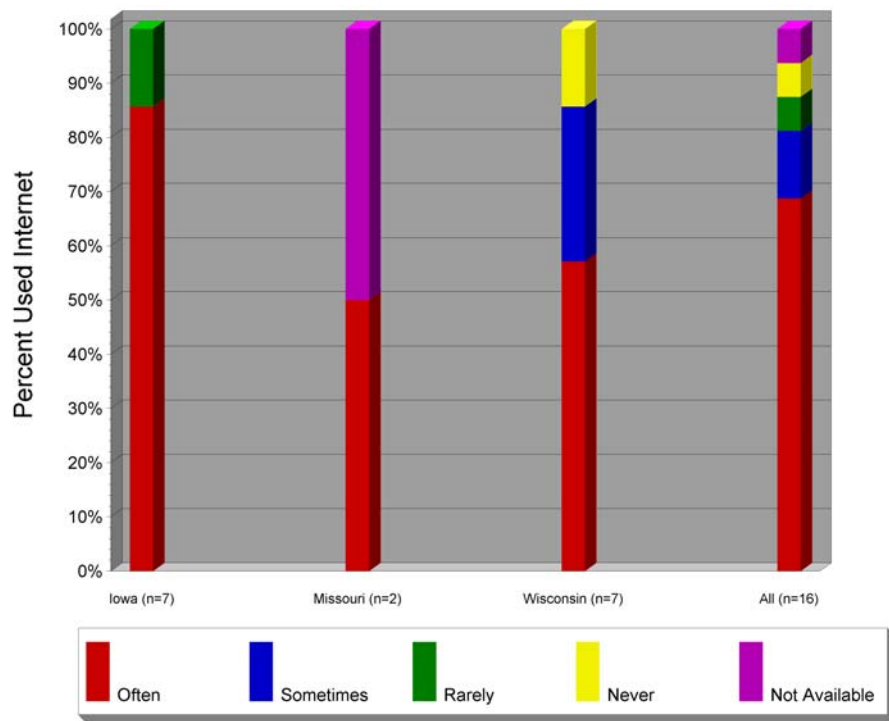


Figure 3.30 Percent of Highway Patrol Personnel who Indicated Using the Internet to Gather Weather-Related Information, by State.

3.2.2.3 User Acceptance

Figure 3.31 shows how well highway patrol personnel accepted weather information obtained from sources other than FORETELL (i.e., under the “before” scenario). With questions ranging from source accessibility and pertinence to particular coverage areas and data accuracy, a majority of the highway patrol respondents agreed or strongly agreed that the information was acceptable. Some respondents were undecided. These general acceptance questions of “before” sources of weather and road condition information provide an overall indication of how well highway patrol personnel accept current weather-related information.

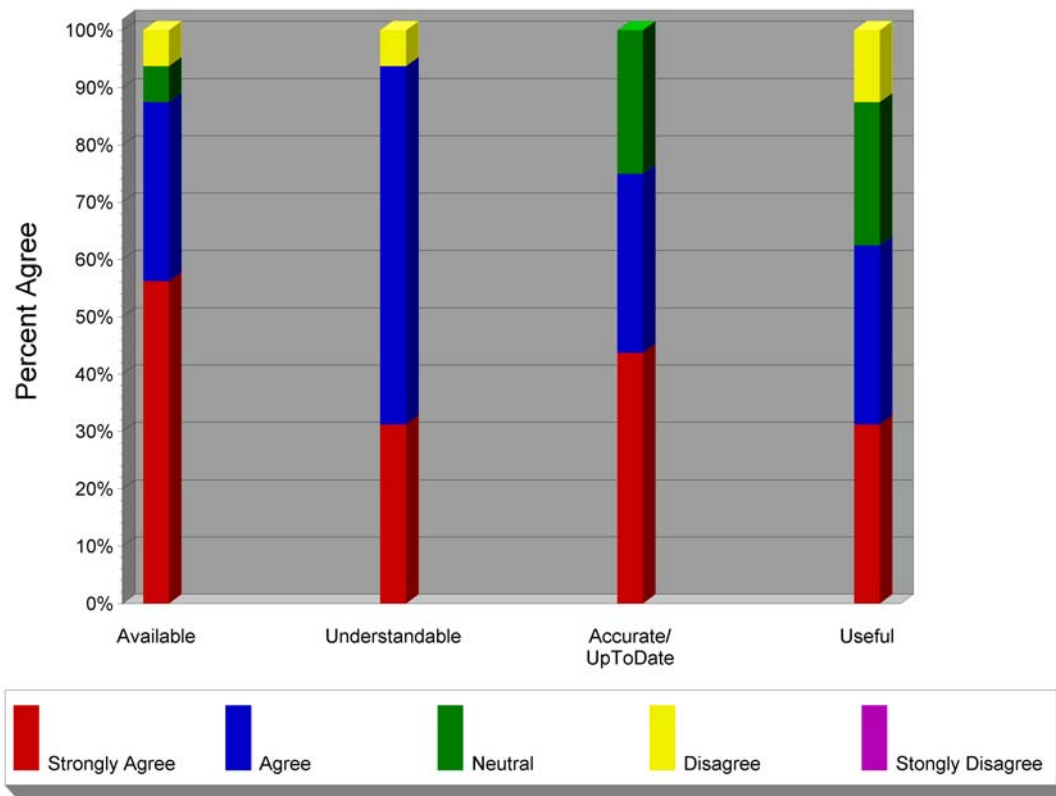


Figure 3.31 Percent of Highway Patrol Personnel who Indicated Agreement with Certain Characteristics of Weather Information They Received.

The telephone interview progressed from information sought and used by highway patrol personnel “before” being introduced to the FORETELL system to their acceptance and use of FORETELL information. More detailed questions probed into personnel’s acceptance of the information gathered from the FORETELL system. Results of these questions are shown in Figure 3.32. Based on the acceptance responses of the interview in the “before” and “after” scenarios, there were a slightly higher number of highway patrol users who responded that they neither agreed nor disagreed with the “after” questions. However, these differences are not statistically different. This uncertainty may suggest insufficient use of FORETELL during the mild winter season. The mild winter reduced highway patrol personnel’s use, testing, and thus familiarization with the new system. Approximately 55 percent to 87 percent of respondents did agree that FORETELL information had characteristics of interest.

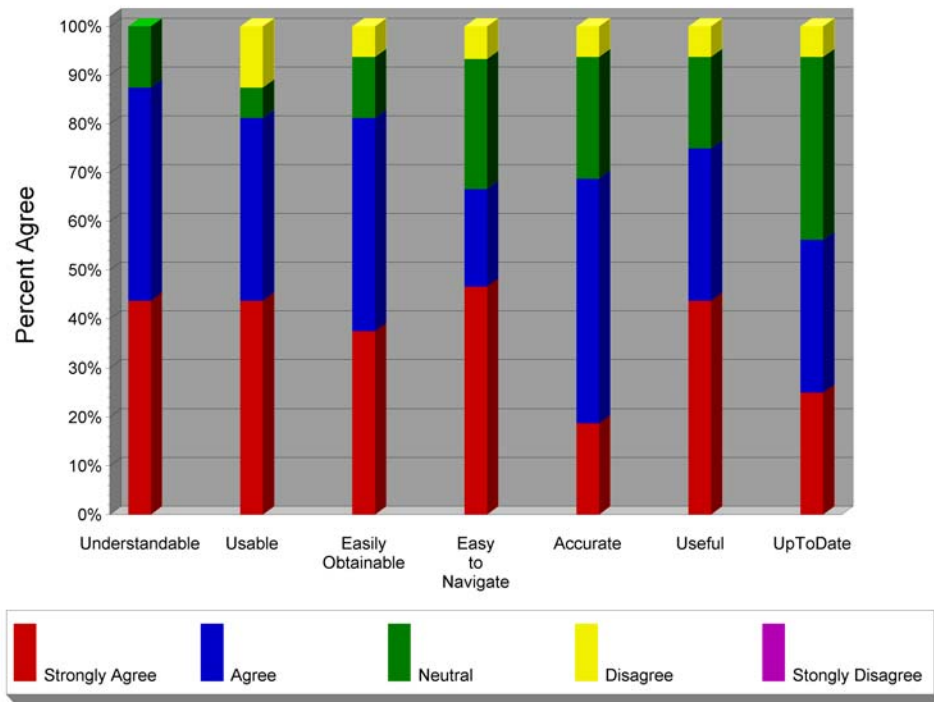


Figure 3.32 Percent of Highway Patrol Personnel who Indicated Agreement with Certain Characteristics of FORETELL Information.

The telephone interview included questions asking how often highway patrol personnel used FORETELL and how their use correlated with weather events. Figure 3.33 shows that no respondents used FORETELL on a daily basis. Approximately 80 percent reported using FORETELL information during a weather event, with about 10 percent of those personnel using it hourly. In addition, 50 percent to 60 percent of the respondents used FORETELL before and after weather events.

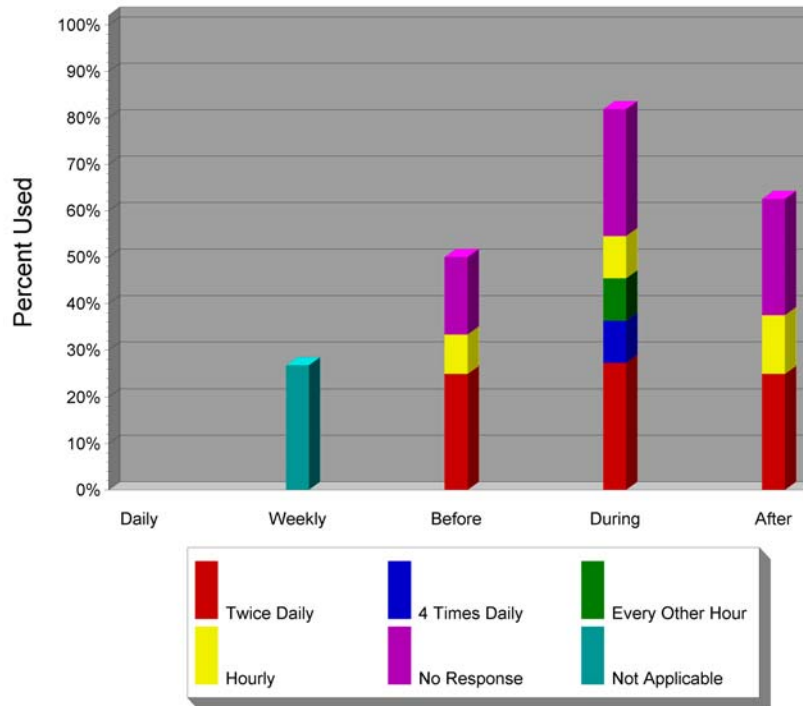


Figure 3.33 Percent of Highway Patrol Personnel who Indicated Use of FORETELL Information at Various Time Intervals.

Figure 3.34 indicates the percent of respondents accessing various types of weather information from the FORETELL system. Compared to Figure 3.28, (types of weather information used prior to knowledge of FORETELL), a greater percentage of personnel indicated accessing pavement condition information from the FORETELL system. Dewpoint was not a valuable piece of information to many highway patrol personnel either before (Figure 3.28) or after (Figure 3.34) knowledge of FORETELL. Wind, precipitation, atmospheric temperature, and pavement information were accessed by highway patrol personnel regularly from the FORETELL website.

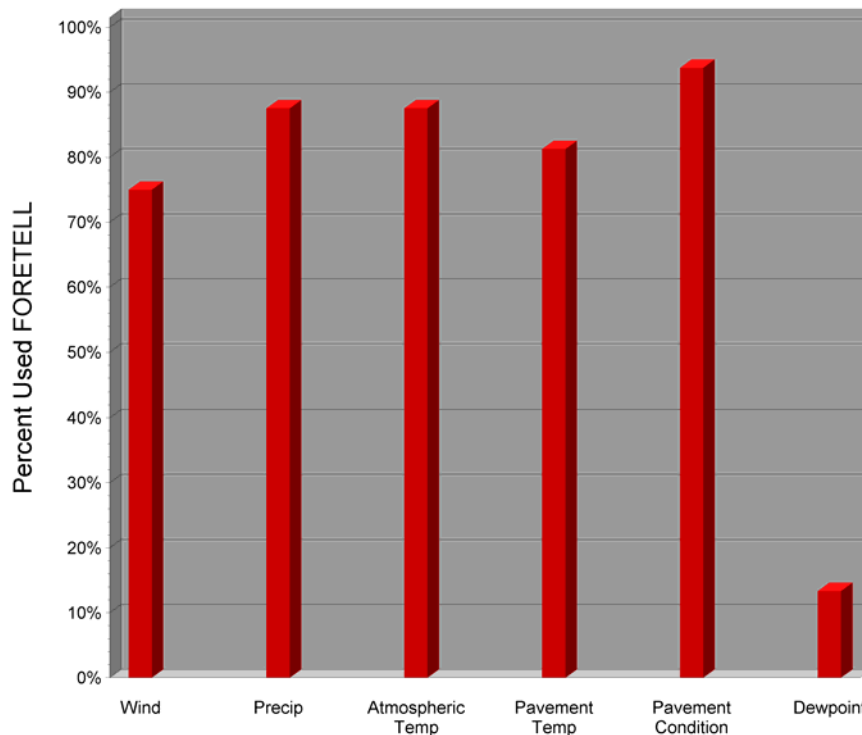


Figure 3.34 Percent of Highway Patrol Personnel who Indicated Using Various Types of FORETELL Information.

By assigning usernames and passwords to each evaluation participant, system records could show how often highway patrol personnel accessed the FORETELL system. At times, there appeared to be discrepancies in the frequency of use as noted in the telephone interview and recorded by the FORETELL system. The team based its conclusions on the interview results. However, the system records are summarized here for completeness.

Figure 3.35 shows the number of times each user, by state, accessed the FORETELL website, according to system records. The figure indicates that use of FORETELL was highest in December (green portion) and slowly tapered off by April. Highway patrol personnel's limited access of the system may be a result of mild weather conditions during the 2001-2002-winter.

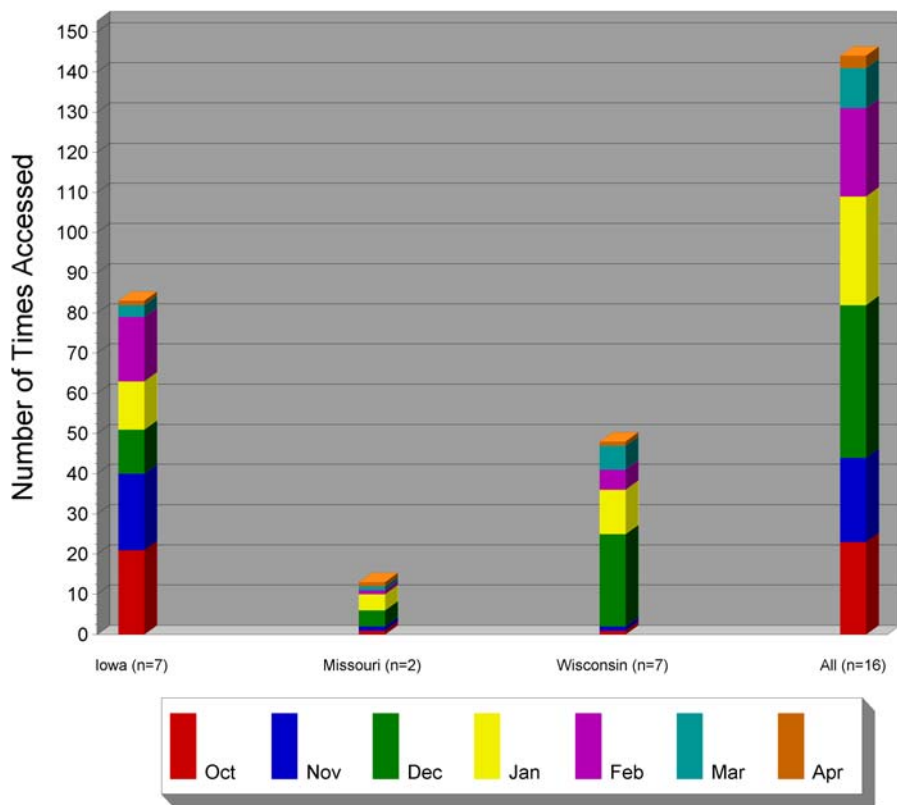


Figure 3.35 Number of Times Highway Patrol Personnel Accessed the FORETELL Website, According to FORETELL System Records.

3.2.2.4 Decision Effectiveness

Figure 3.36 shows that more than 70 percent of respondents felt that weather information in general was useful in making decisions and helpful in taking specific actions.

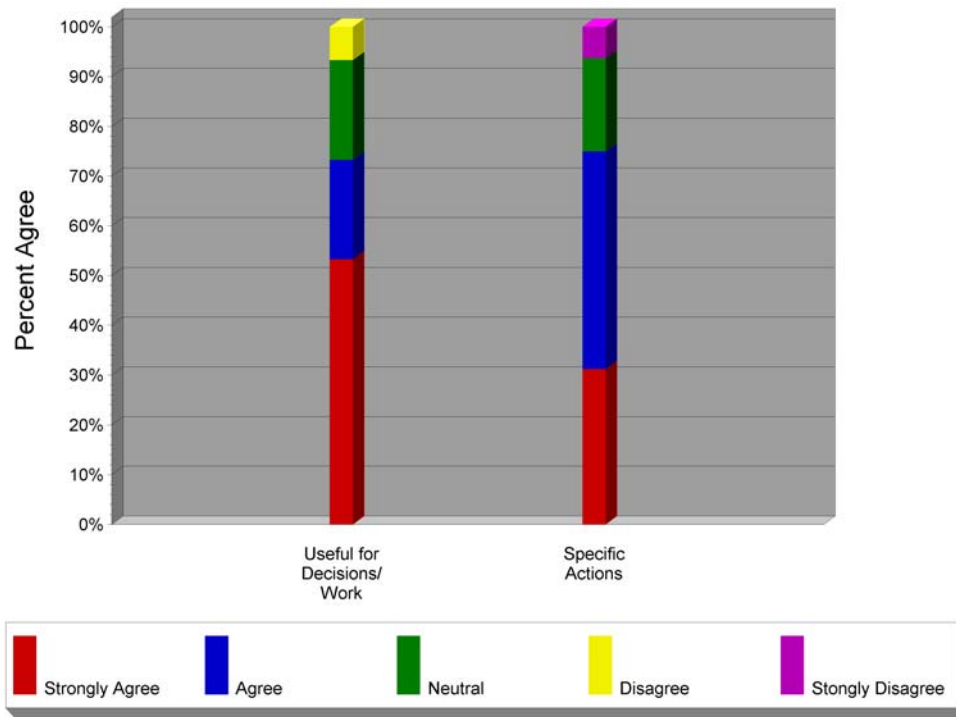


Figure 3.36 Percent of Highway Patrol Personnel who Indicated Having Weather Information Was Helpful in Their Jobs.

Figure 3.37 illustrates highway patrol personnel's responses to questions pertaining to the impact of FORETELL information on decision effectiveness. Questions related to the overall efficiency of operations and respondents' confidence in decisions made using FORETELL information. In the "before" scenario, 75 percent of respondents strongly agreed or agreed that other information sources assisted them in carrying out specific actions versus 57 percent of respondents who used the FORETELL system. There was also a difference in the "before" and "after" scenarios for responses related to the usefulness of information for making decisions and for performing general work responsibilities. Approximately 75 percent of highway patrol personnel agreed or strongly agreed that other sources are useful for making decisions and performing general work versus 57 percent who responded favorably when asked this question about FORETELL. The effect of FORETELL information on job performance is illustrated in the Strongly Disagree and Disagree percentages, indicating dissatisfaction. Again, this may be related to a lack of familiarity with the system due to insufficient use during a mild winter.

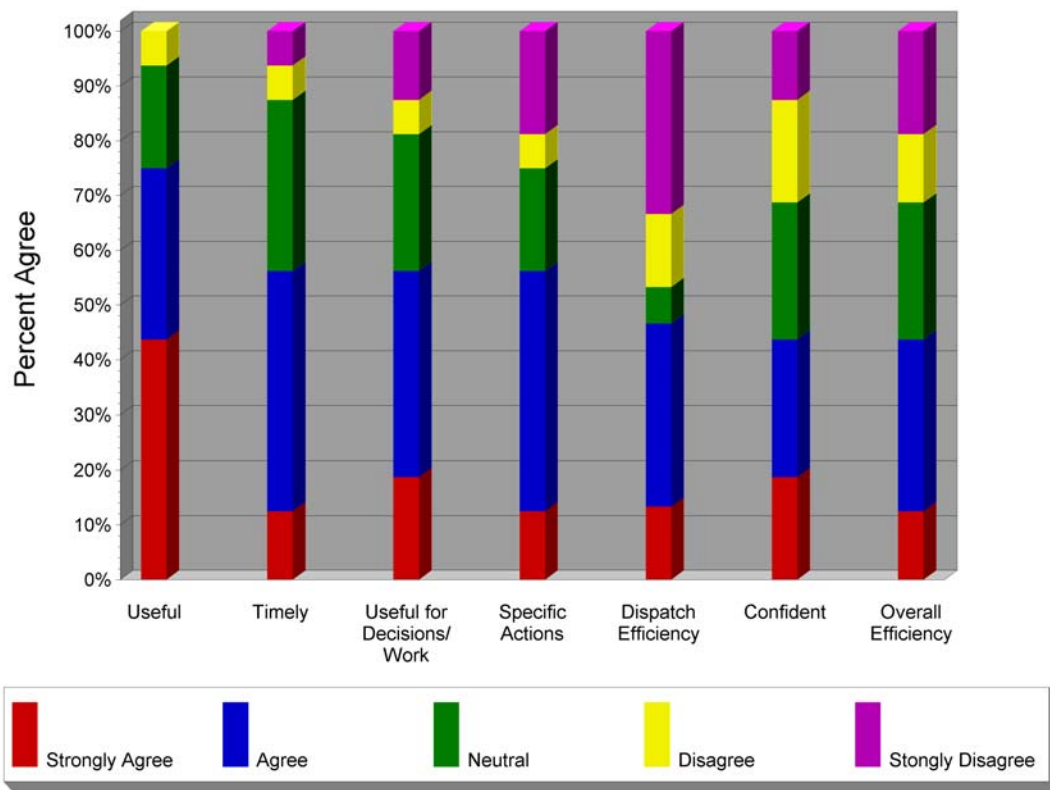


Figure 3.37 Percent of Highway Patrol Personnel who Agreed to Improved Job Performance Using FORETELL Information.

3.2.2.5 Other Factors

Figure 3.38 indicates whether highway patrol personnel felt having information from the FORETELL system increased their safety or reduced accidents among them. Responses concerning safety are provided for each state. Many of the highway patrol personnel expressed that they had not utilized the system enough to voice an opinion on whether the information enhanced safety. However, more than 20 percent of respondents did perceive an improvement in safety with the use of FORETELL information.

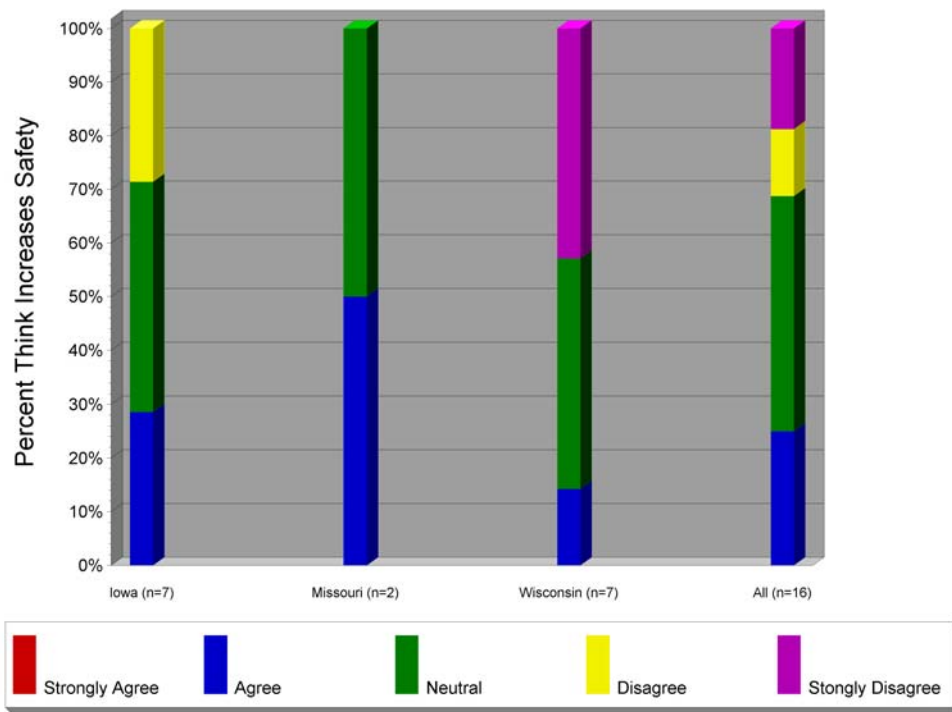


Figure 3.38 Percent of Highway Patrol Personnel who Think FORETELL System Information Increases Safety or Reduces Accidents, by State.

Finally, the questionnaire asked if highway patrol personnel would continue to access information from the FORETELL system. Figure 3.39 illustrates the general responses to this question by state, which demonstrates some interest in the new system. Respondents stated that FORETELL had potential.

Seven of the nine respondents in Iowa and Missouri stated that they would continue using the system in the future if it were available. A majority of Wisconsin respondents felt that system improvements needed to be made before they would commit to the continued use of FORETELL. Approximately 25 percent of highway patrol personnel interviewed chose to neither agree nor disagree when asked if they would continue their use of the FORETELL system.

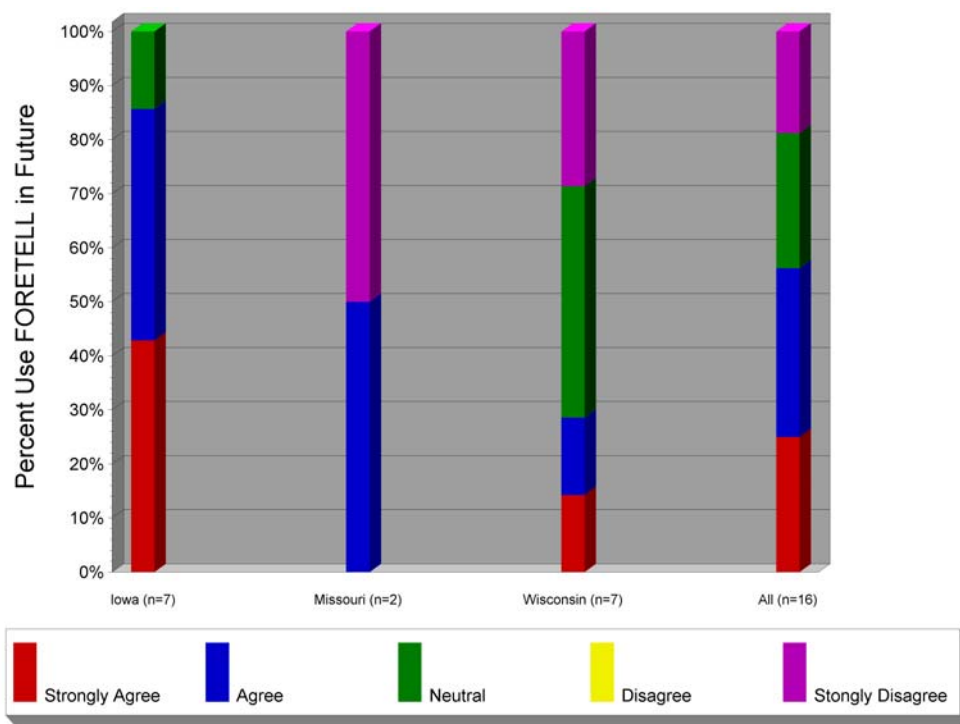


Figure 3.39 Percent of Highway Patrol Personnel who Indicated a Willingness to Continue Using FORETELL in the Future, by State.

3.2.2.6 Summary of Highway Patrol Results

Key comments and results of the analysis of the telephone interview responses are listed below. Note that these results are based on at most 16 individuals. While a general sense of FORETELL performance can be developed, firm conclusions should be avoided.

- Highway patrol personnel had limited use of the FORETELL system because of the mild winter. They did not feel that they had fully tested its capabilities.
- Highway patrol users responded “Neither Agree Nor Disagree” to many questions because they had not sufficiently used the system to make a decisive judgment.
- Highway patrol personnel felt the FORETELL system had potential; however, they would rather pursue a system that could be integrated into their current operating systems and tools rather than add yet another, more complicated, layer to their operations.
- A majority of highway patrol users responding to interviews indicated a willingness to continue using FORETELL in the future.

3.2.3 School Administrators

3.2.3.1 User-Group Overview

Nine school administration personnel in Iowa were identified as potential users of FORETELL during the winter of 2001-2002. Most of these personnel were school superintendents. One was Director of Personnel. The nine Iowa school administration personnel identified were part of a University of Northern Iowa (UNI) program to bring weather information to schools. As part of the UNI program, all nine school administrators attended training for FORETELL and for another weather information service.

In order to evaluate the use of FORETELL and its impacts on user decisions, a hard-copy questionnaire and an activity/weather log were developed to collect data from the nine school administration personnel identified as potential users of FORETELL. In January 2002, activity/weather logs were mailed to the nine school administrators to collect weather-related information on a per-event basis. In April 2002, hard-copy, self-administered questionnaires were mailed to the nine school administration personnel along with postage-paid return envelopes. Copies of the school administrator activity/weather log and questionnaire are provided in Appendix D.

Few data were obtained from this data collection effort. One activity/weather log was returned. Five of the nine (56%) school administration personnel surveyed returned questionnaires. Of these, three respondents did not complete the survey beyond the third question because they did not use FORETELL. This section summarizes the results of the school administrator survey and activity/weather log information collected for the winter of 2001-2002. Table D-1 in Appendix D contains the summarized responses to the school administrator survey.

3.2.3.2 Information Used

The school administrator survey was designed to gather details regarding the types of weather-related information that are useful and accessible to school administrators in making decisions such as whether to cancel school, close school early, reroute buses, and so on. Four survey respondents indicated the types of information that they used in making weather-related management decisions. All four used snow accumulation, precipitation, atmospheric temperature, and radar. Three of the four also used road conditions and visibility information in making weather-related management decisions. Whether respondents used forecast information or actual readings varied.

Only two survey respondents indicated that they used FORETELL. Both respondents relied most heavily on local weather information for atmospheric temperature, with one respondent commenting that it was easier to access than FORETELL. Both relied most heavily on FORETELL for radar information. One respondent also relied on FORETELL for accumulation, precipitation, road conditions, and visibility. The other respondent commented that he relied on local television/radio reports in addition to FORETELL because it was a trial year for the FORETELL system.

The activity/weather log was also designed to gather information regarding the types of weather-related information that are useful and accessible to school administrators, as well as information on weather events that occurred, decisions made, weather information used, and outcomes that resulted from the event (e.g., bus accidents). A single activity/weather log was returned indicating a snow event with accumulation and drifting. The respondent used FORETELL during the event to obtain the following types of weather-related information: accumulation, road decision support, precipitation, atmospheric temperature, road snow depth, road conditions, radar, and visibility. The respondent also used local television stations and web sites for atmospheric temperature and road condition information. Both forecast and actual readings were used for all types of weather information obtained.

Notable comments from the two survey respondents who used FORETELL related to the accuracy of information obtained from FORETELL. One respondent commented that the information from FORETELL was very accurate. The other noted that, compared to local television and radio, FORETELL provided more accurate information, more quickly.

Both respondents agreed that the information from FORETELL was understandable, usable, accurate, easily obtainable, and useful. Neither respondent used FORETELL daily, but both respondents used FORETELL weekly, in advance of a weather event, and during a weather event.

3.2.3.3 User Acceptance

One of the respondents who used FORETELL during the winter of 2001-2002 commented that the winter was very mild and he did not need to use FORETELL very often. Three respondents indicated that they did not use FORETELL because the winter was too mild. Another school administrator returned the cover letter with a note stating that he was not able to complete the survey because the weather was so mild. The winter weather obviously had an effect on these respondents' needs for weather-related information and, thus, their use, or lack of use, of FORETELL. Both of the respondents who used FORETELL stated that they would like to use FORETELL again.

3.2.3.4 Decision Effectiveness

Both survey respondents who used FORETELL agreed that:

- Information from FORETELL helped them make more effective decisions to close schools early, close schools for the day, and change bus routing or scheduling;
- They were more confident in their decisions when they used information from FORETELL;
- FORETELL provided timely (up-to-date) information for making weather-related decisions; and
- FORETELL information helped to improve the overall efficiency of their operations.

The single activity/weather log received reported no decisions made as a result of a winter snow event.

3.2.3.5 Other Factors

Both survey respondents who used FORETELL agreed that FORETELL information helps to improve safety or reduce accidents. Additional comments from these respondents related to the feasibility of schools using FORETELL. One respondent reported problems logging onto FORETELL from the school's computer system. One respondent commented that FORETELL is a useful aid but that it may be difficult for the school to justify expending funds for the service at the present time.

3.2.3.6 Summary of School Administrator Results

It is important to note that the school administrators' use of FORETELL was limited due to the mild winter and that the number of respondents who used FORETELL during the winter of 2001-2002 (2) is not sufficient to draw statistically significant conclusions. Based on the responses from these two school administration personnel, FORETELL:

- Improved the overall efficiency of school administration operations,
- Improved safety/reduces accidents,
- Provided timely (up-to-date) information for making weather-related decisions,
- Increased confidence in making weather-related decisions, and
- Helped school administrators make more effective decisions.

Both respondents who used FORETELL felt that FORETELL was useful and indicated that they would like to continue using the system. However, it is uncertain whether school administrators would be willing to pay for information from FORETELL.

3.2.4 Transit Operators

3.2.4.1 User Group Overview

Fourteen transit agencies were identified as potential FORETELL system users. Nine of these agencies were in Iowa and were identified by FORETELL through contact by the Iowa Department of Transportation. The evaluation team also verified through both electronic mail and telephone contact that the nine transit agencies in Iowa planned to participate. The evaluation team solicited an additional four agencies in Missouri and one in Kansas (Kansas City, Missouri, area) to participate in the FORETELL evaluation.

The evaluation of the transit agency users was anticipated to be a telephone survey. Appendix E contains the interview guide developed for this purpose. The interview would ascertain the acceptance by transit agencies of the FORETELL system and its effectiveness in making decisions. Twelve of the fourteen agencies were contacted by telephone, but limited responses to the interview questions were obtained.

3.2.4.2 Information Used

Nine of the agencies contacted indicated that they did not use FORETELL during the winter of 2001-2002:

- One of the non-users indicated that he was unable to access the system.
- Another non-user said that he used local media for information.
- A third non-user stated that he found it easier to use a different website.
- A fourth indicated that he had used it last year, but tried once this year and had trouble accessing the system.

In contrast to the responses by the nine agency contacts indicating that they did not use FORETELL during the winter of 2001-2002, the user log for the winter of 2001-2002 (provided by Castle Rock Consultants) indicated that of the documented non-user agencies, one had accessed FORETELL 39 times: 24 times in March and 15 times in April. Another non-user agency had accessed FORETELL 33 times: 26 times in March and 7 times in April. No explanation for these apparent discrepancies can be offered other than the agency contact did not wish to be interviewed, the contact person forgot about accessing FORETELL, or the contact person was not the person who accessed the FORETELL site. Due to limited responses to the telephone interviews, no information was obtained on the different types of weather-related information used by transit operators.

3.2.4.3 User Acceptance/Decision Effectiveness

There were few responses to interviews and little use of FORETELL by transit agencies. The three agencies that used FORETELL provided the following anecdotal comments:

- One stated that FORETELL was not helpful.
- One used FORETELL during two storms and thought that the information might be useful for street maintenance operations but was not helpful for his operations.
- The third stated that he could not understand whether or not FORETELL was useful for decision-making. He did access road temperatures a couple of times when it was raining (“just to see if it would help”). However, he mostly relied on a local television station to track a storm’s progress. He commented that, “In reality, though, the weather wasn’t bad enough to give the system a fair shot.”

3.2.4.4 Summary of Transit Agency Results

Though limited responses were obtained from transit agencies, the following observations are offered:

- The number of responses is not sufficient to draw any solid conclusions.
- For the agencies providing feedback, training is essential to ensure that users know how to access the available information and to demonstrate how to incorporate the appropriate information into their decision processes.
- The weather during the winter of 2001-2002 may have been too mild to provide sufficient significant weather events to test users’ acceptance of the system.

3.2.5 Traffic Managers

3.2.5.1 User Group Overview

The final potential user group of the FORETELL system evaluation was traffic managers. This user group consisted conceptually of state DOT or local government agency personnel with at least somewhat comprehensive responsibility for managing transportation infrastructure components aimed at improving traffic operations. Personnel making transportation impact decisions are generally also linked to a wide variety of information sources in order to maintain a clear, resolute picture of the changing conditions on facilities within their purview. In the current transportation management environment, this user group consists almost exclusively of traffic operations center personnel.

Prior to the evaluation period, only two traffic managers from local traffic operation centers were identified as potential users to participate in the evaluation. While other traffic operations centers in the three-state region covered by FORETELL were contacted, none was both fully operational and prepared to engage in use of the system. While a FORETELL training session was not provided to personnel at either of these centers, both were provided a training guide and users’ manual. These documents served as the means for this user group to understand the use of and access to the FORETELL system.

Personnel at one of the centers reported using the FORETELL system on a number of occasions and, therefore, were able to provide valuable feedback regarding their use of the system. The director of the center was interviewed by telephone using the traffic manager's interview guide created prior to the evaluation period. The director indicated that three of the seven staff members had used the system. This respondent received feedback from the staff and incorporated their FORETELL experiences into the survey responses. The traffic managers interview guide is provided in Appendix F.

3.2.5.2 Information Used

While the operations center personnel did use the FORETELL system, the respondent commented that their winter was also more mild than typical. Nonetheless, the responses indicated that personnel accessed the FORETELL site daily and, in association with weather events, they sought the same kinds of information that they had used prior to FORETELL. Specifically, they used precipitation, temperature, and pavement conditions both prior to and during the evaluation period. In addition, they also indicated that they obtained wind speed information from the FORETELL web site.

3.2.5.3 User Acceptance

Personnel found the site easy to access and understandable by comparison with other sources of information. However, they noted some problems with the system from their standpoint. First, the information was not detailed enough or specific enough to the areas in which the center was interested. Second, access to the FORETELL system was not integrated into the systems already in use at the center. This meant that operators had to pull away from their normal duties and more traffic-oriented applications to access the FORETELL site. Also, using FORETELL required Internet access, which may not always be available on all of the workstations in the center. The director interviewed did not feel that the center would continue to access the FORETELL system for weather information due to the lack of integration into their existing systems. The benefits of the FORETELL system did not seem to warrant the extra effort required to access an independent system to obtain information that they can generally access through other means.

3.2.5.4 Decision Effectiveness

The director's responses indicated that personnel thought that the information was accurate but that they were not always able to verify the accuracy. They found that the information was useful to some degree in aiding the center in taking action and that the information helped them to do this more efficiently and confidently. They were able to use the information to assist in adapting traffic control timing, roadway closures, and warning sign deployments, and in their duties to pass information on to others. However, the respondent did not feel that they had an opportunity to integrate use of the system into their daily operations enough to be certain of this.

3.2.5.5 Other Factors

Other possibilities, such as increased safety or reduced crashes, were also noted as potential benefits but could not be determined during this brief evaluation period.

3.2.5.6 Summary of Traffic Manager Results

The traffic manager (center director) felt that the FORETELL system had great potential to improve overall efficiency if used as a primary source of weather and road condition information. The responses, however, indicated that the center did not have ample experience with the system to be confident in the accuracy of the information, to integrate the system into their operations, or to fully explore the possible applications for using the information.

3.3 Comparison across User Groups

This section presents information comparing the responses among the six user groups. Information for transit operators is limited because no interviews were actually completed. The discussion is arranged into categories that explain the types of information used, opinions regarding that information, and the value of using that information.

Table 3.1 (at the end of this chapter) summarizes the responses obtained from each of the user groups during their respective interview or survey. Each column contains the percentage of respondents who indicated the particular item of interest, along with the number of respondents upon which the percentage is based. Results are presented in this manner because not all respondents answered every question. The total number of respondents within each user group is reported in the column headings. The table is categorized into User Information, User Acceptance, Decision Effectiveness, and Summary groupings.

3.3.1 Information Used

Information Used encompasses the various types of weather information obtained before and after FORETELL implementation. Respondents reported their use of wind speed or direction, precipitation, atmospheric temperature, pavement temperature, pavement condition, and/or dewpoint information in their decisions. In addition, they stated whether this information was obtained, along with how often, from the FORETELL system.

Figures 3.40 – 3.42 illustrate the User Information results. Note that when interpreting the graphical results, Table 3.1, presented at the end of this chapter, should be referenced to determine how many responses were available for each particular item. Figure 3.40 shows that a large majority of the users in each group indicated using precipitation, atmospheric temperature, and pavement condition in their weather-related decisions, regardless of the source of the information. Fewer respondents from each group indicated using wind speed/direction and pavement temperature, while only HMOs indicated prevalent use of dewpoint information in their decisions.

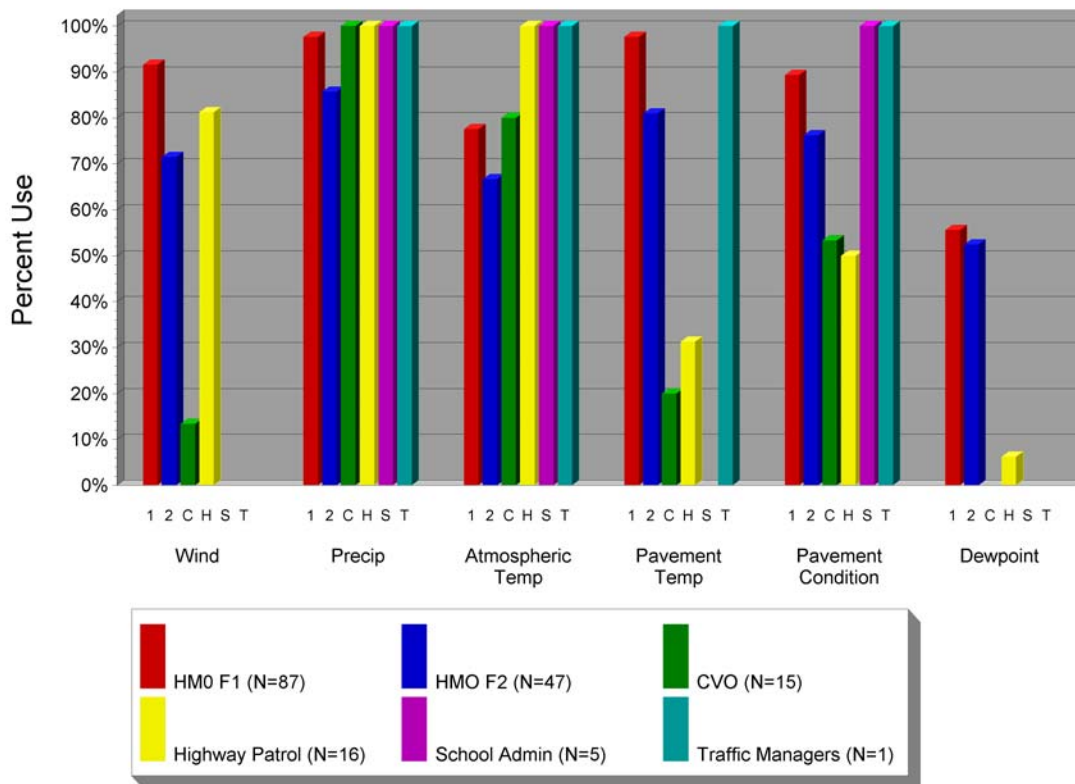


Figure 3.40 Percent of Respondents Indicating Use of Various Types of Information in Making Weather-Related Decisions, by User Group.

Figure 3.41 summarizes the number of users who obtained information from the FORETELL system. Not all respondents acquired the information that they used in their decisions from the system. In fact, about half as many HMO respondents indicated receiving their information from FORETELL, with the exception of dewpoint. More of the highway patrol and CVO respondents specified obtaining pavement temperature and condition data from FORETELL than actually using FORETELL information in their decisions. This suggests that some users access FORETELL to peruse the available data even though they typically do not utilize that type of information. The results presented in Figures 3.40 and 3.41 indicate that, although users did access FORETELL information, they still relied heavily on their previous sources of information. This could change over time as users become more familiar with and gain confidence in the FORETELL system.

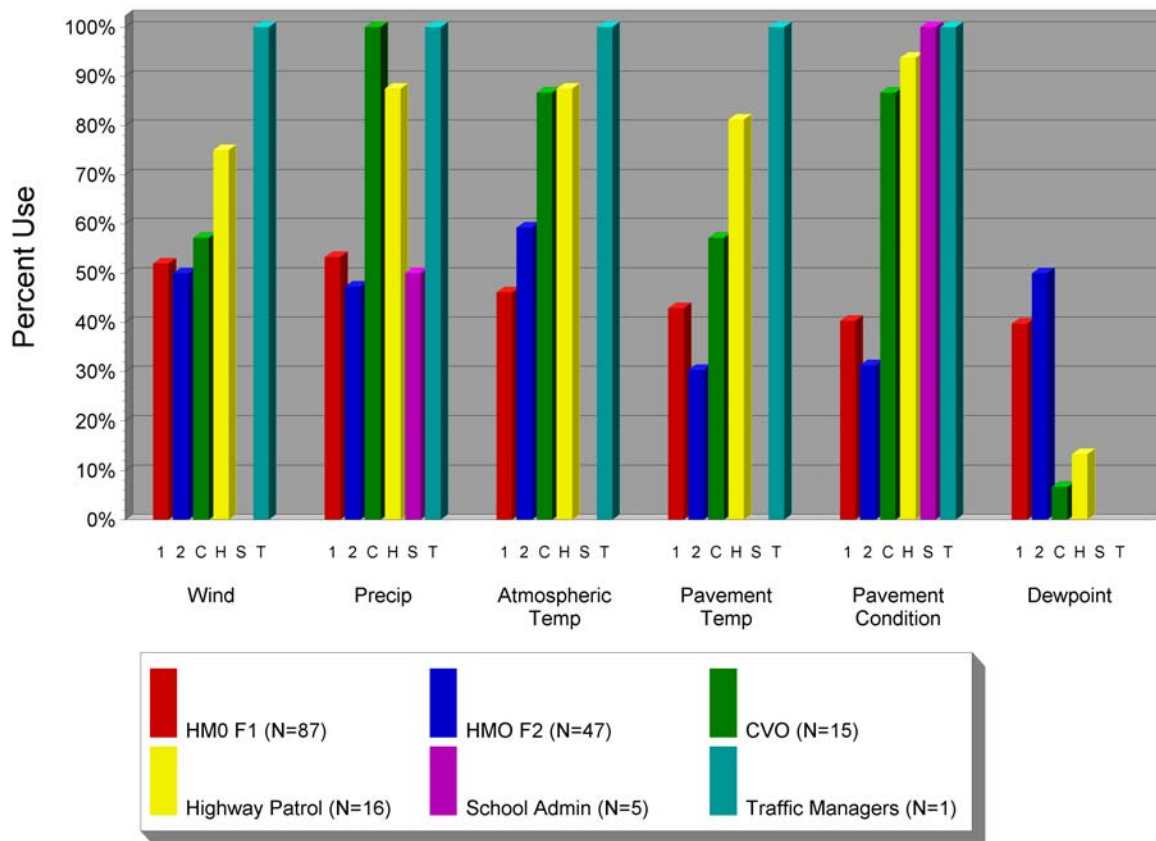


Figure 3.41 Percent of Respondents Who Indicated Obtaining Various Types of Information from FORETELL, by User Group.

Not many interviewed respondents reported accessing FORETELL information daily or even weekly. However, Figure 3.42 shows that reported access to FORETELL increased prior to and during a weather event.

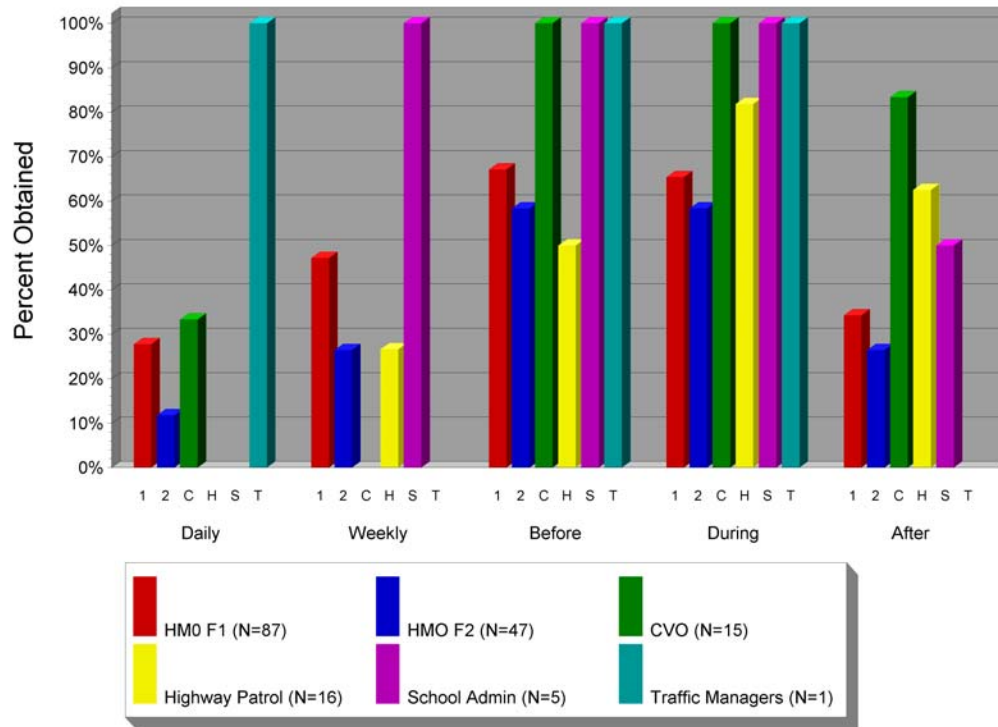


Figure 3.42 Percent of Respondents Indicating How Often FORETELL Information was Obtained, by User Group.

3.3.2 User Acceptance

User acceptance refers to opinions the user has regarding specific attributes of FORETELL information. Figure 3.43 presents the percent of respondents in each user group who agree or strongly agree that the FORETELL information is understandable, usable, easily obtainable, accurate, up-to-date, and/or useful. The figure shows that a majority of respondents in each user group agree with the listed characteristics. CVOs reported the fewest number of favorable responses. However, some traits are defined by as few as five respondents, as presented in Table 3.1.

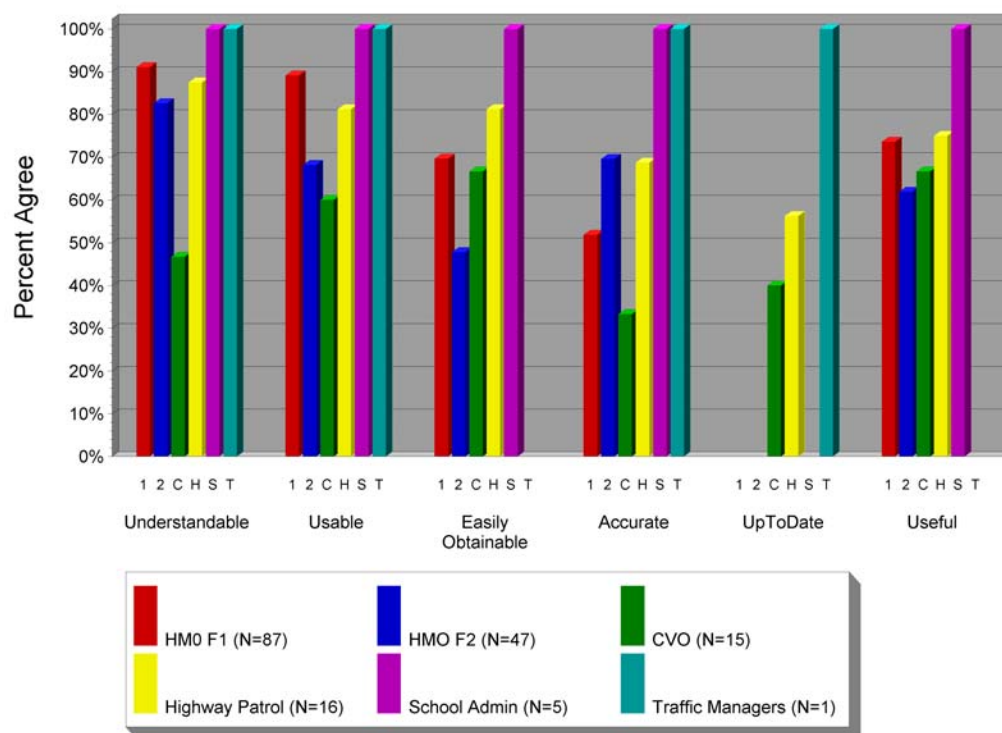


Figure 3.43 Percent of Respondents Indicating Agreement with Certain Characteristics Associated with FORETELL Information, by User Group.

3.3.3 Decision Effectiveness

Decision effectiveness characterizes the impact that using FORETELL information had on the respondents' weather-related decisions. For instance, Figure 3.44 illustrates that around 40 percent of the HMO respondents and more than half of the highway patrol and CVO respondents received FORETELL information in a timely manner. Less than 30 percent of the HMO users feel more confident in their decisions when FORETELL information is used, and less than 30 percent of HMO users believe that the information improves safety and/or efficiency of their operations. However, between 30 percent and 40 percent of HMO users indicated that they changed their decision based on FORETELL information.

Greater than 40 percent of the highway patrol and CVO users stated that they were more confident when FORETELL information was used and that it improved their operational efficiency. The figure illustrates that FORETELL did not have an impact on changing decisions or improving safety for many highway patrol and CVO personnel. Even though the graph depicts 100 percent agreement among traffic managers and school administrators for most of the attributes, those results are based on one or two total respondents.

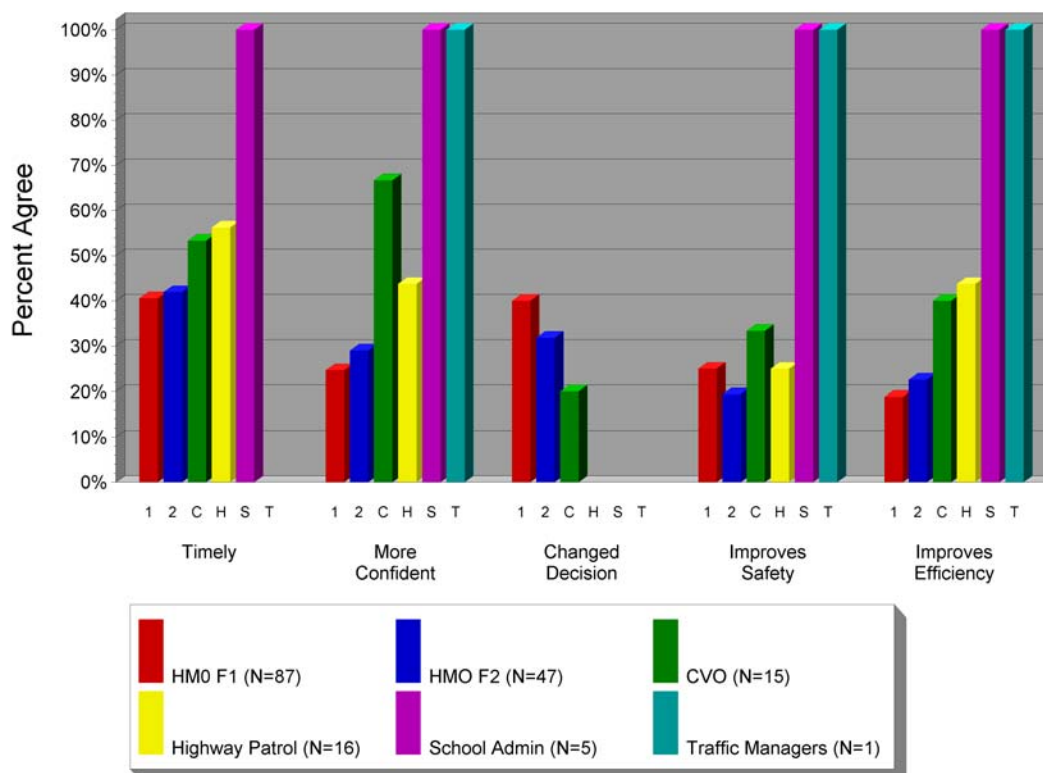


Figure 3.44 Percent of Respondents Indicating Agreement with Decision Effectiveness Aspects of FORETELL Information, by User Group.

3.3.4 Summary of Results across All Respondents

This section presents the general FORETELL experience reported by respondents, along with their future intentions regarding the FORETELL system. Figure 3.45 displays the percent of respondents indicating that they received FORETELL system training, used FORETELL information, wish to continue using FORETELL, and/or are willing to pay for the FORETELL services. The HMO surveys did not directly ask if the respondent received FORETELL training or used FORETELL. However, it is known that some training sessions were held for this user group. Other questions in the surveys provide a general description of the use patterns among HMO respondents. Section 2.3 presents further details on FORETELL system access for all user groups.

More than 70 percent of respondents in the other user groups indicated receiving some FORETELL training or training materials. All of the highway patrol, CVO, and traffic manager personnel used the FORETELL system during the winter of 2001-2002. However, the number of times the system was used was limited due to mild weather conditions. Greater than 50 percent of all respondents indicated a desire to continue using the FORETELL system in the future. However, less than 20 percent were willing to pay for the service.

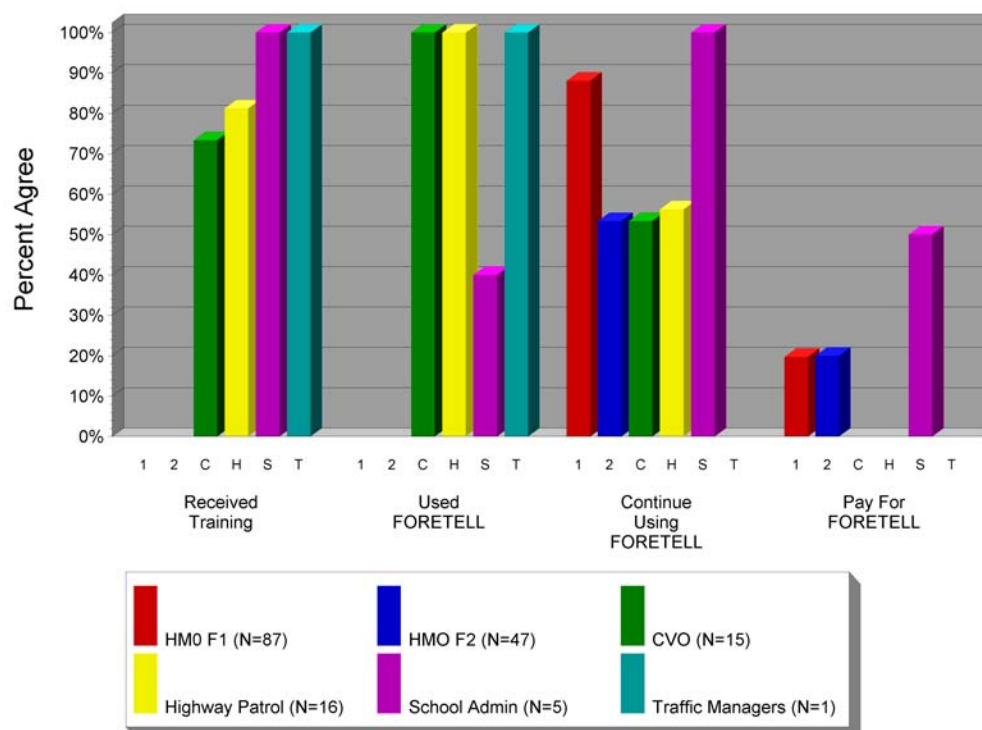


Figure 3.45 Percent of Respondents Indicating General FORETELL Experience and Future FORETELL Intentions, by User Group.

Table 3.1 Comparison of Responses to Similar FORETELL Interview/Survey Questions Among the User Groups ¹

Question	Response	Percentage (Number of Positive Responses) ²					
		HMO First Follow-Up (N=87)	HMO Second Follow-Up (N=47)	Highway Patrol (N=16)	Commercial Vehicle Operators (N=15)	Traffic Managers (N=1)	School Administrators (N=5)
User Information							
What types of weather information do you use in making decisions?	Wind Speed or Direction	91.57% (76)	71.43% (30)	81.25% (13)	13.33% (2)	0.00% (0)	0.00% (0)
	Precipitation	97.65% (83)	85.71% (36)	100.00% (16)	100.00% (15)	100.00% (1)	100.00% (4)
	Atmospheric Temperature	77.50% (62)	66.67% (28)	100.00% (16)	80.00% (12)	100.00% (1)	100.00% (4)
	Pavement Temperature	97.62% (82)	80.95% (34)	31.25% (5)	20.00% (3)	100.00% (1)	0.00% (0)
	Pavement Conditions	89.29% (75)	76.19% (32)	50.00% (8)	53.33% (8)	100.00% (1)	100.00% (3)
	Dewpoint	55.56% (45)	52.38% (22)	6.25% (1)	0.00% (0)	0.00% (0)	0.00% (0)
What types of information do you obtain from FORETELL?	Wind Speed or Direction	51.95% (40)	50.00% (14)	75.00% (12)	57.14% (8)	100.00% (1)	0.00% (0)
	Precipitation	53.25% (41)	47.22% (17)	87.50% (14)	100.00% (15)	100.00% (1)	50.00% (1)
	Atmospheric Temperature	46.05% (35)	59.26% (16)	87.50% (14)	86.67% (13)	100.00% (1)	0.00% (0)
	Pavement Temperature	42.86% (33)	30.30% (10)	81.25% (13)	57.14% (8)	100.00% (1)	0.00% (0)
	Pavement Conditions	40.26% (31)	31.25% (10)	93.75% (15)	86.67% (13)	100.00% (1)	100.00% (1)
	Dewpoint	39.73% (29)	50.00% (10)	13.33% (2)	6.67% (1)	0.00% (0)	0.00% (0)
How often do you obtain information from the FORETELL system?	Daily	27.78% (20)	11.76% (4)	0.00% (0)	33.33% (1)	100.00% (1)	0.00% (0)
	Weekly	47.14% (33)	26.47% (9)	26.67% (4)	0.00% (0)	0.00% (0)	100.00% (2)
	In advance of a weather event	67.11% (51)	58.33% (21)	50.00% (6)	100.00% (5)	100.00% (1)	100.00% (2)
	During a weather event	65.33% (49)	58.33% (21)	81.82% (9)	100.00% (11)	100.00% (1)	100.00% (2)
	After a weather event	34.25% (25)	26.47% (9)	62.50% (5)	83.33% (5)	0.00% (0)	50.00% (1)

¹ No information is presented for the Transit Operators since official interviews could not be completed.

² Statistics are based on the responses provided to each question.

³ This question was not asked on the HMO surveys. However, the operators did receive some training.

⁴ This question was not directly asked on the HMO surveys. However, user access information was available from Castle Rock. See Section 2.3 for more details.

Table 3.1 Comparison of Responses to Similar FORETELL Interview/Survey Questions Among the User Groups ¹ (continued)

Question	Response	Percentage (Number of Positive Responses) ²					
		HMO First Follow-Up (N=87)	HMO Second Follow-Up (N=47)	Highway Patrol (N=16)	Commercial Vehicle Operators (N=15)	Traffic Managers (N=1)	School Administrators (N=5)
User Acceptance							
The information obtained from the FORETELL system was:	Under-standable	91.07% (51)	82.61% (19)	87.50% (14)	46.67% (7)	100.00% (1)	100.00% (1)
	Usable	89.09% (49)	68.18% (15)	81.25% (13)	60.00% (9)	100.00% (1)	100.00% (2)
	Easily Obtainable	69.64% (39)	47.83% (11)	81.25% (13)	66.67% (10)	0.00% (0)	100.00% (2)
	Accurate	51.85% (28)	69.57% (16)	68.75% (11)	33.33% (5)	100.00% (1)	100.00% (2)
	Up-to-Date	N/A	N/A	56.25% (9)	40.00% (6)	100.00% (1)	N/A
	Useful	73.58% (39)	61.90% (13)	75.00% (12)	66.67% (10)	0.00% (0)	100.00% (2)
Decision Effectiveness							
FORETELL provides information in a timely manner.	Yes	40.58% (28)	41.94% (13)	56.25% (9)	53.33% (8)	0.00% (0)	100.00% (2)
You are more confident in your decisions when using FORETELL information.	Yes	24.64% (17)	29.03% (9)	43.75% (7)	66.67% (10)	100.00% (1)	100.00% (2)
You changed your decision based on information from FORETELL.	Yes	40.00% (18)	31.82% (7)	N/A	20.00% (3)	N/A	0.00% (0)
FORETELL information helps to improve safety and reduce accidents.	Yes	25.00% (17)	19.35% (6)	25.00% (4)	33.33% (5)	100.00% (1)	100.00% (2)
FORETELL information helps to improve the efficiency of your operations.	Yes	18.84% (13)	22.58% (7)	43.75% (7)	40.00% (6)	100.00% (1)	100.00% (2)

¹ No information is presented for the Transit Operators since official interviews could not be completed.

² Statistics are based on the responses provided to each question.

³ This question was not asked on the HMO surveys. However, the operators did receive some training.

⁴ This question was not directly asked on the HMO surveys. However, user access information was available from Castle Rock. See Section 2.3 for more details.

Table 3.1 Comparison of Responses to Similar FORETELL Interview/Survey Questions Among the User Groups ¹ (continued)

Question	Response	Percentage (Number of Positive Responses) ²					
		HMO First Follow-Up (N=87)	HMO Second Follow-Up (N=47)	Highway Patrol (N=16)	Commercial Vehicle Operators (N=15)	Traffic Managers (N=1)	School Administrators (N=5)
Summary							
Did you receive any FORETELL Training?	Yes	N/A ³	N/A ³	81.25% (13)	73.33% (11)	100.00% (1)	100.00% (5)
Did you use FORETELL?	Yes	N/A ⁴	N/A ⁴	100.00% (16)	100.00% (15)	100.00% (1)	40.00% (2)
Do you want to use FORETELL in the future?	Yes	88.06% (59)	53.33% (16)	56.25% (9)	53.33% (8)	0.00% (0)	100.00% (2)
Are you willing to pay for FORETELL?	Yes	19.70% (13)	20.00% (6)	N/A	N/A	N/A	50.00% (1)

¹ No information is presented for the Transit Operators since official interviews could not be completed.

² Statistics are based on the responses provided to each question.

³ This question was not asked on the HMO surveys. However, the operators did receive some training.

⁴ This question was not directly asked on the HMO surveys. However, user access information was available from Castle Rock. See Section 2.3 for more details.

4.0 EXTERNAL FACTORS

This chapter provides details on factors beyond the control of the evaluation team that had significant impacts on the results. Section 4.1 provides a detailed analysis of the weather information collected from HMOs during the evaluation. Sections 4.2 and 4.3 describe the System Performance and Institutional Performance evaluations, respectively.

4.1 Weather Analysis

Part of the evaluation data collection included activity/weather logs completed by the Highway Maintenance Operators (HMOs) in Iowa and Missouri. A separate log was to be completed for each weather event. Information was collected on the temperature and precipitation of each event, along with maintenance information such as worst pavement conditions, road surface treatments, and whether or not FORETELL was used. This section presents a summary of the activity/weather log data for the three winter seasons of data collection.

Tables 4.1 to 4.3 illustrate the number of logs that were completed, the type and average amount of precipitation reported, and the average minimum and maximum atmospheric temperatures reported during the events. Note that the event durations vary and could occur overnight. The information is presented separately by month for November through April 1999 – 2002.

Table 4.1 Activity/Weather Log Summary Table - 1999-2000

	1999-2000						
	Number of Events (from 37 Operators)						
	(Average Precipitation in Inches, Number Average Based on)						
	November	December	January	February	March	April	All
Snow	1 (3.00, 1)	66 (2.59, 56)	75 (2.43, 56)	33 (3.63, 24)	9 (2.71, 7)	2 (10.00, 1)	186 (2.76, 145)
Freezing Rain	0	8 (N/A)	18 (0.18, 6)	9 (0.25, 2)	0	0	35 (0.20, 8)
Frost	0	12 (N/A)	2 (N/A)	0	0	0	14 (N/A)
Rain	0	5 (0.63, 2)	11 (0.07, 4)	8 (0.83, 3)	1 (0.10, 1)	0	25 (0.41, 10)
Number of Events	1	84	91	37	9	2	224
Average Atmospheric Temperature Range (F)	20.0 - 32.0	19.0 - 29.4	19.9 - 30.1	25.9 - 31.6	29.7 - 34.8	30.0 - 38.5	21.0 - 30.4

Table 4.2 Activity/Weather Log Summary Table - 2000-2001

	2000-2001						
	Number of Events (from 28 Operators)						
	(Average Precipitation in Inches, Number Average Based on)						
	November	December	January	February	March	April	All
Snow	5 (3.00, 1)	90 (3.84, 69)	44 (1.52, 26)	28 (1.87, 17)	7 (2.67, 3)	0	174 (2.99, 116)
Freezing Rain	2 (N/A)	22 (0.52, 10)	9 (0.27, 3)	16 (0.33, 6)	2 (N/A)	0	51 (0.42, 19)
Frost	0	0	5 (N/A)	4 (N/A)	0	0	9 (N/A)
Rain	1 (N/A)	6 (0.25, 1)	11 (0.67, 6)	4 (1.00, 2)	7 (0.11, 1)	9 (N/A)	38 (0.64, 10)
Number of Events	6	101	58	42	13	9	229
Average Atmospheric Temperature Range (F)	24.3 - 29.5	9.3 - 19.8	24.1 - 31.1	20.2 - 28.9	31.5 - 35.5	52.1 - 61.6	18.7 - 27.2

Table 4.3 Activity/Weather Log Summary Table - 2001-2002

	2001-2002						
	Number of Events (from 14 Operators)						
	(Average Precipitation in Inches, Number Average Based on)						
	November	December	January	February	March	April	All
Snow	1	22 (0.86, 9)	26 (2.63, 18)	20 (1.63, 8)	17 (2.65, 15)	2 (N/A)	88 (2.16, 50)
Freezing Rain	1 (0.25, 1)	2 (N/A)	10 (0.50, 1)	0	7 (0.50, 2)	0	20 (0.44, 4)
Frost	0	6 (0.50, 1)	7 (N/A)	8 (N/A)	4 (N/A)	0	25 (0.50, 1)
Rain	2 (0.25, 2)	3 (N/A)	1 (2.50, 1)	4 (0.37, 3)	7 (0.34, 4)	4 (0.50, 1)	21 (0.54, 11)
Number of Events	2	31	39	30	27	7	136
Average Atmospheric Temperature Range (F)	30.5 - 36.5	22.2 - 27.6	24.4 - 29.9	24.9 - 30.3	20.3 - 30.7	37.9 - 44.1	24.1 - 30.5

The following figures present analogous information. Figure 4.1 shows that about the same number of activity/weather logs were completed during the winters of 1999-2000 and 2000-2001. However, this does not necessarily imply that the winters had the same number of weather events. The winter of 1999-2000 was the baseline year of data collection, with 37 different HMOs reporting events (approximately six logs per operator). The winter of 2000-2001 had only 28 different HMOs reporting events (~ eight logs per operator). Far fewer logs (136) were completed by 14 HMOs during the final evaluation year (~ ten logs per operator).

The climatological data in Section 2.2 show that the winter of 2000-2001 was colder and had more precipitation than the other two evaluation winters. The activity/weather log results seem to be inconsistent with this fact, since the number of logs completed per operator increased throughout the evaluation period. This discrepancy may be due to the smaller number of operators participating over time or a learning curve among the operators to report *all* weather events, including those with only rain or frost. Also, some operators completed more logs, on average, than others.

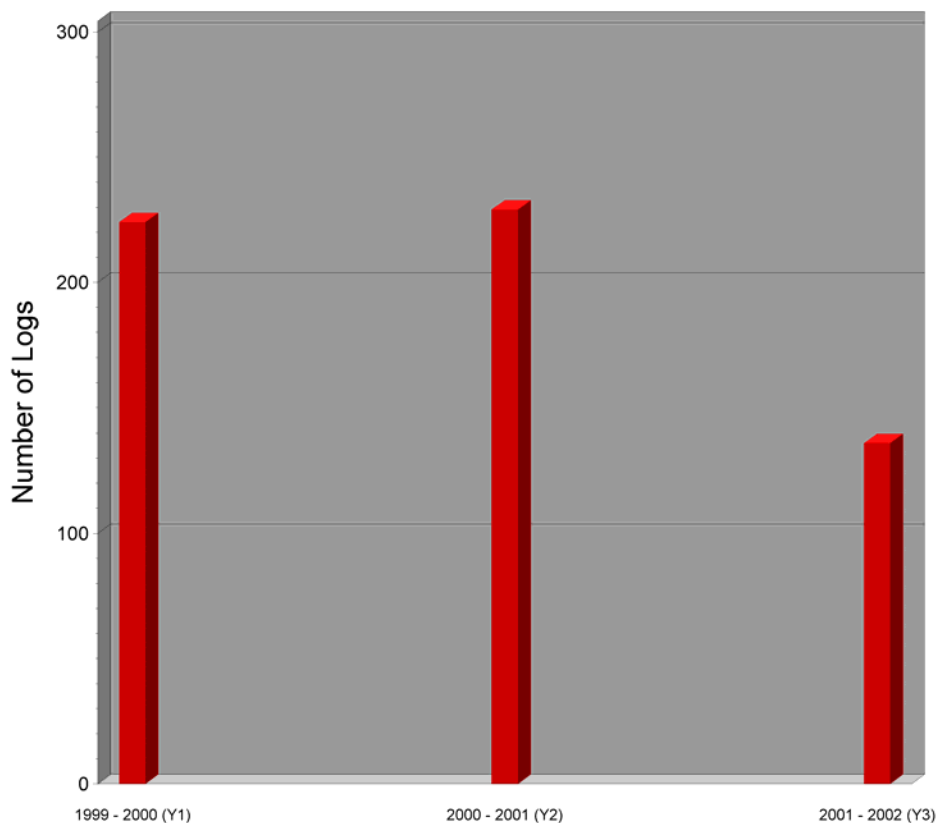


Figure 4.1 The Number of Activity/Weather Logs Completed by Evaluation Year.

Figure 4.2 presents the percent of events in each evaluation year that reported various types of precipitation. Understandably, the majority of events in each year reported snow. In addition, the figure shows that while not statistically significant, there was a general increase in the percentage of the events reporting the types of precipitation requiring little or no intervention on the part of HMOs. For example, more events in the final evaluation year reported frost than rain.

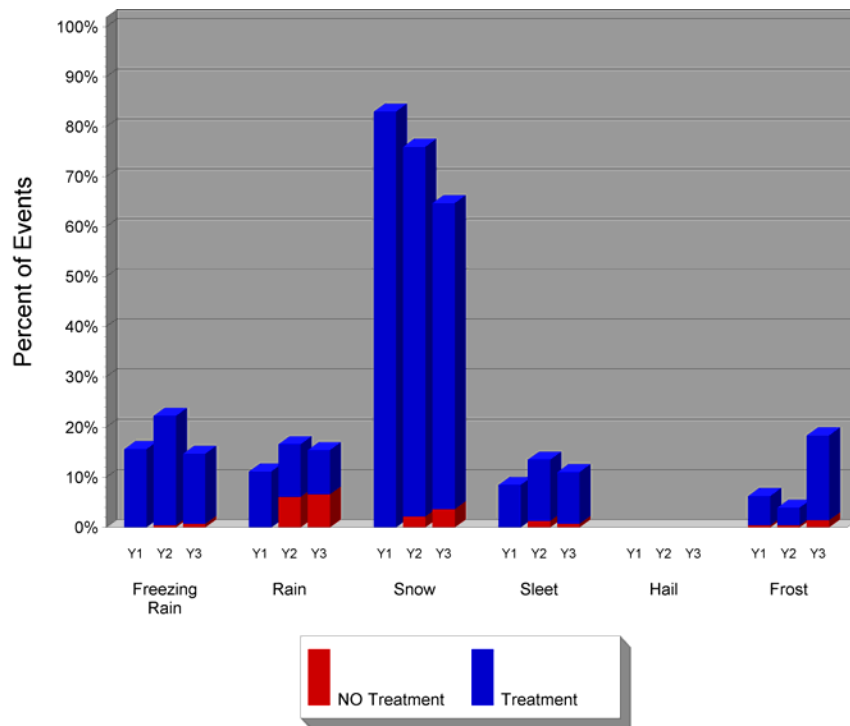


Figure 4.2 The Percentage of Weather Events Reported to Have Various Types of Precipitation.

Figure 4.3 shows the average low and average high temperatures per reported event. The figure shows that the event temperatures stayed fairly consistent across the evaluation period. However, the temperatures for the events reported in the second year of the evaluation were slightly lower, which is consistent with the climatological data presented in Section 2.2.

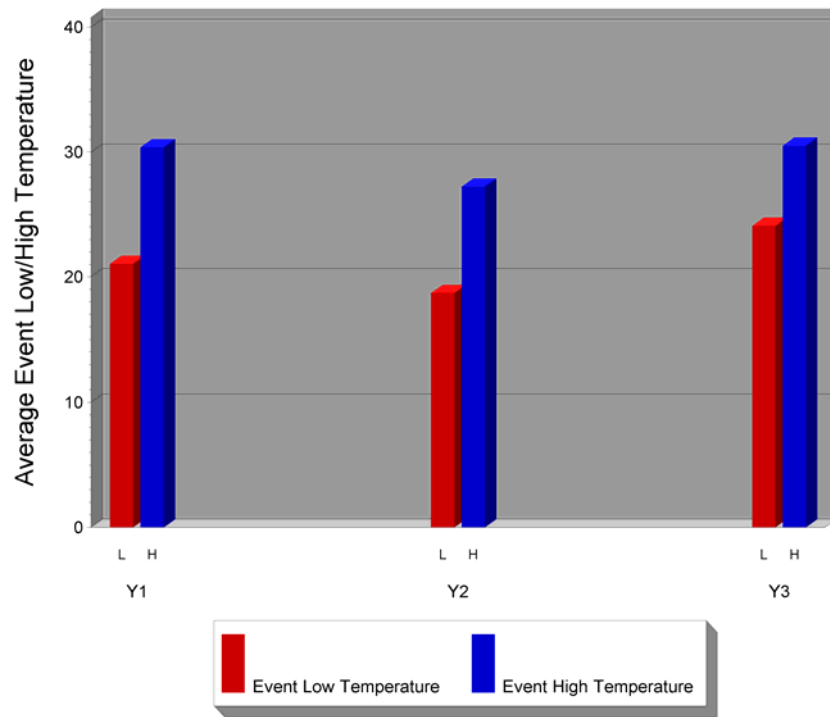


Figure 4.3 The Average Low and Average High Temperatures per Reported Weather Event.

Figures 4.4 – 4.6 illustrate the worst and targeted pavement conditions associated with each event for each year of data collection. The figures indicate that the worst pavement condition among the reported events decreased in severity during the evaluation period, with the majority of the worst conditions being “Patchy Snow or Ice” for the last two winters. In addition, while the targeted condition was “Bare Pavement” for approximately 90 percent of the reported events in all three seasons, the winter of 2000-2001 may have had more severe events, as evidenced by the target conditions of “Plowed and Treated” and “Wheel Tracks Bare.”

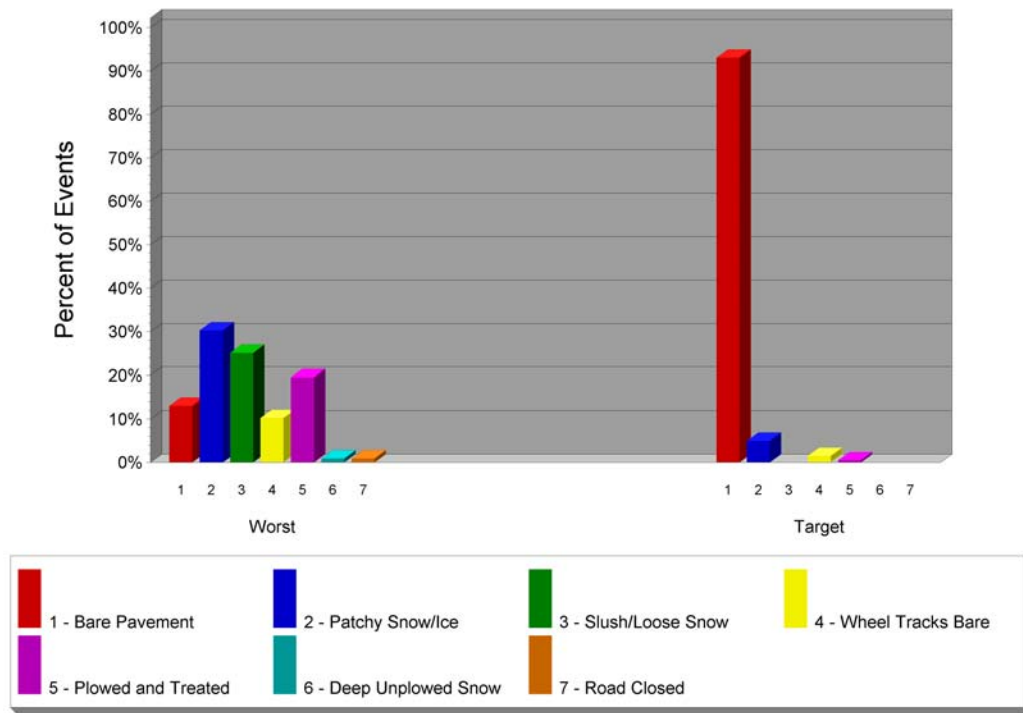


Figure 4.4 Percent of Events Reporting Various Worst and Targeted Pavement Conditions for Evaluation Year 1 (1999-2000).

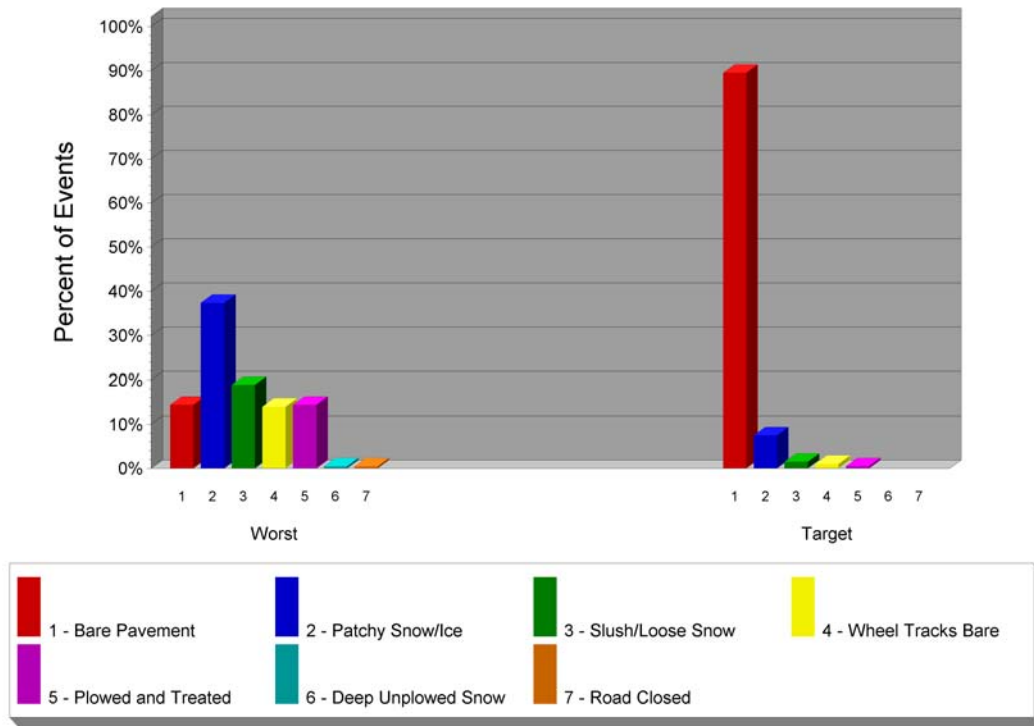


Figure 4.5 Percent of Events Reporting Various Worst and Targeted Pavement Conditions for Evaluation Year 2 (2000-2001).

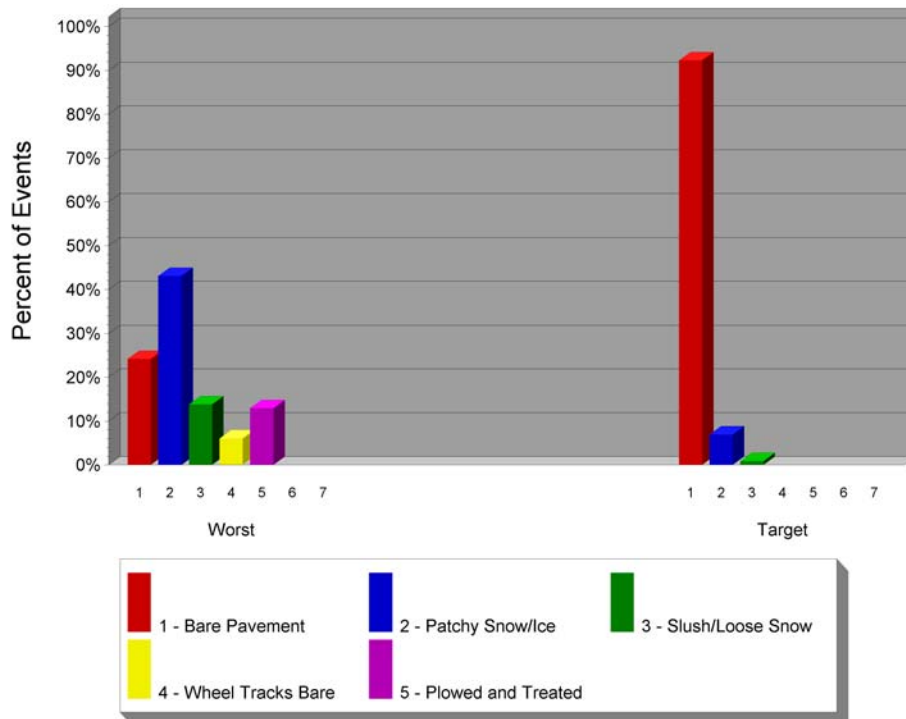


Figure 4.6 Percent of Events Reporting Various Worst and Targeted Pavement Conditions for Evaluation Year 3 (2001-2002).

Figure 4.7 presents the number of events in each winter season reporting various snow and ice control measures being used. These results are consistent with the pavement conditions reported in the previous figures. For instance, patchy snow and ice, the worst condition in the majority of reported events, would be treated with de-icing measures, the method utilized in the majority of events.

The activity/weather log results are generally consistent with the fact that the first and last years of the evaluation were warmer and drier (i.e., reduced need for highway maintenance). These mild winters affected the evaluation effort by reducing the opportunities most of the user groups had to access and use FORETELL information in real-life situations.

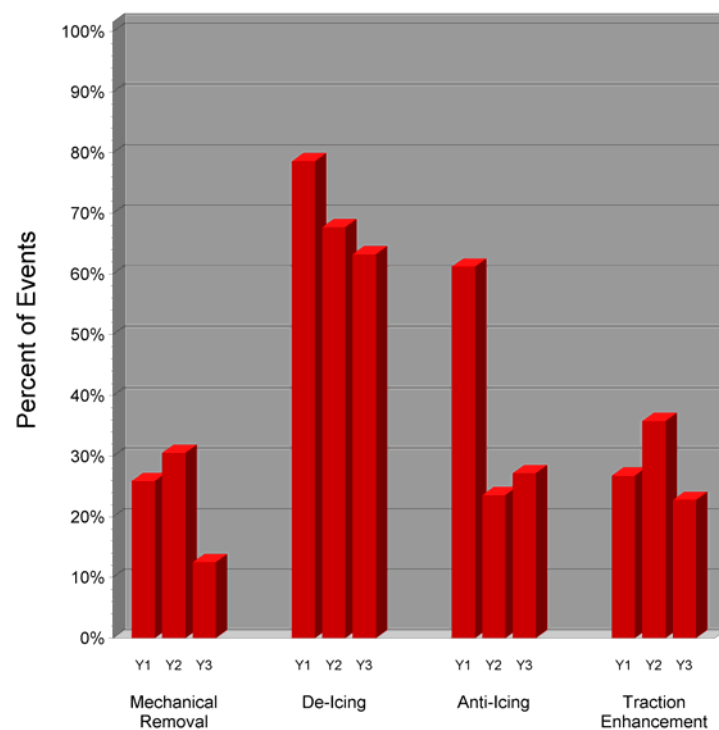


Figure 4.7 Percent of Events Reporting Various Snow and Ice Control Measures being Utilized by Evaluation Year.

4.2 System Performance

The evaluation team was not responsible for collecting data concerning the performance of the FORETELL system (e.g., system downtime, data reliability, forecast accuracy, etc.). Castle Rock Consultants is preparing a separate system performance report for Iowa and FHWA. The report will document the system performance during the evaluation period and is expected to contain:

- Information regarding system uptime (website and models) and the reliability of forecast/data updates;
- Reasons for system downtime (e.g., software or Internet service failure) and details on computer/data redundancy needs;
- Details on safeguards and redundancies that were implemented, such as implementing a backup web server and teaming with a local weather provider to act as a data stream backup;
- System performance from a weather-forecasting point of view and road model performance (e.g., accuracy or bias in the models).

The evaluation team and HMOs experienced a general increase over time in the operational availability of the information provided by FORETELL.

4.3 Institutional Performance

Several issues related to the development and marketing of FORETELL had a significant impact on the use of FORETELL and on the FORETELL evaluation. While these institutional issues were not part of the evaluation focus, they are noted here because of their relevance to the results that are reported.

In 1996 the original FORETELL Consortium included Castle Rock Consultants, the Federal Highway Administration, the National Weather Service (NWS), NOAA's Forecast Systems Laboratory, Environment Canada, and the states of Illinois, Iowa, Minnesota, Missouri, and Wisconsin. Participation by the states meant contribution to a FORETELL pooled fund. By contributing, states would have weather products tailored for their use, as well as access to the FORETELL system. Early in the project, Minnesota and Illinois decided not to contribute to the development. Their participation was therefore limited to initial stakeholder meetings and the early development of the System Design Concept.

In the early stages of development of the FORETELL system, Castle Rock Consultants planned to team with the Forecast Systems Laboratory (FSL) and the National Weather Service (NWS) to download NWS data and develop meso-scale models. The relationship between Castle Rock Consultants, FSL, and NWS never materialized. Subsequently, the FORETELL program was delayed by nearly one year while Castle Rock Consultants contracted with a FSL meteorologist to develop the weather-related models. As a result, FORETELL did not become operational until the winter of 2000-2001.

During the evaluation period, various issues with the information provided on the FORETELL website appeared to be incorrect and may have affected users of the system. In addition, a few flaws with the graphical user interface (GUI) were found, such as map displays with road systems in the wrong location. The Collision and Accident Reporting System (CARS) information was overlaid onto the weather GUI, although it was not exactly suited for the display. Castle Rock Consultants did not incorporate road weather information system (RWIS) sensor data into FORETELL until the second winter of operation. Although the system was operational most of the time, it did go down on several occasions. One memorable occasion occurred early during the winter of 2001. The FORETELL system went down for a couple of days due to server failure, during the first major winter storm. Following the event, FORETELL added a backup server to help ensure redundancy and to improve system availability. These situations appear to be typical problems that occur during the implementation of a new system.

Another issue relates to the focus of the weather information displayed on the website. It was tailored to assist HMOs maintenance activities. Thus, the information provided by FORETELL may not have been as useful as a website designed to meet the information needs of the other user groups.

Marketing efforts for potential user groups were limited and resulted, in some cases, in minimal participation or the inability to access the FORETELL website. The evaluation team itself encouraged FORETELL use by CVOs, traffic managers, and transit operators so that these user groups could be included in the evaluation. Some user groups (e.g., travelers) could not be evaluated at all, since the FORETELL Consortium did not make the password-protected website available to this user group.

In Iowa and Missouri, participation in the FORETELL program by HMOs was coordinated through the state departments of transportation. For instance, the surveys were sent to state DOT personnel who distributed the surveys to the operators. In Iowa, the department of transportation underwent a major reduction in force during the spring of 2001. This reduction directly impacted the participation of highway maintenance personnel in completing the first follow-up survey. In Missouri, over a hundred operators attended FORETELL training, but because many of them had older computers that used older and slower telephone modems, their access to FORETELL was very limited. Also, Missouri's State Engineer was hesitant to encourage reliance upon computers or RWIS sensor data, which FORETELL uses in its road condition model.

In Wisconsin, highway maintenance is not provided by a state department of transportation, as it is in many other states. Individual counties provide highway maintenance for the state through a contractual arrangement. Because the FORETELL program was outside of the contractual agreement for maintenance, the state had little authority to request HMOs to participate in the FORETELL evaluation. As a result, HMOs in Wisconsin were not asked to complete activity/weather logs, and few HMOs responded to the surveys.

5.0 OBSERVATIONS AND RECOMMENDATIONS

The FORETELL evaluation focused on six user groups over one to three winter seasons. Each of these user groups had different needs and potential uses for the weather and road condition information. Each had different decisions and processes they aimed to impact with this new information. To some, the information was not that new (just packaged differently), while others were seeing this kind of information for the first time, packaged in a new medium, such as the Internet. This section attempts to provide some overall observations common to the user groups and then to offer recommendations for future activities.

5.1 Observations

The following observations are made by the evaluation team after a thorough review of all evaluation results presented in this report:

The FORETELL system offered new information in a new format. FORETELL attempted to package weather and road condition information in a new way and provide it to the users in a one-stop-shop approach. For the most part this goal was achieved. For the HMO, much of this information was already available through a variety of sources, and FORETELL brought it together in a website format with special features to assist in viewing volumes of information in a straightforward way. The one new item that was noted by the HMOs that was of great value was the dewpoint. On the other hand, for the other users (CVOs, highway patrol, school administrators, transit operators, and traffic managers), some of the FORETELL information was both new to them and presented in a new format. Elements such as detailed weather forecasts, pavement temperature, and pavement conditions were among the highlighted new items. Clearly, they were intrigued and interested in this information. Although each user had varying information needs, generally they thought this new information in this new packaging was easy to obtain and usable, with a high percentage of them mentioning that they appreciated the special features such as the animation of the information over a specified time period.

FORETELL had aggressive goals and encountered difficulties typical of new systems. FORETELL's goals of bringing much information together in a new format was a first in the industry. The evaluation team understands that new deployments are fraught with challenges. FORETELL was no different. As discussed in Section 4.3, Institutional Performance, the program dealt with major partner changes, users reluctant to changing the way they have done things in the past, schedule delays, information accuracy, and computer/systems/server issues that sometimes negatively affected the delivery of the information in a timely manner. Although unfortunate, these issues were not unexpected for a project of this type. Apparently, these "institutional" challenges had an effect on how the system was perceived by some of the users and may have tainted their responses to surveys and telephone interviews. In some instances these issues may have impacted whether they used the system at all or were willing to participate in the evaluation. Subsequently, the results indicated both positive and negative aspects of the FORETELL system. Between 30 and 40 percent of the HMOs said that they changed their decisions based on FORETELL information, and greater than 50 percent of all users said they want to continue using FORETELL in the future. However, less than 20 percent were willing to

pay for the service. These numbers are a good sign, given the challenges that were faced by the program.

User's resistance to change affected FORETELL use. Like any new tool provided to an operator, FORETELL suffered from users' reluctance to use and accept something new. The team believes this resistance had a direct impact on users' responses about the FORETELL system. In many cases, respondents would not commit to agreeing or disagreeing with how they used or liked the FORETELL system. This may be related to the fact that they really did not use the system, so they did not feel comfortable responding either way.

Weather conditions affected use of the FORETELL system and therefore the ability to evaluate its performance. Weather conditions, or lack thereof, was a major factor in being able to evaluate the system. This was especially true for the non-HMO users (CVOs, highway patrol, school administrators, transit operators, and traffic managers), who only had one season to use the system (winter of 2001-2002). As can be seen in Sections 2.2 and 4.1, data are provided to support the conclusion that this season was an extremely light winter and therefore the need for FORETELL information was diminished or non-existent. This situation affected the number of people willing to participate in the evaluation and the responses of the ones who did. Only 15 of the 34 CVOs, 5 of the 9 school administrators, and 3 of the 14 transit operators agreed to actually participate in the evaluation after accepting the offer prior to the start of the winter season. Almost all of the "other" users interviewed expressed concern that they had not had an opportunity to fully use and evaluate the system because of the mild winter. Also, the HMOs' use of the FORETELL system was significantly reduced during the final evaluation period compared to the prior season (where the data indicate they had a typical winter season). The evaluation team believes this reduced reliance on FORETELL was due in most part to the mild winter of 2001-2002.

Users' decision effectiveness using FORETELL system was mixed. Obtaining, understanding, and using the information were one evaluation criterion (user acceptance). However, how the users put the information to use, which in some way changed their decisions, was the most important criterion. The evaluation team believes that a changed decision based on FORETELL information was the true measure of the system's value. In this case, the results among the users were mixed. As mentioned earlier, the fact that 30 to 40 percent of HMO respondents indicated that they changed their decisions based on this new information was significant, given the natural reluctance to accept something new. However, the other users did not respond as favorably. In the case of the CVOs, they appreciated the FORETELL information, but did not think it would change their key decisions (when to go, if to go, where to go). This is probably driven by the market conditions to get products where they need to go. It was interesting, however, that the HMOs were less confident in their decisions using FORETELL, while the other users were more confident (but less likely to change their decisions). The confounding factors of the "institutional" performance and weather conditions mentioned earlier make these results interesting but may not represent the true attitudes of some of the user groups.

Majority of users expressed an interest in using FORETELL in the future. After the evaluation data were collected, and all the other criteria were evaluated, it is significant that the majority of all users stated they want to use FORETELL in the future. The team believes this is

a result of two primary interests on the part of the users. First, they found value in the information and were interested in using it for future winter seasons. Second, they did not have an opportunity to fully test the system during a mild winter but saw enough promise in the system to want to continue using the FORETELL system and data. On the other hand, very few of these same users were willing to pay for the information and expected to continue receiving it at no cost.

5.2 Recommendations

From the results presented in this report, the evaluation team recommends the following:

FORETELL system development and future enhancements. Evaluating a new system that is still under development is a difficult task at best. Many HMO users initially were reluctant to use a new system that had unknown accuracy and reliability. These biases toward the system are hard to overcome. Clearly the users expressed an interest and perceived value in the FORETELL system and the weather/pavement condition information it provided. With continued system development and enhancements to the system's robustness to improve accuracy and avoid system downtime, as well as some added functionality, the changes could significantly affect future user perceptions of this product. It is very likely that these potential enhancements will encourage continued use of the system, which could lead to expanded acceptance and eventual increases in changed behaviors among the user groups.

Therefore, additional evaluation activities in future years are required to fully evaluate the system for most users. The only evaluation conducted for the "other" users was during a very mild winter, and therefore a meaningful evaluation was not possible. Only after the FORETELL system is fully functional and reliable, and marketed to a significant segment of user group populations, can a comprehensive evaluation be conducted.

Training on the use of weather information is essential to effective decision-making. Most users understand how weather phenomena affect their operations, but they do not necessarily understand how they can use weather information to make more timely and efficient decisions that can improve their operations. It became obvious from the increased use of dewpoint information that the training provided by the states to utilize the FORETELL information significantly affected their decision processes. Dewpoint is a critical factor in the anti-ice versus de-ice HMO road maintenance strategy. Similar training tailored to individual user groups may be beneficial. Such a program could involve a general introduction to weather and road condition monitoring and forecasting, how to obtain desired information from the FORETELL system, and how such information can be used to enhance operational procedures and improve transportation outcomes (e.g., improve safety by reducing crash risk, improve mobility by minimizing travel time delay, improve productivity by decreasing road treatment costs). The evaluation team believes that early and appropriate training could have improved the understanding and use of the FORETELL website.

6.0 BIBLIOGRAPHY / REFERENCES

Battelle, "Evaluation of the FORETELL Consortium Operational Test: Weather Information for Surface Transportation, Evaluation Plan," Battelle report to the US Department of Transportation Joint Program Office, April 2001.

Geer, Ira W., ed., "Glossary of Weather and Climate," American Meteorological Society, Boston, MA, 1996.

JPO, "Evaluation of the FORETELL Consortium Operational Test: Weather Information for Surface Transportation, Evaluation Strategy," Battelle report to the US Department of Transportation Joint Program Office, July 1998. Available at http://www.itsdocs.fhwa.dot.gov/jpodocs/repts_te/7tr01!.pdf

Temeyer, Bradley E., et al, "A Winter Weather Index for Estimating Roadway Winter Maintenance Costs in the Midwest," unpublished preliminary report, Iowa State University, Ames, IA, 2001.

**APPENDIX A:
HIGHWAY MAINTENANCE OPERATORS —
DATA COLLECTION INSTRUMENTS
AND
SUMMARY TABLES**

ACTIVITY/WEATHER LOG



U.S. Department
of Transportation
**Federal Highway
Administration**

FORETELL Activity/Weather Log for Weather Events*

**Please mail or fax to Shawna Collins at Battelle Memorial
Institute, Columbus, OH 43201, (614)424-4611 (fax).**

ID Number 01

**Event
Location**

Event Start

Date:
Time: AM ☐
PM ☐

Event End

Date:
Time: AM ☐
PM ☐

Event Temperatures and Wind Speed

Atmospheric High: ° F Low: ° F
Pavement High: ° F Low: ° F
Maximum Wind Speed mph

Event Precipitation (Please ☐ all that apply)

Type	Amount in Inches (if applicable)	Type	Amount in Inches (if applicable)
☐ Freezing Rain		☐ Sleet	
☐ Snow		☐ Rain	
☐ Wet ☐ Dry ☐ Drifting		☐ Hail	
		☐ Frost	

Method of Treatment During Event (Please ☐ all that apply)

Type	Amount (units / In-mi)
☐ Plowing	— NA —
☐ Deicing	
☐ Anti-icing	
☐ Abrasives	
☐ Other	
☐ None	

Information Used During Event

Did you use: (☐ all that apply)	Type (☐ all that apply)	Source (☐ all that apply)
☐ Maximum Wind Speed/Direction	☐ Forecast ☐ Actual	☐ FORETELL ☐ Other
☐ Precipitation	☐ Forecast ☐ Actual	☐ FORETELL ☐ Other
☐ Atmospheric Temperature	☐ Forecast ☐ Actual	☐ FORETELL ☐ Other
☐ Pavement Temperature	☐ Forecast ☐ Actual	☐ FORETELL ☐ Other
☐ Pavement Conditions	☐ Forecast ☐ Actual	☐ FORETELL ☐ Other
☐ Other _____	☐ Forecast ☐ Actual	☐ FORETELL ☐ Other

Road Condition During Event

Condition	Worst Condition (☐ only one)	Duration at Worst Condition (hrs)	Target Condition (☐ only one)	Time to Achieve Target Condition (hrs)
Bare Pavement	☐		☐	
Patchy snow, ice, or slush	☐		☐	
Slush or loose snow (no packed snow or ice)	☐		☐	
Continuous packed snow or ice; wheel track(s) bare	☐		☐	
Build-up of compacted snow; plowed and treated with abrasives/chemicals	☐		☐	
Build-up of compacted, deep, unplowed snow; ruts in ice pack	☐		☐	
Road closed due to weather conditions	☐		☐	

* A weather event can include high winds, precipitation, extreme atmospheric temperatures, etc.

Comments: _____

BASELINE QUESTIONNAIRE



- ☐ Single lane, bi-directional traffic 

--	--	--	--	--	--
- ☐ Two lane 

--	--	--	--	--	--
- ☐ Four lane and limited access 

--	--	--	--	--	--
- ☐ Suburban and Urban 

--	--	--	--	--	--

4. Do you have access to a computer at work? ☒ Yes ☐ No **Skip to Q7.**

5. Do you have access to the Internet at work? ☒ Yes ☐ No

6. Do you have access to an email account at work? ☒ Yes ☐ No

7. From what sources have you obtained weather-related information? (Please ☒ all that apply.)

☐ Roadside and in-pavement sensors	☐ Satellite data
☐ Tailored, site-specific forecast	☐ Radar data
☐ National Weather Service forecast	☐ Other (please specify) _____

8. How have you obtained weather-related information? (Please $\checkmark$ all that apply.)
- | | |
|--|---|
| ☐ Internet/World Wide Web | ☐ Pager |
| ☐ Email | ☐ Digital Messaging |
| ☐ Fax | ☐ Satellite Delivery |
| ☐ Phone/Cell Phone | ☐ Computer-based subscription services |
| ☐ Television | ☐ Other (please specify) |
| ☐ Radio | |

9. How often do you obtain weather information?

		A.			
		TWICE A DAY	4 TIMES A DAY	EVERY OTHER HOUR	HOURLY
YES	NO				
a. Daily	☐	☐	☐	☐	☐
b. Weekly	☐	NOT APPLICABLE			
c. In advance of a weather event*	☐	☐	☐	☐	☐
d. During a weather event*	☐	☐	☐	☐	☐
e. After a weather event*	☐	☐	☐	☐	☐

*A weather event can include high winds, precipitation, extreme atmospheric temperatures, etc.

10. What snow and ice control strategies do you employ in your winter maintenance operations? (Please ✓ all that apply.)

		A.				
		For each "yes," indicate whether or not weather-related information is helpful in making decisions about employing the strategy. Please circle one number for each strategy you use.				
		NOT HELPFUL → HELPFUL				
YES	NO	1	2	3	4	5
a. Anti-icing	☐					
b. De-icing	☐					
c. Friction Enhancement (Abrasives)	☐					
d. Mechanical Removal (Plowing)	☐					
e. Some other strategy? Please specify	☐					

SPECIFY: _____

11. What weather information do you use in making storm management decisions? Do you use:

		A.	
		Do you use actual readings, forecast information, or both? (Please ✓ the appropriate box(es))	
YES	NO	Actual Readings	Forecast Information
a. Wind speed or direction?	☐	☐	☐
b. Precipitation?	☐	☐	☐
c. Atmospheric temperature?	☐	☐	☐
d. Pavement temperature?	☐	☐	☐
e. Pavement conditions?	☐	☐	☐
f. Dew point temperature?	☐	☐	☐
g. Some other indicator? Please specify	☐	☐	☐

SPECIFY: _____

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Thinking about the weather information you use, that is, those you checked "yes" in Question 11, indicate how strongly you disagree or agree with the following statements. Please circle one number for each category you use.

	A. Wind Speed/Direction		B. Precipitation		C. Atmospheric Temperature		D. Pavement Temperature		E. Pavement Conditions		F. Dew Point Temperature				
	Strongly Disagree	Strongly Agree	Strongly Disagree	Strongly Agree	Strongly Disagree	Strongly Agree	Strongly Disagree	Strongly Agree	Strongly Disagree	Strongly Agree	Strongly Disagree	Strongly Agree			
12. You use the above weather information to:	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
a. make storm management decisions, such as deciding WHAT road surface treatments should be used.	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
b. help determine WHERE to apply road surface treatments during winter conditions.	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
c. help determine WHEN to apply road surface treatments during winter conditions.	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
13. The above weather information you receive is:															
a. UNDERSTANDABLE	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
b. USABLE	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
c. EASILY OBTAINABLE	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
d. ACCURATE	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
e. USEFUL in making storm management decisions.	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5

Please indicate how strongly you disagree or agree with the following statements.
Please circle your response.

	Strongly Disagree	1	2	3	4	Strongly Agree
14. The weather information you receive is sufficient for making storm management decisions.	1	2	3	4	5	
15. Having weather-related information makes your job easier.	1	2	3	4	5	
16. The weather information you receive helps you to improve the traffic efficiency of roadways.	1	2	3	4	5	
17. The weather information you receive helps you to target snow and ice control measures.	1	2	3	4	5	
18. Highway maintenance activities are conducted and/or managed more efficiently using weather-related information.	1	2	3	4	5	
19. The weather information you receive helps you return the roads to a targeted pavement condition quickly.	1	2	3	4	5	
20. Having weather information increases the safety of the Highway Maintenance Operator.	1	2	3	4	5	
21. The weather information you receive helps to lessen the amount of chemical applications and improve the quality of the environment.	1	2	3	4	5	

22. If there is any weather-related information that would be helpful to you in your job that you cannot receive, please explain.

23. Is there any other information you would like to tell us about the weather-related information you receive, how you receive it, or how you use the information in your decision-making process?

Thank you for taking the time to complete this questionnaire.

FOR OFFICE USE ONLY

NO.	DATE	EDITOR:
--------------------------	---------------------------	------------------------------

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FOLLOW-UP QUESTIONNAIRE

Battelle's Interactive System for Internet Surveys (ISIS)

If you have registered a login password previously, continue on to the survey...



If you are new to this site, please provide a login password you would like for use at this site (5 to 14 characters in length). Be certain to record this login password, so you may enter the site later and review your responses.

(Note: if your requested password is assigned to another user already, you will return to this page so you may request an alternate login password)

password

confirm password

Register

FORETELL Survey

The Federal Highway Administration is conducting an evaluation of the FORETELL system. Please complete the following survey as completely and honestly as possible. Your responses will be used to assess the quality, performance, and customer satisfaction of the FORETELL system.

Battelle's Interactive System for Internet Surveys (ISIS)

Please **read** the information **below**.
When you are finished, you may hit the OK button to continue.

FORETELL Survey

The Federal Highway Administration is conducting an evaluation of the FORETELL system. Please complete the following survey as completely and honestly as possible. Your responses will be used to assess the quality, performance, and customer satisfaction of the FORETELL system.

Your participation in this study is completely voluntary. All of the information you provide in this interview will be kept strictly confidential and will not be disclosed to anyone but the researchers conducting the study.

The survey should take about 10 minutes to complete.

OK

FORETELL Survey

The Federal Highway Administration is conducting an evaluation of the FORETELL system. Please complete the following survey as completely and honestly as possible. Your responses will be used to assess the quality, performance, and customer satisfaction of the FORETELL system.

1. Please check the box next to each type of road your location maintains and indicate how many miles of each type of road you maintain.

Type of road:	Check if maintained:	Miles
Single lane, bi-directional traffic	Yes ☐ No ☐	
Two lane	Yes ☐ No ☐	
Four lane and limited access	Yes ☐ No ☐	
Suburban and Urban	Yes ☐ No ☐	

Next

Progress:



FORETELL Survey

2. How many Full Time employees do you supervise? (Write in '000' if you supervise no employees.)

Number of Employees

3. How many Winter Seasonal employees do you supervise? (Write in '000' if you supervise no employees.)

Number of Employees

[Previous](#)

[Next](#)

[* Review *](#)

Progress:



FORETELL Survey

When you use a computer for work...

4a. What operating system do you use?

- ☐ Windows 3.1
- ☐ Windows 95
- ☐ Windows 98
- ☐ Windows NT
- ☐ Windows 2000
- ☐ Unix
- ☐ OS/390
- ☐ Linux
- ☐ Other

If "Other", please specify:

4b. Which Internet browser (such as Netscape, Microsoft Internet Explorer, etc.) do you use?

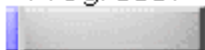
If "Other", please specify:

[Previous](#)

[Next](#)

[*Review*](#)

Progress:



FORETELL Survey

5. Please provide the following contact information. This information will NOT be distributed to ANYONE outside of Battelle.

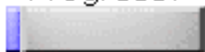
	Enter Requested Information
First Name	
Last Name	
Work email address	
Work Site Name	
Work Street & No	
Work City	
Work State	
Work Zip	

[Previous](#)

[Next](#)

[*Review*](#)

Progress:



FORETELL Survey

6. What information do you use in making weather-related management decisions? For each type of information you use, please indicate whether you use Actual Readings, Forecast Information, or both, by checking the appropriate box[es]. Then choose the source you rely on most heavily for obtaining that information.

Type of Information	Do you use this information?		Do you use Actual Readings?	Do you use Forecast Information?	What is the source you rely on most heavily for this information?
Wind speed or direction	Yes ☐	No ☐	☐ Yes ☐ No	☐ Yes ☐ No	Choose Source
Precipitation	Yes ☐	No ☐	☐ Yes ☐ No	☐ Yes ☐ No	Choose Source
Atmospheric temperature	Yes ☐	No ☐	☐ Yes ☐ No	☐ Yes ☐ No	Choose Source
Pavement temperature	Yes ☐	No ☐	☐ Yes ☐ No	☐ Yes ☐ No	Choose Source
Pavement conditions	Yes ☐	No ☐	☐ Yes ☐ No	☐ Yes ☐ No	Choose Source
Dewpoint	Yes ☐	No ☐	☐ Yes ☐ No	☐ Yes ☐ No	Choose Source
Some other type Specify ==>			☐ Yes ☐ No	☐ Yes ☐ No	Choose Source Choose Source automated weather station CNN DTN FORETELL Intellicast Local Weather National Weather Service SSI Weather Channel *Other

Previous

Next

Review

Progress:

FORETELL Survey

6a. *These next two questions refer to your answers in the previous, large block of questions.*

Among your answers to question 6, you indicated that you rely most heavily on a source of information not found within our survey's listings. Please specify any other sources of information.

If you use any other indicators for your weather-related management decisions, which are other than those you specified in question 6, please enter those indicators here.

Previous

Next

Review

Progress:



FORETELL Survey

7. For the each type of information, please indicate whether you use FORETELL as a source of that information, and if you do not, please describe the reason(s) why.

Type of Information	Do you use FORETELL as a source of this information?	If "No", please describe why you do not rely on FORETELL as a source of this information
Wind speed or direction	☐ Yes ☐ No	
Precipitation	☐ Yes ☐ No	
Atmospheric temperature	☐ Yes ☐ No	
Pavement temperature	☐ Yes ☐ No	
Pavement conditions	☐ Yes ☐ No	
Dewpoint	☐ Yes ☐ No	
Other Specify =>		

Previous

Next

FORETELL Survey

8. Do you obtain information from the FORETELL System....

Do you use FORETELL...	Check "Yes" or "No"	Twice Daily 4 Times Daily Every Other Hour At Least Hourly
Daily?	Yes ☐ No ☐	Please Choose an Answer ▼
Weekly?	Yes ☐ No ☐	Not Applicable ▼
In advance of a weather event?	Yes ☐ No ☐	Please Choose an Answer ▼
During a weather event?	Yes ☐ No ☐	Please Choose an Answer ▼
After a weather event?	Yes ☐ No ☐	Please Choose an Answer ▼ Please Choose an Answer Twice daily 4 Times Daily Every Other Hour At Least Hourly Not Applicable

Previous

Next

Review

Progress:



FORETELL Survey

9. Which feature(s) of FORETELL do you like? (Check all that apply)

- ☐ Animation
- ☐ Long-term forecast
- ☐ Scroll labeling
- ☐ Zoom capability
- ☐ Map display
- ☐ Other
- ☐ None of the above

If "Other", please specify:

[Previous](#)

[Next](#)

[* Review *](#)

Progress:



FORETELL Survey

10. Which feature(s) of FORETELL do you dislike?(Check all that apply)

- ☐ Animation
- ☐ Long-term forecast
- ☐ Scroll labeling
- ☐ Zoom capability
- ☐ Map display
- ☐ Other
- ☐ None of the above

If "Other", please specify:

Previous

Next

Review

Progress:



FORETELL Survey

11a. Do you employ the following snow and ice control strategies in your maintenance decisions? If so, please also indicate, on a scale of 1 to 5, the degree to which FORETELL was helpful in making decisions about employing a strategy.

Do you use	Check "Yes" or "No"	FORETELL was Not Helpful(1) - Helpful(5)
Anti-Icing?	Yes ☐ No ☐	Please Answer
De-Icing?	Yes ☐ No ☐	Please Answer
Traction Enhancement (Abrasives)?	Yes ☐ No ☐	Please Answer
Mechanical Removal (Plowing)?	Yes ☐ No ☐	Please Answer

Previous

Next

Review

Progress:



- Please Answer

 - 1 - Not Helpful
 - 2
 - 3 - Neutral
 - 4
 - 5 - Helpful

FORETELL Survey

11b. Do you employ other maintenance activities that can depend on weather information? If so please also indicate, on a scale of 1 to 5, the degree to which FORETELL was helpful in making decisions about each activity you perform.

Do you perform	Check "Yes" or "No"	FORETELL was Not Helpful(1) - Helpful(5)
Normal highway maintenance (non-snow and ice control)?	Yes ☐ No ☐	Please Answer
Between-storm activities (e.g., vehicle maintenance, equipment washing)?	Yes ☐ No ☐	Please Answer
Other maintenance activity?	Specify: 	Please Answer Please Answer 1 - Not Helpful 2 3 - Neutral 4 5 - Helpful

Progress:



FORETELL Survey

12a. Think about the information you obtain using the FORETELL System (e.g. wind speed/direction, precipitation, etc.). Please indicate how strongly you disagree or agree with the following statements. Choose 'Not Applicable' if you do not use FORETELL for a given decision process.

You use the FORETELL System to:	Wind Speed/Direction	Precipitation	Atmospheric Temperature
make weather-related management decisions, such as deciding WHAT road surface treatments should be used.	Please Choose an Answer ▾ Please Choose an Answer Strongly Disagree Disagree Neutral Agree Strongly Agree Not Applicable	Please Choose an Answer ▾	Please Choose an Answer ▾
help determine WHERE to apply road surface treatments during winter conditions.	Please Choose an Answer ▾	Please Choose an Answer ▾	Please Choose an Answer ▾
help determine WHEN to apply road surface treatments during winter conditions.	Please Choose an Answer ▾	Please Choose an Answer ▾	Please Choose an Answer ▾

Previous

Next

FORETELL Survey

12b. Think about the information you obtain using the FORETELL System (e.g. wind speed/direction, precipitation, etc.). Please indicate how strongly you disagree or agree with the following statements. Choose 'Not Applicable' if you do not use FORETELL for a given decision process.

You use the FORETELL System to:	Pavement Temperature	Pavement Conditions	Dewpoint
make weather-related management decisions, such as deciding WHAT road surface treatments should be used.	Please Choose an Answer ▼ Please Choose an Answer ▼ Strongly Disagree Disagree Neutral Agree Strongly Agree Not Applicable	Please Choose an Answer ▼	Please Choose an Answer ▼
help determine WHERE to apply road surface treatments during winter conditions.	Please Choose an Answer ▼	Please Choose an Answer ▼	Please Choose an Answer ▼
help determine WHEN to apply road surface treatments during winter conditions.	Please Choose an Answer ▼	Please Choose an Answer ▼	Please Choose an Answer ▼

Previous

Next

FORETELL Survey

13a. Please indicate how strongly you disagree or agree with the following statements.
Choose 'Not Applicable' if you do not use FORETELL to obtain a given type of information.

The information from the FORETELL System was:	Wind Speed/Direction	Precipitation	Atmospheric Temperature
UNDERSTANDABLE.	Please Choose an Answer	Please Choose an Answer	Please Choose an Answer
USABLE.	Please Choose an Answer	Please Choose an Answer	Please Choose an Answer
EASILY OBTAINABLE.	Please Choose an Answer	Please Choose an Answer	Please Choose an Answer
ACCURATE.	Please Choose an Answer	Please Choose an Answer	Please Choose an Answer
USEFUL in making weather-related management decisions.	Please Choose an Answer	Please Choose an Answer	Please Choose an Answer
14. Information from the FORETELL System changed the weather-related management decisions you made.	Please Choose an Answer	Please Choose an Answer	Please Choose an Answer Please Choose an Answer Strongly Disagree Disagree Neutral Agree Strongly Agree Not Applicable

Progress:



FORETELL Survey

13b. Please indicate how strongly you disagree or agree with the following statements.
Choose 'Not Applicable' if you do not use FORETELL to obtain a given type of information.

The information from the FORETELL System was:	Pavement Temperature	Pavement Conditions	Dewpoint
UNDERSTANDABLE.	Please Choose an Answer	Please Choose an Answer	Please Choose an Answer
USABLE.	Please Choose an Answer	Please Choose an Answer	Please Choose an Answer
EASILY OBTAINABLE.	Please Choose an Answer	Please Choose an Answer	Please Choose an Answer
ACCURATE.	Please Choose an Answer	Please Choose an Answer	Please Choose an Answer
USEFUL in making weather-related management decisions.	Please Choose an Answer	Please Choose an Answer	Please Choose an Answer
14. Information from the FORETELL System changed the weather-related management decisions you made.	Please Choose an Answer	Please Choose an Answer	Please Choose an Answer Please Choose an Answer Strongly Disagree Disagree Neutral Agree Strongly Agree Not Applicable

Progress:



FORETELL Survey

For questions 15 through 18, please indicate how strongly you disagree or agree with the following statements by choosing the appropriate option.

	Strongly Disagree <---> Strongly Agree
15. The FORETELL system provides valuable information that is not available from other sources.	Please choose an answer
16. You receive the information from the FORETELL System in time to incorporate it into weather-related management decisions.	Please choose an answer
17. The information provided by the FORETELL System is sufficient for making weather-related management decisions.	Please choose an answer
18. Your agency would be willing to pay for the benefit of having information from the FORETELL System, assuming it's reasonably priced.	Please choose an answer Please choose an answer Strongly disagree Disagree Neutral Agree Strongly agree

Progress:



For questions 19 through 27, think about your experiences before FORETELL was implemented, compared to your present experience. Please indicate how strongly you disagree or agree with the following statements by choosing the appropriate option.

	Strongly Disagree Strongly Agree <--->
19. Having information from the FORETELL System makes your job easier.	Please choose an answer
20. With the FORETELL System you are better able to improve the traffic efficiency of roadways.	Please choose an answer
21. With the FORETELL System you are better able to target snow and ice control measures.	Please choose an answer
22. Highway maintenance activities are conducted and/or managed more efficiently using information from the FORETELL System.	Please choose an answer
23. You are more confident in making weather-related management decisions when you use information from the FORETELL System.	Please choose an answer
24. You deploy staff more efficiently when using information from the FORETELL System.	Please choose an answer
25. Information from the FORETELL System helps you return the roads to a targeted pavement condition more quickly than without FORETELL information.	Please choose an answer
26. Having information from the FORETELL System increases the safety of the Highway Maintenance Operator.	Please choose an answer
27. Information from the FORETELL System helps to lessen the amount of chemical applications.	Please choose an answer

Previous

Next

FORETELL Survey

Think about your experience before FORETELL was implemented compared to your present experience.

28. Are you able to make highway maintenance decisions more effectively because of information received from the FORETELL System?

☐ Yes

☐ No

Previous

Next

* Review *

Progress:



FORETELL Survey

28a. On average, when using FORETELL, how much sooner do you learn about weather events prior to their occurrence?

☐ 0-3 Hours

☐ 3-6 Hours

☐ 6-12 Hours

☐ > 12 Hours

Previous

Next

* Review *

Progress:



FORETELL Survey

Think about your experience before FORETELL was implemented compared to your present experience.

29. Are roads returned to an acceptable level of service more quickly because of information received from the FORETELL System?

- ☐ Yes
- ☐ No

Previous

Next

Review

Progress:



FORETELL Survey

29a. On average, when using FORETELL, how much more quickly are the roads returned to an acceptable level of service?

- ☐ 0-3 Hours
- ☐ 3-6 Hours
- ☐ 6-12 Hours
- ☐ > 12 Hours

Previous

Next

Review

Progress:



FORETELL Survey

30. Would you like to use information from the FORETELL System in the future?

☐ Yes

☐ No

31. Is there anything you would change about the FORETELL System (for example, how you receive the information or the types of information you receive)? If so, what would it be?

32. Is there anything that would improve your experience with the FORETELL System? If so, what?

33. Is there any weather-related information that would be helpful to you in your job that you currently cannot receive through the FORETELL System? If so, please explain.

34. Please provide us with any other comments.

[Previous](#)

[Next](#)

[*Review*](#)

Progress:



FORETELL Survey

Thank you for your participation.

At this time, you may review your answers by clicking the "Review" button.

If, however, you are satisfied your responses best reflect your opinions and experience, simply click the "Finished" button. Please be aware that after you press the "Finished" button, you will no longer be able to view, modify, or add information (i.e. your account will be closed).

If you would like to end the session now, but review your responses later, simply close your browser. Your responses will be automatically saved. To re-enter the system, use the hyperlink (<http://www.sdas.battelle.org/FORETELL/FORETELL.asp>) and Login ID provided to you via email.

Previous

Review

Finished

Battelle's Interactive System for Internet Surveys (ISIS)

Thank You

for participating in the FORETELL Survey

This completes the survey process. Your responses have been saved. They will be used along with those submitted by this survey's other participants for discovering and reporting aggregate findings.

Click here to

[visit us](#)

on the web.

Or click here to

[Participate](#)

in another survey.

CONFIDENTIALITY: This information collection complies with the Federal Statistical Confidentiality Order. Therefore, by law, your responses may be used only for statistical purposes and may not be disclosed, or used, in identifiable form for any other purpose. Your survey instrument will be treated as confidential.

SUMMARY TABLES

Table A-1. Summary of Responses to Questions from the FORETELL Activity/Weather Log

Activity\Weather Log Section	SAS Variable Name	Description	Response Category	Iowa (N=399)	Missouri (N=190)	All (N=589)
Event Temperatures and Wind Speed	atmhightemp	Atmospheric High Temperature (F)	Mean	28.4	30.9	29.2
			Standard Deviation	11.1	7.0	10.0
			25th Percentile	23.0	27.0	25.0
			Median	30.0	32.0	30.0
			75th Percentile	34.0	35.0	34.0
			No. of Logs	381	185	566
			No. of Missing	18	5	23
	atmlowtemp	Atmospheric Low Temperature (F)	Mean	20.8	20.7	20.8
			Standard Deviation	12.8	9.3	11.7
			25th Percentile	12.0	15.0	13.0
			Median	23.0	22.5	23.0
			75th Percentile	29.0	28.0	29.0
			No. of Logs	352	182	534
			No. of Missing	47	8	55
	pavhightemp	Pavement High Temperature (F)	Mean	31.0	32.5	31.4
			Standard Deviation	11.7	6.8	10.6
			25th Percentile	25.0	30.0	27.0
			Median	31.0	34.0	32.0
			75th Percentile	36.0	36.0	36.0
			No. of Logs	351	136	487
			No. of Missing	48	54	102
	pavlowtemp	Pavement Low Temperature (F)	Mean	22.2	22.4	22.2
			Standard Deviation	12.5	8.6	11.5
			25th Percentile	15.3	17.0	16.0
			Median	25.0	25.0	25.0
			75th Percentile	30.0	30.0	30.0
			No. of Logs	332	141	473
			No. of Missing	67	49	116
Event Temperatures and Wind Speed	eventmaxwind	Maximum Wind Speed (mph)	Mean	18.0	16.5	17.6
			Standard Deviation	9.2	8.7	9.1
			25th Percentile	11.0	10.0	10.0
			Median	17.0	15.0	17.0
			75th Percentile	24.0	22.0	24.0
			No. of Logs	373	117	490
			No. of Missing	24	69	93
			Other Written Response	a	1	1
			No. of Trace	2	3	5

Table A-1. Summary of Responses to Questions from the FORETELL Activity/Weather Log (continued)

Activity\Weather Log Section	SAS Variable Name	Description	Response Category	Iowa (N=399)	Missouri (N=190)	All (N=589)
Event Precipitation	frain	Was there any Freezing Rain During the Weather Event?	Yes	64 (16.0%)	42 (22.1%)	106 (18.0%)
			No	335 (84.0%)	148 (77.9%)	483 (82.0%)
	frainamt	Amount of Freezing Rain (inches)	Mean	0.3	0.4	0.4
			Standard Deviation	0.2	0.3	0.3
			25th Percentile	0.1	0.1	0.1
			Median	0.3	0.3	0.3
			75th Percentile	0.5	0.5	0.5
			No. of Logs	14	17	31
			No. of Calm	19	10	29
			No. of Appropriate Skip	335	148	483
			No. of Missing	31	15	46
	snow	Was there any Snow during the Weather Event?	Yes	285 (71.4%)	163 (85.8%)	448 (76.1%)
			No	114 (28.6%)	27 (14.2%)	141 (23.9%)
	snowwet	Was the Snow Wet?	Yes	115 (40.4%)	81 (49.7%)	196 (43.8%)
			No	170 (59.6%)	82 (50.3%)	252 (56.3%)
			No. of Appropriate Skip	114	27	141
	snowdry	Was the Snow Dry?	Yes	122 (42.8%)	77 (47.2%)	199 (44.4%)
			No	163 (57.2%)	86 (52.8%)	249 (55.6%)
			No. of Appropriate Skip	114	27	141
	snowdrift	Was the Snow Drifting?	Yes	77 (27.0%)	19 (11.7%)	96 (21.4%)
			No	208 (73.0%)	144 (88.3%)	352 (78.6%)
			No. of Appropriate Skip	114	27	141
	snowamt	Amount of Snow (inches)	Mean	2.8	2.6	2.7
			Standard Deviation	2.5	2.3	2.4
			25th Percentile	1.0	1.0	1.0
			Median	2.0	2.0	2.0
			75th Percentile	4.0	3.0	4.0
			No. of Logs	194	117	311
			Other Written Response	a	1	1
			No. of Calm	22	19	41
			No. of Appropriate Skip	114	27	141
			No. of Missing	69	26	95

Table A-1. Summary of Responses to Questions from the FORETELL Activity/Weather Log (continued)

Activity\Weather Log Section	SAS Variable Name	Description	Response Category	Iowa (N=399)	Missouri (N=190)	All (N=589)
Event Precipitation	sleet	Was there any Sleet during the Weather Event?	Yes	37 (9.3%)	28 (14.7%)	65 (11.0%)
			No	362 (90.7%)	162 (85.3%)	524 (89.0%)
	sleetamt	Amount of Sleet (inches)	Mean	0.6	0.7	0.6
			Standard Deviation	0.3	0.6	0.5
			25th Percentile	0.5	0.2	0.5
			Median	0.5	0.5	0.5
			75th Percentile	1.0	1.0	1.0
			No. of Logs	9	8	17
			Other Written Response	1	a	1
			No. of Calm	10	8	18
			No. of Appropriate Skip	362	162	524
			No. of Missing	17	12	29
	rain	Was there any Rain during the Weather Event?	Yes	49 (12.3%)	35 (18.4%)	84 (14.3%)
			No	350 (87.7%)	155 (81.6%)	505 (85.7%)
	rainamt	Amount of Rain (inches)	Mean	0.3	0.7	0.5
			Standard Deviation	0.2	0.8	0.6
			25th Percentile	0.2	0.1	0.1
			Median	0.3	0.3	0.3
			75th Percentile	0.5	1.0	0.5
			No. of Logs	13	18	31
			No. of Calm	1	5	6
			No. of Appropriate Skip	350	155	505
			No. of Missing	35	12	47
	hail	Was there any Hail During the Weather Event?	No	399 (100.0%)	190 (100.0%)	589 (100.0%)
	hailamt	Amount of Hail (inches)	No. of Appropriate Skip	399	190	589
	frost	Was there any Frost During the Weather Event?	Yes	44 (11.0%)	4 (2.1%)	48 (8.1%)
			No	355 (89.0%)	186 (97.9%)	541 (91.9%)
	frostamt	Amount of Frost	Mean	0.5	a	0.5
			Standard Deviation	a	a	a
			25th Percentile	0.5	a	0.5
			Median	0.5	a	0.5
			75th Percentile	0.5	a	0.5
			No. of Logs	1	0	1
			Other Written Response	1	a	1
			No. of Calm	a	1	1
			No. of Appropriate Skip	355	186	541
			No. of Missing	42	3	45

Table A-1. Summary of Responses to Questions from the FORETELL Activity/Weather Log (continued)

Activity\Weather Log Section	SAS Variable Name	Description	Response Category	Iowa (N=399)	Missouri (N=190)	All (N=589)
Information Used During Event	maxwindinfo	Did you Use Maximum Wind Speed/Direction Information During the Event?	Yes	256 (64.2%)	74 (38.9%)	330 (56.0%)
			No	143 (35.8%)	116 (61.1%)	259 (44.0%)
	maxwindforecast	Was the Maximum Wind Speed/Direction Information Forecasted Readings?	Yes	198 (77.3%)	55 (74.3%)	253 (76.7%)
			No	58 (22.7%)	19 (25.7%)	77 (23.3%)
			No. of Appropriate Skip	143	116	259
	maxwindactual	Was the Maximum Wind Speed/Direction Information Actual Readings?	Yes	228 (89.1%)	50 (67.6%)	278 (84.2%)
			No	28 (10.9%)	24 (32.4%)	52 (15.8%)
			No. of Appropriate Skip	143	116	259
	maxwindforetell	Was the Maximum Wind Speed/Direction Information from FORETELL?	Yes	40 (15.6%)	14 (18.9%)	54 (16.4%)
			No	216 (84.4%)	60 (81.1%)	276 (83.6%)
			No. of Appropriate Skip	143	116	259
	maxwindother	Did you Obtain Maximum Wind Speed/Direction Information from Sources Other than FORETELL?	Yes	119 (46.5%)	40 (54.1%)	159 (48.2%)
			No	137 (53.5%)	34 (45.9%)	171 (51.8%)
			No. of Appropriate Skip	143	116	259
	precip	Did you Use Precipitation Information During the Event?	Yes	302 (75.7%)	158 (83.2%)	460 (78.1%)
			No	97 (24.3%)	32 (16.8%)	129 (21.9%)
	precipforecast	Was Precipitation Information Forecasted Readings?	Yes	240 (79.5%)	104 (65.8%)	344 (74.8%)
			No	62 (20.5%)	54 (34.2%)	116 (25.2%)
			No. of Appropriate Skip	97	32	129
	precipactual	Was Precipitation Information Actual Readings?	Yes	275 (91.1%)	131 (82.9%)	406 (88.3%)
			No	27 (8.9%)	27 (17.1%)	54 (11.7%)
			No. of Appropriate Skip	97	32	129
	precipforetell	Did You Obtain Precipitation Information from FORETELL?	Yes	59 (19.5%)	26 (16.5%)	85 (18.5%)
			No	243 (80.5%)	132 (83.5%)	375 (81.5%)
			No. of Appropriate Skip	97	32	129
	precipother	Did You Obtain Precipitation Information from Sources Other than FORETELL?	Yes	151 (50.0%)	94 (59.5%)	245 (53.3%)
			No	151 (50.0%)	64 (40.5%)	215 (46.7%)
			No. of Appropriate Skip	97	32	129
	atmtemp	Did you Use Atmospheric Temperature Information During the Event?	Yes	320 (80.2%)	155 (81.6%)	475 (80.6%)
			No	79 (19.8%)	35 (18.4%)	114 (19.4%)
	atmtempforecast	Was Atmospheric Temperature Information Forecasted Readings?	Yes	247 (77.2%)	97 (62.6%)	344 (72.4%)
			No	73 (22.8%)	58 (37.4%)	131 (27.6%)
			No. of Appropriate Skip	79	35	114
	atmtempactual	Was the Atmospheric Temperature Information Actual Readings?	Yes	285 (89.1%)	134 (86.5%)	419 (88.2%)
			No	35 (10.9%)	21 (13.5%)	56 (11.8%)
			No. of Appropriate Skip	79	35	114

Table A-1. Summary of Responses to Questions from the FORETELL Activity/Weather Log (continued)

Activity\Weather Log Section	SAS Variable Name	Description	Response Category	Iowa (N=399)	Missouri (N=190)	All (N=589)
Information Used During Event	atmtempforetell	Did You Obtain Atmospheric Temperature Information from FORETELL?	Yes	35 (10.9%)	23 (14.8%)	58 (12.2%)
			No	285 (89.1%)	132 (85.2%)	417 (87.8%)
			No. of Appropriate Skip	79	35	114
	atmtempother	Did You Obtain Atmospheric Temperature Information from Sources Other than FORETELL?	Yes	129 (40.3%)	93 (60.0%)	222 (46.7%)
			No	191 (59.7%)	62 (40.0%)	253 (53.3%)
			No. of Appropriate Skip	79	35	114
	pavetemp	Did you Use Pavement Temperature Information During the Event?	Yes	321 (80.5%)	142 (74.7%)	463 (78.6%)
			No	78 (19.5%)	48 (25.3%)	126 (21.4%)
	pavetempforecast	Was the Pavement Temperature Information Forecasted Readings?	Yes	254 (79.1%)	20 (14.1%)	274 (59.2%)
			No	67 (20.9%)	122 (85.9%)	189 (40.8%)
			No. of Appropriate Skip	78	48	126
	pavetempactual	Was the Pavement Temperature Information Actual Readings?	Yes	286 (89.1%)	120 (84.5%)	406 (87.7%)
			No	35 (10.9%)	22 (15.5%)	57 (12.3%)
			No. of Appropriate Skip	78	48	126
	pavetempforetell	Did You Obtain Pavement Temperature Information from FORETELL?	Yes	43 (13.4%)	6 (4.2%)	49 (10.6%)
			No	278 (86.6%)	136 (95.8%)	414 (89.4%)
			No. of Appropriate Skip	78	48	126
	pavetempother	Did You Obtain Pavement Temperature Information from Sources Other than FORETELL?	Yes	134 (41.7%)	46 (32.4%)	180 (38.9%)
			No	187 (58.3%)	96 (67.6%)	283 (61.1%)
			No. of Appropriate Skip	78	48	126
	pavecond	Did you Use Pavement Condition Information During the Event?	Yes	271 (67.9%)	147 (77.4%)	418 (71.0%)
			No	128 (32.1%)	43 (22.6%)	171 (29.0%)
	pavecondforecast	Was the Pavement Condition Information Forecasted Readings?	Yes	171 (63.1%)	38 (25.9%)	209 (50.0%)
			No	100 (36.9%)	109 (74.1%)	209 (50.0%)
			No. of Appropriate Skip	128	43	171
	pavecondactual	Was the Pavement Condition Information Actual Readings?	Yes	245 (90.4%)	128 (87.1%)	373 (89.2%)
			No	26 (9.6%)	19 (12.9%)	45 (10.8%)
			No. of Appropriate Skip	128	43	171
	pavecondforetell	Did You Obtain Pavement Condition Information from FORETELL?	Yes	17 (6.3%)	5 (3.4%)	22 (5.3%)
			No	254 (93.7%)	142 (96.6%)	396 (94.7%)
			No. of Appropriate Skip	128	43	171
	pavecondother	Did You Obtain Pavement Condition Information from Sources Other than FORETELL?	Yes	87 (32.1%)	53 (36.1%)	140 (33.5%)
			No	184 (67.9%)	94 (63.9%)	278 (66.5%)
			No. of Appropriate Skip	128	43	171
	otherinfo	Did you Use Other Information During the Event?	Yes	241 (60.4%)	80 (42.1%)	321 (54.5%)
			No	158 (39.6%)	110 (57.9%)	268 (45.5%)
	otherforecast	Was Other Information from Forecasted Readings?	Yes	104 (43.2%)	5 (6.3%)	109 (34.0%)
			No	137 (56.8%)	75 (93.8%)	212 (66.0%)
			No. of Appropriate Skip	158	110	268

Table A-1. Summary of Responses to Questions from the FORETELL Activity/Weather Log (continued)

Activity\Weather Log Section	SAS Variable Name	Description	Response Category	Iowa (N=399)	Missouri (N=190)	All (N=589)
Information Used During Event	otheractual	Was Other Information from Actual Readings?	Yes	89 (36.9%)	4 (5.0%)	93 (29.0%)
			No	152 (63.1%)	76 (95.0%)	228 (71.0%)
			No. of Appropriate Skip	158	110	268
Information Used During Event	otherforetell	Did You Obtain Other Information from FORETELL?	Yes	12 (5.0%)	0 (0.0%)	12 (3.7%)
			No	229 (95.0%)	80 (100.0%)	309 (96.3%)
			No. of Appropriate Skip	158	110	268
Information Used During Event	otherother	Did you Obtain Other Information from Sources Other than FORETELL?	Yes	47 (19.5%)	4 (5.0%)	51 (15.9%)
			No	194 (80.5%)	76 (95.0%)	270 (84.1%)
			No. of Appropriate Skip	158	110	268
Road Condition During Event	worst	Worst Road Condition Encountered During Event	Bare Pavement	82 (22.1%)	6 (3.3%)	88 (15.9%)
			Patchy snow, ice, or slush	130 (35.0%)	68 (37.4%)	198 (35.8%)
			Slush or loose snow (no packed snow or ice)	69 (18.6%)	43 (23.6%)	112 (20.3%)
			Continuous packed snow or ice; wheel track(s) bare	28 (7.5%)	32 (17.6%)	60 (10.8%)
			Build-up of compacted snow; plowed and treated with abrasives/chemicals	58 (15.6%)	31 (17.0%)	89 (16.1%)
			Build-up of compacted, deep, unplowed snow; ruts in ice pack	3 (0.8%)	0 (0.0%)	3 (0.5%)
			Road closed due to weather conditions	1 (0.3%)	2 (1.1%)	3 (0.5%)
			Missing	28	8	36
Time to Target Condition	worsttime	Duration of Worst Road Condition	Mean	6.2	6.3	6.2
			Standard Deviation	6.3	6.6	6.4
			25th Percentile	2.0	2.0	2.0
			Median	4.0	4.0	4.0
			75th Percentile	8.0	8.0	8.0
			No. of Logs	297	175	472
			No. of Missing	102	15	117

Table A-1. Summary of Responses to Questions from the FORETELL Activity/Weather Log (continued)

Activity\Weather Log Section	SAS Variable Name	Description	Response Category	Iowa (N=399)	Missouri (N=190)	All (N=589)
Road Condition During Event	target	Target Road Condition Following Event	Bare Pavement	309 (90.6%)	165 (93.2%)	474 (91.5%)
			Patchy snow, ice, or slush	22 (6.5%)	11 (6.2%)	33 (6.4%)
			Slush or loose snow (no packed snow or ice)	4 (1.2%)	0 (0.0%)	4 (0.8%)
			Continuous packed snow or ice; wheel track(s) bare	5 (1.5%)	0 (0.0%)	5 (1.0%)
			Build-up of compacted snow; plowed and treated with abrasives/chemicals	1 (0.3%)	1 (0.6%)	2 (0.4%)
			Missing	58	13	71
Time to Target Condition	targettime	Time to Achieve Target Road Condition	Mean	9.1	10.6	9.7
			Standard Deviation	9.7	10.8	10.2
			25th Percentile	3.0	4.0	3.0
			Median	6.0	7.0	6.0
			75th Percentile	12.0	12.0	12.0
			No. of Logs	270	169	439
			No. of Missing	129	21	150

Table A-2. Summary of the Methods of Treatment Used During Weather Events as Reported in the FORETELL Activity/Weather Log

Activity/Weather Log Section	SAS Variable Name	Description	Units	Response Category	Iowa (N=399)	Missouri (N=190)	All (N=589)
Method of Treatment During Event	plowing	Was Plowing Used as a Method of Treatment?	N/A	Yes	100 (25.1%)	45 (23.7%)	145 (24.6%)
				No	299 (74.9%)	145 (76.3%)	444 (75.4%)
Method of Treatment During Event	deicing	Was Deicing Used as a Method of Treatment?	N/A	Yes	259 (64.9%)	158 (83.2%)	417 (70.8%)
				No	140 (35.1%)	32 (16.8%)	172 (29.2%)
	deicingamt	Amount of Deicing Substance Applied	Not Given	Mean	468	175	377
				Standard Deviation	1917	126	1593
				25th Percentile	200	100	150
				Median	200	175	200
				75th Percentile	200	200	200
				No. of Logs	53	24	77
			gals	Mean	131	27	109
				Standard Deviation	418	3	371
				25th Percentile	40	25	28
				Median	50	25	48
				75th Percentile	50	30	50
				No. of Logs	22	6	28
			lbs	Mean	206	163	186
				Standard Deviation	55	63	63
				25th Percentile	200	100	150
				Median	200	200	200
				75th Percentile	250	200	200
				No. of Logs	135	119	254
			tons	Mean	73	a	73
				Standard Deviation	90	a	90
				25th Percentile	12	a	12
				Median	37	a	37
				75th Percentile	100	a	100
				No. of Logs	26	0	26
			yds	Mean	a	50	50
				Standard Deviation	a	a	a
				25th Percentile	a	50	50
				Median	a	50	50
				75th Percentile	a	50	50
				No. of Logs	0	1	1

Table A-2. Summary of the Methods of Treatment Used During Weather Events as Reported in the FORETELL Activity/Weather Log (continued)

Activity/Weather Log Section	SAS Variable Name	Description	Units	Response Category	Iowa (N=399)	Missouri (N=190)	All (N=589)
Method of Treatment During Event	deicingamt	Amount of Deicing Substance Applied	N/A	No. of Appropriate Skip	140	32	172
				No. of Missing	23	8	31
	antiicing	Was Anti-Icing Used as a Method of Treatment?	N/A	Yes	141 (35.3%)	87 (45.8%)	228 (38.7%)
				No	258 (64.7%)	103 (54.2%)	361 (61.3%)
	antiicingamt	Amount of Anti-Icing Substance Applied	Not Given	Mean	2083	173	1379
				Standard Deviation	5226	240	4196
				25th Percentile	108	25	60
				Median	225	100	200
				75th Percentile	1113	200	325
				No. of Logs	12	7	19
			gals	Mean	544	24	342
				Standard Deviation	3141	28	2464
				25th Percentile	40	10	15
				Median	45	25	40
				75th Percentile	50	26	50
				No. of Logs	82	52	134
			lbs	Mean	187	135	170
				Standard Deviation	71	61	72
				25th Percentile	150	90	100
				Median	200	100	200
				75th Percentile	200	200	200
				No. of Logs	38	19	57
			N/A	No. of Appropriate Skip	258	103	361
				No. of Missing	9	9	18
	abrasives	Were Abrasives Used as a Method of Treatment?	N/A	Yes	115 (28.8%)	58 (30.5%)	173 (29.4%)
				No	284 (71.2%)	132 (69.5%)	416 (70.6%)
	abrasiveamt	Amount of Abrasives Applied	Not Given	Mean	183	318	221
				Standard Deviation	87	189	137
				25th Percentile	150	200	150
				Median	200	350	200
				75th Percentile	250	400	250
				No. of Logs	25	10	35

Table A-2. Summary of the Methods of Treatment Used During Weather Events as Reported in the FORETELL Activity/Weather Log (continued)

Activity/Weather Log Section	SAS Variable Name	Description	Units	Response Category	Iowa (N=399)	Missouri (N=190)	All (N=589)
Method of Treatment During Event	abrasiveamt	Amount of Abrasives Applied	gals	Mean	30	a	30
				Standard Deviation	28	a	28
				25th Percentile	10	a	10
				Median	30	a	30
				75th Percentile	50	a	50
				No. of Logs	2	0	2
	abrasiveamt	Amount of Abrasives Applied	lbs	Mean	240	226	234
				Standard Deviation	57	93	74
				25th Percentile	200	200	200
				Median	250	200	200
				75th Percentile	250	250	250
				No. of Logs	59	42	101
			tons	Mean	92	20	88
				Standard Deviation	111	a	109
				25th Percentile	12	20	13
				Median	26	20	26
				75th Percentile	250	20	163
				No. of Logs	15	1	16
			N/A	No. of Missing	14	5	19
				No. of Appropriate Skip	284	132	416
	othertrt	Were Other Methods Used as a Method of Treatment?	N/A	Yes	60 (15.0%)	17 (8.9%)	77 (13.1%)
				No	339 (85.0%)	173 (91.1%)	512 (86.9%)
		Amount of Other Substance Applied	Not Given	Mean	735	200	682
				Standard Deviation	1429	a	1358
				25th Percentile	10	200	10
				Median	150	200	175
				75th Percentile	200	200	200
				No. of Logs	9	1	10
			gals	Mean	203	18	179
				Standard Deviation	511	9	480
				25th Percentile	10	10	10
				Median	40	18	40
				75th Percentile	50	25	45
				No. of Logs	27	4	31

Table A-2. Summary of the Methods of Treatment Used During Weather Events as Reported in the FORETELL Activity/Weather Log (continued)

Activity/Weather Log Section	SAS Variable Name	Description	Units	Response Category	Iowa (N=399)	Missouri (N=190)	All (N=589)
Method of Treatment During Event	otheramt	Amount of Other Substance Applied	lbs	Mean	224	283	231
				Standard Deviation	72	166	81
				25th Percentile	225	165	200
				Median	250	283	250
				75th Percentile	250	400	250
				No. of Logs	16	2	18
			tons	Mean	a	71	71
				Standard Deviation	a	19	19
				25th Percentile	a	62	62
				Median	a	67	67
				75th Percentile	a	87	87
				No. of Logs	0	6	6
			N/A	No. of Appropriate Skip	339	173	512
				No. of Missing	8	4	12
	none	Was There No Method of Treatment?	N/A	Yes	38 (9.5%)	3 (1.6%)	41 (7.0%)
				No	361 (90.5%)	187 (98.4%)	548 (93.0%)

Table A-3. Frequency and Percentage Distribution for Questions from the Highway Maintenance Operator Baseline and Follow-up Surveys, along with Associated P-Values Computed from the Chi-Square Distribution Testing for Effect between Surveys, Respondents from All States.

Question	Question Label	Response	Percentage (Number of Non-Missing Responses)			Baseline vs. First Follow-Up	Baseline vs. Second Follow-Up	First Follow-Up vs. Second Follow-Up
			Baseline (N=66)	First Follow-Up (N=87)	Second Follow-Up (N=47)			
Q6aa	Uses Wind Speed/Direction in Weather-Related Decisions	Yes	100.00% (66)	91.57% (76)	71.43% (30)	N/A ⁴	N/A ⁴	0.0049
		No	0.00% (0)	8.43% (7)	28.57% (12)			
Q6ab	Uses Actual Wind Speed/Direction Readings	No Actual Readings	68.18% (45)	21.05% (16)	20.00% (6)	<.0001	0.0001	0.8960
		Uses Actual Readings	31.82% (21)	78.95% (60)	80.00% (24)			
Q6ac	Uses Forecast Wind Speed/Direction Readings	No Forecast Information	12.12% (8)	17.11% (13)	10.00% (3)	0.3817	0.7395	0.3648
		Uses Forecast Information	87.88% (58)	82.89% (63)	90.00% (27)			
Q6ba	Uses Precipitation in Weather-Related Decisions	Yes	100.00% (66)	97.65% (83)	85.71% (36)	N/A ⁴	N/A ⁴	0.0205
		No	0.00% (0)	2.35% (2)	14.29% (6)			
Q6bb	Uses Actual Precipitation Readings	No Actual Readings	71.21% (47)	21.69% (18)	13.89% (5)	<.0001	<.0001	0.3237
		Uses Actual Readings	28.79% (19)	78.31% (65)	86.11% (31)			
Q6bc	Uses Forecast Precipitation Readings	No Forecast Information	6.06% (4)	15.66% (13)	11.11% (4)	0.0748	0.3682	0.5180
		Uses Forecast Information	93.94% (62)	84.34% (70)	88.89% (32)			
Q6ca	Uses Atmospheric Temperature in Weather-Related Decisions	Yes	95.45% (63)	77.50% (62)	66.67% (28)	0.0055	0.0006	0.1823
		No	4.55% (3)	22.50% (18)	33.33% (14)			

1. "Weather Information" in the Follow-Up Surveys specifically refers to FORETELL.

2. The question was not asked in the Baseline Survey.

3. Questions with more than two response categories were collapsed into positive and non-positive responses for the Chi-Square Test of Effect between surveys. Neutral responses were considered non-positive.

4. Cells with N/A pertain to questions containing zero-frequency response categories. Therefore, the test cannot be performed.

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Table A-3. Frequency and Percentage Distribution for Questions from the Highway Maintenance Operator Baseline and Follow-up Surveys, along with Associated P-Values Computed from the Chi-Square Distribution Testing for Effect between Surveys, Respondents from All States (continued)

Question	Question Label	Response	Percentage (Number of Non-Missing Responses)			Baseline vs. First Follow-Up	Baseline vs. Second Follow-Up	First Follow-Up vs. Second Follow-Up
			Baseline (N=66)	First Follow-Up (N=87)	Second Follow-Up (N=47)			
Q6cb	Uses Actual Atmospheric Temperature Readings	No Actual Readings	79.37% (50)	12.90% (8)	25.00% (7)	<.0001	<.0001	0.1353
		Uses Actual Readings	20.63% (13)	87.10% (54)	75.00% (21)			
Q6cc	Uses Forecast Atmospheric Temperature Readings	No Forecast Information	28.57% (18)	24.19% (15)	10.71% (3)	0.5708	0.0607	0.1219
		Uses Forecast Information	71.43% (45)	75.81% (47)	89.29% (25)			
Q6da	Uses Pavement Temperature in Weather-Related Decisions	Yes	100.00% (66)	97.62% (82)	80.95% (34)	N/A ⁴	N/A ⁴	0.0051
		No	0.00% (0)	2.38% (2)	19.05% (8)			
Q6db	Uses Actual Pavement Temperature Readings	No Actual Readings	96.97% (64)	8.54% (7)	8.82% (3)	<.0001	<.0001	0.9599
		Uses Actual Readings	3.03% (2)	91.46% (75)	91.18% (31)			
Q6dc	Uses Forecast Pavement Temperature Readings	No Forecast Information	45.45% (30)	35.37% (29)	44.12% (15)	0.1789	0.8931	0.3328
		Uses Forecast Information	54.55% (36)	64.63% (53)	55.88% (19)			
Q6ea	Uses Pavement Condition in Weather-Related Decisions	Yes	100.00% (66)	89.29% (75)	76.19% (32)	N/A ⁴	N/A ⁴	0.0599
		No	0.00% (0)	10.71% (9)	23.81% (10)			
Q6eb	Uses Actual Pavement Condition Readings	No Actual Readings	90.91% (60)	12.00% (9)	6.25% (2)	<.0001	<.0001	0.3793
		Uses Actual Readings	9.09% (6)	88.00% (66)	93.75% (30)			

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Table A-3. Frequency and Percentage Distribution for Questions from the Highway Maintenance Operator Baseline and Follow-up Surveys, along with Associated P-Values Computed from the Chi-Square Distribution Testing for Effect between Surveys, Respondents from All States (continued)

Question	Question Label	Response	Percentage (Number of Non-Missing Responses)			Baseline vs. First Follow-Up	Baseline vs. Second Follow-Up	First Follow-Up vs. Second Follow-Up
			Baseline (N=66)	First Follow-Up (N=87)	Second Follow-Up (N=47)			
Q6ec	Uses Forecast Pavement Condition Readings	No Forecast Information	53.03% (35)	49.33% (37)	50.00% (16)	0.6498	0.7850	0.9471
		Uses Forecast Information	46.97% (31)	50.67% (38)	50.00% (16)			
Q6fa	Uses Dewpoint in Weather-Related Decisions	Yes	78.79% (52)	55.56% (45)	52.38% (22)	0.0032	0.0032	0.7319
		No	21.21% (14)	44.44% (36)	47.62% (20)			
Q6fb	Uses Actual Dewpoint Readings	No Actual Readings	38.46% (20)	28.89% (13)	36.36% (8)	0.3510	0.8722	0.5269
		Uses Actual Readings	61.54% (32)	71.11% (32)	63.64% (14)			
Q6fc	Uses Forecast Dewpoint Readings	No Forecast Information	53.85% (28)	22.22% (10)	18.18% (4)	0.0008	0.0035	0.6965
		Uses Forecast Information	46.15% (24)	77.78% (35)	81.82% (18)			
Q7aa	Uses FORETELL to Receive Wind Speed/Direction Readings	Yes	N/A ²	51.95% (40)	50.00% (14)	N/A ²	N/A ²	0.8511
		No	N/A ²	48.05% (37)	50.00% (14)			
Q7ba	Uses FORETELL to Receive Precipitation Readings	Yes	N/A ²	53.25% (41)	47.22% (17)	N/A ²	N/A ²	0.5231
		No	N/A ²	46.75% (36)	52.78% (19)			
Q7ca	Uses FORETELL to Receive Atmospheric Temperature Readings	Yes	N/A ²	46.05% (35)	59.26% (16)	N/A ²	N/A ²	0.2308
		No	N/A ²	53.95% (41)	40.74% (11)			

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Table A-3. Frequency and Percentage Distribution for Questions from the Highway Maintenance Operator Baseline and Follow-up Surveys, along with Associated P-Values Computed from the Chi-Square Distribution Testing for Effect between Surveys, Respondents from All States (continued)

Question	Question Label	Response	Percentage (Number of Non-Missing Responses)			Baseline vs. First Follow-Up	Baseline vs. Second Follow-Up	First Follow-Up vs. Second Follow-Up
			Baseline (N=66)	First Follow-Up (N=87)	Second Follow-Up (N=47)			
Q7da	Uses FORETELL to Receive Pavement Temperature Readings	Yes	N/A ²	42.86% (33)	30.30% (10)	N/A ²	N/A ²	0.2193
		No	N/A ²	57.14% (44)	69.70% (23)			
Q7ea	Uses FORETELL to Receive Pavement Condition Readings	Yes	N/A ²	40.26% (31)	31.25% (10)	N/A ²	N/A ²	0.3740
		No	N/A ²	59.74% (46)	68.75% (22)			
Q8aa	Uses Weather Information ¹ Daily	Yes	98.48% (65)	27.78% (20)	11.76% (4)	<.0001	<.0001	0.0666
		No	1.52% (1)	72.22% (52)	88.24% (30)			
Q8ab	Uses Weather Information ¹ Daily (How Often)	Twice daily	57.89% (33)	73.68% (14)	100.00% (4)	N/A ⁵	N/A ⁵	N/A ⁵
		4 Times Daily	19.30% (11)	21.05% (4)	0.00% (0)			
		Every Other Hour	3.51% (2)	5.26% (1)	0.00% (0)			
		At Least Hourly	19.30% (11)	0.00% (0)	0.00% (0)			
Q8ba	Uses Weather Information ¹ Weekly	Yes	18.75% (12)	47.14% (33)	26.47% (9)	0.0007	0.4000	0.0535
		No	81.25% (52)	52.86% (37)	73.53% (25)			
Q8ca	Uses Weather Information ¹ In Advance of a Weather Event	Yes	86.36% (57)	67.11% (51)	58.33% (21)	0.0077	0.0006	0.3582
		No	13.64% (9)	32.89% (25)	41.67% (15)			
Q8cb	Uses Weather Information ¹ In Advance of a Weather Event (How Often)	Twice daily	34.00% (17)	41.30% (19)	52.63% (10)	N/A ⁵	N/A ⁵	N/A ⁵
		4 Times Daily	16.00% (8)	28.26% (13)	31.58% (6)			
		Every Other Hour	12.00% (6)	13.04% (6)	5.26% (1)			
		At Least Hourly	38.00% (19)	17.39% (8)	10.53% (2)			
Q8da	Uses Weather Information ¹ During a Weather Event	Yes	89.39% (59)	65.33% (49)	58.33% (21)	0.0008	0.0002	0.4510
		No	10.61% (7)	34.67% (26)	41.67% (15)			

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Table A-3. Frequency and Percentage Distribution for Questions from the Highway Maintenance Operator Baseline and Follow-up Surveys, along with Associated P-Values Computed from the Chi-Square Distribution Testing for Effect between Surveys, Respondents from All States (continued)

Question	Question Label	Response	Percentage (Number of Non-Missing Responses)			Baseline vs. First Follow-Up	Baseline vs. Second Follow-Up	First Follow-Up vs. Second Follow-Up
			Baseline (N=66)	First Follow-Up (N=87)	Second Follow-Up (N=47)			
Q8db	Uses Weather Information ¹ During a Weather Event (How Often)	Twice daily	14.81% (8)	20.00% (9)	40.00% (8)	N/A ⁵	N/A ⁵	N/A ⁵
		4 Times Daily	18.52% (10)	37.78% (17)	35.00% (7)			
		Every Other Hour	5.56% (3)	13.33% (6)	5.00% (1)			
		At Least Hourly	61.11% (33)	28.89% (13)	20.00% (4)			
Q8ea	Uses Weather Information ¹ After a Weather Event	Yes	63.64% (42)	34.25% (25)	26.47% (9)	0.0008	0.0006	0.4179
		No	36.36% (24)	65.75% (48)	73.53% (25)			
Q8eb	Uses Weather Information ¹ After a Weather Event (How Often)	Twice daily	52.50% (21)	85.00% (17)	88.89% (8)	N/A ⁵	N/A ⁵	N/A ⁵
		4 Times Daily	32.50% (13)	10.00% (2)	11.11% (1)			
		Every Other Hour	2.50% (1)	5.00% (1)	0.00% (0)			
		At Least Hourly	12.50% (5)	0.00% (0)	0.00% (0)			
Q9_Q10a	FORETELL Features - Animation	Like Most	N/A ²	100.00% (51)	96.30% (26)	N/A ²	N/A ²	N/A ⁴
		Like Least	N/A ²	0.00% (0)	3.70% (1)			
Q9_Q10b	FORETELL Features - Long-Term Forecast	Like Most	N/A ²	82.50% (33)	50.00% (9)	N/A ²	N/A ²	0.0088
		Like Least	N/A ²	17.50% (7)	50.00% (9)			
Q9_Q10c	FORETELL Features - Scroll Labeling	Like Most	N/A ²	87.50% (21)	80.00% (8)	N/A ²	N/A ²	0.4872
		Like Least	N/A ²	12.50% (3)	20.00% (2)			
Q9_Q10d	FORETELL Features - Zoom Capability	Like Most	N/A ²	100.00% (54)	95.83% (23)	N/A ²	N/A ²	N/A ⁴
		Like Least	N/A ²	0.00% (0)	4.17% (1)			
Q9_Q10e	FORETELL Features - Map Display	Like Most	N/A ²	95.83% (46)	84.21% (16)	N/A ²	N/A ²	0.1273
		Like Least	N/A ²	4.17% (2)	15.79% (3)			
Q11aaa	Uses Anti-Icing Strategies in Maintenance Decisions	Yes	84.85% (56)	88.16% (67)	80.00% (28)	0.5673	0.5290	0.2493
		No	15.15% (10)	11.84% (9)	20.00% (7)			

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4. Cells with N/A pertain to questions containing zero-frequency response categories. Therefore, the test cannot be performed.
5. The test was not performed for these questions because the responses could not be collapsed into positive and non-positive categories.

Table A-3. Frequency and Percentage Distribution for Questions from the Highway Maintenance Operator Baseline and Follow-up Surveys, along with Associated P-Values Computed from the Chi-Square Distribution Testing for Effect between Surveys, Respondents from All States (continued)

Question	Question Label	Response	Percentage (Number of Non-Missing Responses)			Baseline vs. First Follow-Up	Baseline vs. Second Follow-Up	First Follow-Up vs. Second Follow-Up
			Baseline (N=66)	First Follow-Up (N=87)	Second Follow-Up (N=47)			
Q11aab	How Helpful is Weather Information ¹ in Employing Anti-Icing Strategies	Not Very Helpful	1.79% (1)	12.90% (8)	28.57% (8)	<.0001	<.0001	0.0094
		Not Helpful	1.79% (1)	3.23% (2)	7.14% (2)			
		Neutral	3.57% (2)	32.26% (20)	39.29% (11)			
		Helpful	23.21% (13)	24.19% (15)	10.71% (3)			
		Very Helpful	69.64% (39)	27.42% (17)	14.29% (4)			
Q11aba	Uses De-Icing Strategies in Maintenance Decisions	Yes	93.94% (62)	84.21% (64)	76.47% (26)	0.0772	0.0150	0.3187
		No	6.06% (4)	15.79% (12)	23.53% (8)			
Q11abb	How Helpful is Weather Information ¹ in Employing De-Icing Strategies	Not Very Helpful	3.23% (2)	10.53% (6)	26.92% (7)	<.0001	<.0001	0.1655
		Not Helpful	1.61% (1)	5.26% (3)	7.69% (2)			
		Neutral	8.06% (5)	38.60% (22)	34.62% (9)			
		Helpful	22.58% (14)	15.79% (9)	7.69% (2)			
		Very Helpful	64.52% (40)	29.82% (17)	23.08% (6)			
Q11aca	Uses Traction Enhancement Strategies in Maintenance Decisions	Yes	87.88% (58)	75.32% (58)	67.65% (23)	0.0372	0.0163	0.3761
		No	12.12% (8)	24.68% (19)	32.35% (11)			
Q11acb	How Helpful is Weather Information ¹ in Employing Traction Enhancement Strategies	Not Very Helpful	1.75% (1)	17.65% (9)	26.09% (6)	<.0001	<.0001	0.3176
		Not Helpful	5.26% (3)	5.88% (3)	8.70% (2)			
		Neutral	12.28% (7)	52.94% (27)	52.17% (12)			
		Helpful	24.56% (14)	7.84% (4)	0.00% (0)			
		Very Helpful	56.14% (32)	15.69% (8)	13.04% (3)			
Q11ada	Uses Mechanical Removal Strategies in Maintenance Decisions	Yes	100.00% (66)	87.01% (67)	80.00% (28)	N/A ⁴	N/A ⁴	0.3363
		No	0.00% (0)	12.99% (10)	20.00% (7)			

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Table A-3. Frequency and Percentage Distribution for Questions from the Highway Maintenance Operator Baseline and Follow-up Surveys, along with Associated P-Values Computed from the Chi-Square Distribution Testing for Effect between Surveys, Respondents from All States (continued)

Question	Question Label	Response	Percentage (Number of Non-Missing Responses)			Baseline vs. First Follow-Up	Baseline vs. Second Follow-Up	First Follow-Up vs. Second Follow-Up
			Baseline (N=66)	First Follow-Up (N=87)	Second Follow-Up (N=47)			
Q11adb	How Helpful is Weather Information ¹ in Employing Mechanical Removal Strategies	Not Very Helpful	3.08% (2)	16.67% (10)	32.14% (9)	0.0005	<.0001	0.0154
		Not Helpful	6.15% (4)	3.33% (2)	10.71% (3)			
		Neutral	16.92% (11)	36.67% (22)	39.29% (11)			
		Helpful	20.00% (13)	16.67% (10)	3.57% (1)			
		Very Helpful	53.85% (35)	26.67% (16)	14.29% (4)			
Q12aaa	Uses Wind Speed/Direction Information ¹ to Decide WHAT Road Surface Treatments to Use	Strongly Disagree	4.55% (3)	2.08% (1)	10.53% (2)	0.0243	0.0310	0.5935
		Disagree	4.55% (3)	4.17% (2)	0.00% (0)			
		Neutral	18.18% (12)	39.58% (19)	42.11% (8)			
		Agree	27.27% (18)	33.33% (16)	42.11% (8)			
		Strongly Agree	45.45% (30)	20.83% (10)	5.26% (1)			
Q12aab	Uses Precipitation Information ¹ to Decide WHAT Road Surface Treatments to Use	Strongly Disagree	0.00% (0)	1.96% (1)	5.00% (1)	0.0006	0.0004	0.4824
		Disagree	0.00% (0)	0.00% (0)	5.00% (1)			
		Neutral	4.55% (3)	29.41% (15)	30.00% (6)			
		Agree	21.21% (14)	49.02% (25)	45.00% (9)			
		Strongly Agree	74.24% (49)	19.61% (10)	15.00% (3)			
Q12aac	Uses Atmospheric Temperature Information ¹ to Decide WHAT Road Surface Treatments to Use	Strongly Disagree	8.06% (5)	2.17% (1)	5.56% (1)	0.9079	0.5618	0.4859
		Disagree	4.84% (3)	4.35% (2)	0.00% (0)			
		Neutral	33.87% (21)	41.30% (19)	33.33% (6)			
		Agree	14.52% (9)	28.26% (13)	55.56% (10)			
		Strongly Agree	38.71% (24)	23.91% (11)	5.56% (1)			
Q12baa	Uses Pavement Temperature Information ¹ to Decide WHAT Road Surface Treatments to Use	Strongly Disagree	1.52% (1)	2.63% (1)	6.67% (1)	0.0006	0.0028	0.6941
		Disagree	0.00% (0)	2.63% (1)	0.00% (0)			
		Neutral	4.55% (3)	28.95% (11)	33.33% (5)			
		Agree	16.67% (11)	44.74% (17)	40.00% (6)			
		Strongly Agree	77.27% (51)	21.05% (8)	20.00% (3)			

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Table A-3. Frequency and Percentage Distribution for Questions from the Highway Maintenance Operator Baseline and Follow-up Surveys, along with Associated P-Values Computed from the Chi-Square Distribution Testing for Effect between Surveys, Respondents from All States (continued)

Question	Question Label	Response	Percentage (Number of Non-Missing Responses)			Baseline vs. First Follow-Up	Baseline vs. Second Follow-Up	First Follow-Up vs. Second Follow-Up
			Baseline (N=66)	First Follow-Up (N=87)	Second Follow-Up (N=47)			
Q12bab	Uses Pavement Condition Information ¹ to Decide WHAT Road Surface Treatments to Use	Strongly Disagree	1.52% (1)	2.78% (1)	7.14% (1)	<.0001	0.0161	0.2706
		Disagree	3.03% (2)	5.56% (2)	7.14% (1)			
		Neutral	6.06% (4)	44.44% (16)	21.43% (3)			
		Agree	24.24% (16)	33.33% (12)	50.00% (7)			
		Strongly Agree	65.15% (43)	13.89% (5)	14.29% (2)			
Q12bac	Uses Dewpoint Information ¹ to Decide WHAT Road Surface Treatments to Use	Strongly Disagree	15.69% (8)	8.57% (3)	6.67% (1)	0.2546	0.0060	0.0561
		Disagree	19.61% (10)	11.43% (4)	6.67% (1)			
		Neutral	41.18% (21)	45.71% (16)	26.67% (4)			
		Agree	11.76% (6)	28.57% (10)	60.00% (9)			
		Strongly Agree	11.76% (6)	5.71% (2)	0.00% (0)			
Q12aba	Uses Wind Speed/Direction Information ¹ to Decide WHERE Road Surface Treatments Should be Applied	Strongly Disagree	4.55% (3)	2.33% (1)	11.11% (2)	0.0404	0.0019	0.1370
		Disagree	6.06% (4)	9.30% (4)	11.11% (2)			
		Neutral	21.21% (14)	39.53% (17)	50.00% (9)			
		Agree	25.76% (17)	32.56% (14)	16.67% (3)			
		Strongly Agree	42.42% (28)	16.28% (7)	11.11% (2)			
Q12abb	Uses Precipitation Information ¹ to Decide WHERE Road Surface Treatments Should be Applied	Strongly Disagree	0.00% (0)	2.27% (1)	5.26% (1)	0.0001	<.0001	0.1538
		Disagree	1.52% (1)	4.55% (2)	10.53% (2)			
		Neutral	10.61% (7)	38.64% (17)	47.37% (9)			
		Agree	13.64% (9)	45.45% (20)	21.05% (4)			
		Strongly Agree	74.24% (49)	9.09% (4)	15.79% (3)			
Q12abc	Uses Atmospheric Temperature Information ¹ to Decide WHERE Road Surface Treatments Should be Applied	Strongly Disagree	4.76% (3)	0.00% (0)	5.88% (1)	0.1643	0.4795	0.7715
		Disagree	14.29% (9)	5.00% (2)	11.76% (2)			
		Neutral	30.16% (19)	57.50% (23)	41.18% (7)			
		Agree	19.05% (12)	25.00% (10)	29.41% (5)			
		Strongly Agree	31.75% (20)	12.50% (5)	11.76% (2)			

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Table A-3. Frequency and Percentage Distribution for Questions from the Highway Maintenance Operator Baseline and Follow-up Surveys, along with Associated P-Values Computed from the Chi-Square Distribution Testing for Effect between Surveys, Respondents from All States (continued)

Question	Question Label	Response	Percentage (Number of Non-Missing Responses)			Baseline vs. First Follow-Up	Baseline vs. Second Follow-Up	First Follow-Up vs. Second Follow-Up
			Baseline (N=66)	First Follow-Up (N=87)	Second Follow-Up (N=47)			
Q12bba	Uses Pavement Temperature Information ¹ to Decide WHERE Road Surface Treatments Should be Applied	Strongly Disagree	1.52% (1)	2.94% (1)	6.67% (1)	<.0001	<.0001	0.5039
		Disagree	0.00% (0)	2.94% (1)	6.67% (1)			
		Neutral	6.06% (4)	50.00% (17)	53.33% (8)			
		Agree	25.76% (17)	35.29% (12)	20.00% (3)			
		Strongly Agree	66.67% (44)	8.82% (3)	13.33% (2)			
Q12bbb	Uses Pavement Condition Information ¹ to Decide WHERE Road Surface Treatments Should be Applied	Strongly Disagree	1.52% (1)	3.03% (1)	7.14% (1)	<.0001	<.0001	0.6548
		Disagree	0.00% (0)	6.06% (2)	28.57% (4)			
		Neutral	7.58% (5)	48.48% (16)	28.57% (4)			
		Agree	16.67% (11)	30.30% (10)	28.57% (4)			
		Strongly Agree	74.24% (49)	12.12% (4)	7.14% (1)			
Q12bbc	Uses Dewpoint Information ¹ to Decide WHERE Road Surface Treatments Should be Applied	Strongly Disagree	19.23% (10)	6.45% (2)	6.25% (1)	0.6875	0.6954	0.9602
		Disagree	23.08% (12)	12.90% (4)	12.50% (2)			
		Neutral	34.62% (18)	61.29% (19)	62.50% (10)			
		Agree	7.69% (4)	12.90% (4)	12.50% (2)			
		Strongly Agree	15.38% (8)	6.45% (2)	6.25% (1)			
Q12aca	Uses Wind Speed/Direction Information ¹ to Decide WHEN Road Surface Treatments Should be Applied	Strongly Disagree	3.03% (2)	0.00% (0)	10.53% (2)	0.0098	0.0260	0.6517
		Disagree	3.03% (2)	10.64% (5)	0.00% (0)			
		Neutral	19.70% (13)	36.17% (17)	42.11% (8)			
		Agree	21.21% (14)	31.91% (15)	36.84% (7)			
		Strongly Agree	53.03% (35)	21.28% (10)	10.53% (2)			
Q12acb	Uses Precipitation Information ¹ to Decide WHEN Road Surface Treatments Should be Applied	Strongly Disagree	0.00% (0)	0.00% (0)	5.00% (1)	<.0001	0.0001	0.7510
		Disagree	0.00% (0)	4.08% (2)	5.00% (1)			
		Neutral	3.08% (2)	36.73% (18)	35.00% (7)			
		Agree	12.31% (8)	32.65% (16)	40.00% (8)			
		Strongly Agree	84.62% (55)	26.53% (13)	15.00% (3)			

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Question	Question Label	Response	Percentage (Number of Non-Missing Responses)			Baseline vs. First Follow-Up	Baseline vs. Second Follow-Up	First Follow-Up vs. Second Follow-Up
			Baseline (N=66)	First Follow-Up (N=87)	Second Follow-Up (N=47)			
Q12acc	Uses Atmospheric Temperature Information ¹ to Decide WHEN Road Surface Treatments Should be Applied	Strongly Disagree	8.20% (5)	0.00% (0)	5.56% (1)	0.0752	0.3698	0.8036
		Disagree	6.56% (4)	4.65% (2)	5.56% (1)			
		Neutral	22.95% (14)	48.84% (21)	38.89% (7)			
		Agree	21.31% (13)	25.58% (11)	38.89% (7)			
		Strongly Agree	40.98% (25)	20.93% (9)	11.11% (2)			
Q12bca	Uses Pavement Temperature Information ¹ to Decide WHEN Road Surface Treatments Should be Applied	Strongly Disagree	1.54% (1)	2.78% (1)	5.88% (1)	0.0013	<.0001	0.2479
		Disagree	0.00% (0)	5.56% (2)	0.00% (0)			
		Neutral	3.08% (2)	22.22% (8)	41.18% (7)			
		Agree	13.85% (9)	47.22% (17)	29.41% (5)			
		Strongly Agree	81.54% (53)	22.22% (8)	23.53% (4)			
Q12bcb	Uses Pavement Condition Information ¹ to Decide WHEN Road Surface Treatments Should be Applied	Strongly Disagree	1.54% (1)	2.70% (1)	6.67% (1)	<.0001	0.0004	0.8257
		Disagree	0.00% (0)	8.11% (3)	6.67% (1)			
		Neutral	4.62% (3)	32.43% (12)	33.33% (5)			
		Agree	21.54% (14)	37.84% (14)	33.33% (5)			
		Strongly Agree	72.31% (47)	18.92% (7)	20.00% (3)			
Q12bcc	Uses Dewpoint Information ¹ to Decide WHEN Road Surface Treatments Should be Applied	Strongly Disagree	21.57% (11)	5.88% (2)	12.50% (2)	0.0879	0.2020	0.9788
		Disagree	19.61% (10)	14.71% (5)	0.00% (0)			
		Neutral	31.37% (16)	35.29% (12)	43.75% (7)			
		Agree	11.76% (6)	32.35% (11)	43.75% (7)			
		Strongly Agree	15.69% (8)	11.76% (4)	0.00% (0)			
Q13aaa	Wind Speed/Direction Information ¹ is Understandable	Strongly Disagree	1.54% (1)	0.00% (0)	0.00% (0)	0.9522	0.3771	0.4232
		Disagree	1.54% (1)	0.00% (0)	4.55% (1)			
		Neutral	7.69% (5)	11.11% (6)	13.64% (3)			
		Agree	35.38% (23)	61.11% (33)	54.55% (12)			
		Strongly Agree	53.85% (35)	27.78% (15)	27.27% (6)			

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Table A-3. Frequency and Percentage Distribution for Questions from the Highway Maintenance Operator Baseline and Follow-up Surveys, along with Associated P-Values Computed from the Chi-Square Distribution Testing for Effect between Surveys, Respondents from All States (continued)

Question	Question Label	Response	Percentage (Number of Non-Missing Responses)			Baseline vs. First Follow-Up	Baseline vs. Second Follow-Up	First Follow-Up vs. Second Follow-Up
			Baseline (N=66)	First Follow-Up (N=87)	Second Follow-Up (N=47)			
Q13aab	Precipitation Information ¹ is Understandable	Strongly Disagree	0.00% (0)	0.00% (0)	4.55% (1)	0.9336	0.3022	0.3064
		Disagree	4.62% (3)	1.82% (1)	4.55% (1)			
		Neutral	12.31% (8)	14.55% (8)	18.18% (4)			
		Agree	24.62% (16)	58.18% (32)	50.00% (11)			
		Strongly Agree	58.46% (38)	25.45% (14)	22.73% (5)			
Q13aac	Atmospheric Temperature Information ¹ is Understandable	Strongly Disagree	3.33% (2)	2.00% (1)	0.00% (0)	0.6128	0.6264	0.4058
		Disagree	5.00% (3)	0.00% (0)	0.00% (0)			
		Neutral	11.67% (7)	22.00% (11)	15.00% (3)			
		Agree	31.67% (19)	56.00% (28)	55.00% (11)			
		Strongly Agree	48.33% (29)	20.00% (10)	30.00% (6)			
Q13baa	Pavement Temperature Information ¹ is Understandable	Strongly Disagree	1.56% (1)	4.08% (2)	5.26% (1)	0.1030	0.0014	0.0385
		Disagree	1.56% (1)	2.04% (1)	15.79% (3)			
		Neutral	10.94% (7)	20.41% (10)	31.58% (6)			
		Agree	28.13% (18)	51.02% (25)	36.84% (7)			
		Strongly Agree	57.81% (37)	22.45% (11)	10.53% (2)			
Q13bab	Pavement Condition Information ¹ is Understandable	Strongly Disagree	0.00% (0)	2.17% (1)	10.53% (2)	0.9569	0.0007	0.0026
		Disagree	4.69% (3)	6.52% (3)	21.05% (4)			
		Neutral	21.88% (14)	17.39% (8)	36.84% (7)			
		Agree	25.00% (16)	56.52% (26)	21.05% (4)			
		Strongly Agree	48.44% (31)	17.39% (8)	10.53% (2)			
Q13bac	Dewpoint Information ¹ is Understandable	Strongly Disagree	18.37% (9)	2.33% (1)	0.00% (0)	0.4517	0.9293	0.6333
		Disagree	8.16% (4)	4.65% (2)	0.00% (0)			
		Neutral	18.37% (9)	30.23% (13)	43.75% (7)			
		Agree	20.41% (10)	48.84% (21)	43.75% (7)			
		Strongly Agree	34.69% (17)	13.95% (6)	12.50% (2)			

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4. Cells with N/A pertain to questions containing zero-frequency response categories. Therefore, the test cannot be performed.
5. The test was not performed for these questions because the responses could not be collapsed into positive and non-positive categories.

Table A-3. Frequency and Percentage Distribution for Questions from the Highway Maintenance Operator Baseline and Follow-up Surveys, along with Associated P-Values Computed from the Chi-Square Distribution Testing for Effect between Surveys, Respondents from All States (continued)

Question	Question Label	Response	Percentage (Number of Non-Missing Responses)			Baseline vs. First Follow-Up	Baseline vs. Second Follow-Up	First Follow-Up vs. Second Follow-Up
			Baseline (N=66)	First Follow-Up (N=87)	Second Follow-Up (N=47)			
Q13aba	Wind Speed/Direction Information ¹ is Usable	Strongly Disagree	4.69% (3)	0.00% (0)	0.00% (0)	0.1278	0.6332	0.1026
		Disagree	1.56% (1)	3.77% (2)	10.00% (2)			
		Neutral	23.44% (15)	13.21% (7)	25.00% (5)			
		Agree	20.31% (13)	60.38% (32)	50.00% (10)			
		Strongly Agree	50.00% (32)	22.64% (12)	15.00% (3)			
Q13abb	Precipitation Information ¹ is Usable	Strongly Disagree	3.13% (2)	0.00% (0)	9.52% (2)	0.9636	0.6348	0.6260
		Disagree	1.56% (1)	5.56% (3)	9.52% (2)			
		Neutral	23.44% (15)	22.22% (12)	14.29% (3)			
		Agree	14.06% (9)	50.00% (27)	47.62% (10)			
		Strongly Agree	57.81% (37)	22.22% (12)	19.05% (4)			
Q13abc	Atmospheric Temperature Information ¹ is Usable	Strongly Disagree	8.20% (5)	2.08% (1)	0.00% (0)	0.8150	0.8562	0.7339
		Disagree	3.28% (2)	2.08% (1)	11.11% (2)			
		Neutral	19.67% (12)	25.00% (12)	22.22% (4)			
		Agree	19.67% (12)	45.83% (22)	55.56% (10)			
		Strongly Agree	49.18% (30)	25.00% (12)	11.11% (2)			
Q13bba	Pavement Temperature Information ¹ is Usable	Strongly Disagree	3.13% (2)	4.17% (2)	5.26% (1)	0.1172	0.0038	0.0596
		Disagree	4.69% (3)	0.00% (0)	26.32% (5)			
		Neutral	15.63% (10)	33.33% (16)	31.58% (6)			
		Agree	17.19% (11)	45.83% (22)	31.58% (6)			
		Strongly Agree	59.38% (38)	16.67% (8)	5.26% (1)			
Q13bbb	Pavement Condition Information ¹ is Usable	Strongly Disagree	3.13% (2)	2.22% (1)	10.53% (2)	0.9034	0.0272	0.0420
		Disagree	6.25% (4)	6.67% (3)	31.58% (6)			
		Neutral	25.00% (16)	26.67% (12)	21.05% (4)			
		Agree	17.19% (11)	51.11% (23)	31.58% (6)			
		Strongly Agree	48.44% (31)	13.33% (6)	5.26% (1)			

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Table A-3. Frequency and Percentage Distribution for Questions from the Highway Maintenance Operator Baseline and Follow-up Surveys, along with Associated P-Values Computed from the Chi-Square Distribution Testing for Effect between Surveys, Respondents from All States (continued)

Question	Question Label	Response	Percentage (Number of Non-Missing Responses)			Baseline vs. First Follow-Up	Baseline vs. Second Follow-Up	First Follow-Up vs. Second Follow-Up
			Baseline (N=66)	First Follow-Up (N=87)	Second Follow-Up (N=47)			
Q13bbc	Dewpoint Information ¹ is Usable	Strongly Disagree	17.65% (9)	4.76% (2)	0.00% (0)	0.1175	0.0691	0.5288
		Disagree	17.65% (9)	2.38% (1)	0.00% (0)			
		Neutral	33.33% (17)	45.24% (19)	42.86% (6)			
		Agree	17.65% (9)	38.10% (16)	50.00% (7)			
		Strongly Agree	13.73% (7)	9.52% (4)	7.14% (1)			
Q13abb	Precipitation Information ¹ is Usable	Strongly Disagree	3.13% (2)	0.00% (0)	9.52% (2)	0.9636	0.6348	0.6260
		Disagree	1.56% (1)	5.56% (3)	9.52% (2)			
		Neutral	23.44% (15)	22.22% (12)	14.29% (3)			
		Agree	14.06% (9)	50.00% (27)	47.62% (10)			
		Strongly Agree	57.81% (37)	22.22% (12)	19.05% (4)			
Q13aca	Wind Speed/Direction Information ¹ is Easily Obtainable	Strongly Disagree	0.00% (0)	3.85% (2)	13.64% (3)	0.1079	0.0142	0.1607
		Disagree	1.52% (1)	19.23% (10)	9.09% (2)			
		Neutral	19.70% (13)	11.54% (6)	27.27% (6)			
		Agree	22.73% (15)	44.23% (23)	31.82% (7)			
		Strongly Agree	56.06% (37)	21.15% (11)	18.18% (4)			
Q13acb	Precipitation Information ¹ is Easily Obtainable	Strongly Disagree	0.00% (0)	3.92% (2)	9.52% (2)	0.0945	0.0114	0.1921
		Disagree	3.03% (2)	17.65% (9)	14.29% (3)			
		Neutral	19.70% (13)	15.69% (8)	28.57% (6)			
		Agree	24.24% (16)	47.06% (24)	28.57% (6)			
		Strongly Agree	53.03% (35)	15.69% (8)	19.05% (4)			
Q13acc	Atmospheric Temperature Information ¹ is Easily Obtainable	Strongly Disagree	1.61% (1)	4.17% (2)	5.88% (1)	0.0976	0.0573	0.4489
		Disagree	3.23% (2)	18.75% (9)	5.88% (1)			
		Neutral	17.74% (11)	14.58% (7)	35.29% (6)			
		Agree	22.58% (14)	37.50% (18)	29.41% (5)			
		Strongly Agree	54.84% (34)	25.00% (12)	23.53% (4)			

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Table A-3. Frequency and Percentage Distribution for Questions from the Highway Maintenance Operator Baseline and Follow-up Surveys, along with Associated P-Values Computed from the Chi-Square Distribution Testing for Effect between Surveys, Respondents from All States (continued)

Question	Question Label	Response	Percentage (Number of Non-Missing Responses)			Baseline vs. First Follow-Up	Baseline vs. Second Follow-Up	First Follow-Up vs. Second Follow-Up
			Baseline (N=66)	First Follow-Up (N=87)	Second Follow-Up (N=47)			
Q13bca	Pavement Temperature Information ¹ is Easily Obtainable	Strongly Disagree	4.55% (3)	2.13% (1)	10.53% (2)	0.0443	0.0139	0.3474
		Disagree	3.03% (2)	14.89% (7)	10.53% (2)			
		Neutral	15.15% (10)	23.40% (11)	31.58% (6)			
		Agree	25.76% (17)	42.55% (20)	36.84% (7)			
		Strongly Agree	51.52% (34)	17.02% (8)	10.53% (2)			
Q13bcb	Pavement Condition Information ¹ is Easily Obtainable	Strongly Disagree	1.52% (1)	2.22% (1)	10.53% (2)	0.2635	0.0215	0.1709
		Disagree	6.06% (4)	17.78% (8)	10.53% (2)			
		Neutral	22.73% (15)	20.00% (9)	36.84% (7)			
		Agree	19.70% (13)	44.44% (20)	26.32% (5)			
		Strongly Agree	50.00% (33)	15.56% (7)	15.79% (3)			
Q13bcc	Dewpoint Information ¹ is Easily Obtainable	Strongly Disagree	13.46% (7)	4.76% (2)	0.00% (0)	0.7458	0.8675	0.9431
		Disagree	11.54% (6)	19.05% (8)	0.00% (0)			
		Neutral	19.23% (10)	23.81% (10)	46.67% (7)			
		Agree	11.54% (6)	35.71% (15)	40.00% (6)			
		Strongly Agree	44.23% (23)	16.67% (7)	13.33% (2)			
Q13ada	Wind Speed/Direction Information ¹ is Accurate	Strongly Disagree	1.54% (1)	0.00% (0)	5.00% (1)	0.9313	0.1253	0.0877
		Disagree	20.00% (13)	19.61% (10)	5.00% (1)			
		Neutral	38.46% (25)	41.18% (21)	30.00% (6)			
		Agree	26.15% (17)	31.37% (16)	55.00% (11)			
		Strongly Agree	13.85% (9)	7.84% (4)	5.00% (1)			
Q13adb	Precipitation Information ¹ is Accurate	Strongly Disagree	6.15% (4)	7.69% (4)	14.29% (3)	0.5042	0.1196	0.2207
		Disagree	16.92% (11)	13.46% (7)	14.29% (3)			
		Neutral	44.62% (29)	40.38% (21)	19.05% (4)			
		Agree	26.15% (17)	26.92% (14)	42.86% (9)			
		Strongly Agree	6.15% (4)	11.54% (6)	9.52% (2)			

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Table A-3. Frequency and Percentage Distribution for Questions from the Highway Maintenance Operator Baseline and Follow-up Surveys, along with Associated P-Values Computed from the Chi-Square Distribution Testing for Effect between Surveys, Respondents from All States (continued)

Question	Question Label	Response	Percentage (Number of Non-Missing Responses)			Baseline vs. First Follow-Up	Baseline vs. Second Follow-Up	First Follow-Up vs. Second Follow-Up
			Baseline (N=66)	First Follow-Up (N=87)	Second Follow-Up (N=47)			
Q13adc	Atmospheric Temperature Information ¹ is Accurate	Strongly Disagree	3.23% (2)	0.00% (0)	5.00% (1)	0.7597	0.1738	0.0946
		Disagree	17.74% (11)	15.22% (7)	10.00% (2)			
		Neutral	37.10% (23)	45.65% (21)	25.00% (5)			
		Agree	27.42% (17)	28.26% (13)	55.00% (11)			
		Strongly Agree	14.52% (9)	10.87% (5)	5.00% (1)			
Q13bda	Pavement Temperature Information ¹ is Accurate	Strongly Disagree	0.00% (0)	4.35% (2)	16.67% (3)	0.0040	0.0512	0.8878
		Disagree	12.31% (8)	13.04% (6)	27.78% (5)			
		Neutral	32.31% (21)	56.52% (26)	27.78% (5)			
		Agree	40.00% (26)	21.74% (10)	27.78% (5)			
		Strongly Agree	15.38% (10)	4.35% (2)	0.00% (0)			
Q13bdb	Pavement Condition Information ¹ is Accurate	Strongly Disagree	3.08% (2)	4.55% (2)	21.05% (4)	0.1066	0.5081	0.5723
		Disagree	18.46% (12)	15.91% (7)	31.58% (6)			
		Neutral	38.46% (25)	54.55% (24)	15.79% (3)			
		Agree	24.62% (16)	20.45% (9)	26.32% (5)			
		Strongly Agree	15.38% (10)	4.55% (2)	5.26% (1)			
Q13bdc	Dewpoint Information ¹ is Accurate	Strongly Disagree	7.84% (4)	7.50% (3)	0.00% (0)	0.7923	0.0441	0.0186
		Disagree	31.37% (16)	17.50% (7)	14.29% (2)			
		Neutral	33.33% (17)	50.00% (20)	28.57% (4)			
		Agree	23.53% (12)	22.50% (9)	57.14% (8)			
		Strongly Agree	3.92% (2)	2.50% (1)	0.00% (0)			
Q13aea	Wind Speed/Direction Information ¹ is Useful for Weather-Related Decisions	Strongly Disagree	0.00% (0)	1.96% (1)	0.00% (0)	0.0953	0.0913	0.7260
		Disagree	3.03% (2)	3.92% (2)	5.26% (1)			
		Neutral	19.70% (13)	31.37% (16)	36.84% (7)			
		Agree	33.33% (22)	50.98% (26)	42.11% (8)			
		Strongly Agree	43.94% (29)	11.76% (6)	15.79% (3)			

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Table A-3. Frequency and Percentage Distribution for Questions from the Highway Maintenance Operator Baseline and Follow-up Surveys, along with Associated P-Values Computed from the Chi-Square Distribution Testing for Effect between Surveys, Respondents from All States (continued)

Question	Question Label	Response	Percentage (Number of Non-Missing Responses)			Baseline vs. First Follow-Up	Baseline vs. Second Follow-Up	First Follow-Up vs. Second Follow-Up
			Baseline (N=66)	First Follow-Up (N=87)	Second Follow-Up (N=47)			
Q13aeb	Precipitation Information ¹ is Useful for Weather-Related Decisions	Strongly Disagree	0.00% (0)	5.88% (3)	5.26% (1)	0.0210	0.0216	0.7070
		Disagree	1.52% (1)	5.88% (3)	10.53% (2)			
		Neutral	16.67% (11)	25.49% (13)	26.32% (5)			
		Agree	28.79% (19)	47.06% (24)	36.84% (7)			
		Strongly Agree	53.03% (35)	15.69% (8)	21.05% (4)			
Q13aec	Atmospheric Temperature Information ¹ is Useful for Weather-Related Decisions	Strongly Disagree	0.00% (0)	4.35% (2)	0.00% (0)	0.1770	0.4890	0.7785
		Disagree	4.76% (3)	4.35% (2)	11.76% (2)			
		Neutral	22.22% (14)	30.43% (14)	23.53% (4)			
		Agree	22.22% (14)	50.00% (23)	41.18% (7)			
		Strongly Agree	50.79% (32)	10.87% (5)	23.53% (4)			
Q13bea	Pavement Temperature Information ¹ is Useful for Weather-Related Decisions	Strongly Disagree	0.00% (0)	4.65% (2)	17.65% (3)	0.0004	0.0006	0.5823
		Disagree	3.08% (2)	6.98% (3)	11.76% (2)			
		Neutral	13.85% (9)	39.53% (17)	29.41% (5)			
		Agree	24.62% (16)	37.21% (16)	29.41% (5)			
		Strongly Agree	58.46% (38)	11.63% (5)	11.76% (2)			
Q13beb	Pavement Condition Information ¹ is Useful for Weather-Related Decisions	Strongly Disagree	1.52% (1)	4.88% (2)	16.67% (3)	0.0098	0.0095	0.5811
		Disagree	4.55% (3)	14.63% (6)	22.22% (4)			
		Neutral	21.21% (14)	34.15% (14)	22.22% (4)			
		Agree	25.76% (17)	41.46% (17)	22.22% (4)			
		Strongly Agree	46.97% (31)	4.88% (2)	16.67% (3)			
Q13bec	Dewpoint Information ¹ is Useful for Weather-Related Decisions	Strongly Disagree	13.46% (7)	7.69% (3)	0.00% (0)	0.1931	0.1599	0.0214
		Disagree	17.31% (9)	15.38% (6)	0.00% (0)			
		Neutral	25.00% (13)	46.15% (18)	35.71% (5)			
		Agree	25.00% (13)	28.21% (11)	57.14% (8)			
		Strongly Agree	19.23% (10)	2.56% (1)	7.14% (1)			

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Table A-3. Frequency and Percentage Distribution for Questions from the Highway Maintenance Operator Baseline and Follow-up Surveys, along with Associated P-Values Computed from the Chi-Square Distribution Testing for Effect between Surveys, Respondents from All States (continued)

Question	Question Label	Response	Percentage (Number of Non-Missing Responses)			Baseline vs. First Follow-Up	Baseline vs. Second Follow-Up	First Follow-Up vs. Second Follow-Up
			Baseline (N=66)	First Follow-Up (N=87)	Second Follow-Up (N=47)			
Q14afa	FORETELL Wind Speed/Direction Information Changed Weather-Related Decisions You Made	Strongly Disagree	N/A ²	7.14% (3)	15.00% (3)	N/A ²	N/A ²	0.2401
		Disagree	N/A ²	16.67% (7)	25.00% (5)			
		Neutral	N/A ²	42.86% (18)	40.00% (8)			
		Agree	N/A ²	26.19% (11)	15.00% (3)			
		Strongly Agree	N/A ²	7.14% (3)	5.00% (1)			
Q14afb	FORETELL Precipitation Information Changed Weather-Related Decisions You Made	Strongly Disagree	N/A ²	6.67% (3)	14.29% (3)	N/A ²	N/A ²	0.1648
		Disagree	N/A ²	17.78% (8)	23.81% (5)			
		Neutral	N/A ²	40.00% (18)	42.86% (9)			
		Agree	N/A ²	31.11% (14)	9.52% (2)			
		Strongly Agree	N/A ²	4.44% (2)	9.52% (2)			
Q14afc	FORETELL Atmospheric Temperature Information Changed Weather-Related Decisions You Made	Strongly Disagree	N/A ²	7.50% (3)	16.67% (3)	N/A ²	N/A ²	0.4923
		Disagree	N/A ²	12.50% (5)	22.22% (4)			
		Neutral	N/A ²	50.00% (20)	38.89% (7)			
		Agree	N/A ²	20.00% (8)	16.67% (3)			
		Strongly Agree	N/A ²	10.00% (4)	5.56% (1)			
Q14bfa	FORETELL Pavement Temperature Information Changed Weather-Related Decisions You Made	Strongly Disagree	N/A ²	8.33% (3)	17.65% (3)	N/A ²	N/A ²	0.5849
		Disagree	N/A ²	22.22% (8)	47.06% (8)			
		Neutral	N/A ²	38.89% (14)	11.76% (2)			
		Agree	N/A ²	30.56% (11)	17.65% (3)			
		Strongly Agree	N/A ²	0.00% (0)	5.88% (1)			
Q14bfb	FORETELL Pavement Condition Information Changed Weather-Related Decisions You Made	Strongly Disagree	N/A ²	5.71% (2)	23.53% (4)	N/A ²	N/A ²	0.8618
		Disagree	N/A ²	25.71% (9)	41.18% (7)			
		Neutral	N/A ²	42.86% (15)	11.76% (2)			
		Agree	N/A ²	25.71% (9)	17.65% (3)			
		Strongly Agree	N/A ²	0.00% (0)	5.88% (1)			

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Table A-3. Frequency and Percentage Distribution for Questions from the Highway Maintenance Operator Baseline and Follow-up Surveys, along with Associated P-Values Computed from the Chi-Square Distribution Testing for Effect between Surveys, Respondents from All States (continued)

Question	Question Label	Response	Percentage (Number of Non-Missing Responses)			Baseline vs. First Follow-Up	Baseline vs. Second Follow-Up	First Follow-Up vs. Second Follow-Up
			Baseline (N=66)	First Follow-Up (N=87)	Second Follow-Up (N=47)			
Q14bfc	FORETELL Dewpoint Information Changed Weather-Related Decisions You Made	Strongly Disagree	N/A ²	11.76% (4)	14.29% (2)	N/A ²	N/A ²	0.0912
		Disagree	N/A ²	14.71% (5)	21.43% (3)			
		Neutral	N/A ²	64.71% (22)	35.71% (5)			
		Agree	N/A ²	8.82% (3)	21.43% (3)			
		Strongly Agree	N/A ²	0.00% (0)	7.14% (1)			
Q15	FORETELL Provides Valuable Information Not Provided Elsewhere	Strongly Disagree	N/A ²	17.65% (12)	22.58% (7)	N/A ²	N/A ²	0.3365
		Disagree	N/A ²	16.18% (11)	29.03% (9)			
		Neutral	N/A ²	27.94% (19)	19.35% (6)			
		Agree	N/A ²	30.88% (21)	22.58% (7)			
		Strongly Agree	N/A ²	7.35% (5)	6.45% (2)			
Q16	Receive FORETELL Information in Time to Make Weather-Related Decisions	Strongly Disagree	N/A ²	10.14% (7)	12.90% (4)	N/A ²	N/A ²	0.8945
		Disagree	N/A ²	13.04% (9)	16.13% (5)			
		Neutral	N/A ²	36.23% (25)	29.03% (9)			
		Agree	N/A ²	40.58% (28)	38.71% (12)			
		Strongly Agree	N/A ²	0.00% (0)	3.23% (1)			
Q17	Weather Information ¹ is Sufficient for Making Weather-Related Decisions	Strongly Disagree	0.00% (0)	7.25% (5)	16.13% (5)	0.0689	0.1823	0.9422
		Disagree	16.67% (11)	24.64% (17)	16.13% (5)			
		Neutral	33.33% (22)	33.33% (23)	32.26% (10)			
		Agree	37.88% (25)	31.88% (22)	32.26% (10)			
		Strongly Agree	12.12% (8)	2.90% (2)	3.23% (1)			
Q18	Willing to Pay for FORETELL	Strongly Disagree	N/A ²	12.12% (8)	26.67% (8)	N/A ²	N/A ²	0.9708
		Disagree	N/A ²	15.15% (10)	13.33% (4)			
		Neutral	N/A ²	53.03% (35)	40.00% (12)			
		Agree	N/A ²	18.18% (12)	13.33% (4)			
		Strongly Agree	N/A ²	1.52% (1)	6.67% (2)			

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Table A-3. Frequency and Percentage Distribution for Questions from the Highway Maintenance Operator Baseline and Follow-up Surveys, along with Associated P-Values Computed from the Chi-Square Distribution Testing for Effect between Surveys, Respondents from All States (continued)

Question	Question Label	Response	Percentage (Number of Non-Missing Responses)			Baseline vs. First Follow-Up	Baseline vs. Second Follow-Up	First Follow-Up vs. Second Follow-Up
			Baseline (N=66)	First Follow-Up (N=87)	Second Follow-Up (N=47)			
Q19	Having Weather Information ¹ Makes Job Easier	Strongly Disagree	0.00% (0)	10.14% (7)	16.13% (5)	<.0001	<.0001	0.4044
		Disagree	3.08% (2)	8.70% (6)	16.13% (5)			
		Neutral	6.15% (4)	43.48% (30)	38.71% (12)			
		Agree	18.46% (12)	33.33% (23)	25.81% (8)			
		Strongly Agree	72.31% (47)	4.35% (3)	3.23% (1)			
Q20	Weather Information ¹ Helps You Improve Traffic Efficiency of Roadways	Strongly Disagree	0.00% (0)	10.14% (7)	16.13% (5)	<.0001	<.0001	0.6884
		Disagree	1.52% (1)	7.25% (5)	3.23% (1)			
		Neutral	22.73% (15)	56.52% (39)	58.06% (18)			
		Agree	40.91% (27)	26.09% (18)	19.35% (6)			
		Strongly Agree	34.85% (23)	0.00% (0)	3.23% (1)			
Q21	Weather Information ¹ Helps You to Target Snow and Ice Control Measures	Strongly Disagree	1.52% (1)	10.14% (7)	9.68% (3)	<.0001	<.0001	0.6440
		Disagree	3.03% (2)	11.59% (8)	16.13% (5)			
		Neutral	13.64% (9)	44.93% (31)	45.16% (14)			
		Agree	42.42% (28)	30.43% (21)	25.81% (8)			
		Strongly Agree	39.39% (26)	2.90% (2)	3.23% (1)			
Q22	Highway Maintenance Activities are Conducted More Efficiently Using Weather Information ¹	Strongly Disagree	0.00% (0)	10.29% (7)	9.68% (3)	<.0001	<.0001	0.7916
		Disagree	0.00% (0)	14.71% (10)	29.03% (9)			
		Neutral	7.58% (5)	51.47% (35)	35.48% (11)			
		Agree	33.33% (22)	23.53% (16)	22.58% (7)			
		Strongly Agree	59.09% (39)	0.00% (0)	3.23% (1)			
Q23	FORETELL Information Makes You More Confident in Making Weather-Related Decisions	Strongly Disagree	N/A ²	10.14% (7)	12.90% (4)	N/A ²	N/A ²	0.5997
		Disagree	N/A ²	14.49% (10)	22.58% (7)			
		Neutral	N/A ²	50.72% (35)	35.48% (11)			
		Agree	N/A ²	21.74% (15)	22.58% (7)			
		Strongly Agree	N/A ²	2.90% (2)	6.45% (2)			

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Table A-3. Frequency and Percentage Distribution for Questions from the Highway Maintenance Operator Baseline and Follow-up Surveys, along with Associated P-Values Computed from the Chi-Square Distribution Testing for Effect between Surveys, Respondents from All States (continued)

Question	Question Label	Response	Percentage (Number of Non-Missing Responses)			Baseline vs. First Follow-Up	Baseline vs. Second Follow-Up	First Follow-Up vs. Second Follow-Up
			Baseline (N=66)	First Follow-Up (N=87)	Second Follow-Up (N=47)			
Q24	FORETELL Information Helps You Deploy Staff More Efficiently	Strongly Disagree	N/A ²	11.59% (8)	9.68% (3)	N/A ²	N/A ²	0.6507
		Disagree	N/A ²	15.94% (11)	22.58% (7)			
		Neutral	N/A ²	53.62% (37)	45.16% (14)			
		Agree	N/A ²	17.39% (12)	16.13% (5)			
		Strongly Agree	N/A ²	1.45% (1)	6.45% (2)			
Q25	Roads Return to Targeted Level of Service More Quickly with Weather Information ¹	Strongly Disagree	0.00% (0)	11.76% (8)	9.68% (3)	<.0001	<.0001	0.7536
		Disagree	3.03% (2)	16.18% (11)	25.81% (8)			
		Neutral	31.82% (21)	50.00% (34)	45.16% (14)			
		Agree	25.76% (17)	20.59% (14)	16.13% (5)			
		Strongly Agree	39.39% (26)	1.47% (1)	3.23% (1)			
Q26	Safety of the Highway Maintenance Operator is Increased with Weather Information ¹	Strongly Disagree	1.52% (1)	10.29% (7)	16.13% (5)	<.0001	<.0001	0.5229
		Disagree	6.06% (4)	16.18% (11)	12.90% (4)			
		Neutral	12.12% (8)	48.53% (33)	51.61% (16)			
		Agree	27.27% (18)	22.06% (15)	16.13% (5)			
		Strongly Agree	53.03% (35)	2.94% (2)	3.23% (1)			
Q27	Weather Information ¹ Helps to Lessen the Amount of Chemical Applications	Strongly Disagree	1.52% (1)	10.29% (7)	16.13% (5)	<.0001	<.0001	0.2113
		Disagree	4.55% (3)	22.06% (15)	12.90% (4)			
		Neutral	22.73% (15)	51.47% (35)	45.16% (14)			
		Agree	31.82% (21)	13.24% (9)	22.58% (7)			
		Strongly Agree	39.39% (26)	2.94% (2)	3.23% (1)			
Q28	Make Highway Maintenance Decisions More Efficiently because of FORETELL Information	Yes	N/A ²	54.55% (36)	38.71% (12)	N/A ²	N/A ²	0.1238
		No	N/A ²	45.45% (30)	61.29% (19)			

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Table A-3. Frequency and Percentage Distribution for Questions from the Highway Maintenance Operator Baseline and Follow-up Surveys, along with Associated P-Values Computed from the Chi-Square Distribution Testing for Effect between Surveys, Respondents from All States (continued)

Question	Question Label	Response	Percentage (Number of Non-Missing Responses)			Baseline vs. First Follow-Up	Baseline vs. Second Follow-Up	First Follow-Up vs. Second Follow-Up
			Baseline (N=66)	First Follow-Up (N=87)	Second Follow-Up (N=47)			
Q28a	How Much Sooner Do You Learn about Weather Events when Using FORETELL Information	0-3 Hours	N/A ²	17.65% (6)	50.00% (6)	N/A ²	N/A ²	N/A ⁵
		3-6 Hours	N/A ²	38.24% (13)	8.33% (1)			
		6-12 Hours	N/A ²	38.24% (13)	25.00% (3)			
		> 12 Hours	N/A ²	5.88% (2)	16.67% (2)			
Q29	Roads are More Quickly Returned to Acceptable Level of Service when Using FORETELL Information	Yes	N/A ²	33.33% (22)	22.58% (7)	N/A ²	N/A ²	0.2782
		No	N/A ²	66.67% (44)	77.42% (24)			
Q29a	How Much More Quickly are Roads Returned to Service when Using FORETELL Information	0-3 Hours	N/A ²	47.62% (10)	71.43% (5)	N/A ²	N/A ²	N/A ⁵
		3-6 Hours	N/A ²	47.62% (10)	14.29% (1)			
		6-12 Hours	N/A ²	4.76% (1)	14.29% (1)			
Q30	Would Like to Use FORETELL Information in the Future	Yes	N/A ²	88.06% (59)	53.33% (16)	N/A ²	N/A ²	<.0001
		No	N/A ²	11.94% (8)	46.67% (14)			

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Table A-4. Frequency and Percentage Distribution for Questions from the Highway Maintenance Operator Baseline and Follow-up Surveys, along with Associated P-Values Computed from the Chi-Square Distribution Testing for Effect between Surveys, Iowa Respondents Only

Question	Question Label	Response	Percentage (Number of Non-Missing Responses)			Baseline vs. First Follow-Up	Baseline vs. Second Follow-Up	First Follow-Up vs. Second Follow-Up
			Baseline (N=30)	First Follow-Up (N=51)	Second Follow-Up (N=11)			
Q6aa	Uses Wind Speed/Direction in Weather-Related Decisions	Yes	100.00% (30)	96.08% (49)	100.00% (11)	N/A ⁴	N/A ⁴	N/A ⁴
		No	0.00% (0)	3.92% (2)	0.00% (0)			
Q6ab	Uses Actual Wind Speed/Direction Readings	No Actual Readings	83.33% (25)	6.12% (3)	9.09% (1)	<.0001	0.0008	0.7219
		Uses Actual Readings	16.67% (5)	93.88% (46)	90.91% (10)			
Q6ac	Uses Forecast Wind Speed/Direction Readings	No Forecast Information	0.00% (0)	20.41% (10)	0.00% (0)	N/A ⁴	N/A ⁴	N/A ⁴
		Uses Forecast Information	100.00% (30)	79.59% (39)	100.00% (11)			
Q6ba	Uses Precipitation in Weather-Related Decisions	Yes	100.00% (30)	98.04% (50)	100.00% (11)	N/A ⁴	N/A ⁴	N/A ⁴
		No	0.00% (0)	1.96% (1)	0.00% (0)			
Q6bb	Uses Actual Precipitation Readings	No Actual Readings	93.33% (28)	20.00% (10)	18.18% (2)	<.0001	0.0001	0.8891
		Uses Actual Readings	6.67% (2)	80.00% (40)	81.82% (9)			
Q6bc	Uses Forecast Precipitation Readings	No Forecast Information	10.00% (3)	18.00% (9)	0.00% (0)	0.3345	N/A ⁴	N/A ⁴
		Uses Forecast Information	90.00% (27)	82.00% (41)	100.00% (11)			

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Question	Question Label	Response	Percentage (Number of Non-Missing Responses)			Baseline vs. First Follow-Up	Baseline vs. Second Follow-Up	First Follow-Up vs. Second Follow-Up
			Baseline (N=30)	First Follow-Up (N=51)	Second Follow-Up (N=11)			
Q6ca	Uses Atmospheric Temperature in Weather-Related Decisions	Yes	96.67% (29)	76.00% (38)	81.82% (9)	0.0369	0.1435	0.6791
		No	3.33% (1)	24.00% (12)	18.18% (2)			
Q6cb	Uses Actual Atmospheric Temperature Readings	No Actual Readings	79.31% (23)	10.53% (4)	11.11% (1)	<.0001	0.0034	0.9589
		Uses Actual Readings	20.69% (6)	89.47% (34)	88.89% (8)			
Q6cc	Uses Forecast Atmospheric Temperature Readings	No Forecast Information	24.14% (7)	21.05% (8)	11.11% (1)	0.7513	0.4172	0.4994
		Uses Forecast Information	75.86% (22)	78.95% (30)	88.89% (8)			
Q6da	Uses Pavement Temperature in Weather-Related Decisions	Yes	100.00% (30)	98.04% (50)	100.00% (11)	N/A ⁴	N/A ⁴	N/A ⁴
		No	0.00% (0)	1.96% (1)	0.00% (0)			
Q6db	Uses Actual Pavement Temperature Readings	No Actual Readings	96.67% (29)	8.00% (4)	0.00% (0)	<.0001	N/A ⁴	N/A ⁴
		Uses Actual Readings	3.33% (1)	92.00% (46)	100.00% (11)			
Q6dc	Uses Forecast Pavement Temperature Readings	No Forecast Information	16.67% (5)	22.00% (11)	18.18% (2)	0.5735	0.9131	0.7764
		Uses Forecast Information	83.33% (25)	78.00% (39)	81.82% (9)			
Q6ea	Uses Pavement Condition in Weather-Related Decisions	Yes	100.00% (30)	88.24% (45)	90.91% (10)	N/A ⁴	N/A ⁴	0.8015
		No	0.00% (0)	11.76% (6)	9.09% (1)			

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			Baseline (N=30)	First Follow-Up (N=51)	Second Follow-Up (N=11)	P-value ³		
Q6eb	Uses Actual Pavement Condition Readings	No Actual Readings	93.33% (28)	8.89% (4)	0.00% (0)	<.0001	N/A ⁴	N/A ⁴
		Uses Actual Readings	6.67% (2)	91.11% (41)	100.00% (10)			
Q6ec	Uses Forecast Pavement Condition Readings	No Forecast Information	36.67% (11)	40.00% (18)	40.00% (4)	0.7760	0.8608	1.0000
		Uses Forecast Information	63.33% (19)	60.00% (27)	60.00% (6)			
Q6fa	Uses Dewpoint in Weather-Related Decisions	Yes	80.00% (24)	58.00% (29)	63.64% (7)	0.0620	0.2851	0.7293
		No	20.00% (6)	42.00% (21)	36.36% (4)			
Q6fb	Uses Actual Dewpoint Readings	No Actual Readings	62.50% (15)	20.69% (6)	14.29% (1)	0.0036	0.0677	0.7011
		Uses Actual Readings	37.50% (9)	79.31% (23)	85.71% (6)			
Q6fc	Uses Forecast Dewpoint Readings	No Forecast Information	54.17% (13)	24.14% (7)	14.29% (1)	0.0258	0.0894	0.5764
		Uses Forecast Information	45.83% (11)	75.86% (22)	85.71% (6)			
Q7aa	Uses FORETELL to Receive Wind Speed/Direction Readings	Yes	N/A ²	60.00% (27)	45.45% (5)	N/A ²	N/A ²	0.3643
		No	N/A ²	40.00% (18)	54.55% (6)			
Q7ba	Uses FORETELL to Receive Precipitation Readings	Yes	N/A ²	57.78% (26)	45.45% (5)	N/A ²	N/A ²	0.4453
		No	N/A ²	42.22% (19)	54.55% (6)			

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			Baseline (N=30)	First Follow-Up (N=51)	Second Follow-Up (N=11)	P-value ³		
Q7ca	Uses FORETELL to Receive Atmospheric Temperature Readings	Yes	N/A ²	50.00% (22)	55.56% (5)	N/A ²	N/A ²	0.7707
		No	N/A ²	50.00% (22)	44.44% (4)			
Q7da	Uses FORETELL to Receive Pavement Temperature Readings	Yes	N/A ²	48.89% (22)	27.27% (3)	N/A ²	N/A ²	0.2151
		No	N/A ²	51.11% (23)	72.73% (8)			
Q7ea	Uses FORETELL to Receive Pavement Condition Readings	Yes	N/A ²	46.67% (21)	30.00% (3)	N/A ²	N/A ²	0.3545
		No	N/A ²	53.33% (24)	70.00% (7)			
Q8aa	Uses Weather Information ¹ Daily	Yes	100.00% (30)	30.23% (13)	9.09% (1)	N/A ⁴	N/A ⁴	0.1541
		No	0.00% (0)	69.77% (30)	90.91% (10)			
Q8ab	Uses Weather Information ¹ Daily (How Often)	Twice daily	53.33% (16)	66.67% (8)	100.00% (1)	N/A ⁵	N/A ⁵	N/A ⁵
		4 Times Daily	26.67% (8)	25.00% (3)	0.00% (0)			
		Every Other Hour	0.00% (0)	8.33% (1)	0.00% (0)			
		At Least Hourly	20.00% (6)	0.00% (0)	0.00% (0)			
Q8ba	Uses Weather Information ¹ Weekly	Yes	17.86% (5)	50.00% (21)	27.27% (3)	0.0075	0.5205	0.2044
		No	82.14% (23)	50.00% (21)	72.73% (8)			
Q8ca	Uses Weather Information ¹ In Advance of a Weather Event	Yes	83.33% (25)	72.09% (31)	54.55% (6)	0.2345	0.0302	0.2717
		No	16.67% (5)	27.91% (12)	45.45% (5)			
Q8cb	Uses Weather Information ¹ In Advance of a Weather Event (How Often)	Twice daily	16.67% (4)	45.16% (14)	50.00% (3)	N/A ⁵	N/A ⁵	N/A ⁵
		4 Times Daily	29.17% (7)	29.03% (9)	33.33% (2)			
		Every Other Hour	20.83% (5)	9.68% (3)	16.67% (1)			
		At Least Hourly	33.33% (8)	16.13% (5)	0.00% (0)			

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Question	Question Label	Response	Percentage (Number of Non-Missing Responses)			Baseline vs. First Follow-Up	Baseline vs. Second Follow-Up	First Follow-Up vs. Second Follow-Up
			Baseline (N=30)	First Follow-Up (N=51)	Second Follow-Up (N=11)			
Q8da	Uses Weather Information ¹ During a Weather Event	Yes	86.67% (26)	72.09% (31)	72.73% (8)	0.1121	0.2342	0.9665
		No	13.33% (4)	27.91% (12)	27.27% (3)			
Q8db	Uses Weather Information ¹ During a Weather Event (How Often)	Twice daily	8.00% (2)	16.13% (5)	62.50% (5)	N/A ⁵	N/A ⁵	N/A ⁵
		4 Times Daily	12.00% (3)	48.39% (15)	25.00% (2)			
		Every Other Hour	0.00% (0)	9.68% (3)	0.00% (0)			
		At Least Hourly	80.00% (20)	25.81% (8)	12.50% (1)			
Q8ea	Uses Weather Information ¹ After a Weather Event	Yes	76.67% (23)	38.10% (16)	27.27% (3)	0.0027	0.0083	0.5039
		No	23.33% (7)	61.90% (26)	72.73% (8)			
Q8eb	Uses Weather Information ¹ After a Weather Event (How Often)	Twice daily	50.00% (11)	86.67% (13)	66.67% (2)	N/A ⁵	N/A ⁵	N/A ⁵
		4 Times Daily	36.36% (8)	6.67% (1)	33.33% (1)			
		Every Other Hour	0.00% (0)	6.67% (1)	0.00% (0)			
		At Least Hourly	13.64% (3)	0.00% (0)	0.00% (0)			
Q9_Q10a	FORETELL Features - Animation	Like Most	N/A ²	100.00% (35)	88.89% (8)	N/A ²	N/A ²	N/A ⁴
		Like Least	N/A ²	0.00% (0)	11.11% (1)			
Q9_Q10b	FORETELL Features - Long-Term Forecast	Like Most	N/A ²	85.19% (23)	62.50% (5)	N/A ²	N/A ²	0.1641
		Like Least	N/A ²	14.81% (4)	37.50% (3)			
Q9_Q10c	FORETELL Features - Scroll Labeling	Like Most	N/A ²	88.89% (16)	60.00% (3)	N/A ²	N/A ²	0.0701
		Like Least	N/A ²	11.11% (2)	40.00% (2)			
Q9_Q10d	FORETELL Features - Zoom Capability	Like Most	N/A ²	100.00% (35)	88.89% (8)	N/A ²	N/A ²	N/A ⁴
		Like Least	N/A ²	0.00% (0)	11.11% (1)			
Q9_Q10e	FORETELL Features - Map Display	Like Most	N/A ²	93.10% (27)	71.43% (5)	N/A ²	N/A ²	0.1329
		Like Least	N/A ²	6.90% (2)	28.57% (2)			

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Table A-4. Frequency and Percentage Distribution for Questions from the Highway Maintenance Operator Baseline and Follow-up Surveys, along with Associated P-Values Computed from the Chi-Square Distribution Testing for Effect between Surveys, Iowa Respondents Only (continued)

Question	Question Label	Response	Percentage (Number of Non-Missing Responses)			Baseline vs. First Follow-Up	Baseline vs. Second Follow-Up	First Follow-Up vs. Second Follow-Up
			Baseline (N=30)	First Follow-Up (N=51)	Second Follow-Up (N=11)			
Q11aaa	Uses Anti-Icing Strategies in Maintenance Decisions	Yes	100.00% (30)	86.05% (37)	72.73% (8)	N/A ⁴	N/A ⁴	0.2890
		No	0.00% (0)	13.95% (6)	27.27% (3)			
Q11aab	How Helpful is Weather Information ¹ in Employing Anti-Icing Strategies	Not Very Helpful	0.00% (0)	8.33% (3)	25.00% (2)	0.0067	0.0003	0.0269
		Not Helpful	3.33% (1)	2.78% (1)	12.50% (1)			
		Neutral	3.33% (1)	27.78% (10)	50.00% (4)			
		Helpful	16.67% (5)	25.00% (9)	0.00% (0)			
		Very Helpful	76.67% (23)	36.11% (13)	12.50% (1)			
Q11aba	Uses De-Icing Strategies in Maintenance Decisions	Yes	100.00% (30)	86.05% (37)	72.73% (8)	N/A ⁴	N/A ⁴	0.2890
		No	0.00% (0)	13.95% (6)	27.27% (3)			
Q11abb	How Helpful is Weather Information ¹ in Employing De-Icing Strategies	Not Very Helpful	0.00% (0)	5.56% (2)	37.50% (3)	0.0017	0.0006	0.2742
		Not Helpful	0.00% (0)	5.56% (2)	0.00% (0)			
		Neutral	6.67% (2)	41.67% (15)	37.50% (3)			
		Helpful	30.00% (9)	11.11% (4)	12.50% (1)			
		Very Helpful	63.33% (19)	36.11% (13)	12.50% (1)			
Q11aca	Uses Traction Enhancement Strategies in Maintenance Decisions	Yes	93.33% (28)	72.09% (31)	54.55% (6)	0.0141	0.0083	0.2673
		No	6.67% (2)	27.91% (12)	45.45% (5)			

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Table A-4. Frequency and Percentage Distribution for Questions from the Highway Maintenance Operator Baseline and Follow-up Surveys, along with Associated P-Values Computed from the Chi-Square Distribution Testing for Effect between Surveys, Iowa Respondents Only (continued)

Question	Question Label	Response	Percentage (Number of Non-Missing Responses)			Baseline vs. First Follow-Up	Baseline vs. Second Follow-Up	First Follow-Up vs. Second Follow-Up
			Baseline (N=30)	First Follow-Up (N=51)	Second Follow-Up (N=11)			
Q11acb	How Helpful is Weather Information ¹ in Employing Traction Enhancement Strategies	Not Very Helpful	0.00% (0)	10.00% (3)	33.33% (2)	<.0001	0.0051	0.7329
		Not Helpful	7.41% (2)	3.33% (1)	0.00% (0)			
		Neutral	7.41% (2)	63.33% (19)	50.00% (3)			
		Helpful	22.22% (6)	3.33% (1)	0.00% (0)			
		Very Helpful	62.96% (17)	20.00% (6)	16.67% (1)			
Q11ada	Uses Mechanical Removal Strategies in Maintenance Decisions	Yes	100.00% (30)	86.05% (37)	72.73% (8)	N/A ⁴	N/A ⁴	0.3070
		No	0.00% (0)	13.95% (6)	27.27% (3)			
Q11adb	How Helpful is Weather Information ¹ in Employing Mechanical Removal Strategies	Not Very Helpful	0.00% (0)	11.11% (4)	25.00% (2)	0.0109	0.0052	0.2074
		Neutral	20.00% (6)	38.89% (14)	50.00% (4)			
		Helpful	23.33% (7)	13.89% (5)	12.50% (1)			
		Very Helpful	56.67% (17)	36.11% (13)	12.50% (1)			
Q12aaa	Uses Wind Speed/Direction Information ¹ to Decide WHAT Road Surface Treatments to Use	Strongly Disagree	3.33% (1)	0.00% (0)	0.00% (0)	0.0170	0.0169	0.1738
		Disagree	0.00% (0)	3.45% (1)	0.00% (0)			
		Neutral	10.00% (3)	34.48% (10)	75.00% (3)			
		Agree	40.00% (12)	34.48% (10)	25.00% (1)			
		Strongly Agree	46.67% (14)	27.59% (8)	0.00% (0)			
Q12aab	Uses Precipitation Information ¹ to Decide WHAT Road Surface Treatments to Use	Neutral	6.67% (2)	38.71% (12)	60.00% (3)	0.0080	0.0090	0.3839
		Agree	13.33% (4)	41.94% (13)	40.00% (2)			
		Strongly Agree	80.00% (24)	19.35% (6)	0.00% (0)			

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Table A-4. Frequency and Percentage Distribution for Questions from the Highway Maintenance Operator Baseline and Follow-up Surveys, along with Associated P-Values Computed from the Chi-Square Distribution Testing for Effect between Surveys, Iowa Respondents Only (continued)

Question	Question Label	Response	Percentage (Number of Non-Missing Responses)			Baseline vs. First Follow-Up	Baseline vs. Second Follow-Up	First Follow-Up vs. Second Follow-Up
			Baseline (N=30)	First Follow-Up (N=51)	Second Follow-Up (N=11)			
Q12aac	Uses Atmospheric Temperature Information ¹ to Decide WHAT Road Surface Treatments to Use	Strongly Disagree	3.57% (1)	0.00% (0)	0.00% (0)	0.5866	0.5933	0.7802
		Disagree	3.57% (1)	7.14% (2)	0.00% (0)			
		Neutral	57.14% (16)	50.00% (14)	50.00% (2)			
		Agree	14.29% (4)	21.43% (6)	50.00% (2)			
		Strongly Agree	21.43% (6)	21.43% (6)	0.00% (0)			
Q12baa	Uses Pavement Temperature Information ¹ to Decide WHAT Road Surface Treatments to Use	Disagree	0.00% (0)	4.76% (1)	0.00% (0)	0.0093	0.0952	0.8763
		Neutral	3.33% (1)	33.33% (7)	33.33% (1)			
		Agree	6.67% (2)	42.86% (9)	33.33% (1)			
		Strongly Agree	90.00% (27)	19.05% (4)	33.33% (1)			
Q12bab	Uses Pavement Condition Information ¹ to Decide WHAT Road Surface Treatments to Use	Disagree	0.00% (0)	5.00% (1)	0.00% (0)	0.0033	N/A ⁴	N/A ⁴
		Neutral	10.00% (3)	50.00% (10)	0.00% (0)			
		Agree	26.67% (8)	30.00% (6)	100.00% (2)			
		Strongly Agree	63.33% (19)	15.00% (3)	0.00% (0)			
Q12bac	Uses Dewpoint Information ¹ to Decide WHAT Road Surface Treatments to Use	Strongly Disagree	8.00% (2)	5.26% (1)	0.00% (0)	0.3675	N/A ⁴	N/A ⁴
		Disagree	20.00% (5)	10.53% (2)	0.00% (0)			
		Neutral	52.00% (13)	52.63% (10)	100.00% (2)			
		Agree	16.00% (4)	21.05% (4)	0.00% (0)			
		Strongly Agree	4.00% (1)	10.53% (2)	0.00% (0)			
Q12aba	Uses Wind Speed/Direction Information ¹ to Decide WHERE Road Surface Treatments Should be Applied	Strongly Disagree	3.33% (1)	0.00% (0)	0.00% (0)	0.0560	0.0739	0.3482
		Disagree	0.00% (0)	7.69% (2)	0.00% (0)			
		Neutral	13.33% (4)	30.77% (8)	66.67% (2)			
		Agree	43.33% (13)	38.46% (10)	0.00% (0)			
		Strongly Agree	40.00% (12)	23.08% (6)	33.33% (1)			

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Table A-4. Frequency and Percentage Distribution for Questions from the Highway Maintenance Operator Baseline and Follow-up Surveys, along with Associated P-Values Computed from the Chi-Square Distribution Testing for Effect between Surveys, Iowa Respondents Only (continued)

Question	Question Label	Response	Percentage (Number of Non-Missing Responses)			Baseline vs. First Follow-Up	Baseline vs. Second Follow-Up	First Follow-Up vs. Second Follow-Up
			Baseline (N=30)	First Follow-Up (N=51)	Second Follow-Up (N=11)	P-value ³		
Q12abb	Uses Precipitation Information ¹ to Decide WHERE Road Surface Treatments Should be Applied	Disagree	0.00% (0)	3.85% (1)	0.00% (0)	0.0029	0.0104	0.2700
		Neutral	10.00% (3)	42.31% (11)	75.00% (3)			
		Agree	6.67% (2)	42.31% (11)	0.00% (0)			
		Strongly Agree	83.33% (25)	11.54% (3)	25.00% (1)			
Q12abc	Uses Atmospheric Temperature Information ¹ to Decide WHERE Road Surface Treatments Should be Applied	Strongly Disagree	3.45% (1)	0.00% (0)	0.00% (0)	0.7824	0.8683	0.9621
		Disagree	17.24% (5)	7.69% (2)	0.00% (0)			
		Neutral	41.38% (12)	57.69% (15)	66.67% (2)			
		Agree	17.24% (5)	23.08% (6)	33.33% (1)			
		Strongly Agree	20.69% (6)	11.54% (3)	0.00% (0)			
Q12bba	Uses Pavement Temperature Information ¹ to Decide WHERE Road Surface Treatments Should be Applied	Disagree	0.00% (0)	5.26% (1)	0.00% (0)	0.0007	0.0185	0.7922
		Neutral	6.67% (2)	52.63% (10)	66.67% (2)			
		Agree	13.33% (4)	26.32% (5)	33.33% (1)			
		Strongly Agree	80.00% (24)	15.79% (3)	0.00% (0)			
Q12bbb	Uses Pavement Condition Information ¹ to Decide WHERE Road Surface Treatments Should be Applied	Disagree	0.00% (0)	5.56% (1)	50.00% (1)	0.0011	0.0927	0.8738
		Neutral	6.67% (2)	50.00% (9)	0.00% (0)			
		Agree	23.33% (7)	27.78% (5)	50.00% (1)			
		Strongly Agree	70.00% (21)	16.67% (3)	0.00% (0)			

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Question	Question Label	Response	Percentage (Number of Non-Missing Responses)			Baseline vs. First Follow-Up	Baseline vs. Second Follow-Up	First Follow-Up vs. Second Follow-Up
			Baseline (N=30)	First Follow-Up (N=51)	Second Follow-Up (N=11)	P-value ³		
Q12bbc	Uses Dewpoint Information ¹ to Decide WHERE Road Surface Treatments Should be Applied	Strongly Disagree	16.00% (4)	0.00% (0)	0.00% (0)	0.7741	0.7219	0.8405
		Disagree	24.00% (6)	11.11% (2)	0.00% (0)			
		Neutral	36.00% (9)	61.11% (11)	66.67% (2)			
		Agree	16.00% (4)	16.67% (3)	0.00% (0)			
		Strongly Agree	8.00% (2)	11.11% (2)	33.33% (1)			
Q12aca	Uses Wind Speed/Direction Information ¹ to Decide WHEN Road Surface Treatments Should be Applied	Disagree	3.33% (1)	6.90% (2)	0.00% (0)	0.0196	0.8151	0.4751
		Neutral	16.67% (5)	37.93% (11)	25.00% (1)			
		Agree	23.33% (7)	31.03% (9)	75.00% (3)			
		Strongly Agree	56.67% (17)	24.14% (7)	0.00% (0)			
Q12acb	Uses Precipitation Information ¹ to Decide WHEN Road Surface Treatments Should be Applied	Disagree	0.00% (0)	6.90% (2)	0.00% (0)	N/A ⁴	N/A ⁴	0.2392
		Neutral	0.00% (0)	44.83% (13)	20.00% (1)			
		Agree	6.90% (2)	24.14% (7)	60.00% (3)			
		Strongly Agree	93.10% (27)	24.14% (7)	20.00% (1)			
Q12acc	Uses Atmospheric Temperature Information ¹ to Decide WHEN Road Surface Treatments Should be Applied	Strongly Disagree	3.70% (1)	0.00% (0)	0.00% (0)	0.1464	0.5585	0.2362
		Disagree	11.11% (3)	7.41% (2)	0.00% (0)			
		Neutral	37.04% (10)	62.96% (17)	33.33% (1)			
		Agree	29.63% (8)	14.81% (4)	66.67% (2)			
		Strongly Agree	18.52% (5)	14.81% (4)	0.00% (0)			
Q12bca	Uses Pavement Temperature Information ¹ to Decide WHEN Road Surface Treatments Should be Applied	Disagree	0.00% (0)	10.00% (2)	0.00% (0)	N/A ⁴	N/A ⁴	0.8371
		Neutral	0.00% (0)	25.00% (5)	40.00% (2)			
		Agree	10.34% (3)	50.00% (10)	20.00% (1)			
		Strongly Agree	89.66% (26)	15.00% (3)	40.00% (2)			

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			Baseline (N=30)	First Follow-Up (N=51)	Second Follow-Up (N=11)	P-value ³		
Q12bcb	Uses Pavement Condition Information ¹ to Decide WHEN Road Surface Treatments Should be Applied	Disagree	0.00% (0)	10.00% (2)	0.00% (0)	0.0025	0.1769	0.6980
		Neutral	6.90% (2)	35.00% (7)	33.33% (1)			
		Agree	20.69% (6)	40.00% (8)	33.33% (1)			
		Strongly Agree	72.41% (21)	15.00% (3)	33.33% (1)			
Q12bcc	Uses Dewpoint Information ¹ to Decide WHEN Road Surface Treatments Should be Applied	Strongly Disagree	16.67% (4)	0.00% (0)	0.00% (0)	0.1863	0.7535	0.7297
		Disagree	20.83% (5)	22.22% (4)	0.00% (0)			
		Neutral	37.50% (9)	33.33% (6)	66.67% (2)			
		Agree	20.83% (5)	33.33% (6)	33.33% (1)			
		Strongly Agree	4.17% (1)	11.11% (2)	0.00% (0)			
Q13aaa	Wind Speed/Direction Information ¹ is Understandable	Disagree	0.00% (0)	0.00% (0)	14.29% (1)	0.6713	0.0684	0.0952
		Neutral	3.45% (1)	5.71% (2)	14.29% (1)			
		Agree	31.03% (9)	65.71% (23)	42.86% (3)			
		Strongly Agree	65.52% (19)	28.57% (10)	28.57% (2)			
Q13aab	Precipitation Information ¹ is Understandable	Disagree	3.45% (1)	2.94% (1)	14.29% (1)	0.8381	0.2826	0.2956
		Neutral	6.90% (2)	8.82% (3)	14.29% (1)			
		Agree	24.14% (7)	70.59% (24)	42.86% (3)			
		Strongly Agree	65.52% (19)	17.65% (6)	28.57% (2)			

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Question	Question Label	Response	Percentage (Number of Non-Missing Responses)			Baseline vs. First Follow-Up	Baseline vs. Second Follow-Up	First Follow-Up vs. Second Follow-Up
			Baseline (N=30)	First Follow-Up (N=51)	Second Follow-Up (N=11)			
Q13aac	Atmospheric Temperature Information ¹ is Understandable	Disagree	3.85% (1)	0.00% (0)	0.00% (0)	0.5167	0.8840	0.8046
		Neutral	15.38% (4)	12.90% (4)	16.67% (1)			
		Agree	30.77% (8)	70.97% (22)	33.33% (2)			
		Strongly Agree	50.00% (13)	16.13% (5)	50.00% (3)			
Q13baa	Pavement Temperature Information ¹ is Understandable	Strongly Disagree	0.00% (0)	3.23% (1)	16.67% (1)	0.3630	0.0085	0.0355
		Disagree	0.00% (0)	3.23% (1)	16.67% (1)			
		Neutral	10.71% (3)	12.90% (4)	33.33% (2)			
		Agree	17.86% (5)	58.06% (18)	33.33% (2)			
		Strongly Agree	71.43% (20)	22.58% (7)	0.00% (0)			
Q13bab	Pavement Condition Information ¹ is Understandable	Disagree	3.57% (1)	3.45% (1)	50.00% (3)	0.7145	0.0282	0.0185
		Neutral	25.00% (7)	20.69% (6)	33.33% (2)			
		Agree	10.71% (3)	58.62% (17)	16.67% (1)			
		Strongly Agree	60.71% (17)	17.24% (5)	0.00% (0)			
Q13bac	Dewpoint Information ¹ is Understandable	Strongly Disagree	4.55% (1)	0.00% (0)	0.00% (0)	0.7503	0.9200	0.9347
		Disagree	9.09% (2)	3.85% (1)	0.00% (0)			
		Neutral	9.09% (2)	23.08% (6)	25.00% (1)			
		Agree	22.73% (5)	53.85% (14)	75.00% (3)			
		Strongly Agree	54.55% (12)	19.23% (5)	0.00% (0)			
Q13aba	Wind Speed/Direction Information ¹ is Usable	Strongly Disagree	6.90% (2)	0.00% (0)	0.00% (0)	0.1291	0.1560	0.0053
		Disagree	0.00% (0)	0.00% (0)	20.00% (1)			
		Neutral	17.24% (5)	8.82% (3)	40.00% (2)			
		Agree	27.59% (8)	67.65% (23)	40.00% (2)			
		Strongly Agree	48.28% (14)	23.53% (8)	0.00% (0)			

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Question	Question Label	Response	Percentage (Number of Non-Missing Responses)			Baseline vs. First Follow-Up	Baseline vs. Second Follow-Up	First Follow-Up vs. Second Follow-Up
			Baseline (N=30)	First Follow-Up (N=51)	Second Follow-Up (N=11)			
Q13abb	Precipitation Information ¹ is Usable	Strongly Disagree	6.90% (2)	0.00% (0)	0.00% (0)	0.7530	0.7905	0.6676
		Disagree	0.00% (0)	3.03% (1)	16.67% (1)			
		Neutral	20.69% (6)	21.21% (7)	16.67% (1)			
		Agree	17.24% (5)	54.55% (18)	50.00% (3)			
		Strongly Agree	55.17% (16)	21.21% (7)	16.67% (1)			
Q13abc	Atmospheric Temperature Information ¹ is Usable	Strongly Disagree	10.71% (3)	0.00% (0)	0.00% (0)	0.1731	0.7412	0.2900
		Disagree	3.57% (1)	3.45% (1)	20.00% (1)			
		Neutral	17.86% (5)	13.79% (4)	20.00% (1)			
		Agree	25.00% (7)	51.72% (15)	60.00% (3)			
		Strongly Agree	42.86% (12)	31.03% (9)	0.00% (0)			
Q13bba	Pavement Temperature Information ¹ is Usable	Strongly Disagree	6.90% (2)	3.33% (1)	0.00% (0)	0.3967	0.0261	0.0729
		Disagree	0.00% (0)	0.00% (0)	33.33% (2)			
		Neutral	10.34% (3)	23.33% (7)	33.33% (2)			
		Agree	24.14% (7)	50.00% (15)	33.33% (2)			
		Strongly Agree	58.62% (17)	23.33% (7)	0.00% (0)			
Q13bbb	Pavement Condition Information ¹ is Usable	Strongly Disagree	6.90% (2)	0.00% (0)	0.00% (0)	0.4714	0.1545	0.0613
		Disagree	3.45% (1)	0.00% (0)	50.00% (3)			
		Neutral	24.14% (7)	25.00% (7)	16.67% (1)			
		Agree	17.24% (5)	53.57% (15)	33.33% (2)			
		Strongly Agree	48.28% (14)	21.43% (6)	0.00% (0)			

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Table A-4. Frequency and Percentage Distribution for Questions from the Highway Maintenance Operator Baseline and Follow-up Surveys, along with Associated P-Values Computed from the Chi-Square Distribution Testing for Effect between Surveys, Iowa Respondents Only (continued)

Question	Question Label	Response	Percentage (Number of Non-Missing Responses)			Baseline vs. First Follow-Up	Baseline vs. Second Follow-Up	First Follow-Up vs. Second Follow-Up
			Baseline (N=30)	First Follow-Up (N=51)	Second Follow-Up (N=11)	P-value ³		
Q13bbc	Dewpoint Information ¹ is Usable	Strongly Disagree	16.67% (4)	0.00% (0)	0.00% (0)	0.1847	0.1969	0.4919
		Disagree	16.67% (4)	0.00% (0)	0.00% (0)			
		Neutral	29.17% (7)	44.00% (11)	25.00% (1)			
		Agree	12.50% (3)	40.00% (10)	75.00% (3)			
		Strongly Agree	25.00% (6)	16.00% (4)	0.00% (0)			
Q13aca	Wind Speed/Direction Information ¹ is Easily Obtainable	Disagree	0.00% (0)	12.12% (4)	14.29% (1)	0.1908	0.1244	0.4892
		Neutral	6.67% (2)	6.06% (2)	14.29% (1)			
		Agree	26.67% (8)	57.58% (19)	57.14% (4)			
		Strongly Agree	66.67% (20)	24.24% (8)	14.29% (1)			
Q13acb	Precipitation Information ¹ is Easily Obtainable	Disagree	0.00% (0)	10.00% (3)	28.57% (2)	0.0494	0.0157	0.2643
		Neutral	3.33% (1)	13.33% (4)	14.29% (1)			
		Agree	26.67% (8)	60.00% (18)	42.86% (3)			
		Strongly Agree	70.00% (21)	16.67% (5)	14.29% (1)			
Q13acc	Atmospheric Temperature Information ¹ is Easily Obtainable	Disagree	3.57% (1)	10.34% (3)	0.00% (0)	0.4987	0.4306	0.7055
		Neutral	7.14% (2)	6.90% (2)	25.00% (1)			
		Agree	25.00% (7)	51.72% (15)	50.00% (2)			
		Strongly Agree	64.29% (18)	31.03% (9)	25.00% (1)			
Q13bca	Pavement Temperature Information ¹ is Easily Obtainable	Disagree	0.00% (0)	7.14% (2)	16.67% (1)	0.0433	0.0883	0.8153
		Neutral	6.67% (2)	21.43% (6)	16.67% (1)			
		Agree	30.00% (9)	50.00% (14)	50.00% (3)			
		Strongly Agree	63.33% (19)	21.43% (6)	16.67% (1)			

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Table A-4. Frequency and Percentage Distribution for Questions from the Highway Maintenance Operator Baseline and Follow-up Surveys, along with Associated P-Values Computed from the Chi-Square Distribution Testing for Effect between Surveys, Iowa Respondents Only (continued)

Question	Question Label	Response	Percentage (Number of Non-Missing Responses)			Baseline vs. First Follow-Up	Baseline vs. Second Follow-Up	First Follow-Up vs. Second Follow-Up
			Baseline (N=30)	First Follow-Up (N=51)	Second Follow-Up (N=11)			
Q13bcb	Pavement Condition Information ¹ is Easily Obtainable	Disagree	6.67% (2)	7.41% (2)	16.67% (1)	0.2241	0.3619	0.8576
		Neutral	10.00% (3)	22.22% (6)	16.67% (1)			
		Agree	26.67% (8)	51.85% (14)	50.00% (3)			
		Strongly Agree	56.67% (17)	18.52% (5)	16.67% (1)			
Q13bcc	Dewpoint Information ¹ is Easily Obtainable	Strongly Disagree	4.00% (1)	0.00% (0)	0.00% (0)	0.8192	0.7109	0.8108
		Disagree	8.00% (2)	8.33% (2)	0.00% (0)			
		Neutral	16.00% (4)	16.67% (4)	20.00% (1)			
		Agree	12.00% (3)	54.17% (13)	60.00% (3)			
		Strongly Agree	60.00% (15)	20.83% (5)	20.00% (1)			
Q13ada	Wind Speed/Direction Information ¹ is Accurate	Disagree	24.14% (7)	21.88% (7)	0.00% (0)	0.5646	0.8171	0.5596
		Neutral	31.03% (9)	40.63% (13)	50.00% (3)			
		Agree	34.48% (10)	28.13% (9)	50.00% (3)			
		Strongly Agree	10.34% (3)	9.38% (3)	0.00% (0)			
Q13adb	Precipitation Information ¹ is Accurate	Strongly Disagree	0.00% (0)	6.45% (2)	0.00% (0)	0.5467	0.3801	0.5999
		Disagree	24.14% (7)	22.58% (7)	33.33% (2)			
		Neutral	44.83% (13)	32.26% (10)	16.67% (1)			
		Agree	27.59% (8)	29.03% (9)	50.00% (3)			
		Strongly Agree	3.45% (1)	9.68% (3)	0.00% (0)			
Q13adc	Atmospheric Temperature Information ¹ is Accurate	Disagree	21.43% (6)	18.52% (5)	0.00% (0)	0.8992	0.3084	0.3429
		Neutral	35.71% (10)	37.04% (10)	33.33% (2)			
		Agree	32.14% (9)	37.04% (10)	66.67% (4)			
		Strongly Agree	10.71% (3)	7.41% (2)	0.00% (0)			

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Table A-4. Frequency and Percentage Distribution for Questions from the Highway Maintenance Operator Baseline and Follow-up Surveys, along with Associated P-Values Computed from the Chi-Square Distribution Testing for Effect between Surveys, Iowa Respondents Only (continued)

Question	Question Label	Response	Percentage (Number of Non-Missing Responses)			Baseline vs. First Follow-Up	Baseline vs. Second Follow-Up	First Follow-Up vs. Second Follow-Up
			Baseline (N=30)	First Follow-Up (N=51)	Second Follow-Up (N=11)			
Q13bda	Pavement Temperature Information ¹ is Accurate	Strongly Disagree	0.00% (0)	3.57% (1)	0.00% (0)	0.0532	0.1752	0.6858
		Disagree	6.90% (2)	17.86% (5)	20.00% (1)			
		Neutral	37.93% (11)	50.00% (14)	60.00% (3)			
		Agree	41.38% (12)	28.57% (8)	20.00% (1)			
		Strongly Agree	13.79% (4)	0.00% (0)	0.00% (0)			
Q13bdb	Pavement Condition Information ¹ is Accurate	Strongly Disagree	3.45% (1)	3.70% (1)	0.00% (0)	0.9094	0.6144	0.6535
		Disagree	20.69% (6)	14.81% (4)	40.00% (2)			
		Neutral	44.83% (13)	51.85% (14)	40.00% (2)			
		Agree	20.69% (6)	25.93% (7)	20.00% (1)			
		Strongly Agree	10.34% (3)	3.70% (1)	0.00% (0)			
Q13bdc	Dewpoint Information ¹ is Accurate	Strongly Disagree	4.17% (1)	4.35% (1)	0.00% (0)	0.6809	0.1135	0.1503
		Disagree	37.50% (9)	17.39% (4)	0.00% (0)			
		Neutral	29.17% (7)	43.48% (10)	25.00% (1)			
		Agree	25.00% (6)	30.43% (7)	75.00% (3)			
		Strongly Agree	4.17% (1)	4.35% (1)	0.00% (0)			
Q13aea	Wind Speed/Direction Information ¹ is Useful for Weather-Related Decisions	Strongly Disagree	0.00% (0)	3.13% (1)	0.00% (0)	0.0823	0.0111	0.1464
		Disagree	0.00% (0)	3.13% (1)	0.00% (0)			
		Neutral	13.33% (4)	25.00% (8)	66.67% (4)			
		Agree	46.67% (14)	56.25% (18)	16.67% (1)			
		Strongly Agree	40.00% (12)	12.50% (4)	16.67% (1)			

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Table A-4. Frequency and Percentage Distribution for Questions from the Highway Maintenance Operator Baseline and Follow-up Surveys, along with Associated P-Values Computed from the Chi-Square Distribution Testing for Effect between Surveys, Iowa Respondents Only (continued)

Question	Question Label	Response	Percentage (Number of Non-Missing Responses)			Baseline vs. First Follow-Up	Baseline vs. Second Follow-Up	First Follow-Up vs. Second Follow-Up
			Baseline (N=30)	First Follow-Up (N=51)	Second Follow-Up (N=11)			
Q13aeb	Precipitation Information ¹ is Useful for Weather-Related Decisions	Strongly Disagree	0.00% (0)	3.23% (1)	0.00% (0)	0.2026	0.1383	0.5364
		Disagree	0.00% (0)	9.68% (3)	16.67% (1)			
		Neutral	20.00% (6)	22.58% (7)	33.33% (2)			
		Agree	30.00% (9)	51.61% (16)	33.33% (2)			
		Strongly Agree	50.00% (15)	12.90% (4)	16.67% (1)			
Q13aec	Atmospheric Temperature Information ¹ is Useful for Weather-Related Decisions	Strongly Disagree	0.00% (0)	3.70% (1)	0.00% (0)	0.6511	0.6885	0.9032
		Disagree	3.45% (1)	7.41% (2)	20.00% (1)			
		Neutral	27.59% (8)	25.93% (7)	20.00% (1)			
		Agree	27.59% (8)	51.85% (14)	20.00% (1)			
		Strongly Agree	41.38% (12)	11.11% (3)	40.00% (2)			
Q13bea	Pavement Temperature Information ¹ is Useful for Weather-Related Decisions	Strongly Disagree	0.00% (0)	3.70% (1)	0.00% (0)	0.0041	0.0111	0.4953
		Disagree	0.00% (0)	7.41% (2)	33.33% (2)			
		Neutral	13.33% (4)	40.74% (11)	33.33% (2)			
		Agree	26.67% (8)	40.74% (11)	16.67% (1)			
		Strongly Agree	60.00% (18)	7.41% (2)	16.67% (1)			
Q13beb	Pavement Condition Information ¹ is Useful for Weather-Related Decisions	Strongly Disagree	0.00% (0)	3.85% (1)	0.00% (0)	0.0496	0.0907	0.7283
		Disagree	0.00% (0)	11.54% (3)	28.57% (2)			
		Neutral	23.33% (7)	34.62% (9)	28.57% (2)			
		Agree	26.67% (8)	42.31% (11)	14.29% (1)			
		Strongly Agree	50.00% (15)	7.69% (2)	28.57% (2)			

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			Baseline (N=30)	First Follow-Up (N=51)	Second Follow-Up (N=11)			
Q13bec	Dewpoint Information ¹ is Useful for Weather-Related Decisions	Strongly Disagree	12.00% (3)	4.55% (1)	0.00% (0)	0.4284	0.3430	0.1680
		Disagree	16.00% (4)	18.18% (4)	0.00% (0)			
		Neutral	24.00% (6)	40.91% (9)	25.00% (1)			
		Agree	32.00% (8)	31.82% (7)	75.00% (3)			
		Strongly Agree	16.00% (4)	4.55% (1)	0.00% (0)			
Q14afa	FORETELL Wind Speed/Direction Information Changed Weather-Related Decisions You Made	Strongly Disagree	N/A ²	3.85% (1)	0.00% (0)	N/A ²	N/A ²	N/A ⁴
		Disagree	N/A ²	15.38% (4)	40.00% (2)			
		Neutral	N/A ²	38.46% (10)	60.00% (3)			
		Agree	N/A ²	34.62% (9)	0.00% (0)			
		Strongly Agree	N/A ²	7.69% (2)	0.00% (0)			
Q14afb	FORETELL Precipitation Information Changed Weather-Related Decisions You Made	Strongly Disagree	N/A ²	3.70% (1)	0.00% (0)	N/A ²	N/A ²	N/A ⁴
		Disagree	N/A ²	18.52% (5)	40.00% (2)			
		Neutral	N/A ²	40.74% (11)	60.00% (3)			
		Agree	N/A ²	29.63% (8)	0.00% (0)			
		Strongly Agree	N/A ²	7.41% (2)	0.00% (0)			
Q14afc	FORETELL Atmospheric Temperature Information Changed Weather-Related Decisions You Made	Strongly Disagree	N/A ²	4.35% (1)	0.00% (0)	N/A ²	N/A ²	N/A ⁴
		Disagree	N/A ²	13.04% (3)	25.00% (1)			
		Neutral	N/A ²	47.83% (11)	75.00% (3)			
		Agree	N/A ²	21.74% (5)	0.00% (0)			
		Strongly Agree	N/A ²	13.04% (3)	0.00% (0)			

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			Baseline (N=30)	First Follow-Up (N=51)	Second Follow-Up (N=11)	P-value ³		
Q14bfa	FORETELL Pavement Temperature Information Changed Weather-Related Decisions You Made	Strongly Disagree	N/A ²	4.55% (1)	0.00% (0)	N/A ²	N/A ²	0.7305
		Disagree	N/A ²	27.27% (6)	60.00% (3)			
		Neutral	N/A ²	40.91% (9)	20.00% (1)			
		Agree	N/A ²	27.27% (6)	20.00% (1)			
Q14bfb	FORETELL Pavement Condition Information Changed Weather-Related Decisions You Made	Strongly Disagree	N/A ²	4.55% (1)	0.00% (0)	N/A ²	N/A ²	0.7305
		Disagree	N/A ²	27.27% (6)	60.00% (3)			
		Neutral	N/A ²	40.91% (9)	20.00% (1)			
		Agree	N/A ²	27.27% (6)	20.00% (1)			
Q14bfc	FORETELL Dewpoint Information Changed Weather-Related Decisions You Made	Strongly Disagree	N/A ²	5.26% (1)	0.00% (0)	N/A ²	N/A ²	0.3062
		Disagree	N/A ²	10.53% (2)	33.33% (1)			
		Neutral	N/A ²	73.68% (14)	33.33% (1)			
		Agree	N/A ²	10.53% (2)	33.33% (1)			
Q15	FORETELL Provides Valuable Information Not Provided Elsewhere	Strongly Disagree	N/A ²	17.07% (7)	11.11% (1)	N/A ²	N/A ²	0.2764
		Disagree	N/A ²	17.07% (7)	44.44% (4)			
		Neutral	N/A ²	24.39% (10)	22.22% (2)			
		Agree	N/A ²	31.71% (13)	11.11% (1)			
		Strongly Agree	N/A ²	9.76% (4)	11.11% (1)			
Q16	Receive FORETELL Information in Time to Make Weather-Related Decisions	Strongly Disagree	N/A ²	7.14% (3)	0.00% (0)	N/A ²	N/A ²	0.9653
		Disagree	N/A ²	11.90% (5)	22.22% (2)			
		Neutral	N/A ²	35.71% (15)	33.33% (3)			
		Agree	N/A ²	45.24% (19)	44.44% (4)			

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			Baseline (N=30)	First Follow-Up (N=51)	Second Follow-Up (N=11)	P-value ³		
Q17	Weather Information ¹ is Sufficient for Making Weather-Related Decisions	Strongly Disagree	0.00% (0)	9.52% (4)	33.33% (3)	0.1339	0.6495	0.5971
		Disagree	13.33% (4)	21.43% (9)	11.11% (1)			
		Neutral	33.33% (10)	33.33% (14)	11.11% (1)			
		Agree	33.33% (10)	30.95% (13)	44.44% (4)			
		Strongly Agree	20.00% (6)	4.76% (2)	0.00% (0)			
Q18	Willing to Pay for FORETELL	Strongly Disagree	N/A ²	9.76% (4)	22.22% (2)	N/A ²	N/A ²	0.6920
		Disagree	N/A ²	12.20% (5)	22.22% (2)			
		Neutral	N/A ²	51.22% (21)	22.22% (2)			
		Agree	N/A ²	26.83% (11)	11.11% (1)			
		Strongly Agree	N/A ²	0.00% (0)	22.22% (2)			
Q19	Having Weather Information ¹ Makes Job Easier	Strongly Disagree	0.00% (0)	9.52% (4)	0.00% (0)	0.0004	0.0004	0.5216
		Disagree	3.45% (1)	7.14% (3)	22.22% (2)			
		Neutral	3.45% (1)	38.10% (16)	44.44% (4)			
		Agree	24.14% (7)	40.48% (17)	22.22% (2)			
		Strongly Agree	68.97% (20)	4.76% (2)	11.11% (1)			
Q20	Weather Information ¹ Helps You Improve Traffic Efficiency of Roadways	Strongly Disagree	0.00% (0)	9.52% (4)	0.00% (0)	<.0001	0.0093	0.6612
		Disagree	3.33% (1)	4.76% (2)	0.00% (0)			
		Neutral	16.67% (5)	59.52% (25)	66.67% (6)			
		Agree	46.67% (14)	26.19% (11)	22.22% (2)			
		Strongly Agree	33.33% (10)	0.00% (0)	11.11% (1)			
Q21	Weather Information ¹ Helps You to Target Snow and Ice Control Measures	Strongly Disagree	0.00% (0)	9.52% (4)	0.00% (0)	0.0003	0.0021	0.6697
		Disagree	6.67% (2)	11.90% (5)	11.11% (1)			
		Neutral	6.67% (2)	38.10% (16)	55.56% (5)			
		Agree	43.33% (13)	40.48% (17)	22.22% (2)			
		Strongly Agree	43.33% (13)	0.00% (0)	11.11% (1)			

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Table A-4. Frequency and Percentage Distribution for Questions from the Highway Maintenance Operator Baseline and Follow-up Surveys, along with Associated P-Values Computed from the Chi-Square Distribution Testing for Effect between Surveys, Iowa Respondents Only (continued)

Question	Question Label	Response	Percentage (Number of Non-Missing Responses)			Baseline vs. First Follow-Up	Baseline vs. Second Follow-Up	First Follow-Up vs. Second Follow-Up
			Baseline (N=30)	First Follow-Up (N=51)	Second Follow-Up (N=11)	P-value ³		
Q22	Highway Maintenance Activities are Conducted More Efficiently Using Weather Information ¹	Strongly Disagree	0.00% (0)	9.76% (4)	0.00% (0)	<.0001	0.0003	0.5783
		Disagree	0.00% (0)	14.63% (6)	33.33% (3)			
		Neutral	6.67% (2)	51.22% (21)	33.33% (3)			
		Agree	33.33% (10)	24.39% (10)	22.22% (2)			
		Strongly Agree	60.00% (18)	0.00% (0)	11.11% (1)			
Q23	FORETELL Information Makes You More Confident in Making Weather-Related Decisions	Strongly Disagree	N/A ²	9.52% (4)	11.11% (1)	N/A ²	N/A ²	0.3621
		Disagree	N/A ²	9.52% (4)	22.22% (2)			
		Neutral	N/A ²	52.38% (22)	22.22% (2)			
		Agree	N/A ²	23.81% (10)	33.33% (3)			
		Strongly Agree	N/A ²	4.76% (2)	11.11% (1)			
Q24	FORETELL Information Helps You Deploy Staff More Efficiently	Strongly Disagree	N/A ²	9.52% (4)	0.00% (0)	N/A ²	N/A ²	0.9582
		Disagree	N/A ²	16.67% (7)	33.33% (3)			
		Neutral	N/A ²	52.38% (22)	44.44% (4)			
		Agree	N/A ²	21.43% (9)	11.11% (1)			
		Strongly Agree	N/A ²	0.00% (0)	11.11% (1)			
Q25	Roads Return to Targeted Level of Service More Quickly with Weather Information ¹	Strongly Disagree	0.00% (0)	9.76% (4)	0.00% (0)	0.0004	0.0188	0.8932
		Disagree	3.33% (1)	14.63% (6)	22.22% (2)			
		Neutral	30.00% (9)	51.22% (21)	55.56% (5)			
		Agree	26.67% (8)	24.39% (10)	11.11% (1)			
		Strongly Agree	40.00% (12)	0.00% (0)	11.11% (1)			
Q26	Safety of the Highway Maintenance Operator is Increased with Weather Information ¹	Strongly Disagree	3.33% (1)	9.76% (4)	11.11% (1)	0.0002	0.0117	0.9612
		Disagree	6.67% (2)	14.63% (6)	0.00% (0)			
		Neutral	10.00% (3)	41.46% (17)	55.56% (5)			
		Agree	36.67% (11)	31.71% (13)	22.22% (2)			
		Strongly Agree	43.33% (13)	2.44% (1)	11.11% (1)			

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Table A-4. Frequency and Percentage Distribution for Questions from the Highway Maintenance Operator Baseline and Follow-up Surveys, along with Associated P-Values Computed from the Chi-Square Distribution Testing for Effect between Surveys, Iowa Respondents Only (continued)

Question	Question Label	Response	Percentage (Number of Non-Missing Responses)			Baseline vs. First Follow-Up	Baseline vs. Second Follow-Up	First Follow-Up vs. Second Follow-Up
			Baseline (N=30)	First Follow-Up (N=51)	Second Follow-Up (N=11)	P-value ³		
Q27	Weather Information ¹ Helps to Lessen the Amount of Chemical Applications	Strongly Disagree	0.00% (0)	9.76% (4)	11.11% (1)	0.0005	0.6494	0.0403
		Disagree	10.00% (3)	17.07% (7)	11.11% (1)			
		Neutral	26.67% (8)	51.22% (21)	22.22% (2)			
		Agree	23.33% (7)	19.51% (8)	55.56% (5)			
		Strongly Agree	40.00% (12)	2.44% (1)	0.00% (0)			
Q28	Make Highway Maintenance Decisions More Efficiently because of FORETELL Information	Yes	N/A ²	62.50% (25)	44.44% (4)	N/A ²	N/A ²	0.3022
		No	N/A ²	37.50% (15)	55.56% (5)			
Q28a	How Much Sooner Do You Learn about Weather Events when Using FORETELL Information	0-3 Hours	N/A ²	24.00% (6)	50.00% (2)	N/A ²	N/A ²	N/A ⁵
		3-6 Hours	N/A ²	36.00% (9)	25.00% (1)			
		6-12 Hours	N/A ²	32.00% (8)	25.00% (1)			
		> 12 Hours	N/A ²	8.00% (2)	0.00% (0)			
Q29	Roads are More Quickly Returned to Acceptable Level of Service when Using FORETELL Information	Yes	N/A ²	45.00% (18)	33.33% (3)	N/A ²	N/A ²	0.5423
		No	N/A ²	55.00% (22)	66.67% (6)			
Q29a	How Much More Quickly are Roads Returned to Service when Using FORETELL Information	0-3 Hours	N/A ²	41.18% (7)	66.67% (2)	N/A ²	N/A ²	N/A ⁵
		3-6 Hours	N/A ²	52.94% (9)	0.00% (0)			
		6-12 Hours	N/A ²	5.88% (1)	33.33% (1)			

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Table A-4. Frequency and Percentage Distribution for Questions from the Highway Maintenance Operator Baseline and Follow-up Surveys, along with Associated P-Values Computed from the Chi-Square Distribution Testing for Effect between Surveys, Iowa Respondents Only (continued)

Question	Question Label	Response	Percentage (Number of Non-Missing Responses)			Baseline vs. First Follow-Up	Baseline vs. Second Follow-Up	First Follow-Up vs. Second Follow-Up
			Baseline (N=30)	First Follow-Up (N=51)	Second Follow-Up (N=11)	P-value ³		
Q30	Would Like to Use FORETELL Information in the Future	Yes	N/A ²	92.68% (38)	55.56% (5)	N/A ²	N/A ²	0.0037
		No	N/A ²	7.32% (3)	44.44% (4)			

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Table A-5. Frequency and Percentage Distribution for Questions from the Highway Maintenance Operator Baseline and Follow-up Surveys, along with Associated P-Values Computed from the Chi-Square Distribution Testing for Effect between Surveys, Missouri Respondents Only

Question	Question Label	Response	Percentage (Number of Non-Missing Responses)			Baseline vs. First Follow-Up	Baseline vs. Second Follow-Up	First Follow-Up vs. Second Follow-Up
			Baseline (N=29)	First Follow-Up (N=31)	Second Follow-Up (N=29)	P-value ³		
Q6aa	Uses Wind Speed/Direction in Weather-Related Decisions	Yes	100.00% (29)	81.48% (22)	53.85% (14)	N/A ⁴	N/A ⁴	0.0274
		No	0.00% (0)	18.52% (5)	46.15% (12)			
Q6ab	Uses Actual Wind Speed/Direction Readings	No Actual Readings	48.28% (14)	50.00% (11)	35.71% (5)	0.9127	0.4671	0.3270
		Uses Actual Readings	51.72% (15)	50.00% (11)	64.29% (9)			
Q6ac	Uses Forecast Wind Speed/Direction Readings	No Forecast Information	24.14% (7)	9.09% (2)	14.29% (2)	0.1264	0.4062	0.6313
		Uses Forecast Information	75.86% (22)	90.91% (20)	85.71% (12)			
Q6ba	Uses Precipitation in Weather-Related Decisions	Yes	100.00% (29)	96.55% (28)	76.92% (20)	N/A ⁴	N/A ⁴	0.0544
		No	0.00% (0)	3.45% (1)	23.08% (6)			
Q6bb	Uses Actual Precipitation Readings	No Actual Readings	51.72% (15)	21.43% (6)	10.00% (2)	0.0275	0.0109	0.3086
		Uses Actual Readings	48.28% (14)	78.57% (22)	90.00% (18)			
Q6bc	Uses Forecast Precipitation Readings	No Forecast Information	3.45% (1)	14.29% (4)	15.00% (3)	0.1788	0.1784	0.9459
		Uses Forecast Information	96.55% (28)	85.71% (24)	85.00% (17)			

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Table A-5. Frequency and Percentage Distribution for Questions from the Highway Maintenance Operator Baseline and Follow-up Surveys, along with Associated P-Values Computed from the Chi-Square Distribution Testing for Effect between Surveys, Missouri Respondents Only (continued)

Question	Question Label	Response	Percentage (Number of Non-Missing Responses)			Baseline vs. First Follow-Up	Baseline vs. Second Follow-Up	First Follow-Up vs. Second Follow-Up
			Baseline (N=29)	First Follow-Up (N=31)	Second Follow-Up (N=29)			
Q6ca	Uses Atmospheric Temperature in Weather-Related Decisions	Yes	93.10% (27)	80.00% (20)	61.54% (16)	0.1798	0.0117	0.1474
		No	6.90% (2)	20.00% (5)	38.46% (10)			
Q6cb	Uses Actual Atmospheric Temperature Readings	No Actual Readings	77.78% (21)	15.00% (3)	25.00% (4)	0.0002	0.0008	0.4613
		Uses Actual Readings	22.22% (6)	85.00% (17)	75.00% (12)			
Q6cc	Uses Forecast Atmospheric Temperature Readings	No Forecast Information	37.04% (10)	30.00% (6)	12.50% (2)	0.6202	0.0727	0.1533
		Uses Forecast Information	62.96% (17)	70.00% (14)	87.50% (14)			
Q6da	Uses Pavement Temperature in Weather-Related Decisions	Yes	100.00% (29)	96.43% (27)	69.23% (18)	N/A ⁴	N/A ⁴	0.0224
		No	0.00% (0)	3.57% (1)	30.77% (8)			
Q6db	Uses Actual Pavement Temperature Readings	No Actual Readings	96.55% (28)	11.11% (3)	16.67% (3)	<.0001	<.0001	0.5907
		Uses Actual Readings	3.45% (1)	88.89% (24)	83.33% (15)			
Q6dc	Uses Forecast Pavement Temperature Readings	No Forecast Information	75.86% (22)	59.26% (16)	66.67% (12)	0.1267	0.4751	0.6132
		Uses Forecast Information	24.14% (7)	40.74% (11)	33.33% (6)			
Q6ea	Uses Pavement Condition in Weather-Related Decisions	Yes	100.00% (29)	92.86% (26)	65.38% (17)	N/A ⁴	N/A ⁴	0.0245
		No	0.00% (0)	7.14% (2)	34.62% (9)			

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Table A-5. Frequency and Percentage Distribution for Questions from the Highway Maintenance Operator Baseline and Follow-up Surveys, along with Associated P-Values Computed from the Chi-Square Distribution Testing for Effect between Surveys, Missouri Respondents Only (continued)

Question	Question Label	Response	Percentage (Number of Non-Missing Responses)			Baseline vs. First Follow-Up	Baseline vs. Second Follow-Up	First Follow-Up vs. Second Follow-Up
			Baseline (N=29)	First Follow-Up (N=31)	Second Follow-Up (N=29)	P-value ³		
Q6eb	Uses Actual Pavement Condition Readings	No Actual Readings	89.66% (26)	19.23% (5)	11.76% (2)	<.0001	0.0002	0.5229
		Uses Actual Readings	10.34% (3)	80.77% (21)	88.24% (15)			
Q6ec	Uses Forecast Pavement Condition Readings	No Forecast Information	72.41% (21)	65.38% (17)	58.82% (10)	0.5257	0.3611	0.6790
		Uses Forecast Information	27.59% (8)	34.62% (9)	41.18% (7)			
Q6fa	Uses Dewpoint in Weather-Related Decisions	Yes	75.86% (22)	53.85% (14)	42.31% (11)	0.0622	0.0103	0.4013
		No	24.14% (7)	46.15% (12)	57.69% (15)			
Q6fb	Uses Actual Dewpoint Readings	No Actual Readings	13.64% (3)	42.86% (6)	54.55% (6)	0.0741	0.0217	0.5421
		Uses Actual Readings	86.36% (19)	57.14% (8)	45.45% (5)			
Q6fc	Uses Forecast Dewpoint Readings	No Forecast Information	63.64% (14)	21.43% (3)	18.18% (2)	0.0043	0.0055	0.8357
		Uses Forecast Information	36.36% (8)	78.57% (11)	81.82% (9)			
Q7aa	Uses FORETELL to Receive Wind Speed/Direction Readings	Yes	N/A ²	40.74% (11)	58.33% (7)	N/A ²	N/A ²	0.2478
		No	N/A ²	59.26% (16)	41.67% (5)			
Q7ba	Uses FORETELL to Receive Precipitation Readings	Yes	N/A ²	48.15% (13)	55.00% (11)	N/A ²	N/A ²	0.5927
		No	N/A ²	51.85% (14)	45.00% (9)			

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Question	Question Label	Response	Percentage (Number of Non-Missing Responses)			Baseline vs. First Follow-Up	Baseline vs. Second Follow-Up	First Follow-Up vs. Second Follow-Up
			Baseline (N=29)	First Follow-Up (N=31)	Second Follow-Up (N=29)	P-value ³		
Q7ca	Uses FORETELL to Receive Atmospheric Temperature Readings	Yes	N/A ²	44.44% (12)	60.00% (9)	N/A ²	N/A ²	0.2789
		No	N/A ²	55.56% (15)	40.00% (6)			
Q7da	Uses FORETELL to Receive Pavement Temperature Readings	Yes	N/A ²	40.74% (11)	35.29% (6)	N/A ²	N/A ²	0.7091
		No	N/A ²	59.26% (16)	64.71% (11)			
Q7ea	Uses FORETELL to Receive Pavement Condition Readings	Yes	N/A ²	37.04% (10)	35.29% (6)	N/A ²	N/A ²	0.9007
		No	N/A ²	62.96% (17)	64.71% (11)			
Q8aa	Uses Weather Information ¹ Daily	Yes	96.55% (28)	20.83% (5)	16.67% (3)	<.0001	<.0001	0.7354
		No	3.45% (1)	79.17% (19)	83.33% (15)			
Q8ab	Uses Weather Information ¹ Daily (How Often)	Twice daily	75.00% (15)	80.00% (4)	100.00% (3)	N/A ⁵	N/A ⁵	N/A ⁵
		4 Times Daily	10.00% (2)	20.00% (1)	0.00% (0)			
		Every Other Hour	10.00% (2)	0.00% (0)	0.00% (0)			
		At Least Hourly	5.00% (1)	0.00% (0)	0.00% (0)			
Q8ba	Uses Weather Information ¹ Weekly	Yes	17.24% (5)	34.78% (8)	27.78% (5)	0.1746	0.4249	0.6374
		No	82.76% (24)	65.22% (15)	72.22% (13)			
Q8ca	Uses Weather Information ¹ In Advance of a Weather Event	Yes	89.66% (26)	57.14% (16)	65.00% (13)	0.0117	0.0377	0.5664
		No	10.34% (3)	42.86% (12)	35.00% (7)			
Q8cb	Uses Weather Information ¹ In Advance of a Weather Event (How Often)	Twice daily	60.00% (12)	16.67% (2)	54.55% (6)	N/A ⁵	N/A ⁵	N/A ⁵
		4 Times Daily	5.00% (1)	33.33% (4)	36.36% (4)			
		Every Other Hour	5.00% (1)	25.00% (3)	0.00% (0)			
		At Least Hourly	30.00% (6)	25.00% (3)	9.09% (1)			

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Question	Question Label	Response	Percentage (Number of Non-Missing Responses)			Baseline vs. First Follow-Up	Baseline vs. Second Follow-Up	First Follow-Up vs. Second Follow-Up
			Baseline (N=29)	First Follow-Up (N=31)	Second Follow-Up (N=29)			
Q8da	Uses Weather Information ¹ During a Weather Event	Yes	93.10% (27)	57.14% (16)	55.00% (11)	0.0048	0.0041	0.8692
		No	6.90% (2)	42.86% (12)	45.00% (9)			
Q8db	Uses Weather Information ¹ During a Weather Event (How Often)	Twice daily	21.74% (5)	16.67% (2)	20.00% (2)	N/A ⁵	N/A ⁵	N/A ⁵
		4 Times Daily	30.43% (7)	16.67% (2)	50.00% (5)			
		Every Other Hour	8.70% (2)	25.00% (3)	10.00% (1)			
		At Least Hourly	39.13% (9)	41.67% (5)	20.00% (2)			
Q8ea	Uses Weather Information ¹ After a Weather Event	Yes	51.72% (15)	30.77% (8)	33.33% (6)	0.1106	0.2002	0.8575
		No	48.28% (14)	69.23% (18)	66.67% (12)			
Q8eb	Uses Weather Information ¹ After a Weather Event (How Often)	Twice daily	71.43% (10)	75.00% (3)	100.00% (6)	N/A ⁵	N/A ⁵	N/A ⁵
		4 Times Daily	14.29% (2)	25.00% (1)	0.00% (0)			
		Every Other Hour	7.14% (1)	0.00% (0)	0.00% (0)			
		At Least Hourly	7.14% (1)	0.00% (0)	0.00% (0)			
Q9_Q10a	FORETELL Features - Animation	Like Most	N/A ²	100.00% (13)	100.00% (15)	N/A ²	N/A ²	N/A ⁴
Q9_Q10b	FORETELL Features - Long-Term Forecast	Like Most	N/A ²	90.91% (10)	44.44% (4)	N/A ²	N/A ²	0.0418
		Like Least	N/A ²	9.09% (1)	55.56% (5)			
Q9_Q10c	FORETELL Features - Scroll Labeling	Like Most	N/A ²	75.00% (3)	100.00% (4)	N/A ²	N/A ²	N/A ⁴
		Like Least	N/A ²	25.00% (1)	0.00% (0)			
Q9_Q10d	FORETELL Features - Zoom Capability	Like Most	N/A ²	100.00% (16)	100.00% (12)	N/A ²	N/A ²	N/A ⁴
Q9_Q10e	FORETELL Features - Map Display	Like Most	N/A ²	100.00% (16)	90.91% (10)	N/A ²	N/A ²	N/A ⁴
		Like Least	N/A ²	0.00% (0)	9.09% (1)			

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Table A-5. Frequency and Percentage Distribution for Questions from the Highway Maintenance Operator Baseline and Follow-up Surveys, along with Associated P-Values Computed from the Chi-Square Distribution Testing for Effect between Surveys, Missouri Respondents Only (continued)

Question	Question Label	Response	Percentage (Number of Non-Missing Responses)			Baseline vs. First Follow-Up	Baseline vs. Second Follow-Up	First Follow-Up vs. Second Follow-Up
			Baseline (N=29)	First Follow-Up (N=31)	Second Follow-Up (N=29)			
Q11aaa	Uses Anti-Icing Strategies in Maintenance Decisions	Yes	79.31% (23)	89.29% (25)	89.47% (17)	0.3074	0.3554	0.9834
		No	20.69% (6)	10.71% (3)	10.53% (2)			
Q11aab	How Helpful is Weather Information ¹ in Employing Anti-Icing Strategies	Not Very Helpful	4.35% (1)	14.29% (3)	35.29% (6)	0.0009	0.0004	0.4834
		Neutral	4.35% (1)	47.62% (10)	35.29% (6)			
		Helpful	30.43% (7)	23.81% (5)	11.76% (2)			
		Very Helpful	60.87% (14)	14.29% (3)	17.65% (3)			
Q11aba	Uses De-Icing Strategies in Maintenance Decisions	Yes	86.21% (25)	82.14% (23)	83.33% (15)	0.6699	0.7806	0.9149
		No	13.79% (4)	17.86% (5)	16.67% (3)			
Q11abb	How Helpful is Weather Information ¹ in Employing De-Icing Strategies	Not Very Helpful	8.00% (2)	11.76% (2)	26.67% (4)	0.0807	0.0150	0.3438
		Not Helpful	4.00% (1)	0.00% (0)	6.67% (1)			
		Neutral	12.00% (3)	41.18% (7)	33.33% (5)			
		Helpful	16.00% (4)	29.41% (5)	6.67% (1)			
		Very Helpful	60.00% (15)	17.65% (3)	26.67% (4)			
Q11aca	Uses Traction Enhancement Strategies in Maintenance Decisions	Yes	82.76% (24)	79.31% (23)	83.33% (15)	0.7178	0.9588	0.7261
		No	17.24% (5)	20.69% (6)	16.67% (3)			
Q11acb	How Helpful is Weather Information ¹ in Employing Traction Enhancement Strategies	Not Very Helpful	4.17% (1)	23.53% (4)	26.67% (4)	0.0182	0.0009	0.2915
		Not Helpful	4.17% (1)	11.76% (2)	6.67% (1)			
		Neutral	20.83% (5)	35.29% (6)	53.33% (8)			
		Helpful	25.00% (6)	17.65% (3)	0.00% (0)			
		Very Helpful	45.83% (11)	11.76% (2)	13.33% (2)			

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Table A-5. Frequency and Percentage Distribution for Questions from the Highway Maintenance Operator Baseline and Follow-up Surveys, along with Associated P-Values Computed from the Chi-Square Distribution Testing for Effect between Surveys, Missouri Respondents Only (continued)

Question	Question Label	Response	Percentage (Number of Non-Missing Responses)			Baseline vs. First Follow-Up	Baseline vs. Second Follow-Up	First Follow-Up vs. Second Follow-Up
			Baseline (N=29)	First Follow-Up (N=31)	Second Follow-Up (N=29)	P-value ³		
Q11ada	Uses Mechanical Removal Strategies in Maintenance Decisions	Yes	100.00% (29)	86.21% (25)	89.47% (17)	N/A ⁴	N/A ⁴	0.7343
		No	0.00% (0)	13.79% (4)	10.53% (2)			
Q11adb	How Helpful is Weather Information ¹ in Employing Mechanical Removal Strategies	Not Very Helpful	7.14% (2)	21.05% (4)	41.18% (7)	0.1083	0.0043	0.1517
		Not Helpful	14.29% (4)	5.26% (1)	5.88% (1)			
		Neutral	17.86% (5)	36.84% (7)	35.29% (6)			
		Helpful	14.29% (4)	21.05% (4)	0.00% (0)			
		Very Helpful	46.43% (13)	15.79% (3)	17.65% (3)			
Q12aaa	Uses Wind Speed/Direction Information ¹ to Decide WHAT Road Surface Treatments to Use	Strongly Disagree	3.45% (1)	0.00% (0)	16.67% (2)	0.0376	0.4141	0.3709
		Disagree	10.34% (3)	6.67% (1)	0.00% (0)			
		Neutral	24.14% (7)	60.00% (9)	33.33% (4)			
		Agree	17.24% (5)	26.67% (4)	41.67% (5)			
		Strongly Agree	44.83% (13)	6.67% (1)	8.33% (1)			
Q12aab	Uses Precipitation Information ¹ to Decide WHAT Road Surface Treatments to Use	Strongly Disagree	0.00% (0)	0.00% (0)	8.33% (1)	N/A ⁴	N/A ⁴	0.6438
		Neutral	0.00% (0)	18.75% (3)	16.67% (2)			
		Agree	27.59% (8)	68.75% (11)	50.00% (6)			
		Strongly Agree	72.41% (21)	12.50% (2)	25.00% (3)			
Q12aac	Uses Atmospheric Temperature Information ¹ to Decide WHAT Road Surface Treatments to Use	Strongly Disagree	11.11% (3)	0.00% (0)	9.09% (1)	0.6515	0.4024	0.6402
		Disagree	7.41% (2)	0.00% (0)	0.00% (0)			
		Neutral	3.70% (1)	28.57% (4)	27.27% (3)			
		Agree	14.81% (4)	42.86% (6)	54.55% (6)			
		Strongly Agree	62.96% (17)	28.57% (4)	9.09% (1)			

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Table A-5. Frequency and Percentage Distribution for Questions from the Highway Maintenance Operator Baseline and Follow-up Surveys, along with Associated P-Values Computed from the Chi-Square Distribution Testing for Effect between Surveys, Missouri Respondents Only (continued)

Question	Question Label	Response	Percentage (Number of Non-Missing Responses)			Baseline vs. First Follow-Up	Baseline vs. Second Follow-Up	First Follow-Up vs. Second Follow-Up
			Baseline (N=29)	First Follow-Up (N=31)	Second Follow-Up (N=29)	P-value ³		
Q12baa	Uses Pavement Temperature Information ¹ to Decide WHAT Road Surface Treatments to Use	Strongly Disagree	0.00% (0)	0.00% (0)	10.00% (1)	0.0668	0.0395	0.5553
		Neutral	6.90% (2)	28.57% (4)	30.00% (3)			
		Agree	27.59% (8)	42.86% (6)	40.00% (4)			
		Strongly Agree	65.52% (19)	28.57% (4)	20.00% (2)			
Q12bab	Uses Pavement Condition Information ¹ to Decide WHAT Road Surface Treatments to Use	Strongly Disagree	0.00% (0)	0.00% (0)	10.00% (1)	0.0130	0.0082	0.7662
		Disagree	3.45% (1)	7.69% (1)	0.00% (0)			
		Neutral	3.45% (1)	38.46% (5)	30.00% (3)			
		Agree	20.69% (6)	38.46% (5)	40.00% (4)			
		Strongly Agree	72.41% (21)	15.38% (2)	20.00% (2)			
Q12bac	Uses Dewpoint Information ¹ to Decide WHAT Road Surface Treatments to Use	Strongly Disagree	25.00% (5)	7.69% (1)	8.33% (1)	0.4329	0.0033	0.0334
		Disagree	25.00% (5)	15.38% (2)	8.33% (1)			
		Neutral	30.00% (6)	46.15% (6)	16.67% (2)			
		Agree	0.00% (0)	30.77% (4)	66.67% (8)			
		Strongly Agree	20.00% (4)	0.00% (0)	0.00% (0)			
Q12aba	Uses Wind Speed/Direction Information ¹ to Decide WHERE Road Surface Treatments Should be Applied	Strongly Disagree	6.90% (2)	0.00% (0)	16.67% (2)	0.0703	0.0482	0.8432
		Disagree	13.79% (4)	14.29% (2)	16.67% (2)			
		Neutral	20.69% (6)	57.14% (8)	41.67% (5)			
		Agree	10.34% (3)	21.43% (3)	16.67% (2)			
		Strongly Agree	48.28% (14)	7.14% (1)	8.33% (1)			

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Table A-5. Frequency and Percentage Distribution for Questions from the Highway Maintenance Operator Baseline and Follow-up Surveys, along with Associated P-Values Computed from the Chi-Square Distribution Testing for Effect between Surveys, Missouri Respondents Only (continued)

Question	Question Label	Response	Percentage (Number of Non-Missing Responses)			Baseline vs. First Follow-Up	Baseline vs. Second Follow-Up	First Follow-Up vs. Second Follow-Up
			Baseline (N=29)	First Follow-Up (N=31)	Second Follow-Up (N=29)	P-value ³		
Q12abb	Uses Precipitation Information ¹ to Decide WHERE Road Surface Treatments Should be Applied	Strongly Disagree	0.00% (0)	0.00% (0)	8.33% (1)	0.0266	0.0186	0.5512
		Disagree	3.45% (1)	0.00% (0)	8.33% (1)			
		Neutral	6.90% (2)	40.00% (6)	33.33% (4)			
		Agree	24.14% (7)	53.33% (8)	33.33% (4)			
		Strongly Agree	65.52% (19)	6.67% (1)	16.67% (2)			
Q12abc	Uses Atmospheric Temperature Information ¹ to Decide WHERE Road Surface Treatments Should be Applied	Strongly Disagree	7.41% (2)	0.00% (0)	8.33% (1)	0.0896	0.1504	0.8555
		Disagree	11.11% (3)	0.00% (0)	16.67% (2)			
		Neutral	14.81% (4)	61.54% (8)	33.33% (4)			
		Agree	22.22% (6)	30.77% (4)	25.00% (3)			
		Strongly Agree	44.44% (12)	7.69% (1)	16.67% (2)			
Q12bba	Uses Pavement Temperature Information ¹ to Decide WHERE Road Surface Treatments Should be Applied	Strongly Disagree	0.00% (0)	0.00% (0)	10.00% (1)	0.0089	0.0003	0.2416
		Disagree	0.00% (0)	0.00% (0)	10.00% (1)			
		Neutral	6.90% (2)	46.15% (6)	50.00% (5)			
		Agree	34.48% (10)	53.85% (7)	10.00% (1)			
		Strongly Agree	58.62% (17)	0.00% (0)	20.00% (2)			
Q12bbb	Uses Pavement Condition Information ¹ to Decide WHERE Road Surface Treatments Should be Applied	Strongly Disagree	3.45% (1)	0.00% (0)	10.00% (1)	0.0055	0.0020	0.7693
		Disagree	0.00% (0)	7.69% (1)	20.00% (2)			
		Neutral	6.90% (2)	46.15% (6)	30.00% (3)			
		Agree	6.90% (2)	38.46% (5)	30.00% (3)			
		Strongly Agree	82.76% (24)	7.69% (1)	10.00% (1)			

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Table A-5. Frequency and Percentage Distribution for Questions from the Highway Maintenance Operator Baseline and Follow-up Surveys, along with Associated P-Values Computed from the Chi-Square Distribution Testing for Effect between Surveys, Missouri Respondents Only (continued)

Question	Question Label	Response	Percentage (Number of Non-Missing Responses)			Baseline vs. First Follow-Up	Baseline vs. Second Follow-Up	First Follow-Up vs. Second Follow-Up
			Baseline (N=29)	First Follow-Up (N=31)	Second Follow-Up (N=29)			
Q12bbc	Uses Dewpoint Information ¹ to Decide WHERE Road Surface Treatments Should be Applied	Strongly Disagree	28.57% (6)	9.09% (1)	8.33% (1)	0.4714	0.8402	0.5993
		Disagree	28.57% (6)	18.18% (2)	16.67% (2)			
		Neutral	23.81% (5)	63.64% (7)	58.33% (7)			
		Agree	0.00% (0)	9.09% (1)	16.67% (2)			
		Strongly Agree	19.05% (4)	0.00% (0)	0.00% (0)			
Q12aca	Uses Wind Speed/Direction Information ¹ to Decide WHEN Road Surface Treatments Should be Applied	Strongly Disagree	6.90% (2)	0.00% (0)	16.67% (2)	0.0942	0.0730	0.6248
		Disagree	3.45% (1)	14.29% (2)	0.00% (0)			
		Neutral	17.24% (5)	35.71% (5)	41.67% (5)			
		Agree	24.14% (7)	35.71% (5)	33.33% (4)			
		Strongly Agree	48.28% (14)	14.29% (2)	8.33% (1)			
Q12acb	Uses Precipitation Information ¹ to Decide WHEN Road Surface Treatments Should be Applied	Strongly Disagree	0.00% (0)	0.00% (0)	8.33% (1)	N/A ⁴	N/A ⁴	0.1395
		Neutral	0.00% (0)	18.75% (3)	33.33% (4)			
		Agree	20.69% (6)	50.00% (8)	41.67% (5)			
		Strongly Agree	79.31% (23)	31.25% (5)	16.67% (2)			
Q12acc	Uses Atmospheric Temperature Information ¹ to Decide WHEN Road Surface Treatments Should be Applied	Strongly Disagree	11.11% (3)	0.00% (0)	8.33% (1)	0.7373	0.1423	0.2616
		Disagree	3.70% (1)	0.00% (0)	8.33% (1)			
		Neutral	3.70% (1)	23.08% (3)	25.00% (3)			
		Agree	11.11% (3)	46.15% (6)	41.67% (5)			
		Strongly Agree	70.37% (19)	30.77% (4)	16.67% (2)			
Q12bca	Uses Pavement Temperature Information ¹ to Decide WHEN Road Surface Treatments Should be Applied	Strongly Disagree	0.00% (0)	0.00% (0)	10.00% (1)	0.1498	0.0007	0.3669
		Neutral	6.90% (2)	23.08% (3)	30.00% (3)			
		Agree	20.69% (6)	46.15% (6)	40.00% (4)			
		Strongly Agree	72.41% (21)	30.77% (4)	20.00% (2)			

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Table A-5. Frequency and Percentage Distribution for Questions from the Highway Maintenance Operator Baseline and Follow-up Surveys, along with Associated P-Values Computed from the Chi-Square Distribution Testing for Effect between Surveys, Missouri Respondents Only (continued)

Question	Question Label	Response	Percentage (Number of Non-Missing Responses)			Baseline vs. First Follow-Up	Baseline vs. Second Follow-Up	First Follow-Up vs. Second Follow-Up
			Baseline (N=29)	First Follow-Up (N=31)	Second Follow-Up (N=29)	P-value ³		
Q12bcb	Uses Pavement Condition Information ¹ to Decide WHEN Road Surface Treatments Should be Applied	Strongly Disagree	0.00% (0)	0.00% (0)	10.00% (1)	0.0143	0.0154	0.8903
		Disagree	0.00% (0)	7.14% (1)	0.00% (0)			
		Neutral	3.45% (1)	35.71% (5)	30.00% (3)			
		Agree	20.69% (6)	35.71% (5)	40.00% (4)			
		Strongly Agree	75.86% (22)	21.43% (3)	20.00% (2)			
Q12bcc	Uses Dewpoint Information ¹ to Decide WHEN Road Surface Treatments Should be Applied	Strongly Disagree	28.57% (6)	7.69% (1)	16.67% (2)	0.1394	0.0321	0.4269
		Disagree	23.81% (5)	7.69% (1)	0.00% (0)			
		Neutral	28.57% (6)	46.15% (6)	33.33% (4)			
		Agree	0.00% (0)	30.77% (4)	50.00% (6)			
		Strongly Agree	19.05% (4)	7.69% (1)	0.00% (0)			
Q13aaa	Wind Speed/Direction Information ¹ is Understandable	Strongly Disagree	3.45% (1)	0.00% (0)	0.00% (0)	0.8143	0.8826	0.7415
		Neutral	13.79% (4)	20.00% (3)	15.38% (2)			
		Agree	37.93% (11)	60.00% (9)	61.54% (8)			
		Strongly Agree	44.83% (13)	20.00% (3)	23.08% (3)			
Q13aab	Precipitation Information ¹ is Understandable	Disagree	3.45% (1)	0.00% (0)	0.00% (0)	0.8229	0.8688	0.9767
		Neutral	17.24% (5)	23.53% (4)	23.08% (3)			
		Agree	31.03% (9)	47.06% (8)	53.85% (7)			
		Strongly Agree	48.28% (14)	29.41% (5)	23.08% (3)			
Q13aac	Atmospheric Temperature Information ¹ is Understandable	Strongly Disagree	7.41% (2)	0.00% (0)	0.00% (0)	0.4174	0.7047	0.3056
		Disagree	3.70% (1)	0.00% (0)	0.00% (0)			
		Neutral	11.11% (3)	33.33% (5)	16.67% (2)			
		Agree	33.33% (9)	40.00% (6)	58.33% (7)			
		Strongly Agree	44.44% (12)	26.67% (4)	25.00% (3)			

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Table A-5. Frequency and Percentage Distribution for Questions from the Highway Maintenance Operator Baseline and Follow-up Surveys, along with Associated P-Values Computed from the Chi-Square Distribution Testing for Effect between Surveys, Missouri Respondents Only (continued)

Question	Question Label	Response	Percentage (Number of Non-Missing Responses)			Baseline vs. First Follow-Up	Baseline vs. Second Follow-Up	First Follow-Up vs. Second Follow-Up
			Baseline (N=29)	First Follow-Up (N=31)	Second Follow-Up (N=29)			
Q13baa	Pavement Temperature Information ¹ is Understandable	Disagree	3.45% (1)	0.00% (0)	0.00% (0)	0.2335	0.1678	0.7369
		Neutral	13.79% (4)	33.33% (5)	40.00% (4)			
		Agree	41.38% (12)	46.67% (7)	40.00% (4)			
		Strongly Agree	41.38% (12)	20.00% (3)	20.00% (2)			
Q13bab	Pavement Condition Information ¹ is Understandable	Disagree	3.45% (1)	7.14% (1)	10.00% (1)	0.9554	0.0183	0.0560
		Neutral	17.24% (5)	14.29% (2)	50.00% (5)			
		Agree	41.38% (12)	64.29% (9)	20.00% (2)			
		Strongly Agree	37.93% (11)	14.29% (2)	20.00% (2)			
Q13bac	Dewpoint Information ¹ is Understandable	Strongly Disagree	33.33% (7)	7.14% (1)	0.00% (0)	0.2719	0.3127	1.0000
		Disagree	9.52% (2)	7.14% (1)	0.00% (0)			
		Neutral	23.81% (5)	35.71% (5)	50.00% (5)			
		Agree	23.81% (5)	50.00% (7)	30.00% (3)			
		Strongly Agree	9.52% (2)	0.00% (0)	20.00% (2)			
Q13aba	Wind Speed/Direction Information ¹ is Usable	Strongly Disagree	3.57% (1)	0.00% (0)	0.00% (0)	0.3953	0.5328	0.8059
		Disagree	0.00% (0)	6.67% (1)	7.69% (1)			
		Neutral	35.71% (10)	20.00% (3)	23.08% (3)			
		Agree	14.29% (4)	53.33% (8)	53.85% (7)			
		Strongly Agree	46.43% (13)	20.00% (3)	15.38% (2)			
Q13abb	Precipitation Information ¹ is Usable	Strongly Disagree	0.00% (0)	0.00% (0)	7.69% (1)	0.6726	0.8748	0.6011
		Disagree	3.57% (1)	5.88% (1)	7.69% (1)			
		Neutral	25.00% (7)	17.65% (3)	15.38% (2)			
		Agree	14.29% (4)	52.94% (9)	46.15% (6)			
		Strongly Agree	57.14% (16)	23.53% (4)	23.08% (3)			

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Table A-5. Frequency and Percentage Distribution for Questions from the Highway Maintenance Operator Baseline and Follow-up Surveys, along with Associated P-Values Computed from the Chi-Square Distribution Testing for Effect between Surveys, Missouri Respondents Only (continued)

Question	Question Label	Response	Percentage (Number of Non-Missing Responses)			Baseline vs. First Follow-Up	Baseline vs. Second Follow-Up	First Follow-Up vs. Second Follow-Up
			Baseline (N=29)	First Follow-Up (N=31)	Second Follow-Up (N=29)			
Q13abc	Atmospheric Temperature Information ¹ is Usable	Strongly Disagree	7.69% (2)	0.00% (0)	0.00% (0)	0.5070	0.7201	0.8203
		Disagree	0.00% (0)	0.00% (0)	9.09% (1)			
		Neutral	23.08% (6)	40.00% (6)	27.27% (3)			
		Agree	11.54% (3)	40.00% (6)	45.45% (5)			
		Strongly Agree	57.69% (15)	20.00% (3)	18.18% (2)			
Q13bba	Pavement Temperature Information ¹ is Usable	Disagree	7.14% (2)	0.00% (0)	20.00% (2)	0.3447	0.1704	0.5129
		Neutral	25.00% (7)	46.67% (7)	40.00% (4)			
		Agree	14.29% (4)	46.67% (7)	30.00% (3)			
		Strongly Agree	53.57% (15)	6.67% (1)	10.00% (1)			
Q13bbb	Pavement Condition Information ¹ is Usable	Disagree	3.57% (1)	21.43% (3)	30.00% (3)	0.5124	0.1449	0.3909
		Neutral	28.57% (8)	21.43% (3)	30.00% (3)			
		Agree	21.43% (6)	57.14% (8)	30.00% (3)			
		Strongly Agree	46.43% (13)	0.00% (0)	10.00% (1)			
Q13bbc	Dewpoint Information ¹ is Usable	Strongly Disagree	23.81% (5)	7.14% (1)	0.00% (0)	0.1359	0.0737	0.7159
		Disagree	19.05% (4)	7.14% (1)	0.00% (0)			
		Neutral	38.10% (8)	42.86% (6)	50.00% (4)			
		Agree	14.29% (3)	42.86% (6)	37.50% (3)			
		Strongly Agree	4.76% (1)	0.00% (0)	12.50% (1)			
Q13aca	Wind Speed/Direction Information ¹ is Easily Obtainable	Strongly Disagree	0.00% (0)	6.67% (1)	23.08% (3)	0.3220	0.3527	0.9755
		Disagree	3.45% (1)	26.67% (4)	7.69% (1)			
		Neutral	34.48% (10)	20.00% (3)	23.08% (3)			
		Agree	20.69% (6)	26.67% (4)	23.08% (3)			
		Strongly Agree	41.38% (12)	20.00% (3)	23.08% (3)			

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2. The question was not asked in the Baseline Survey.

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5. The test was not performed for these questions because the responses could not be collapsed into positive and non-positive categories.

Table A-5. Frequency and Percentage Distribution for Questions from the Highway Maintenance Operator Baseline and Follow-up Surveys, along with Associated P-Values Computed from the Chi-Square Distribution Testing for Effect between Surveys, Missouri Respondents Only (continued)

Question	Question Label	Response	Percentage (Number of Non-Missing Responses)			Baseline vs. First Follow-Up	Baseline vs. Second Follow-Up	First Follow-Up vs. Second Follow-Up
			Baseline (N=29)	First Follow-Up (N=31)	Second Follow-Up (N=29)			
Q13acb	Precipitation Information ¹ is Easily Obtainable	Strongly Disagree	0.00% (0)	5.88% (1)	16.67% (2)	0.7184	0.6027	0.8665
		Disagree	6.90% (2)	23.53% (4)	8.33% (1)			
		Neutral	34.48% (10)	17.65% (3)	25.00% (3)			
		Agree	20.69% (6)	35.29% (6)	25.00% (3)			
		Strongly Agree	37.93% (11)	17.65% (3)	25.00% (3)			
Q13acc	Atmospheric Temperature Information ¹ is Easily Obtainable	Strongly Disagree	3.70% (1)	6.67% (1)	9.09% (1)	0.0947	0.5016	0.4303
		Disagree	0.00% (0)	26.67% (4)	9.09% (1)			
		Neutral	29.63% (8)	26.67% (4)	27.27% (3)			
		Agree	18.52% (5)	20.00% (3)	27.27% (3)			
		Strongly Agree	48.15% (13)	20.00% (3)	27.27% (3)			
Q13bca	Pavement Temperature Information ¹ is Easily Obtainable	Strongly Disagree	6.90% (2)	0.00% (0)	20.00% (2)	0.5676	0.6253	1.0000
		Disagree	6.90% (2)	25.00% (4)	10.00% (1)			
		Neutral	27.59% (8)	25.00% (4)	20.00% (2)			
		Agree	20.69% (6)	37.50% (6)	40.00% (4)			
		Strongly Agree	37.93% (11)	12.50% (2)	10.00% (1)			
Q13bcb	Pavement Condition Information ¹ is Easily Obtainable	Strongly Disagree	3.45% (1)	0.00% (0)	20.00% (2)	0.9027	0.3651	0.4943
		Disagree	6.90% (2)	33.33% (5)	10.00% (1)			
		Neutral	34.48% (10)	13.33% (2)	30.00% (3)			
		Agree	10.34% (3)	40.00% (6)	20.00% (2)			
		Strongly Agree	44.83% (13)	13.33% (2)	20.00% (2)			
Q13bcc	Dewpoint Information ¹ is Easily Obtainable	Strongly Disagree	28.57% (6)	6.67% (1)	0.00% (0)	0.6663	0.4121	0.1708
		Disagree	19.05% (4)	33.33% (5)	0.00% (0)			
		Neutral	19.05% (4)	33.33% (5)	50.00% (4)			
		Agree	4.76% (1)	13.33% (2)	37.50% (3)			
		Strongly Agree	28.57% (6)	13.33% (2)	12.50% (1)			

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Table A-5. Frequency and Percentage Distribution for Questions from the Highway Maintenance Operator Baseline and Follow-up Surveys, along with Associated P-Values Computed from the Chi-Square Distribution Testing for Effect between Surveys, Missouri Respondents Only (continued)

Question	Question Label	Response	Percentage (Number of Non-Missing Responses)			Baseline vs. First Follow-Up	Baseline vs. Second Follow-Up	First Follow-Up vs. Second Follow-Up
			Baseline (N=29)	First Follow-Up (N=31)	Second Follow-Up (N=29)			
Q13ada	Wind Speed/Direction Information ¹ is Accurate	Strongly Disagree	0.00% (0)	0.00% (0)	8.33% (1)	0.4312	0.0763	0.2295
		Disagree	13.79% (4)	6.67% (1)	0.00% (0)			
		Neutral	51.72% (15)	46.67% (7)	25.00% (3)			
		Agree	17.24% (5)	40.00% (6)	58.33% (7)			
		Strongly Agree	17.24% (5)	6.67% (1)	8.33% (1)			
Q13adb	Precipitation Information ¹ is Accurate	Strongly Disagree	10.34% (3)	0.00% (0)	23.08% (3)	0.2492	0.0390	0.1803
		Disagree	13.79% (4)	0.00% (0)	0.00% (0)			
		Neutral	51.72% (15)	58.82% (10)	15.38% (2)			
		Agree	13.79% (4)	23.53% (4)	46.15% (6)			
		Strongly Agree	10.34% (3)	17.65% (3)	15.38% (2)			
Q13adc	Atmospheric Temperature Information ¹ is Accurate	Strongly Disagree	3.70% (1)	0.00% (0)	8.33% (1)	0.9614	0.3030	0.2341
		Disagree	14.81% (4)	0.00% (0)	8.33% (1)			
		Neutral	40.74% (11)	60.00% (9)	25.00% (3)			
		Agree	22.22% (6)	20.00% (3)	50.00% (6)			
		Strongly Agree	18.52% (5)	20.00% (3)	8.33% (1)			
Q13bda	Pavement Temperature Information ¹ is Accurate	Strongly Disagree	0.00% (0)	0.00% (0)	20.00% (2)	0.1942	0.6611	0.5008
		Disagree	17.24% (5)	0.00% (0)	20.00% (2)			
		Neutral	34.48% (10)	73.33% (11)	20.00% (2)			
		Agree	31.03% (9)	13.33% (2)	40.00% (4)			
		Strongly Agree	17.24% (5)	13.33% (2)	0.00% (0)			
Q13bdb	Pavement Condition Information ¹ is Accurate	Strongly Disagree	0.00% (0)	0.00% (0)	18.18% (2)	0.2159	0.8248	0.2003
		Disagree	20.69% (6)	14.29% (2)	27.27% (3)			
		Neutral	37.93% (11)	64.29% (9)	9.09% (1)			
		Agree	24.14% (7)	14.29% (2)	36.36% (4)			
		Strongly Agree	17.24% (5)	7.14% (1)	9.09% (1)			

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Table A-5. Frequency and Percentage Distribution for Questions from the Highway Maintenance Operator Baseline and Follow-up Surveys, along with Associated P-Values Computed from the Chi-Square Distribution Testing for Effect between Surveys, Missouri Respondents Only (continued)

Question	Question Label	Response	Percentage (Number of Non-Missing Responses)			Baseline vs. First Follow-Up	Baseline vs. Second Follow-Up	First Follow-Up vs. Second Follow-Up
			Baseline (N=29)	First Follow-Up (N=31)	Second Follow-Up (N=29)	P-value ³		
Q13bdc	Dewpoint Information ¹ is Accurate	Strongly Disagree	14.29% (3)	7.14% (1)	0.00% (0)	0.4591	0.1432	0.0190
		Disagree	28.57% (6)	14.29% (2)	12.50% (1)			
		Neutral	33.33% (7)	64.29% (9)	37.50% (3)			
		Agree	19.05% (4)	14.29% (2)	50.00% (4)			
		Strongly Agree	4.76% (1)	0.00% (0)	0.00% (0)			
Q13aea	Wind Speed/Direction Information ¹ is Useful for Weather-Related Decisions	Disagree	3.45% (1)	6.67% (1)	9.09% (1)	0.7296	0.9089	0.8461
		Neutral	31.03% (9)	33.33% (5)	27.27% (3)			
		Agree	20.69% (6)	46.67% (7)	45.45% (5)			
		Strongly Agree	44.83% (13)	13.33% (2)	18.18% (2)			
Q13aeb	Precipitation Information ¹ is Useful for Weather-Related Decisions	Disagree	0.00% (0)	0.00% (0)	9.09% (1)	0.2171	0.1088	0.7476
		Neutral	17.24% (5)	31.25% (5)	27.27% (3)			
		Agree	31.03% (9)	50.00% (8)	36.36% (4)			
		Strongly Agree	51.72% (15)	18.75% (3)	27.27% (3)			
Q13aec	Atmospheric Temperature Information ¹ is Useful for Weather-Related Decisions	Disagree	3.70% (1)	0.00% (0)	10.00% (1)	0.4770	0.1594	0.4102
		Neutral	14.81% (4)	26.67% (4)	30.00% (3)			
		Agree	18.52% (5)	60.00% (9)	40.00% (4)			
		Strongly Agree	62.96% (17)	13.33% (2)	20.00% (2)			
Q13bea	Pavement Temperature Information ¹ is Useful for Weather-Related Decisions	Strongly Disagree	0.00% (0)	0.00% (0)	25.00% (2)	0.2690	0.0951	0.5964
		Disagree	3.57% (1)	0.00% (0)	0.00% (0)			
		Neutral	17.86% (5)	38.46% (5)	25.00% (2)			
		Agree	28.57% (8)	38.46% (5)	37.50% (3)			
		Strongly Agree	50.00% (14)	23.08% (3)	12.50% (1)			

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Table A-5. Frequency and Percentage Distribution for Questions from the Highway Maintenance Operator Baseline and Follow-up Surveys, along with Associated P-Values Computed from the Chi-Square Distribution Testing for Effect between Surveys, Missouri Respondents Only (continued)

Question	Question Label	Response	% (n)			Baseline vs. First Follow-Up	Baseline vs. Second Follow-Up	First Follow-Up vs. Second Follow-Up
			Baseline (N=29)	First Follow-Up (N=31)	Second Follow-Up (N=29)			
Q13beb	Pavement Condition Information ¹ is Useful for Weather-Related Decisions	Strongly Disagree	3.45% (1)	0.00% (0)	25.00% (2)	0.2734	0.1144	0.5679
		Disagree	3.45% (1)	16.67% (2)	12.50% (1)			
		Neutral	24.14% (7)	33.33% (4)	25.00% (2)			
		Agree	27.59% (8)	50.00% (6)	25.00% (2)			
		Strongly Agree	41.38% (12)	0.00% (0)	12.50% (1)			
Q13bec	Dewpoint Information ¹ is Useful for Weather-Related Decisions	Strongly Disagree	19.05% (4)	7.14% (1)	0.00% (0)	0.7452	0.1007	0.0843
		Disagree	19.05% (4)	7.14% (1)	0.00% (0)			
		Neutral	28.57% (6)	57.14% (8)	37.50% (3)			
		Agree	19.05% (4)	28.57% (4)	50.00% (4)			
		Strongly Agree	14.29% (3)	0.00% (0)	12.50% (1)			
Q14afa	FORETELL Wind Speed/Direction Information Changed Weather-Related Decisions You Made	Strongly Disagree	N/A ²	8.33% (1)	23.08% (3)	N/A ²	N/A ²	0.6123
		Disagree	N/A ²	16.67% (2)	15.38% (2)			
		Neutral	N/A ²	58.33% (7)	38.46% (5)			
		Agree	N/A ²	16.67% (2)	15.38% (2)			
		Strongly Agree	N/A ²	0.00% (0)	7.69% (1)			
Q14afb	FORETELL Precipitation Information Changed Weather-Related Decisions You Made	Strongly Disagree	N/A ²	7.14% (1)	21.43% (3)	N/A ²	N/A ²	0.6404
		Disagree	N/A ²	14.29% (2)	14.29% (2)			
		Neutral	N/A ²	42.86% (6)	35.71% (5)			
		Agree	N/A ²	35.71% (5)	14.29% (2)			
		Strongly Agree	N/A ²	0.00% (0)	14.29% (2)			

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Table A-5. Frequency and Percentage Distribution for Questions from the Highway Maintenance Operator Baseline and Follow-up Surveys, along with Associated P-Values Computed from the Chi-Square Distribution Testing for Effect between Surveys, Missouri Respondents Only (continued)

Question	Question Label	Response	Percentage (Number of Non-Missing Responses)			Baseline vs. First Follow-Up	Baseline vs. Second Follow-Up	First Follow-Up vs. Second Follow-Up
			Baseline (N=29)	First Follow-Up (N=31)	Second Follow-Up (N=29)			
Q14afc	FORETELL Atmospheric Temperature Information Changed Weather-Related Decisions You Made	Strongly Disagree	N/A ²	7.69% (1)	25.00% (3)	N/A ²	N/A ²	0.8908
		Disagree	N/A ²	7.69% (1)	16.67% (2)			
		Neutral	N/A ²	61.54% (8)	33.33% (4)			
		Agree	N/A ²	15.38% (2)	16.67% (2)			
		Strongly Agree	N/A ²	7.69% (1)	8.33% (1)			
Q14bfa	FORETELL Pavement Temperature Information Changed Weather-Related Decisions You Made	Strongly Disagree	N/A ²	9.09% (1)	22.22% (2)	N/A ²	N/A ²	0.8811
		Disagree	N/A ²	18.18% (2)	33.33% (3)			
		Neutral	N/A ²	36.36% (4)	11.11% (1)			
		Agree	N/A ²	36.36% (4)	22.22% (2)			
		Strongly Agree	N/A ²	0.00% (0)	11.11% (1)			
Q14bfb	FORETELL Pavement Condition Information Changed Weather-Related Decisions You Made	Strongly Disagree	N/A ²	0.00% (0)	22.22% (2)	N/A ²	N/A ²	0.5054
		Disagree	N/A ²	30.00% (3)	33.33% (3)			
		Neutral	N/A ²	50.00% (5)	11.11% (1)			
		Agree	N/A ²	20.00% (2)	22.22% (2)			
		Strongly Agree	N/A ²	0.00% (0)	11.11% (1)			
Q14bfc	FORETELL Dewpoint Information Changed Weather-Related Decisions You Made	Strongly Disagree	N/A ²	16.67% (2)	11.11% (1)	N/A ²	N/A ²	0.1806
		Disagree	N/A ²	16.67% (2)	11.11% (1)			
		Neutral	N/A ²	58.33% (7)	44.44% (4)			
		Agree	N/A ²	8.33% (1)	22.22% (2)			
		Strongly Agree	N/A ²	0.00% (0)	11.11% (1)			

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Question	Question Label	Response	Percentage (Number of Non-Missing Responses)			Baseline vs. First Follow-Up	Baseline vs. Second Follow-Up	First Follow-Up vs. Second Follow-Up
			Baseline (N=29)	First Follow-Up (N=31)	Second Follow-Up (N=29)			
Q15	FORETELL Provides Valuable Information Not Provided Elsewhere	Strongly Disagree	N/A ²	22.73% (5)	23.53% (4)	N/A ²	N/A ²	0.7219
		Disagree	N/A ²	4.55% (1)	17.65% (3)			
		Neutral	N/A ²	36.36% (8)	17.65% (3)			
		Agree	N/A ²	31.82% (7)	35.29% (6)			
		Strongly Agree	N/A ²	4.55% (1)	5.88% (1)			
Q16	Receive FORETELL Information in Time to Make Weather-Related Decisions	Strongly Disagree	N/A ²	9.09% (2)	17.65% (3)	N/A ²	N/A ²	0.6743
		Disagree	N/A ²	13.64% (3)	11.76% (2)			
		Neutral	N/A ²	36.36% (8)	23.53% (4)			
		Agree	N/A ²	40.91% (9)	41.18% (7)			
		Strongly Agree	N/A ²	0.00% (0)	5.88% (1)			
Q17	Weather Information ¹ is Sufficient for Making Weather-Related Decisions	Strongly Disagree	0.00% (0)	0.00% (0)	5.88% (1)	0.7180	0.6587	0.9382
		Disagree	20.69% (6)	31.82% (7)	17.65% (3)			
		Neutral	37.93% (11)	31.82% (7)	41.18% (7)			
		Agree	34.48% (10)	36.36% (8)	29.41% (5)			
		Strongly Agree	6.90% (2)	0.00% (0)	5.88% (1)			
Q18	Willing to Pay for FORETELL	Strongly Disagree	N/A ²	15.00% (3)	25.00% (4)	N/A ²	N/A ²	0.7462
		Disagree	N/A ²	15.00% (3)	6.25% (1)			
		Neutral	N/A ²	60.00% (12)	56.25% (9)			
		Agree	N/A ²	5.00% (1)	12.50% (2)			
		Strongly Agree	N/A ²	5.00% (1)	0.00% (0)			

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Question	Question Label	Response	Percentage (Number of Non-Missing Responses)			Baseline vs. First Follow-Up	Baseline vs. Second Follow-Up	First Follow-Up vs. Second Follow-Up
			Baseline (N=29)	First Follow-Up (N=31)	Second Follow-Up (N=29)	P-value ³		
Q19	Having Weather Information ¹ Makes Job Easier	Strongly Disagree	0.00% (0)	9.09% (2)	17.65% (3)	<.0001	<.0001	0.8737
		Disagree	0.00% (0)	13.64% (3)	11.76% (2)			
		Neutral	10.34% (3)	50.00% (11)	41.18% (7)			
		Agree	13.79% (4)	22.73% (5)	29.41% (5)			
		Strongly Agree	75.86% (22)	4.55% (1)	0.00% (0)			
Q20	Weather Information ¹ Helps You Improve Traffic Efficiency of Roadways	Strongly Disagree	0.00% (0)	9.09% (2)	17.65% (3)	0.0101	0.0011	0.2157
		Disagree	0.00% (0)	9.09% (2)	5.88% (1)			
		Neutral	31.03% (9)	50.00% (11)	58.82% (10)			
		Agree	37.93% (11)	31.82% (7)	17.65% (3)			
		Strongly Agree	31.03% (9)	0.00% (0)	0.00% (0)			
Q21	Weather Information ¹ Helps You to Target Snow and Ice Control Measures	Strongly Disagree	3.45% (1)	9.09% (2)	5.88% (1)	0.0002	0.0007	0.9485
		Disagree	0.00% (0)	9.09% (2)	23.53% (4)			
		Neutral	20.69% (6)	59.09% (13)	47.06% (8)			
		Agree	44.83% (13)	13.64% (3)	23.53% (4)			
		Strongly Agree	31.03% (9)	9.09% (2)	0.00% (0)			
Q22	Highway Maintenance Activities are Conducted More Efficiently Using Weather Information ¹	Strongly Disagree	0.00% (0)	9.09% (2)	5.88% (1)	<.0001	<.0001	0.9485
		Disagree	0.00% (0)	13.64% (3)	35.29% (6)			
		Neutral	6.90% (2)	54.55% (12)	35.29% (6)			
		Agree	34.48% (10)	22.73% (5)	23.53% (4)			
		Strongly Agree	58.62% (17)	0.00% (0)	0.00% (0)			

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Table A-5. Frequency and Percentage Distribution for Questions from the Highway Maintenance Operator Baseline and Follow-up Surveys, along with Associated P-Values Computed from the Chi-Square Distribution Testing for Effect between Surveys, Missouri Respondents Only (continued)

Question	Question Label	Response	Percentage (Number of Non-Missing Responses)			Baseline vs. First Follow-Up	Baseline vs. Second Follow-Up	First Follow-Up vs. Second Follow-Up
			Baseline (N=29)	First Follow-Up (N=31)	Second Follow-Up (N=29)			
Q23	FORETELL Information Makes You More Confident in Making Weather-Related Decisions	Strongly Disagree	N/A ²	9.09% (2)	5.88% (1)	N/A ²	N/A ²	0.5859
		Disagree	N/A ²	22.73% (5)	29.41% (5)			
		Neutral	N/A ²	50.00% (11)	41.18% (7)			
		Agree	N/A ²	18.18% (4)	17.65% (3)			
		Strongly Agree	N/A ²	0.00% (0)	5.88% (1)			
Q24	FORETELL Information Helps You Deploy Staff More Efficiently	Strongly Disagree	N/A ²	13.64% (3)	5.88% (1)	N/A ²	N/A ²	0.6362
		Disagree	N/A ²	13.64% (3)	23.53% (4)			
		Neutral	N/A ²	54.55% (12)	47.06% (8)			
		Agree	N/A ²	13.64% (3)	17.65% (3)			
		Strongly Agree	N/A ²	4.55% (1)	5.88% (1)			
Q25	Roads Return to Targeted Level of Service More Quickly with Weather Information ¹	Strongly Disagree	0.00% (0)	13.64% (3)	5.88% (1)	0.0103	0.0020	0.6532
		Disagree	3.45% (1)	18.18% (4)	35.29% (6)			
		Neutral	34.48% (10)	45.45% (10)	41.18% (7)			
		Agree	24.14% (7)	18.18% (4)	17.65% (3)			
		Strongly Agree	37.93% (11)	4.55% (1)	0.00% (0)			
Q26	Safety of the Highway Maintenance Operator is Increased with Weather Information ¹	Strongly Disagree	0.00% (0)	9.09% (2)	11.76% (2)	<.0001	<.0001	0.8340
		Disagree	6.90% (2)	18.18% (4)	23.53% (4)			
		Neutral	13.79% (4)	59.09% (13)	52.94% (9)			
		Agree	24.14% (7)	9.09% (2)	11.76% (2)			
		Strongly Agree	55.17% (16)	4.55% (1)	0.00% (0)			

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4. Cells with N/A pertain to questions containing zero-frequency response categories. Therefore, the test cannot be performed.

5. The test was not performed for these questions because the responses could not be collapsed into positive and non-positive categories.

Table A-5. Frequency and Percentage Distribution for Questions from the Highway Maintenance Operator Baseline and Follow-up Surveys, along with Associated P-Values Computed from the Chi-Square Distribution Testing for Effect between Surveys, Missouri Respondents Only (continued)

Question	Question Label	Response	Percentage (Number of Non-Missing Responses)			Baseline vs. First Follow-Up	Baseline vs. Second Follow-Up	First Follow-Up vs. Second Follow-Up
			Baseline (N=29)	First Follow-Up (N=31)	Second Follow-Up (N=29)	P-value ³		
Q27	Weather Information ¹ Helps to Lessen the Amount of Chemical Applications	Strongly Disagree	3.45% (1)	9.09% (2)	11.76% (2)	<.0001	<.0001	0.3223
		Disagree	0.00% (0)	27.27% (6)	17.65% (3)			
		Neutral	20.69% (6)	54.55% (12)	52.94% (9)			
		Agree	34.48% (10)	4.55% (1)	11.76% (2)			
		Strongly Agree	41.38% (12)	4.55% (1)	5.88% (1)			
Q28	Make Highway Maintenance Decisions More Efficiently because of FORETELL Information	Yes	N/A ²	42.86% (9)	35.29% (6)	N/A ²	N/A ²	0.6032
		No	N/A ²	57.14% (12)	64.71% (11)			
Q28a	How Much Sooner Do You Learn about Weather Events when Using FORETELL Information	0-3 Hours	N/A ²	0.00% (0)	50.00% (3)	N/A ²	N/A ²	N/A ⁵
		3-6 Hours	N/A ²	44.44% (4)	0.00% (0)			
		6-12 Hours	N/A ²	55.56% (5)	16.67% (1)			
		> 12 Hours	N/A ²	0.00% (0)	33.33% (2)			
Q29	Roads are More Quickly Returned to Acceptable Level of Service when Using FORETELL Information	Yes	N/A ²	19.05% (4)	17.65% (3)	N/A ²	N/A ²	0.8961
		No	N/A ²	80.95% (17)	82.35% (14)			
Q29a	How Much More Quickly are Roads Returned to Service when Using FORETELL Information	0-3 Hours	N/A ²	75.00% (3)	66.67% (2)	N/A ²	N/A ²	N/A ⁵
		3-6 Hours	N/A ²	25.00% (1)	33.33% (1)			

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3. Questions with more than two response categories were collapsed into positive and non-positive responses for the Chi-Square Test of Effect between surveys. Neutral responses were considered non-positive.

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Table A-5. Frequency and Percentage Distribution for Questions from the Highway Maintenance Operator Baseline and Follow-up Surveys, along with Associated P-Values Computed from the Chi-Square Distribution Testing for Effect between Surveys, Missouri Respondents Only (continued)

Question	Question Label	Response	Percentage (Number of Non-Missing Responses)			Baseline vs. First Follow-Up	Baseline vs. Second Follow-Up	First Follow-Up vs. Second Follow-Up
			Baseline (N=29)	First Follow-Up (N=31)	Second Follow-Up (N=29)	P-value ³		
Q30	Would Like to Use FORETELL Information in the Future	Yes	N/A ²	85.71% (18)	50.00% (8)	N/A ²	N/A ²	0.0204
		No	N/A ²	14.29% (3)	50.00% (8)			

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Table A-6. Frequency and Percentage Distribution for Questions from the Highway Maintenance Operator Baseline and Follow-up Surveys, along with Associated P-Values Computed from the Chi-Square Distribution Testing for Effect between Surveys, Wisconsin Respondents Only

Question	Question Label	Response	Percentage (Number of Non-Missing Responses)			Baseline vs. First Follow-Up	Baseline vs. Second Follow-Up	First Follow-Up vs. Second Follow-Up
			Baseline (N=7)	First Follow-Up (N=5)	Second Follow-Up (N=5)	P-value ³		
Q6aa	Uses Wind Speed/Direction in Weather-Related Decisions	Yes	100.00% (7)	100.00% (5)	100.00% (5)	N/A ⁴	N/A ⁴	N/A ⁴
Q6ab	Uses Actual Wind Speed/Direction Readings	No Actual Readings	85.71% (6)	40.00% (2)	0.00% (0)	0.1151	N/A ⁴	N/A ⁴
		Uses Actual Readings	14.29% (1)	60.00% (3)	100.00% (5)			
Q6ac	Uses Forecast Wind Speed/Direction Readings	No Forecast Information	14.29% (1)	20.00% (1)	20.00% (1)	0.8039	0.7869	1.0000
		Uses Forecast Information	85.71% (6)	80.00% (4)	80.00% (4)			
Q6ba	Uses Precipitation in Weather-Related Decisions	Yes	100.00% (7)	100.00% (5)	100.00% (5)	N/A ⁴	N/A ⁴	N/A ⁴
Q6bb	Uses Actual Precipitation Readings	No Actual Readings	57.14% (4)	40.00% (2)	20.00% (1)	0.5483	0.2461	0.4880
		Uses Actual Readings	42.86% (3)	60.00% (3)	80.00% (4)			
Q6bc	Uses Forecast Precipitation Readings	No Forecast Information	0.00% (0)	0.00% (0)	20.00% (1)	N/A ⁴	N/A ⁴	N/A ⁴
		Uses Forecast Information	100.00% (7)	100.00% (5)	80.00% (4)			
Q6ca	Uses Atmospheric Temperature in Weather-Related Decisions	Yes	100.00% (7)	80.00% (4)	60.00% (3)	N/A ⁴	N/A ⁴	0.2574
		No	0.00% (0)	20.00% (1)	40.00% (2)			

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Table A-6. Frequency and Percentage Distribution for Questions from the Highway Maintenance Operator Baseline and Follow-up Surveys, along with Associated P-Values Computed from the Chi-Square Distribution Testing for Effect between Surveys, Wisconsin Respondents Only (continued)

Question	Question Label	Response	Percentage (Number of Non-Missing Responses)			Baseline vs. First Follow-Up	Baseline vs. Second Follow-Up	First Follow-Up vs. Second Follow-Up
			Baseline (N=7)	First Follow-Up (N=5)	Second Follow-Up (N=5)	P-value ³		
Q6cb	Uses Actual Atmospheric Temperature Readings	No Actual Readings	85.71% (6)	25.00% (1)	66.67% (2)	0.0555	0.5140	0.0971
		Uses Actual Readings	14.29% (1)	75.00% (3)	33.33% (1)			
Q6cc	Uses Forecast Atmospheric Temperature Readings	No Forecast Information	14.29% (1)	25.00% (1)	0.00% (0)	0.6460	N/A ⁴	N/A ⁴
		Uses Forecast Information	85.71% (6)	75.00% (3)	100.00% (3)			
Q6da	Uses Pavement Temperature in Weather-Related Decisions	Yes	100.00% (7)	100.00% (5)	100.00% (5)	N/A ⁴	N/A ⁴	N/A ⁴
Q6db	Uses Actual Pavement Temperature Readings	No Actual Readings	100.00% (7)	0.00% (0)	0.00% (0)	N/A ⁴	N/A ⁴	N/A ⁴
		Uses Actual Readings	0.00% (0)	100.00% (5)	100.00% (5)			
Q6dc	Uses Forecast Pavement Temperature Readings	No Forecast Information	42.86% (3)	40.00% (2)	20.00% (1)	0.9227	0.4224	0.4357
		Uses Forecast Information	57.14% (4)	60.00% (3)	80.00% (4)			
Q6ea	Uses Pavement Condition in Weather-Related Decisions	Yes	100.00% (7)	80.00% (4)	100.00% (5)	N/A ⁴	N/A ⁴	N/A ⁴
		No	0.00% (0)	20.00% (1)	0.00% (0)			
Q6eb	Uses Actual Pavement Condition Readings	No Actual Readings	85.71% (6)	0.00% (0)	0.00% (0)	N/A ⁴	N/A ⁴	N/A ⁴
		Uses Actual Readings	14.29% (1)	100.00% (4)	100.00% (5)			
Q6ec	Uses Forecast Pavement Condition Readings	No Forecast Information	42.86% (3)	50.00% (2)	40.00% (2)	0.8192	0.9234	0.6195
		Uses Forecast Information	57.14% (4)	50.00% (2)	60.00% (3)			

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Table A-6. Frequency and Percentage Distribution for Questions from the Highway Maintenance Operator Baseline and Follow-up Surveys, along with Associated P-Values Computed from the Chi-Square Distribution Testing for Effect between Surveys, Wisconsin Respondents Only (continued)

Question	Question Label	Response	Percentage (Number of Non-Missing Responses)			Baseline vs. First Follow-Up	Baseline vs. Second Follow-Up	First Follow-Up vs. Second Follow-Up
			Baseline (N=7)	First Follow-Up (N=5)	Second Follow-Up (N=5)			
Q6fa	Uses Dewpoint in Weather-Related Decisions	Yes	85.71% (6)	40.00% (2)	80.00% (4)	0.0419	0.4825	0.0613
		No	14.29% (1)	60.00% (3)	20.00% (1)			
Q6fb	Uses Actual Dewpoint Readings	No Actual Readings	33.33% (2)	50.00% (1)	25.00% (1)	0.7006	0.7696	0.5474
		Uses Actual Readings	66.67% (4)	50.00% (1)	75.00% (3)			
Q6fc	Uses Forecast Dewpoint Readings	No Forecast Information	16.67% (1)	0.00% (0)	25.00% (1)	N/A ⁴	0.7416	N/A ⁴
		Uses Forecast Information	83.33% (5)	100.00% (2)	75.00% (3)			
Q7aa	Uses FORETELL to Receive Wind Speed/Direction Readings	Yes	N/A ²	40.00% (2)	40.00% (2)	N/A ²	N/A ²	1.0000
		No	N/A ²	60.00% (3)	60.00% (3)			
Q7ba	Uses FORETELL to Receive Precipitation Readings	Yes	N/A ²	40.00% (2)	20.00% (1)	N/A ²	N/A ²	0.5601
		No	N/A ²	60.00% (3)	80.00% (4)			
Q7ca	Uses FORETELL to Receive Atmospheric Temperature Readings	Yes	N/A ²	20.00% (1)	66.67% (2)	N/A ²	N/A ²	0.1415
		No	N/A ²	80.00% (4)	33.33% (1)			
Q7da	Uses FORETELL to Receive Pavement Temperature Readings	Yes	N/A ²	0.00% (0)	20.00% (1)	N/A ²	N/A ²	N/A ⁴
		No	N/A ²	100.00% (5)	80.00% (4)			
Q7ea	Uses FORETELL to Receive Pavement Condition Readings	Yes	N/A ²	0.00% (0)	20.00% (1)	N/A ²	N/A ²	N/A ⁴
		No	N/A ²	100.00% (5)	80.00% (4)			
Q8aa	Uses Weather Information ¹ Daily	Yes	100.00% (7)	40.00% (2)	0.00% (0)	N/A ⁴	N/A ⁴	N/A ⁴
		No	0.00% (0)	60.00% (3)	100.00% (5)			

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Table A-6. Frequency and Percentage Distribution for Questions from the Highway Maintenance Operator Baseline and Follow-up Surveys, along with Associated P-Values Computed from the Chi-Square Distribution Testing for Effect between Surveys, Wisconsin Respondents Only (continued)

Question	Question Label	Response	Percentage (Number of Non-Missing Responses)			Baseline vs. First Follow-Up	Baseline vs. Second Follow-Up	First Follow-Up vs. Second Follow-Up
			Baseline (N=7)	First Follow-Up (N=5)	Second Follow-Up (N=5)			
Q8ab	Uses Weather Information ¹ Daily (How Often)	Twice daily	28.57% (2)	100.00% (2)	0.00% (0)	N/A ⁵	N/A ⁵	N/A ⁵
		4 Times Daily	14.29% (1)	0.00% (0)	0.00% (0)			
		At Least Hourly	57.14% (4)	0.00% (0)	0.00% (0)			
Q8ba	Uses Weather Information ¹ Weekly	Yes	28.57% (2)	80.00% (4)	20.00% (1)	0.0861	0.7457	0.0645
		No	71.43% (5)	20.00% (1)	80.00% (4)			
Q8ca	Uses Weather Information ¹ in Advance of a Weather Event	Yes	85.71% (6)	80.00% (4)	40.00% (2)	0.7869	0.0888	0.1756
		No	14.29% (1)	20.00% (1)	60.00% (3)			
Q8cb	Uses Weather Information ¹ In Advance of a Weather Event (How Often)	Twice daily	16.67% (1)	100.00% (3)	50.00% (1)	N/A ⁵	N/A ⁵	N/A ⁵
		At Least Hourly	83.33% (5)	0.00% (0)	50.00% (1)			
Q8da	Uses Weather Information ¹ During a Weather Event	Yes	85.71% (6)	50.00% (2)	40.00% (2)	0.2052	0.0888	0.7535
		No	14.29% (1)	50.00% (2)	60.00% (3)			
Q8db	Uses Weather Information ¹ During a Weather Event (How Often)	Twice daily	16.67% (1)	100.00% (2)	50.00% (1)	N/A ⁵	N/A ⁵	N/A ⁵
		Every Other Hour	16.67% (1)	0.00% (0)	0.00% (0)			
		At Least Hourly	66.67% (4)	0.00% (0)	50.00% (1)			
Q8ea	Uses Weather Information ¹ After a Weather Event	Yes	57.14% (4)	20.00% (1)	0.00% (0)	0.1657	N/A ⁴	N/A ⁴
		No	42.86% (3)	80.00% (4)	100.00% (5)			
Q8eb	Uses Weather Information ¹ After a Weather Event (How Often)	Twice daily	0.00% (0)	100.00% (1)	0.00% (0)	N/A ⁵	N/A ⁵	N/A ⁵
		4 Times Daily	75.00% (3)	0.00% (0)	0.00% (0)			
		At Least Hourly	25.00% (1)	0.00% (0)	0.00% (0)			
Q9_Q10a	FORETELL Features - Animation	Like Most	N/A ²	100.00% (3)	100.00% (3)	N/A ²	N/A ²	N/A ⁴

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Question	Question Label	Response	Percentage (Number of Non-Missing Responses)			Baseline vs. First Follow-Up	Baseline vs. Second Follow-Up	First Follow-Up vs. Second Follow-Up
			Baseline (N=7)	First Follow-Up (N=5)	Second Follow-Up (N=5)	P-value ³		
Q9_Q10b	FORETELL Features - Long-Term Forecast	Like Least	N/A ²	100.00% (2)	100.00% (1)	N/A ²	N/A ²	N/A ⁴
Q9_Q10c	FORETELL Features - Scroll Labeling	Like Most	N/A ²	100.00% (2)	100.00% (1)	N/A ²	N/A ²	N/A ⁴
Q9_Q10d	FORETELL Features - Zoom Capability	Like Most	N/A ²	100.00% (3)	100.00% (3)	N/A ²	N/A ²	N/A ⁴
Q9_Q10e	FORETELL Features - Map Display	Like Most	N/A ²	100.00% (3)	100.00% (1)	N/A ²	N/A ²	N/A ⁴
Q11aaa	Uses Anti-Icing Strategies in Maintenance Decisions	Yes	42.86% (3)	100.00% (5)	60.00% (3)	N/A ⁴	0.4821	N/A ⁴
		No	57.14% (4)	0.00% (0)	40.00% (2)			
Q11aab	How Helpful is Weather Information ¹ in Employing Anti-Icing Strategies	Not Very Helpful	0.00% (0)	40.00% (2)	0.00% (0)	N/A ⁴	N/A ⁴	0.7246
		Not Helpful	0.00% (0)	20.00% (1)	33.33% (1)			
		Neutral	0.00% (0)	0.00% (0)	33.33% (1)			
		Helpful	33.33% (1)	20.00% (1)	33.33% (1)			
Q11aba	Uses De-Icing Strategies in Maintenance Decisions	Yes	100.00% (7)	80.00% (4)	60.00% (3)	N/A ⁴	N/A ⁴	0.4357
		No	0.00% (0)	20.00% (1)	40.00% (2)			
Q11abb	How Helpful is Weather Information ¹ in Employing De-Icing Strategies	Not Very Helpful	0.00% (0)	50.00% (2)	0.00% (0)	N/A ⁴	N/A ⁴	0.3206
		Not Helpful	0.00% (0)	25.00% (1)	33.33% (1)			
		Neutral	0.00% (0)	0.00% (0)	33.33% (1)			
		Helpful	14.29% (1)	0.00% (0)	0.00% (0)			
Q11aca	Uses Traction Enhancement Strategies in Maintenance Decisions	Yes	85.71% (6)	80.00% (4)	40.00% (2)	0.7869	0.0888	0.0613
		No	14.29% (1)	20.00% (1)	60.00% (3)			

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Question	Question Label	Response	Percentage (Number of Non-Missing Responses)			Baseline vs. First Follow-Up	Baseline vs. Second Follow-Up	First Follow-Up vs. Second Follow-Up
			Baseline (N=7)	First Follow-Up (N=5)	Second Follow-Up (N=5)	P-value ³		
Q11acb	How Helpful is Weather Information ¹ in Employing Traction Enhancement Strategies	Not Very Helpful	0.00% (0)	50.00% (2)	0.00% (0)	N/A ⁴	N/A ⁴	N/A ⁴
		Not Helpful	0.00% (0)	0.00% (0)	50.00% (1)			
		Neutral	0.00% (0)	50.00% (2)	50.00% (1)			
		Helpful	33.33% (2)	0.00% (0)	0.00% (0)			
		Very Helpful	66.67% (4)	0.00% (0)	0.00% (0)			
Q11ada	Uses Mechanical Removal Strategies in Maintenance Decisions	Yes	100.00% (7)	100.00% (5)	60.00% (3)	N/A ⁴	N/A ⁴	N/A ⁴
		No	0.00% (0)	0.00% (0)	40.00% (2)			
Q11adb	How Helpful is Weather Information ¹ in Employing Mechanical Removal Strategies	Not Very Helpful	0.00% (0)	40.00% (2)	0.00% (0)	N/A ⁴	N/A ⁴	N/A ⁴
		Not Helpful	0.00% (0)	20.00% (1)	66.67% (2)			
		Neutral	0.00% (0)	20.00% (1)	33.33% (1)			
		Helpful	28.57% (2)	20.00% (1)	0.00% (0)			
		Very Helpful	71.43% (5)	0.00% (0)	0.00% (0)			
Q12aaa	Uses Wind Speed/Direction Information ¹ to Decide WHAT Road Surface Treatments to Use	Strongly Disagree	14.29% (1)	25.00% (1)	0.00% (0)	0.5636	0.7830	0.7830
		Neutral	28.57% (2)	0.00% (0)	33.33% (1)			
		Agree	14.29% (1)	50.00% (2)	66.67% (2)			
		Strongly Agree	42.86% (3)	25.00% (1)	0.00% (0)			
Q12aab	Uses Precipitation Information ¹ to Decide WHAT Road Surface Treatments to Use	Strongly Disagree	0.00% (0)	25.00% (1)	0.00% (0)	0.6460	0.1160	0.2571
		Disagree	0.00% (0)	0.00% (0)	33.33% (1)			
		Neutral	14.29% (1)	0.00% (0)	33.33% (1)			
		Agree	28.57% (2)	25.00% (1)	33.33% (1)			
		Strongly Agree	57.14% (4)	50.00% (2)	0.00% (0)			

1. "Weather Information" in the Follow-Up Surveys specifically refers to FORETELL.

2. The question was not asked in the Baseline Survey.

3. Questions with more than two response categories were collapsed into positive and non-positive responses for the Chi-Square Test of Effect between surveys. Neutral responses were considered non-positive.

4. Cells with N/A pertain to questions containing zero-frequency response categories. Therefore, the test cannot be performed.

5. The test was not performed for these questions because the responses could not be collapsed into positive and non-positive categories.

Table A-6. Frequency and Percentage Distribution for Questions from the Highway Maintenance Operator Baseline and Follow-up Surveys, along with Associated P-Values Computed from the Chi-Square Distribution Testing for Effect between Surveys, Wisconsin Respondents Only (continued)

Question	Question Label	Response	Percentage (Number of Non-Missing Responses)			Baseline vs. First Follow-Up	Baseline vs. Second Follow-Up	First Follow-Up vs. Second Follow-Up
			Baseline (N=7)	First Follow-Up (N=5)	Second Follow-Up (N=5)	P-value ³		
Q12aac	Uses Atmospheric Temperature Information ¹ to Decide WHAT Road Surface Treatments to Use	Strongly Disagree	14.29% (1)	25.00% (1)	0.00% (0)	0.2734	0.1418	0.5714
		Neutral	57.14% (4)	25.00% (1)	33.33% (1)			
		Agree	14.29% (1)	25.00% (1)	66.67% (2)			
		Strongly Agree	14.29% (1)	25.00% (1)	0.00% (0)			
Q12baa	Uses Pavement Temperature Information ¹ to Decide WHAT Road Surface Treatments to Use	Strongly Disagree	14.29% (1)	33.33% (1)	0.00% (0)	0.4720	0.3140	0.7110
		Neutral	0.00% (0)	0.00% (0)	50.00% (1)			
		Agree	14.29% (1)	66.67% (2)	50.00% (1)			
		Strongly Agree	71.43% (5)	0.00% (0)	0.00% (0)			
Q12bab	Uses Pavement Condition Information ¹ to Decide WHAT Road Surface Treatments to Use	Strongly Disagree	14.29% (1)	33.33% (1)	0.00% (0)	0.2551	0.5771	0.3270
		Disagree	14.29% (1)	0.00% (0)	50.00% (1)			
		Neutral	0.00% (0)	33.33% (1)	0.00% (0)			
		Agree	28.57% (2)	33.33% (1)	50.00% (1)			
		Strongly Agree	42.86% (3)	0.00% (0)	0.00% (0)			
Q12bac	Uses Dewpoint Information ¹ to Decide WHAT Road Surface Treatments to Use	Strongly Disagree	16.67% (1)	33.33% (1)	0.00% (0)	0.6611	N/A ⁴	N/A ⁴
		Neutral	33.33% (2)	0.00% (0)	0.00% (0)			
		Agree	33.33% (2)	66.67% (2)	100.00% (1)			
		Strongly Agree	16.67% (1)	0.00% (0)	0.00% (0)			
Q12aba	Uses Wind Speed/Direction Information ¹ to Decide WHERE Road Surface Treatments Should be Applied	Strongly Disagree	0.00% (0)	33.33% (1)	0.00% (0)	0.7942	0.7074	1.0000
		Neutral	57.14% (4)	33.33% (1)	66.67% (2)			
		Agree	14.29% (1)	33.33% (1)	33.33% (1)			
		Strongly Agree	28.57% (2)	0.00% (0)	0.00% (0)			

1. "Weather Information" in the Follow-Up Surveys specifically refers to FORETELL.

2. The question was not asked in the Baseline Survey.

3. Questions with more than two response categories were collapsed into positive and non-positive responses for the Chi-Square Test of Effect between surveys. Neutral responses were considered non-positive.

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5. The test was not performed for these questions because the responses could not be collapsed into positive and non-positive categories.

Table A-6. Frequency and Percentage Distribution for Questions from the Highway Maintenance Operator Baseline and Follow-up Surveys, along with Associated P-Values Computed from the Chi-Square Distribution Testing for Effect between Surveys, Wisconsin Respondents Only (continued)

Question	Question Label	Response	Percentage (Number of Non-Missing Responses)			Baseline vs. First Follow-Up	Baseline vs. Second Follow-Up	First Follow-Up vs. Second Follow-Up
			Baseline (N=7)	First Follow-Up (N=5)	Second Follow-Up (N=5)	P-value ³		
Q12abb	Uses Precipitation Information ¹ to Decide WHERE Road Surface Treatments Should be Applied	Strongly Disagree	0.00% (0)	33.33% (1)	0.00% (0)	0.2989	N/A ⁴	N/A ⁴
		Disagree	0.00% (0)	33.33% (1)	33.33% (1)			
		Neutral	28.57% (2)	0.00% (0)	66.67% (2)			
		Agree	0.00% (0)	33.33% (1)	0.00% (0)			
		Strongly Agree	71.43% (5)	0.00% (0)	0.00% (0)			
Q12abc	Uses Atmospheric Temperature Information ¹ to Decide WHERE Road Surface Treatments Should be Applied	Disagree	14.29% (1)	0.00% (0)	0.00% (0)	N/A ⁴	0.8579	N/A ⁴
		Neutral	42.86% (3)	0.00% (0)	50.00% (1)			
		Agree	14.29% (1)	0.00% (0)	50.00% (1)			
		Strongly Agree	28.57% (2)	100.00% (1)	0.00% (0)			
Q12bba	Uses Pavement Temperature Information ¹ to Decide WHERE Road Surface Treatments Should be Applied	Strongly Disagree	14.29% (1)	50.00% (1)	0.00% (0)	N/A ⁴	0.3140	N/A ⁴
		Neutral	0.00% (0)	50.00% (1)	50.00% (1)			
		Agree	42.86% (3)	0.00% (0)	50.00% (1)			
		Strongly Agree	42.86% (3)	0.00% (0)	0.00% (0)			
Q12bbb	Uses Pavement Condition Information ¹ to Decide WHERE Road Surface Treatments Should be Applied	Strongly Disagree	0.00% (0)	50.00% (1)	0.00% (0)	N/A ⁴	N/A ⁴	N/A ⁴
		Disagree	0.00% (0)	0.00% (0)	50.00% (1)			
		Neutral	14.29% (1)	50.00% (1)	50.00% (1)			
		Agree	28.57% (2)	0.00% (0)	0.00% (0)			
		Strongly Agree	57.14% (4)	0.00% (0)	0.00% (0)			
Q12bbc	Uses Dewpoint Information ¹ to Decide WHERE Road Surface Treatments Should be Applied	Strongly Disagree	0.00% (0)	50.00% (1)	0.00% (0)	N/A ⁴	N/A ⁴	N/A ⁴
		Neutral	66.67% (4)	50.00% (1)	100.00% (1)			
		Strongly Agree	33.33% (2)	0.00% (0)	0.00% (0)			

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3. Questions with more than two response categories were collapsed into positive and non-positive responses for the Chi-Square Test of Effect between surveys. Neutral responses were considered non-positive.

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5. The test was not performed for these questions because the responses could not be collapsed into positive and non-positive categories.

Table A-6. Frequency and Percentage Distribution for Questions from the Highway Maintenance Operator Baseline and Follow-up Surveys, along with Associated P-Values Computed from the Chi-Square Distribution Testing for Effect between Surveys, Wisconsin Respondents Only (continued)

Question	Question Label	Response	Percentage (Number of Non-Missing Responses)			Baseline vs. First Follow-Up	Baseline vs. Second Follow-Up	First Follow-Up vs. Second Follow-Up
			Baseline (N=7)	First Follow-Up (N=5)	Second Follow-Up (N=5)	P-value ³		
Q12aca	Uses Wind Speed/Direction Information ¹ to Decide WHEN Road Surface Treatments Should be Applied	Disagree	0.00% (0)	25.00% (1)	0.00% (0)	0.8237	0.3803	0.6240
		Neutral	42.86% (3)	25.00% (1)	66.67% (2)			
		Agree	0.00% (0)	25.00% (1)	0.00% (0)			
		Strongly Agree	57.14% (4)	25.00% (1)	33.33% (1)			
Q12acb	Uses Precipitation Information ¹ to Decide WHEN Road Surface Treatments Should be Applied	Disagree	0.00% (0)	0.00% (0)	33.33% (1)	0.4216	N/A ⁴	N/A ⁴
		Neutral	28.57% (2)	50.00% (2)	66.67% (2)			
		Agree	0.00% (0)	25.00% (1)	0.00% (0)			
		Strongly Agree	71.43% (5)	25.00% (1)	0.00% (0)			
Q12acc	Uses Atmospheric Temperature Information ¹ to Decide WHEN Road Surface Treatments Should be Applied	Strongly Disagree	14.29% (1)	0.00% (0)	0.00% (0)	0.4099	N/A ⁴	N/A ⁴
		Neutral	42.86% (3)	33.33% (1)	100.00% (3)			
		Agree	28.57% (2)	33.33% (1)	0.00% (0)			
		Strongly Agree	14.29% (1)	33.33% (1)	0.00% (0)			
Q12bca	Uses Pavement Temperature Information ¹ to Decide WHEN Road Surface Treatments Should be Applied	Strongly Disagree	14.29% (1)	33.33% (1)	0.00% (0)	0.4720	N/A ⁴	N/A ⁴
		Neutral	0.00% (0)	0.00% (0)	100.00% (2)			
		Agree	0.00% (0)	33.33% (1)	0.00% (0)			
		Strongly Agree	85.71% (6)	33.33% (1)	0.00% (0)			
Q12bcb	Uses Pavement Condition Information ¹ to Decide WHEN Road Surface Treatments Should be Applied	Strongly Disagree	14.29% (1)	33.33% (1)	0.00% (0)	0.4720	N/A ⁴	N/A ⁴
		Disagree	0.00% (0)	0.00% (0)	50.00% (1)			
		Neutral	0.00% (0)	0.00% (0)	50.00% (1)			
		Agree	28.57% (2)	33.33% (1)	0.00% (0)			
Q12bcc	Uses Dewpoint Information ¹ to Decide WHEN Road Surface Treatments Should be Applied	Strongly Agree	57.14% (4)	33.33% (1)	0.00% (0)	1.0000	N/A ⁴	N/A ⁴
		Strongly Disagree	16.67% (1)	33.33% (1)	0.00% (0)			
		Neutral	16.67% (1)	0.00% (0)	100.00% (1)			
		Agree	16.67% (1)	33.33% (1)	0.00% (0)			
		Strongly Agree	50.00% (3)	33.33% (1)	0.00% (0)			

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Table A-6. Frequency and Percentage Distribution for Questions from the Highway Maintenance Operator Baseline and Follow-up Surveys, along with Associated P-Values Computed from the Chi-Square Distribution Testing for Effect between Surveys, Wisconsin Respondents Only (continued)

Question	Question Label	Response	Percentage (Number of Non-Missing Responses)			Baseline vs. First Follow-Up	Baseline vs. Second Follow-Up	First Follow-Up vs. Second Follow-Up
			Baseline (N=7)	First Follow-Up (N=5)	Second Follow-Up (N=5)			
Q13aaa	Wind Speed/Direction Information ¹ is Understandable	Disagree	14.29% (1)	0.00% (0)	0.00% (0)	0.6744	N/A ⁴	N/A ⁴
		Neutral	0.00% (0)	25.00% (1)	0.00% (0)			
		Agree	42.86% (3)	25.00% (1)	50.00% (1)			
		Strongly Agree	42.86% (3)	50.00% (2)	50.00% (1)			
Q13aab	Precipitation Information ¹ is Understandable	Strongly Disagree	0.00% (0)	0.00% (0)	50.00% (1)	0.9127	0.4216	0.6538
		Disagree	14.29% (1)	0.00% (0)	0.00% (0)			
		Neutral	14.29% (1)	25.00% (1)	0.00% (0)			
		Agree	0.00% (0)	0.00% (0)	50.00% (1)			
Q13aac	Atmospheric Temperature Information ¹ is Understandable	Strongly Agree	71.43% (5)	75.00% (3)	0.00% (0)	0.0555	N/A ⁴	N/A ⁴
		Strongly Disagree	0.00% (0)	25.00% (1)	0.00% (0)			
		Disagree	14.29% (1)	0.00% (0)	0.00% (0)			
		Neutral	0.00% (0)	50.00% (2)	0.00% (0)			
Q13baa	Pavement Temperature Information ¹ is Understandable	Agree	28.57% (2)	0.00% (0)	100.00% (2)	0.1160	0.1160	1.000
		Strongly Agree	57.14% (4)	25.00% (1)	0.00% (0)			
		Strongly Disagree	14.29% (1)	33.33% (1)	0.00% (0)			
		Disagree	0.00% (0)	0.00% (0)	66.67% (2)			
Q13bab	Pavement Condition Information ¹ is Understandable	Neutral	0.00% (0)	33.33% (1)	0.00% (0)	0.5712	0.3803	1.0000
		Agree	14.29% (1)	0.00% (0)	33.33% (1)			
		Strongly Agree	71.43% (5)	33.33% (1)	0.00% (0)			
		Strongly Disagree	0.00% (0)	33.33% (1)	66.67% (2)			
Q13bac	Dewpoint Information ¹ is Understandable	Disagree	14.29% (1)	33.33% (1)	0.00% (0)	0.6611	1.0000	0.7110
		Neutral	28.57% (2)	0.00% (0)	0.00% (0)			
		Agree	14.29% (1)	0.00% (0)	33.33% (1)			
		Strongly Agree	42.86% (3)	33.33% (1)	0.00% (0)			
Q13aba	Wind Speed/Direction Information ¹ is Usable	Strongly Disagree	16.67% (1)	0.00% (0)	0.00% (0)	0.2571	N/A ⁴	N/A ⁴
		Neutral	33.33% (2)	66.67% (2)	50.00% (1)			
		Agree	0.00% (0)	0.00% (0)	50.00% (1)			
		Strongly Agree	50.00% (3)	33.33% (1)	0.00% (0)			
		Disagree	14.29% (1)	25.00% (1)	0.00% (0)			
		Neutral	0.00% (0)	25.00% (1)	0.00% (0)			
		Agree	14.29% (1)	25.00% (1)	50.00% (1)			
		Strongly Agree	71.43% (5)	25.00% (1)	50.00% (1)			

1. "Weather Information" in the Follow-Up Surveys specifically refers to FORETELL.

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Table A-6. Frequency and Percentage Distribution for Questions from the Highway Maintenance Operator Baseline and Follow-up Surveys, along with Associated P-Values Computed from the Chi-Square Distribution Testing for Effect between Surveys, Wisconsin Respondents Only (continued)

Question	Question Label	Response	Percentage (Number of Non-Missing Responses)			Baseline vs. First Follow-Up	Baseline vs. Second Follow-Up	First Follow-Up vs. Second Follow-Up
			Baseline (N=7)	First Follow-Up (N=5)	Second Follow-Up (N=5)	P-value ³		
Q13abb	Precipitation Information ¹ is Usable	Strongly Disagree	0.00% (0)	0.00% (0)	50.00% (1)	0.1367	0.4216	0.5474
		Disagree	0.00% (0)	25.00% (1)	0.00% (0)			
		Neutral	28.57% (2)	50.00% (2)	0.00% (0)			
		Agree	0.00% (0)	0.00% (0)	50.00% (1)			
		Strongly Agree	71.43% (5)	25.00% (1)	0.00% (0)			
Q13abc	Atmospheric Temperature Information ¹ is Usable	Strongly Disagree	0.00% (0)	25.00% (1)	0.00% (0)	0.1295	N/A ⁴	N/A ⁴
		Disagree	14.29% (1)	0.00% (0)	0.00% (0)			
		Neutral	14.29% (1)	50.00% (2)	0.00% (0)			
		Agree	28.57% (2)	25.00% (1)	100.00% (2)			
		Strongly Agree	42.86% (3)	0.00% (0)	0.00% (0)			
Q13bba	Pavement Temperature Information ¹ is Usable	Strongly Disagree	0.00% (0)	33.33% (1)	33.33% (1)	N/A ⁴	0.1160	N/A ⁴
		Disagree	14.29% (1)	0.00% (0)	33.33% (1)			
		Neutral	0.00% (0)	66.67% (2)	0.00% (0)			
		Agree	0.00% (0)	0.00% (0)	33.33% (1)			
		Strongly Agree	85.71% (6)	0.00% (0)	0.00% (0)			
Q13bbb	Pavement Condition Information ¹ is Usable	Strongly Disagree	0.00% (0)	33.33% (1)	66.67% (2)	N/A ⁴	0.3803	N/A ⁴
		Disagree	28.57% (2)	0.00% (0)	0.00% (0)			
		Neutral	14.29% (1)	66.67% (2)	0.00% (0)			
		Agree	0.00% (0)	0.00% (0)	33.33% (1)			
		Strongly Agree	57.14% (4)	0.00% (0)	0.00% (0)			
Q13bbc	Dewpoint Information ¹ is Usable	Strongly Disagree	0.00% (0)	33.33% (1)	0.00% (0)	N/A ⁴	1.0000	N/A ⁴
		Disagree	16.67% (1)	0.00% (0)	0.00% (0)			
		Neutral	33.33% (2)	66.67% (2)	50.00% (1)			
		Agree	50.00% (3)	0.00% (0)	50.00% (1)			
Q13aca	Wind Speed/Direction Information ¹ is Easily Obtainable	Strongly Disagree	0.00% (0)	25.00% (1)	0.00% (0)	N/A ⁴	N/A ⁴	N/A ⁴
		Disagree	0.00% (0)	50.00% (2)	0.00% (0)			
		Neutral	14.29% (1)	25.00% (1)	100.00% (2)			
		Agree	14.29% (1)	0.00% (0)	0.00% (0)			
		Strongly Agree	71.43% (5)	0.00% (0)	0.00% (0)			

1. "Weather Information" in the Follow-Up Surveys specifically refers to FORETELL.

2. The question was not asked in the Baseline Survey.

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Table A-6. Frequency and Percentage Distribution for Questions from the Highway Maintenance Operator Baseline and Follow-up Surveys, along with Associated P-Values Computed from the Chi-Square Distribution Testing for Effect between Surveys, Wisconsin Respondents Only (continued)

Question	Question Label	Response	Percentage (Number of Non-Missing Responses)			Baseline vs. First Follow-Up	Baseline vs. Second Follow-Up	First Follow-Up vs. Second Follow-Up
			Baseline (N=7)	First Follow-Up (N=5)	Second Follow-Up (N=5)			
Q13acb	Precipitation Information ¹ is Easily Obtainable	Strongly Disagree	0.00% (0)	25.00% (1)	0.00% (0)	N/A ⁴	N/A ⁴	N/A ⁴
		Disagree	0.00% (0)	50.00% (2)	0.00% (0)			
		Neutral	28.57% (2)	25.00% (1)	100.00% (2)			
		Agree	28.57% (2)	0.00% (0)	0.00% (0)			
		Strongly Agree	42.86% (3)	0.00% (0)	0.00% (0)			
Q13acc	Atmospheric Temperature Information ¹ is Easily Obtainable	Strongly Disagree	0.00% (0)	25.00% (1)	0.00% (0)	N/A ⁴	N/A ⁴	N/A ⁴
		Disagree	14.29% (1)	50.00% (2)	0.00% (0)			
		Neutral	14.29% (1)	25.00% (1)	100.00% (2)			
		Agree	28.57% (2)	0.00% (0)	0.00% (0)			
		Strongly Agree	42.86% (3)	0.00% (0)	0.00% (0)			
Q13bca	Pavement Temperature Information ¹ is Easily Obtainable	Strongly Disagree	14.29% (1)	33.33% (1)	0.00% (0)	N/A ⁴	N/A ⁴	N/A ⁴
		Disagree	0.00% (0)	33.33% (1)	0.00% (0)			
		Neutral	0.00% (0)	33.33% (1)	100.00% (3)			
		Agree	28.57% (2)	0.00% (0)	0.00% (0)			
		Strongly Agree	57.14% (4)	0.00% (0)	0.00% (0)			
Q13bcb	Pavement Condition Information ¹ is Easily Obtainable	Strongly Disagree	0.00% (0)	33.33% (1)	0.00% (0)	N/A ⁴	N/A ⁴	N/A ⁴
		Disagree	0.00% (0)	33.33% (1)	0.00% (0)			
		Neutral	28.57% (2)	33.33% (1)	100.00% (3)			
		Agree	28.57% (2)	0.00% (0)	0.00% (0)			
		Strongly Agree	42.86% (3)	0.00% (0)	0.00% (0)			
Q13bcc	Dewpoint Information ¹ is Easily Obtainable	Strongly Disagree	0.00% (0)	33.33% (1)	0.00% (0)	N/A ⁴	N/A ⁴	N/A ⁴
		Disagree	0.00% (0)	33.33% (1)	0.00% (0)			
		Neutral	33.33% (2)	33.33% (1)	100.00% (2)			
		Agree	33.33% (2)	0.00% (0)	0.00% (0)			
		Strongly Agree	33.33% (2)	0.00% (0)	0.00% (0)			
Q13ada	Wind Speed/Direction Information ¹ is Accurate	Strongly Disagree	14.29% (1)	0.00% (0)	0.00% (0)	0.5193	0.8579	0.5474
		Disagree	28.57% (2)	50.00% (2)	50.00% (1)			
		Neutral	14.29% (1)	25.00% (1)	0.00% (0)			
		Agree	28.57% (2)	25.00% (1)	50.00% (1)			
		Strongly Agree	14.29% (1)	0.00% (0)	0.00% (0)			

1. "Weather Information" in the Follow-Up Surveys specifically refers to FORETELL.

2. The question was not asked in the Baseline Survey.

3. Questions with more than two response categories were collapsed into positive and non-positive responses for the Chi-Square Test of Effect between surveys. Neutral responses were considered non-positive.

4. Cells with N/A pertain to questions containing zero-frequency response categories. Therefore, the test cannot be performed.

5. The test was not performed for these questions because the responses could not be collapsed into positive and non-positive categories.

Table A-6. Frequency and Percentage Distribution for Questions from the Highway Maintenance Operator Baseline and Follow-up Surveys, along with Associated P-Values Computed from the Chi-Square Distribution Testing for Effect between Surveys, Wisconsin Respondents Only (continued)

Question	Question Label	Response	Percentage (Number of Non-Missing Responses)			Baseline vs. First Follow-Up	Baseline vs. Second Follow-Up	First Follow-Up vs. Second Follow-Up
			Baseline (N=7)	First Follow-Up (N=5)	Second Follow-Up (N=5)	P-value ³		
Q13adb	Precipitation Information ¹ is Accurate	Strongly Disagree	14.29% (1)	50.00% (2)	0.00% (0)	0.1367	N/A ⁴	N/A ⁴
		Disagree	0.00% (0)	0.00% (0)	50.00% (1)			
		Neutral	14.29% (1)	25.00% (1)	50.00% (1)			
		Agree	71.43% (5)	25.00% (1)	0.00% (0)			
Q13adc	Atmospheric Temperature Information ¹ is Accurate	Strongly Disagree	14.29% (1)	0.00% (0)	0.00% (0)	N/A ⁴	0.8819	N/A ⁴
		Disagree	14.29% (1)	50.00% (2)	50.00% (1)			
		Neutral	28.57% (2)	50.00% (2)	0.00% (0)			
		Agree	28.57% (2)	0.00% (0)	50.00% (1)			
		Strongly Agree	14.29% (1)	0.00% (0)	0.00% (0)			
Q13bda	Pavement Temperature Information ¹ is Accurate	Strongly Disagree	0.00% (0)	33.33% (1)	33.33% (1)	N/A ⁴	N/A ⁴	N/A ⁴
		Disagree	14.29% (1)	33.33% (1)	66.67% (2)			
		Neutral	0.00% (0)	33.33% (1)	0.00% (0)			
		Agree	71.43% (5)	0.00% (0)	0.00% (0)			
		Strongly Agree	14.29% (1)	0.00% (0)	0.00% (0)			
Q13bdb	Pavement Condition Information ¹ is Accurate	Strongly Disagree	14.29% (1)	33.33% (1)	66.67% (2)	N/A ⁴	N/A ⁴	N/A ⁴
		Disagree	0.00% (0)	33.33% (1)	33.33% (1)			
		Neutral	14.29% (1)	33.33% (1)	0.00% (0)			
		Agree	42.86% (3)	0.00% (0)	0.00% (0)			
		Strongly Agree	28.57% (2)	0.00% (0)	0.00% (0)			
Q13bdc	Dewpoint Information ¹ is Accurate	Strongly Disagree	0.00% (0)	33.33% (1)	0.00% (0)	N/A ⁴	0.7204	N/A ⁴
		Disagree	16.67% (1)	33.33% (1)	50.00% (1)			
		Neutral	50.00% (3)	33.33% (1)	0.00% (0)			
		Agree	33.33% (2)	0.00% (0)	50.00% (1)			
Q13aea	Wind Speed/Direction Information ¹ is Useful for Weather-Related Decisions	Disagree	14.29% (1)	0.00% (0)	0.00% (0)	0.0798	N/A ⁴	N/A ⁴
		Neutral	0.00% (0)	75.00% (3)	0.00% (0)			
		Agree	28.57% (2)	25.00% (1)	100.00% (2)			
		Strongly Agree	57.14% (4)	0.00% (0)	0.00% (0)			

1. "Weather Information" in the Follow-Up Surveys specifically refers to FORETELL.

2. The question was not asked in the Baseline Survey.

3. Questions with more than two response categories were collapsed into positive and non-positive responses for the Chi-Square Test of Effect between surveys. Neutral responses were considered non-positive.

4. Cells with N/A pertain to questions containing zero-frequency response categories. Therefore, the test cannot be performed.

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Table A-6. Frequency and Percentage Distribution for Questions from the Highway Maintenance Operator Baseline and Follow-up Surveys, along with Associated P-Values Computed from the Chi-Square Distribution Testing for Effect between Surveys, Wisconsin Respondents Only (continued)

Question	Question Label	Response	Percentage (Number of Non-Missing Responses)			Baseline vs. First Follow-Up	Baseline vs. Second Follow-Up	First Follow-Up vs. Second Follow-Up
			Baseline (N=7)	First Follow-Up (N=5)	Second Follow-Up (N=5)			
Q13aeb	Precipitation Information ¹ is Useful for Weather-Related Decisions	Strongly Disagree	0.00% (0)	50.00% (2)	50.00% (1)	0.0798	0.3140	0.5474
		Disagree	14.29% (1)	0.00% (0)	0.00% (0)			
		Neutral	0.00% (0)	25.00% (1)	0.00% (0)			
		Agree	14.29% (1)	0.00% (0)	50.00% (1)			
		Strongly Agree	71.43% (5)	25.00% (1)	0.00% (0)			
Q13aec	Atmospheric Temperature Information ¹ is Useful for Weather-Related Decisions	Strongly Disagree	0.00% (0)	25.00% (1)	0.00% (0)	N/A ⁴	N/A ⁴	N/A ⁴
		Disagree	14.29% (1)	0.00% (0)	0.00% (0)			
		Neutral	28.57% (2)	75.00% (3)	0.00% (0)			
		Agree	14.29% (1)	0.00% (0)	100.00% (2)			
		Strongly Agree	42.86% (3)	0.00% (0)	0.00% (0)			
Q13bea	Pavement Temperature Information ¹ is Useful for Weather-Related Decisions	Strongly Disagree	0.00% (0)	33.33% (1)	33.33% (1)	N/A ⁴	0.1160	N/A ⁴
		Disagree	14.29% (1)	33.33% (1)	0.00% (0)			
		Neutral	0.00% (0)	33.33% (1)	33.33% (1)			
		Agree	0.00% (0)	0.00% (0)	33.33% (1)			
		Strongly Agree	85.71% (6)	0.00% (0)	0.00% (0)			
Q13beb	Pavement Condition Information ¹ is Useful for Weather-Related Decisions	Strongly Disagree	0.00% (0)	33.33% (1)	33.33% (1)	N/A ⁴	0.2551	N/A ⁴
		Disagree	28.57% (2)	33.33% (1)	33.33% (1)			
		Neutral	0.00% (0)	33.33% (1)	0.00% (0)			
		Agree	14.29% (1)	0.00% (0)	33.33% (1)			
		Strongly Agree	57.14% (4)	0.00% (0)	0.00% (0)			
Q13bec	Dewpoint Information ¹ is Useful for Weather-Related Decisions	Strongly Disagree	0.00% (0)	33.33% (1)	0.00% (0)	N/A ⁴	0.6440	N/A ⁴
		Disagree	16.67% (1)	33.33% (1)	0.00% (0)			
		Neutral	16.67% (1)	33.33% (1)	50.00% (1)			
		Agree	16.67% (1)	0.00% (0)	50.00% (1)			
		Strongly Agree	50.00% (3)	0.00% (0)	0.00% (0)			
Q14afa	FORETELL Wind Speed/Direction Information Changed Weather-Related Decisions You Made	Strongly Disagree	N/A ²	25.00% (1)	0.00% (0)	N/A ²	N/A ²	0.1785
		Disagree	N/A ²	25.00% (1)	50.00% (1)			
		Neutral	N/A ²	25.00% (1)	0.00% (0)			
		Agree	N/A ²	0.00% (0)	50.00% (1)			
		Strongly Agree	N/A ²	25.00% (1)	0.00% (0)			

1. "Weather Information" in the Follow-Up Surveys specifically refers to FORETELL.

2. The question was not asked in the Baseline Survey.

3. Questions with more than two response categories were collapsed into positive and non-positive responses for the Chi-Square Test of Effect between surveys. Neutral responses were considered non-positive.

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Table A-6. Frequency and Percentage Distribution for Questions from the Highway Maintenance Operator Baseline and Follow-up Surveys, along with Associated P-Values Computed from the Chi-Square Distribution Testing for Effect between Surveys, Wisconsin Respondents Only (continued)

Question	Question Label	Response	Percentage (Number of Non-Missing Responses)			Baseline vs. First Follow-Up	Baseline vs. Second Follow-Up	First Follow-Up vs. Second Follow-Up
			Baseline (N=7)	First Follow-Up (N=5)	Second Follow-Up (N=5)			
Q14afb	FORETELL Precipitation Information Changed Weather-Related Decisions You Made	Strongly Disagree	N/A ²	25.00% (1)	0.00% (0)	N/A ²	N/A ²	N/A ⁴
		Disagree	N/A ²	25.00% (1)	50.00% (1)			
		Neutral	N/A ²	25.00% (1)	50.00% (1)			
		Agree	N/A ²	25.00% (1)	0.00% (0)			
Q14afc	FORETELL Atmospheric Temperature Information Changed Weather-Related Decisions You Made	Strongly Disagree	N/A ²	25.00% (1)	0.00% (0)	N/A ²	N/A ²	0.1785
		Disagree	N/A ²	25.00% (1)	50.00% (1)			
		Neutral	N/A ²	25.00% (1)	0.00% (0)			
		Agree	N/A ²	25.00% (1)	50.00% (1)			
Q14bfa	FORETELL Pavement Temperature Information Changed Weather-Related Decisions You Made	Strongly Disagree	N/A ²	33.33% (1)	33.33% (1)	N/A ²	N/A ²	N/A ⁴
		Disagree	N/A ²	0.00% (0)	66.67% (2)			
		Neutral	N/A ²	33.33% (1)	0.00% (0)			
		Agree	N/A ²	33.33% (1)	0.00% (0)			
Q14bfb	FORETELL Pavement Condition Information Changed Weather-Related Decisions You Made	Strongly Disagree	N/A ²	33.33% (1)	66.67% (2)	N/A ²	N/A ²	N/A ⁴
		Disagree	N/A ²	0.00% (0)	33.33% (1)			
		Neutral	N/A ²	33.33% (1)	0.00% (0)			
		Agree	N/A ²	33.33% (1)	0.00% (0)			
Q14bfc	FORETELL Dewpoint Information Changed Weather-Related Decisions You Made	Strongly Disagree	N/A ²	33.33% (1)	50.00% (1)	N/A ²	N/A ²	N/A ⁴
		Disagree	N/A ²	33.33% (1)	50.00% (1)			
		Neutral	N/A ²	33.33% (1)	0.00% (0)			
Q15	FORETELL Provides Valuable Information Not Provided Elsewhere	Strongly Disagree	N/A ²	0.00% (0)	40.00% (2)	N/A ²	N/A ²	N/A ⁴
		Disagree	N/A ²	60.00% (3)	40.00% (2)			
		Neutral	N/A ²	20.00% (1)	20.00% (1)			
		Agree	N/A ²	20.00% (1)	0.00% (0)			

1. "Weather Information" in the Follow-Up Surveys specifically refers to FORETELL.

2. The question was not asked in the Baseline Survey.

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Table A-6. Frequency and Percentage Distribution for Questions from the Highway Maintenance Operator Baseline and Follow-up Surveys, along with Associated P-Values Computed from the Chi-Square Distribution Testing for Effect between Surveys, Wisconsin Respondents Only (continued)

Question	Question Label	Response	Percentage (Number of Non-Missing Responses)			Baseline vs. First Follow-Up	Baseline vs. Second Follow-Up	First Follow-Up vs. Second Follow-Up
			Baseline (N=7)	First Follow-Up (N=5)	Second Follow-Up (N=5)	P-value ³		
Q16	Receive FORETELL Information in Time to Make Weather-Related Decisions	Strongly Disagree	N/A ²	40.00% (2)	20.00% (1)	N/A ²	N/A ²	N/A ⁴
		Disagree	N/A ²	20.00% (1)	20.00% (1)			
		Neutral	N/A ²	40.00% (2)	40.00% (2)			
		Agree	N/A ²	0.00% (0)	20.00% (1)			
Q17	Weather Information ¹ is Sufficient for Making Weather-Related Decisions	Strongly Disagree	0.00% (0)	20.00% (1)	20.00% (1)	0.0434	0.1874	1.0000
		Disagree	14.29% (1)	20.00% (1)	20.00% (1)			
		Neutral	14.29% (1)	40.00% (2)	40.00% (2)			
		Agree	71.43% (5)	20.00% (1)	20.00% (1)			
Q18	Willing to Pay for FORETELL	Strongly Disagree	N/A ²	20.00% (1)	40.00% (2)	N/A ²	N/A ²	N/A ⁴
		Disagree	N/A ²	40.00% (2)	20.00% (1)			
		Neutral	N/A ²	40.00% (2)	20.00% (1)			
		Agree	N/A ²	0.00% (0)	20.00% (1)			
Q19	Having Weather Information ¹ Makes Job Easier	Strongly Disagree	0.00% (0)	20.00% (1)	40.00% (2)	0.0308	0.0308	1.0000
		Disagree	14.29% (1)	0.00% (0)	20.00% (1)			
		Neutral	0.00% (0)	60.00% (3)	20.00% (1)			
		Agree	14.29% (1)	20.00% (1)	20.00% (1)			
		Strongly Agree	71.43% (5)	0.00% (0)	0.00% (0)			
Q20	Weather Information ¹ Helps You Improve Traffic Efficiency of Roadways	Strongly Disagree	0.00% (0)	20.00% (1)	40.00% (2)	N/A ⁴	0.0308	N/A ⁴
		Disagree	0.00% (0)	20.00% (1)	0.00% (0)			
		Neutral	14.29% (1)	60.00% (3)	40.00% (2)			
		Agree	28.57% (2)	0.00% (0)	20.00% (1)			
		Strongly Agree	57.14% (4)	0.00% (0)	0.00% (0)			
Q21	Weather Information ¹ Helps You to Target Snow and Ice Control Measures	Strongly Disagree	0.00% (0)	20.00% (1)	40.00% (2)	0.1341	0.1918	0.3638
		Disagree	0.00% (0)	20.00% (1)	0.00% (0)			
		Neutral	14.29% (1)	40.00% (2)	20.00% (1)			
		Agree	28.57% (2)	20.00% (1)	40.00% (2)			
		Strongly Agree	57.14% (4)	0.00% (0)	0.00% (0)			

1. "Weather Information" in the Follow-Up Surveys specifically refers to FORETELL.

2. The question was not asked in the Baseline Survey.

3. Questions with more than two response categories were collapsed into positive and non-positive responses for the Chi-Square Test of Effect between surveys. Neutral responses were considered non-positive.

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Table A-6. Frequency and Percentage Distribution for Questions from the Highway Maintenance Operator Baseline and Follow-up Surveys, along with Associated P-Values Computed from the Chi-Square Distribution Testing for Effect between Surveys, Wisconsin Respondents Only (continued)

Question	Question Label	Response	Percentage (Number of Non-Missing Responses)			Baseline vs. First Follow-Up	Baseline vs. Second Follow-Up	First Follow-Up vs. Second Follow-Up
			Baseline (N=7)	First Follow-Up (N=5)	Second Follow-Up (N=5)	P-value ³		
Q22	Highway Maintenance Activities are Conducted More Efficiently Using Weather Information ¹	Strongly Disagree	0.00% (0)	20.00% (1)	40.00% (2)	0.0308	0.0308	1.0000
		Disagree	0.00% (0)	20.00% (1)	0.00% (0)			
		Neutral	14.29% (1)	40.00% (2)	40.00% (2)			
		Agree	28.57% (2)	20.00% (1)	20.00% (1)			
		Strongly Agree	57.14% (4)	0.00% (0)	0.00% (0)			
Q23	FORETELL Information Makes You More Confident in Making Weather-Related Decisions	Strongly Disagree	N/A ²	20.00% (1)	40.00% (2)	N/A ²	N/A ²	1.0000
		Disagree	N/A ²	20.00% (1)	0.00% (0)			
		Neutral	N/A ²	40.00% (2)	40.00% (2)			
		Agree	N/A ²	20.00% (1)	20.00% (1)			
Q24	FORETELL Information Helps You Deploy Staff More Efficiently	Strongly Disagree	N/A ²	20.00% (1)	40.00% (2)	N/A ²	N/A ²	N/A ⁴
		Disagree	N/A ²	20.00% (1)	0.00% (0)			
		Neutral	N/A ²	60.00% (3)	40.00% (2)			
		Agree	N/A ²	0.00% (0)	20.00% (1)			
Q25	Roads Return to Targeted Level of Service More Quickly with Weather Information ¹	Strongly Disagree	0.00% (0)	20.00% (1)	40.00% (2)	N/A ⁴	0.1874	N/A ⁴
		Disagree	0.00% (0)	20.00% (1)	0.00% (0)			
		Neutral	28.57% (2)	60.00% (3)	40.00% (2)			
		Agree	28.57% (2)	0.00% (0)	20.00% (1)			
		Strongly Agree	42.86% (3)	0.00% (0)	0.00% (0)			
Q26	Safety of the Highway Maintenance Operator is Increased with Weather Information ¹	Strongly Disagree	0.00% (0)	20.00% (1)	40.00% (2)	N/A ⁴	0.0308	N/A ⁴
		Disagree	0.00% (0)	20.00% (1)	0.00% (0)			
		Neutral	14.29% (1)	60.00% (3)	40.00% (2)			
		Agree	0.00% (0)	0.00% (0)	20.00% (1)			
		Strongly Agree	85.71% (6)	0.00% (0)	0.00% (0)			

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Table A-6. Frequency and Percentage Distribution for Questions from the Highway Maintenance Operator Baseline and Follow-up Surveys, along with Associated P-Values Computed from the Chi-Square Distribution Testing for Effect between Surveys, Wisconsin Respondents Only (continued)

Question	Question Label	Response	Percentage (Number of Non-Missing Responses)			Baseline vs. First Follow-Up	Baseline vs. Second Follow-Up	First Follow-Up vs. Second Follow-Up
			Baseline (N=7)	First Follow-Up (N=5)	Second Follow-Up (N=5)	P-value ³		
Q27	Weather Information ¹ Helps to Lessen the Amount of Chemical Applications	Strongly Disagree	0.00% (0)	20.00% (1)	40.00% (2)	N/A ⁴	N/A ⁴	N/A ⁴
		Disagree	0.00% (0)	40.00% (2)	0.00% (0)			
		Neutral	14.29% (1)	40.00% (2)	60.00% (3)			
		Agree	57.14% (4)	0.00% (0)	0.00% (0)			
		Strongly Agree	28.57% (2)	0.00% (0)	0.00% (0)			
Q28	Make Highway Maintenance Decisions More Efficiently because of FORETELL Information	Yes	N/A ²	40.00% (2)	40.00% (2)	N/A ²	N/A ²	1.0000
		No	N/A ²	60.00% (3)	60.00% (3)			
Q28a	How Much Sooner Do You Learn about Weather Events when Using FORETELL Information	0-3 Hours	N/A ²	0.00% (0)	50.00% (1)	N/A ²	N/A ²	N/A ⁵
		6-12 Hours	N/A ²	0.00% (0)	50.00% (1)			
Q29	Roads are More Quickly Returned to Acceptable Level of Service when Using FORETELL Information	Yes	N/A ²	0.00% (0)	20.00% (1)	N/A ²	N/A ²	N/A ⁴
		No	N/A ²	100.00% (5)	80.00% (4)			
Q29a	How Much More Quickly are Roads Returned to Service when Using FORETELL Information	0-3 Hours	N/A ²	0.00% (0)	100.00% (1)	N/A ²	N/A ²	N/A ⁵

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Table A-6. Frequency and Percentage Distribution for Questions from the Highway Maintenance Operator Baseline and Follow-up Surveys, along with Associated P-Values Computed from the Chi-Square Distribution Testing for Effect between Surveys, Wisconsin Respondents Only (continued)

Question	Question Label	Response	Percentage (Number of Non-Missing Responses)			Baseline vs. First Follow-Up	Baseline vs. Second Follow-Up	First Follow-Up vs. Second Follow-Up
			Baseline (N=7)	First Follow-Up (N=5)	Second Follow-Up (N=5)	P-value ³		
Q30	Would Like to Use FORETELL Information in the Future	Yes	N/A ²	60.00% (3)	60.00% (3)	N/A ²	N/A ²	1.0000
		No	N/A ²	40.00% (2)	40.00% (2)			

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**APPENDIX B:
COMMERCIAL VEHICLE OPERATORS —
DATA COLLECTION INSTRUMENT
AND
SUMMARY TABLE**

INTERVIEW GUIDE

COMMERCIAL VEHICLE OPERATORS INTERVIEW GUIDE

Introduction for discussion:

- We are assisting Battelle Memorial Institute to conduct an FHWA-sponsored independent evaluation of a new road surface/weather information system called FORETELL.
- We are conducting telephone interviews to evaluate who has used the FORETELL web site, how well the system works (accuracy), for what purpose the information is being used (e.g., routing or timing alterations), and whether or not it provides improvements in operations, mobility, and safety. The results of our evaluation will be used to improve the FORETELL system and the information it provides to help you make weather-related decisions.
- You were contacted previously as a potential user and identified as one who is interested in using (or trying) the FORETELL web site and assisting us in this evaluation process
- Have you had an opportunity to familiarize and use the FORETELL system (if not, thank you for your time; this questionnaire was developed for evaluation of those who have experience in some minimal amount of FORETELL products). Are you willing to help us in this evaluation?

Be assured that company and individual information will be kept confidential. The following information will be used for the purpose of this survey only.

- This will take 15-25 minutes. Is this a good time to talk or would you prefer to talk at a different time? Would it be more appropriate to speak to a dispatcher, driver, or other person in your company?
- I appreciate your time. If you would like to interrupt the interview at any time, please let me know.

Name: _____ Title: _____

Organization: _____ Operating Area: _____

Office Location: _____ No. of Drivers: _____

Business Type/Haul: _____ No. of Trucks: _____

Date/Time: _____

The first set of questions pertain to information available prior to your use of the FORETELL web site.

1. Before introduced to the FORETELL web site, what information sources did you use for road surface and weather information? I'm going to read a list of different information sources. Please indicate whether the sources were available, how often you used them, and when you used them (e.g., before a trip or en-route).

Source of Information	Frequency of Use					Type of Use	
	Not Avail	Often	Sometimes	Rarely	Never	Pre-trip	En-route
AM/FM Radio	☐	☐	☐	☐	☐	☐	☐
CB Radio	☐	☐	☐	☐	☐	☐	☐
TV	☐	☐	☐	☐	☐	☐	☐
Cell Phone	☐	☐	☐	☐	☐	☐	☐
DOT Call-in	☐	☐	☐	☐	☐	☐	☐
Highway Patrol Call-in	☐	☐	☐	☐	☐	☐	☐
Internet	☐	☐	☐	☐	☐	☐	☐
Private Forecasting Service	☐	☐	☐	☐	☐	☐	☐
Word of Mouth	☐	☐	☐	☐	☐	☐	☐
Other(s) Specify: _____	☐	☐	☐	☐	☐	☐	☐

Note: If no previous sources were used to access road surface and weather information, skip to question 12 of this questionnaire.

Please indicate how strongly you disagree or agree with the following statements based on a scale of 1 to 5, 1 being strongly disagree and 5 being strongly agree.

Strongly Disagree → Strongly Agree

2. The information sources used were easy to access.
3. Generally speaking, the content (information) from the above sources was easy to understand.
4. Of the information sources your organization accessed, the information was very accurate.
5. Your organization found the information to be up to date.
6. The road surface and weather information was very useful for your organizations operations.

1	2	3	4	5
1	2	3	4	5
1	2	3	4	5
1	2	3	4	5
1	2	3	4	5

If so, comment how: _____

7. Information accessed was used to alter trip timing during a weather event.
8. Obtained information assisted your drivers and dispatchers in route decisions.

1	2	3	4	5
1	2	3	4	5

How? _____

9. Use of information from these sources made you more confident in your decisions to alter your schedule or route during a weather related event.
10. The information from these sources assisted in overall driver safety during weather events.
11. During a weather event, road surface and weather information assisted in the efficiency of overall operations.

1	2	3	4	5
1	2	3	4	5
1	2	3	4	5

12. What information do you use in making weather-related management decisions?

If YES, please go to box A.
 ➔

Do you use actual readings, forecast information, or both? (Please check the appropriate box[es])

	YES	NO	Actual Readings	Forecast Information
a. Wind speed or direction?	☐	☐	☐	☐
b. Precipitation?	☐	☐	☐	☐
c. Atmospheric temperature?	☐	☐	☐	☐
d. Pavement temperature?	☐	☐	☐	☐
e. Pavement conditions?	☐	☐	☐	☐
f. Dewpoint?	☐	☐	☐	☐
g. Some other indicator? <i>Please specify</i> ..	☐	☐	☐	☐

SPECIFY: _____

The remaining questions pertain to information obtained through your use of FORETELL.

13. a) Have you or your organization received any training or training material regarding the FORETELL system?

☐ Yes

☐ No

b) Was it useful?

☐ Yes

☐ No

14. Do you obtain the following information from FORETELL?

YES NO

a. Wind speed or direction ☐ ☐

b. Precipitation ☐ ☐

c. Atmosphere temperature ☐ ☐

d. Pavement temperature ☐ ☐

e. Pavement conditions ☐ ☐

f. Dewpoint ☐ ☐

15. If you don't use the information, why not? _____

16. How often do you obtain information from the FORETELL System...

(please check all that apply)

	YES	NO	TWICE A DAY	4 TIMES A DAY	EVERY OTHER HOUR	HOURLY
a. Daily?	☐	☐	☐	☐	☐	☐
b. Weekly?.....	☐	☐	NOT APPLICABLE			
c. In advance of a weather event*? ..	☐	☐	☐	☐	☐	☐
d. During a weather event*?.....	☐	☐	☐	☐	☐	☐
e. After a weather event*?	☐	☐	☐	☐	☐	☐

* A weather event can include high winds, precipitation, extreme atmospheric temperatures, frost, etc.

Again, please rate the following statements based on a scale of 1 to 5, 1 being strongly disagree and 5 being strongly agree. [Interviewer: If an answer is Disagree or Strongly Disagree, ask the respondent to please explain.]

	Strongly Disagree		Strongly Agree
	1	2	3 4 5
17. Information received from the FORETELL system is understandable.	1	2	3 4 5
18. Information received from the FORETELL system is usable.	1	2	3 4 5
19. Information received from the FORETELL system is easily obtainable.	1	2	3 4 5
20. The FORETELL web site was easy to navigate.	1	2	3 4 5

Comment: _____

21. Information received from the FORETELL system is accurate.	1	2	3	4	5
--	---	---	---	---	---

Explain: _____

22. Information received from the FORETELL system is useful.	1	2	3	4	5
--	---	---	---	---	---

Comment: _____

23. Information provided by the FORETELL web site was up to date.	1	2	3	4	5
---	---	---	---	---	---

24. You received the information from the FORETELL System in time to incorporate it into weather-related management decisions. 1 2 3 4 5

25. Use of the FORETELL web site provided information that played a role in altering trip timing. 1 2 3 4 5

How? _____

26. Information accessed on the FORETELL web site played a role in altering trip routes. 1 2 3 4 5

How? _____

27. You are more confident in making weather-related management decisions when you use information from the FORETELL System. 1 2 3 4 5

Explain: _____

28. Having information from the FORETELL System increases safety and/or reduces accidents. 1 2 3 4 5

How? _____

29. Information obtained on the FORETELL web site improved the overall efficiency of your operations. 1 2 3 4 5

Explain: _____

30. Your organization will likely continue to access information on the FORETELL web site. 1 2 3 4 5

Do you have other comments (e.g., ways to improve FORETELL)?: _____

Thank you for taking the time to participate in this interview. If you have any questions concerning the evaluation, please call me at 208-345-4630. Do you think it would be beneficial to speak to a dispatcher, a driver, or another person in your company?

Name: _____ Title: _____ Phone: _____

SUMMARY TABLE

Table B.1 Frequency and Percentage Distribution for Questions from the Commercial Vehicle Operators Survey

SAS Variable Name	Label	Response Category	Number (%) ¹ (N=15)
No__Drivers	Number of Drivers	Mean	91.9
		Standard Deviation	225.0
		25th Percentile	20.0
		Median	26.0
		75th Percentile	50.0
		n	15
No__Trucks	Number of Trucks	Mean	64.9
		Standard Deviation	123.0
		25th Percentile	18.0
		Median	26.0
		75th Percentile	50.0
		n	15
Q1aa	Use of AM/FM Radio Before FORETELL	Often	3 (20.0%)
		Sometimes	8 (53.3%)
		Rarely	4 (26.7%)
Q1ab	Type of Use of AM/FM Radio Before FORETELL	Pre-trip	3 (20.0%)
		En-route	6 (40.0%)
		Both	6 (40.0%)
Q1ba	Use of CB Radio before FORETELL	Often	4 (28.6%)
		Sometimes	6 (42.9%)
		Rarely	1 (7.1%)
		Never	3 (21.4%)
		Refused	1
Q1bb	Type of Use of CB Radio Before FORETELL	En-route	10 (90.9%)
		Both	1 (9.1%)
		Refused	1
		No. of Appropriate Skip	3
Q1ca	Use of TV Before FORETELL	Often	4 (28.6%)
		Sometimes	3 (21.4%)
		Rarely	1 (7.1%)
		Never	5 (35.7%)
		Not Available	1 (7.1%)
		Refused	1

1. Percentages are calculated based on the non-missing responses.

Table B.1 Frequency and Percentage Distribution for Questions from the Commercial Vehicle Operators Survey (continued)

SAS Variable Name	Label	Response Category	Number (%) ¹ (N=15)
Q1cb	Type of Use of TV Before FORETELL	Pre-trip	4 (50.0%)
		Both	4 (50.0%)
		Refused	1
		No. of Appropriate Skip	6
Q1da	Use of Cell Phone Before FORETELL	Often	8 (57.1%)
		Sometimes	4 (28.6%)
		Rarely	1 (7.1%)
		Never	1 (7.1%)
		Refused	1
Q1db	Type of Use of Cell Phone Before FORETELL	En-route	5 (45.5%)
		Both	6 (54.5%)
		Refused	3
		No. of Appropriate Skip	1
Q1ea	Use of DOT Call Before FORETELL	Sometimes	1 (7.1%)
		Rarely	7 (50.0%)
		Never	6 (42.9%)
		Refused	1
Q1eb	Type of Use of DOT Call Before FORETELL	Pre-trip	3 (50.0%)
		En-route	1 (16.7%)
		Both	2 (33.3%)
		Refused	3
		No. of Appropriate Skip	6
Q1fa	Use of Highway Patrol Call Before FORETELL	Sometimes	1 (7.1%)
		Rarely	7 (50.0%)
		Never	6 (42.9%)
		Refused	1
Q1fb	Type of Use of Highway Patrol Call Before FORETELL	Pre-trip	3 (50.0%)
		En-route	1 (16.7%)
		Both	2 (33.3%)
		Refused	3
		No. of Appropriate Skip	6
Q1ga	Use of Internet Before FORETELL	Often	9 (60.0%)
		Sometimes	3 (20.0%)
		Rarely	3 (20.0%)
Q1gb	Type of Use of Internet Before FORETELL	Pre-trip	8 (61.5%)
		Both	5 (38.5%)
		Refused	2

1. Percentages are calculated based on the non-missing responses.

Table B.1 Frequency and Percentage Distribution for Questions from the Commercial Vehicle Operators Survey (continued)

SAS Variable Name	Label	Response Category	Number (%) ¹ (N=15)
Q1ha	Use of Private Forecasting Service Before FORETELL	Often	3 (21.4%)
		Sometimes	1 (7.1%)
		Never	3 (21.4%)
		Not Available	7 (50.0%)
		Refused	1
Q1hb	Type of Use of Private Forecasting Service Before FORETELL	Pre-trip	2 (66.7%)
		Both	1 (33.3%)
		Refused	2
		No. of Appropriate Skip	10
Q1ia	Use of Word of Mouth Before FORETELL	Often	13 (86.7%)
		Sometimes	2 (13.3%)
Q1ib	Type of Use of Word of Mouth Before FORETELL	Pre-trip	1 (7.7%)
		En-route	1 (7.7%)
		Both	11 (84.6%)
		Refused	2
Q1ja	Use of Other Source Before FORETELL	Never	1 (100.0%)
		Refused	14
Q1jb	Type of Use of Other Source Before FORETELL	Refused	14
		No. of Appropriate Skip	1
Q2	Agree/Disagree Information Easy to Access	Neutral	2 (13.3%)
		Agree	9 (60.0%)
		Strongly Agree	4 (26.7%)
Q3	Agree/Disagree Content Easy to Understand	Disagree	1 (6.7%)
		Neutral	4 (26.7%)
		Agree	7 (46.7%)
		Strongly Agree	3 (20.0%)
Q4	Agree/Disagree Information Accurate	Disagree	1 (6.7%)
		Neutral	7 (46.7%)
		Agree	5 (33.3%)
		Strongly Agree	2 (13.3%)
Q5	Agree/Disagree Information Up to Date	Disagree	1 (6.7%)
		Neutral	6 (40.0%)
		Agree	5 (33.3%)
		Strongly Agree	3 (20.0%)
Q6	Agree/Disagree Information Useful in Operations	Strongly Disagree	3 (20.0%)
		Disagree	2 (13.3%)
		Neutral	4 (26.7%)
		Agree	4 (26.7%)
		Strongly Agree	2 (13.3%)

1. Percentages are calculated based on the non-missing responses.

Table B.1 Frequency and Percentage Distribution for Questions from the Commercial Vehicle Operators Survey (continued)

SAS Variable Name	Label	Response Category	Number (%) ¹ (N=15)
Q7	Agree/Disagree Information Used to Alter Trip Timing During Weather Event	Strongly Disagree	1 (6.7%)
		Disagree	5 (33.3%)
		Neutral	5 (33.3%)
		Agree	3 (20.0%)
		Strongly Agree	1 (6.7%)
Q8	Agree/Disagree Information Assisted Drivers and Dispatchers in Route Decisions	Strongly Disagree	1 (6.7%)
		Disagree	6 (40.0%)
		Neutral	5 (33.3%)
		Agree	2 (13.3%)
		Strongly Agree	1 (6.7%)
Q9	Agree/Disagree Information Made You More Confident in Decisions to Alter Schedule or Route	Disagree	4 (26.7%)
		Neutral	2 (13.3%)
		Agree	7 (46.7%)
		Strongly Agree	2 (13.3%)
Q10	Agree/Disagree Information Assisted in Overall Driver Safety During Weather Events	Strongly Disagree	1 (6.7%)
		Disagree	3 (20.0%)
		Neutral	1 (6.7%)
		Agree	8 (53.3%)
		Strongly Agree	2 (13.3%)
Q11	Agree/Disagree Information Assisted in Efficiency of Overall Operations	Disagree	4 (26.7%)
		Neutral	3 (20.0%)
		Agree	8 (53.3%)
Q12a	Use Wind Speed/Direction Information For Decisions	Yes	2 (13.3%)
		No	13 (86.7%)
Q12aa	Which Information Used for Wind Speed/Direction	Forecast Information	1 (50.0%)
		Actual Information	1 (50.0%)
		No. of Appropriate Skip	13
Q12b	Use Precipitation Information for Decisions	Yes	15 (100.0%)
Q12ba	Which Information Used for Precipitation	Forecast Information	1 (6.7%)
		Actual Information	4 (26.7%)
		Both	10 (66.7%)
Q12c	Use Atmospheric Temperature Information for Decisions	Yes	12 (80.0%)
		No	3 (20.0%)
Q12ca	Which Information Used for Atmospheric Temperature	Forecast Information	3 (25.0%)
		Actual Information	2 (16.7%)
		Both	7 (58.3%)
		No. of Appropriate Skip	3

1. Percentages are calculated based on the non-missing responses.

Table B.1 Frequency and Percentage Distribution for Questions from the Commercial Vehicle Operators Survey (continued)

SAS Variable Name	Label	Response Category	Number (%) ¹ (N=15)
Q12d	Use Pavement Temperature Information for Decisions	Yes	3 (20.0%)
		No	12 (80.0%)
Q12da	Which Information Used for Pavement Temperature	Forecast Information	2 (66.7%)
		Actual Information	1 (33.3%)
		No. of Appropriate Skip	12
Q12e	Use Pavement Condition Information for Decisions	Yes	8 (53.3%)
		No	7 (46.7%)
Q12ea	Which Information Used for Pavement Condition	Forecast Information	3 (37.5%)
		Actual Information	1 (12.5%)
		Both	4 (50.0%)
		No. of Appropriate Skip	7
Q12f	Use Dewpoint Information for Decisions	No	14 (100.0%)
		Refused	1
Q12fa	Which Information Used for Dewpoint	Refused	15
Q12g	Use Other Information for Decisions	Yes	1 (33.3%)
		No	2 (66.7%)
		Refused	12
Q12ga	Which Information Used for Other	Both	1 (100.0%)
		Refused	12
		No. of Appropriate Skip	2
Q13a	Received Training Material for FORETELL	Yes	11 (73.3%)
		No	4 (26.7%)
Q13b	Was FORETELL Training Material Helpful	Yes	7 (63.6%)
		No	4 (36.4%)
		No. of Appropriate Skip	4
Q14a	Obtain Wind Speed/Direction Information from FORETELL	Yes	8 (57.1%)
		No	6 (42.9%)
		Refused	1
Q14b	Obtain Precipitation Information from FORETELL	Yes	15 (100.0%)
Q14c	Obtain Atmospheric Temperature Information from FORETELL	Yes	13 (86.7%)
		No	2 (13.3%)
Q14d	Obtain Pavement Temperature Information from FORETELL	Yes	8 (57.1%)
		No	6 (42.9%)
		Refused	1
Q14e	Obtain Pavement Condition Information from FORETELL	Yes	13 (86.7%)
		No	2 (13.3%)
Q14f	Obtain Dewpoint Information from FORETELL	Yes	1 (6.7%)
		No	14 (93.3%)

1. Percentages are calculated based on the non-missing responses.

Table B.1 Frequency and Percentage Distribution for Questions from the Commercial Vehicle Operators Survey (continued)

SAS Variable Name	Label	Response Category	Number (%) ¹ (N=15)
Q16aa	Obtain Information from FORETELL - Daily	Yes	1 (33.3%)
		No	2 (66.7%)
		Refused	12
Q16ab	How Often Daily	Twice a Day	1 (100.0%)
		Refused	12
		No. of Appropriate Skip	2
Q16b	Obtain Information from FORETELL - Weekly	No	2 (100.0%)
		Refused	13
Q16ca	Obtain Information from FORETELL - Before Event	Yes	5 (100.0%)
		Refused	10
Q16cb	How Often Before Event	Twice a Day	4 (80.0%)
		4 Times a Day	1 (20.0%)
		Refused	10
Q16da	Obtain Information from FORETELL - During Event	Yes	11 (100.0%)
		Refused	4
Q16db	How Often During Event	Twice a Day	9 (81.8%)
		4 Times a Day	2 (18.2%)
		Refused	4
Q16ea	Obtain Information from FORETELL - After Event	Yes	5 (83.3%)
		No	1 (16.7%)
		Refused	9
Q16eb	How Often After Event	Twice a Day	5 (100.0%)
		Refused	9
		No. of Appropriate Skip	1
Q17	Agree/Disagree Information from FORETELL System Understandable	Disagree	2 (13.3%)
		Neutral	6 (40.0%)
		Agree	3 (20.0%)
		Strongly Agree	4 (26.7%)
Q18	Agree/Disagree Information from FORETELL System is Usable	Disagree	2 (13.3%)
		Neutral	4 (26.7%)
		Agree	5 (33.3%)
		Strongly Agree	4 (26.7%)
Q19	Agree/Disagree Information from FORETELL System is Easily Obtained	Strongly Disagree	1 (6.7%)
		Disagree	2 (13.3%)
		Neutral	2 (13.3%)
		Agree	7 (46.7%)
		Strongly Agree	3 (20.0%)

1. Percentages are calculated based on the non-missing responses.

Table B.1 Frequency and Percentage Distribution for Questions from the Commercial Vehicle Operators Survey (continued)

SAS Variable Name	Label	Response Category	Number (%) ¹ (N=15)
Q20	Agree/Disagree FORETELL Web Site Easy to Navigate	Strongly Disagree	1 (6.7%)
		Neutral	4 (26.7%)
		Agree	6 (40.0%)
		Strongly Agree	4 (26.7%)
Q21	Agree/Disagree Information from FORETELL System is Accurate	Disagree	3 (20.0%)
		Neutral	7 (46.7%)
		Agree	4 (26.7%)
		Strongly Agree	1 (6.7%)
Q22	Agree/Disagree Information from FORETELL System is Useful	Disagree	3 (20.0%)
		Neutral	2 (13.3%)
		Agree	7 (46.7%)
		Strongly Agree	3 (20.0%)
Q23	Agree/Disagree Information from FORETELL Web Site is Up to Date	Strongly Disagree	1 (6.7%)
		Disagree	2 (13.3%)
		Neutral	6 (40.0%)
		Agree	5 (33.3%)
		Strongly Agree	1 (6.7%)
Q24	Agree/Disagree Received Information from FORETELL System in Time to Incorporate into Decisions	Strongly Disagree	2 (13.3%)
		Neutral	5 (33.3%)
		Agree	7 (46.7%)
		Strongly Agree	1 (6.7%)
Q25	Agree/Disagree FORETELL Information Played Role in Altering Trip Timing	Strongly Disagree	3 (20.0%)
		Disagree	5 (33.3%)
		Neutral	4 (26.7%)
		Agree	3 (20.0%)
Q26	Agree/Disagree FORETELL Information Played Role in Altering Trip Routes	Strongly Disagree	3 (20.0%)
		Disagree	6 (40.0%)
		Neutral	3 (20.0%)
		Agree	3 (20.0%)
Q27	Agree/Disagree More Confident with Decisions When Using FORETELL Information	Strongly Disagree	2 (13.3%)
		Disagree	2 (13.3%)
		Neutral	1 (6.7%)
		Agree	7 (46.7%)
		Strongly Agree	3 (20.0%)
Q28	Agree/Disagree FORETELL Information Increases Safety and/or Reduces Accidents	Strongly Disagree	2 (13.3%)
		Disagree	2 (13.3%)
		Neutral	6 (40.0%)
		Agree	3 (20.0%)
		Strongly Agree	2 (13.3%)

1. Percentages are calculated based on the non-missing responses.

Table B.1 Frequency and Percentage Distribution for Questions from the Commercial Vehicle Operators Survey (continued)

SAS Variable Name	Label	Response Category	Number (%) ¹ (N=15)
Q29	Agree/Disagree FORETELL Information Increased Overall Efficiency of Operations	Strongly Disagree	2 (13.3%)
		Disagree	1 (6.7%)
		Neutral	6 (40.0%)
		Agree	5 (33.3%)
		Strongly Agree	1 (6.7%)
Q30	Agree/Disagree Will Continue to Use FORETELL	Strongly Disagree	1 (6.7%)
		Disagree	2 (13.3%)
		Neutral	4 (26.7%)
		Agree	7 (46.7%)
		Strongly Agree	1 (6.7%)

1. Percentages are calculated based on the non-missing responses.

**APPENDIX C:
HIGHWAY PATROL PERSONNEL—
DATA COLLECTION INSTRUMENT
AND
SUMMARY TABLE**

INTERVIEW GUIDE

HIGHWAY PATROL PERSONNEL INTERVIEW GUIDE

Introduction for discussion:

- We are assisting Battelle Memorial Institute to conduct an FHWA-sponsored independent evaluation of a new road surface/weather information system called FORETELL.
- We are conducting telephone interviews to evaluate who has used the FORETELL web site, how well the system works (accuracy), for what purpose the information is being used (e.g., routing or timing alterations), and whether or not it provides improvements in operations, mobility, and safety. The results of our evaluation will be used to improve the FORETELL system and the information it provides to help you make weather-related decisions.
- You were contacted previously as a potential user and identified as one who is interested in using (or trying) the FORETELL web site and assisting us in this evaluation process
- Have you had an opportunity to familiarize and use the FORETELL system (if not, thank you for your time; this questionnaire was developed for evaluation of those who have experience in some minimal amount of FORETELL products). Are you willing to help us in this evaluation?

Be assured that company and individual information will be kept confidential. The following information will be used for the purpose of this survey only.

- This will take 15-25 minutes. Is this a good time to talk or would you prefer to talk at a different time? Would it be beneficial to speak to operations personnel?
- I appreciate your time. If you would like to interrupt the interview at any time, please let me know.

Name: _____ Title: _____

State Highway Patrol: _____ Patrolling Area: _____

Office Location: _____ Number of Officers: _____

Date/Time: _____

The first set of Questions pertain to information available prior to your use of the FORETELL web site.

1. Before introduced to the FORETELL web site, what information sources were used, if any, to get road surface and weather information? I'm going to read a list of different information sources. Please indicate whether the sources are available, how often you used them, and your type of use.

Source of Information	Not Avail	Frequency of Use				Type of Use	
		Often	Sometimes	Rarely	Never	Operate	Disseminate
AM/FM Radio	☐	☐	☐	☐	☐	☐	☐
CB Radio	☐	☐	☐	☐	☐	☐	☐
TV	☐	☐	☐	☐	☐	☐	☐
Cell Phone	☐	☐	☐	☐	☐	☐	☐
DOT Call-in	☐	☐	☐	☐	☐	☐	☐
Highway Patrol Call-in	☐	☐	☐	☐	☐	☐	☐
Internet	☐	☐	☐	☐	☐	☐	☐
Private Forecasting Service	☐	☐	☐	☐	☐	☐	☐
Word of Mouth	☐	☐	☐	☐	☐	☐	☐
Other(s) Specify: _____	☐	☐	☐	☐	☐	☐	☐

Note: If no previous sources were used to access road surface and weather information, skip to question 8 of this questionnaire.

Please indicate how strongly you disagree or agree with the following statements based on a scale of 1 to 5, 1 being strongly disagree and 5 being strongly agree.

	Strongly Disagree → Strongly Agree				
2. The information sources used were easy to access and readily available.	1	2	3	4	5
3. The content (information) from the above sources was easy to understand.	1	2	3	4	5
4. Of the information sources your organization accessed, the information was accurate and up to date.	1	2	3	4	5
5. The road surface and weather information obtained was very useful for making decisions and performing your work.	1	2	3	4	5

Comment: _____

6. Information pertained to your coverage area with the necessary detail.	1	2	3	4	5
7. Obtained information assisted you in making decisions and carrying out specific actions.	1	2	3	4	5

How? _____

8. What information do you use in making weather-related management decisions?	<i>If YES, please go to box A.</i>		Do you use actual readings, forecast information, or both? (Please check the appropriate box[es])	
Do you use:	YES	NO	Actual Readings	Forecast Information
a. Wind speed or direction?	☐	☐	☐	☐
b. Precipitation?	☐	☐	☐	☐
c. Atmospheric temperature?	☐	☐	☐	☐
d. Pavement temperature?	☐	☐	☐	☐
e. Pavement conditions?	☐	☐	☐	☐
f. Dewpoint?	☐	☐	☐	☐
g. Some other indicator? <i>Please specify...</i>	☐	☐	☐	☐
SPECIFY: _____				

The remaining questions pertain to information obtained through your use of FORETELL.

9. a) Have you or your organization received any training or training material regarding the FORETELL system?

☐ Yes

☐ No

- b) Was it useful?

☐ Yes

☐ No

10. Do you obtain the following information from FORETELL?

YES NO

- a. Wind speed or direction ☐ YES ☐ NO
- b. Precipitation ☐ YES ☐ NO
- c. Atmosphere temperature ☐ YES ☐ NO
- d. Pavement temperature ☐ YES ☐ NO
- e. Pavement conditions ☐ YES ☐ NO
- f. Dewpoint ☐ YES ☐ NO

If not, why not? _____

11. How often do you obtain information from the FORETELL System...
(please check all that apply)

	YES	NO	TWICE A DAY	4 TIMES A DAY	EVERY OTHER HOUR	HOURLY
a. Daily?	☐	☐	☐	☐	☐	☐
b. Weekly?	☐	☐	NOT APPLICABLE			
c. In advance of a weather event*? ..	☐	☐	☐	☐	☐	☐
d. During a weather event*?	☐	☐	☐	☐	☐	☐
e. After a weather event*?	☐	☐	☐	☐	☐	☐

**A weather event can include high winds, precipitation, extreme atmospheric temperatures, frost, etc.*

Again, please rate the following statements based on a scale of 1 to 5, 1 being strongly disagree and 5 being strongly agree. [Interviewer: If an answer is Disagree or Strongly Disagree, ask the respondent to please explain.]

		Strongly Disagree		→	Strongly Agree	
		1	2	3	4	5
12.	Information received from the FORETELL system is understandable.					
13.	Information received from the FORETELL system is usable.					
14.	Information received from the FORETELL system is easily obtainable.					
15.	The FORETELL web site was easy to navigate.					

Comment: _____

16.	Information received from the FORETELL system is accurate.	1	2	3	4	5
-----	--	---	---	---	---	---

Explain: _____

17.	Information received from the FORETELL system is useful.	1	2	3	4	5
-----	--	---	---	---	---	---

Comment: _____

18.	Information provided by the FORETELL web site was up to date.	1	2	3	4	5
-----	---	---	---	---	---	---

19.	You received the information from the FORETELL System in time to incorporate it into weather-related management decisions.	1	2	3	4	5
-----	--	---	---	---	---	---

20.	The road surface and weather information obtained on the FORETELL web site was very useful for making decisions and performing your work.	1	2	3	4	5
-----	---	---	---	---	---	---

How? _____

21.	Obtained information assisted you in making decisions and carrying out specific actions (road closures and advisories).	1	2	3	4	5
-----	---	---	---	---	---	---

How? _____

22.	Road surface and weather information is compiled and disseminated more efficiently for dispatch purposes.	1	2	3	4	5
-----	---	---	---	---	---	---

Explain: _____

23. You are more confident in making weather-related management decisions when you use information from the FORETELL System. 1 2 3 4 5

Explain: _____

24. Having information from the FORETELL System increases safety and/or reduces accidents. 1 2 3 4 5

How? _____

25. Information obtained on the FORETELL web site improved the overall efficiency of your operations. 1 2 3 4 5

Explain: _____

26. Your organization will likely continue to access information on the FORETELL web site and rely on it more over time than you do on other alternative sources. 1 2 3 4 5

Do you have other comments (e.g., ways to improve FORETELL)?: _____

Thank you for taking the time to participate in this interview. If you have any questions concerning the evaluation, please call me at 208-345-4630. Do you think it would be beneficial to speak to a dispatch or communications officer?

Name: _____ Title: _____ Phone: _____

SUMMARY TABLE

Table C.1 Frequency and Percentage Distribution for Questions from the Highway Patrol Survey.

SAS Variable Name	Label	Response Category	Number (%) ¹ (N=16)
Users	Number of Officers at Location	Mean	14.3
		Standard Deviation	23.0
		25th Percentile	6.5
		Median	9.0
		75th Percentile	11.0
		n	16
Q1aa	Use of AM/FM Radio Before FORETELL	Often	1 (6.3%)
		Sometimes	2 (12.5%)
		Rarely	6 (37.5%)
		Never	6 (37.5%)
		Not Available	1 (6.3%)
Q1ab	Type of Use of AM/FM Radio Before FORETELL	Operate	6 (66.7%)
		Both	3 (33.3%)
		No. of Appropriate Skip	7
Q1ba	Use of CB Radio before FORETELL	Rarely	2 (12.5%)
		Never	5 (31.3%)
		Not Available	9 (56.3%)
Q1bb	Type of Use of CB Radio Before FORETELL	Refused	2
		No. of Appropriate Skip	14
Q1ca	Use of TV Before FORETELL	Often	6 (37.5%)
		Sometimes	6 (37.5%)
		Rarely	4 (25.0%)
Q1cb	Type of Use of TV Before FORETELL	Operate	13 (81.3%)
		Both	3 (18.8%)
Q1da	Use of Cell Phone Before FORETELL	Often	5 (31.3%)
		Sometimes	2 (12.5%)
		Rarely	3 (18.8%)
		Never	2 (12.5%)
		Not Available	4 (25.0%)
Q1db	Type of Use of Cell Phone Before FORETELL	Operate	5 (50.0%)
		Both	5 (50.0%)
		No. of Appropriate Skip	6
Q1ea	Use of DOT Call-In Before FORETELL	Often	4 (25.0%)
		Sometimes	4 (25.0%)
		Rarely	5 (31.3%)
		Never	2 (12.5%)
		Not Available	1 (6.3%)
Q1eb	Type of Use of DOT Call-In Before FORETELL	Operate	8 (61.5%)
		Disseminate	1 (7.7%)
		Both	4 (30.8%)
		No. of Appropriate Skip	3
Q1fa	Use of Highway Patrol Call-In Before FORETELL	Often	1 (6.3%)
		Sometimes	3 (18.8%)
		Rarely	1 (6.3%)
		Never	11 (68.8%)

1. Percentages are calculated based on the non-missing responses.

Table C.1 Frequency and Percentage Distribution for Questions from the Highway Patrol Survey (continued)

SAS Variable Name	Label	Response Category	Number (%)¹ (N=16)
Q1fb	Type of Use of Highway Patrol Call-In Before FORETELL	Operate	2 (40.0%)
		Both	3 (60.0%)
		No. of Appropriate Skip	11
Q1ga	Use of Internet Before FORETELL	Often	11 (68.8%)
		Sometimes	2 (12.5%)
		Rarely	1 (6.3%)
		Never	1 (6.3%)
		Not Available	1 (6.3%)
Q1gb	Type of Use of Internet Before FORETELL	Operate	4 (30.8%)
		Both	9 (69.2%)
		Refused	1
		No. of Appropriate Skip	2
Q1ha	Use of Private Forecasting Service Before FORETELL	Often	7 (43.8%)
		Sometimes	2 (12.5%)
		Rarely	1 (6.3%)
		Never	1 (6.3%)
		Not Available	5 (31.3%)
Q1hb	Type of Use of Private Forecasting Service Before FORETELL	Operate	3 (30.0%)
		Both	7 (70.0%)
		No. of Appropriate Skip	6
Q1ia	Use of Word of Mouth Before FORETELL	Often	15 (100.0%)
		Refused	1
Q1ib	Type of Use of Word of Mouth Before FORETELL	Operate	2 (12.5%)
		Both	14 (87.5%)
Q1ja	Use of Other Source Before FORETELL	Often	14 (87.5%)
		Sometimes	2 (12.5%)
Q1jb	Type of Use of Other Source Before FORETELL	Operate	2 (12.5%)
		Both	14 (87.5%)
Q2	Agree/Disagree Information Easy and Readily Available	Disagree	1 (6.3%)
		Neutral	1 (6.3%)
		Agree	5 (31.3%)
		Strongly Agree	9 (56.3%)
Q3	Agree/Disagree Content Easy to Understand	Disagree	1 (6.3%)
		Agree	10 (62.5%)
		Strongly Agree	5 (31.3%)
Q4	Agree/Disagree Information Accurate and Current	Neutral	4 (25.0%)
		Agree	5 (31.3%)
		Strongly Agree	7 (43.8%)
Q5	Agree/Disagree Information Useful in Decisions	Disagree	1 (6.7%)
		Neutral	3 (20.0%)
		Agree	3 (20.0%)
		Strongly Agree	8 (53.3%)
		Refused	1
Q6	Agree/Disagree Information for Area with Detail	Disagree	2 (12.5%)
		Neutral	4 (25.0%)
		Agree	5 (31.3%)
		Strongly Agree	5 (31.3%)

1. Percentages are calculated based on the non-missing responses.

Table C.1 Frequency and Percentage Distribution for Questions from the Highway Patrol Survey (continued)

SAS Variable Name	Label	Response Category	Number (%) ¹ (N=16)
Q7	Agree/Disagree Information Assisted in Decisions	Strongly Disagree	1 (6.3%)
		Neutral	3 (18.8%)
		Agree	7 (43.8%)
		Strongly Agree	5 (31.3%)
Q8a	Use Wind Speed/Direction Information for Decisions	Yes	13 (81.3%)
		No	3 (18.8%)
Q8ab	Which Information used for Wind Speed/Direction	Forecast Information	7 (53.8%)
		Both	6 (46.2%)
		No. of Appropriate Skip	3
Q8b	Use Precipitation Information for Decisions	Yes	16 (100.0%)
Q8ba	Which Information Used for Precipitation	Forecast Information	5 (31.3%)
		Both	11 (68.8%)
Q8c	Use Atmospheric Temperature Information for Decisions	Yes	16 (100.0%)
Q8ca	Which Information Used for Atmospheric Temperature	Forecast Information	5 (33.3%)
		Both	10 (66.7%)
		Refused	1
Q8d	Use Pavement Temperature Information for Decisions	Yes	5 (31.3%)
		No	11 (68.8%)
Q8da	Which Information Used for Pavement Temperature	Forecast Information	4 (80.0%)
		Both	1 (20.0%)
		No. of Appropriate Skip	11
Q8e	Use Pavement Condition Information for Decisions	Yes	8 (50.0%)
		No	8 (50.0%)
Q8ea	Which Information Used for Pavement Condition	Forecast Information	6 (75.0%)
		Both	2 (25.0%)
		No. of Appropriate Skip	8
Q8f	Use Dewpoint Information for Decisions	Yes	1 (6.3%)
		No	15 (93.8%)
Q8fa	Which Information Used for Dewpoint	Forecast Information	1 (100.0%)
		No. of Appropriate Skip	15
Q8g	Use Other Information for Decisions	Yes	1 (6.3%)
		No	15 (93.8%)
Q8ga	Which Information Used for Other	Both	1 (100.0%)
		No. of Appropriate Skip	15
Q9a	Received Training Material for FORETELL	Yes	13 (81.3%)
		No	3 (18.8%)
Q9b	Was Training Material Helpful	Yes	10 (83.3%)
		No	2 (16.7%)
		Refused	1
		No. of Appropriate Skip	3
Q10a	Obtain Wind Information from FORETELL	Yes	12 (75.0%)
		No	4 (25.0%)
Q10b	Obtain Precipitation Information from FORETELL	Yes	14 (87.5%)
		No	2 (12.5%)

1. Percentages are calculated based on the non-missing responses.

Table C.1 Frequency and Percentage Distribution for Questions from the Highway Patrol Survey (continued)

SAS Variable Name	Label	Response Category	Number (%)¹ (N=16)
Q10c	Obtain Atmospheric Temperature Information from FORETELL	Yes	14 (87.5%)
		No	2 (12.5%)
Q10d	Obtain Pavement Temperature Information from FORETELL	Yes	13 (81.3%)
		No	3 (18.8%)
Q10e	Obtain Pavement Condition Information from FORETELL	Yes	15 (93.8%)
		No	1 (6.3%)
Q10f	Obtain Dewpoint Information from FORETELL	Yes	2 (13.3%)
		No	13 (86.7%)
		Refused	1
Q10h	Why Not Use FORETELL Information	Refused	16
Q11aa	Obtain Information from FORETELL - Daily	No	1 (100.0%)
		Refused	15
Q11ab	How Often Daily	Refused	15
		No. of Appropriate Skip	1
Q11b	Obtain Information from FORETELL - Weekly	Yes	4 (26.7%)
		No	11 (73.3%)
		Refused	1
Q11ca	Obtain Information from FORETELL - Before Event	Yes	6 (50.0%)
		No	6 (50.0%)
		Refused	4
Q11cb	How Often Before Event	Twice a Day	3 (75.0%)
		Every Hour	1 (25.0%)
		Refused	6
		No. of Appropriate Skip	6
Q11da	Obtain Information from FORETELL - During Event	Yes	9 (81.8%)
		No	2 (18.2%)
		Refused	5
Q11db	How Often During Event	Twice a Day	3 (50.0%)
		4 Times a Day	1 (16.7%)
		Every Other Hour	1 (16.7%)
		Every Hour	1 (16.7%)
		Refused	8
		No. of Appropriate Skip	2
Q11ea	Obtain Information from FORETELL - After Event	Yes	5 (62.5%)
		No	3 (37.5%)
		Refused	8
Q11eb	How Often After Event	Twice a Day	2 (66.7%)
		Every Hour	1 (33.3%)
		Refused	10
		No. of Appropriate Skip	3
Q12	Agree/Disagree System Understandable	Neutral	2 (12.5%)
		Agree	7 (43.8%)
		Strongly Agree	7 (43.8%)
Q13	Agree/Disagree Information is Usable	Disagree	2 (12.5%)
		Neutral	1 (6.3%)
		Agree	6 (37.5%)
		Strongly Agree	7 (43.8%)

1. Percentages are calculated based on the non-missing responses.

Table C.1 Frequency and Percentage Distribution for Questions from the Highway Patrol Survey (continued)

SAS Variable Name	Label	Response Category	Number (%)¹ (N=16)
Q14	Agree/Disagree Information is Easily Obtained	Disagree	1 (6.3%)
		Neutral	2 (12.5%)
		Agree	7 (43.8%)
		Strongly Agree	6 (37.5%)
Q15	Agree/Disagree Web Site Easy to Navigate	Disagree	1 (6.7%)
		Neutral	4 (26.7%)
		Agree	3 (20.0%)
		Strongly Agree	7 (46.7%)
		Refused	1
Q16	Agree/Disagree Information Accurate and Current	Disagree	1 (6.3%)
		Neutral	4 (25.0%)
		Agree	8 (50.0%)
		Strongly Agree	3 (18.8%)
Q17	Agree/Disagree Information is Useful	Disagree	1 (6.3%)
		Neutral	3 (18.8%)
		Agree	5 (31.3%)
		Strongly Agree	7 (43.8%)
Q18	Agree/Disagree Information is Up to Date	Disagree	1 (6.3%)
		Neutral	6 (37.5%)
		Agree	5 (31.3%)
		Strongly Agree	4 (25.0%)
Q19	Agree/Disagree Information Timely to Use in Decisions	Strongly Disagree	1 (6.3%)
		Disagree	1 (6.3%)
		Neutral	5 (31.3%)
		Agree	7 (43.8%)
		Strongly Agree	2 (12.5%)
Q20	Agree/Disagree Information Useful in Performing Work	Strongly Disagree	2 (12.5%)
		Disagree	1 (6.3%)
		Neutral	4 (25.0%)
		Agree	6 (37.5%)
		Strongly Agree	3 (18.8%)
Q21	Agree/Disagree Information Useful in Performing Action	Strongly Disagree	3 (18.8%)
		Disagree	1 (6.3%)
		Neutral	3 (18.8%)
		Agree	7 (43.8%)
		Strongly Agree	2 (12.5%)
Q22	Agree/Disagree Information Disseminated Efficiently	Strongly Disagree	5 (33.3%)
		Disagree	2 (13.3%)
		Neutral	1 (6.7%)
		Agree	5 (33.3%)
		Strongly Agree	2 (13.3%)
		Refused	1
Q23	Agree/Disagree More Confident with FORETELL	Strongly Disagree	2 (12.5%)
		Disagree	3 (18.8%)
		Neutral	4 (25.0%)
		Agree	4 (25.0%)
		Strongly Agree	3 (18.8%)

1. Percentages are calculated based on the non-missing responses.

Table C.1 Frequency and Percentage Distribution for Questions from the Highway Patrol Survey (continued)

SAS Variable Name	Label	Response Category	Number (%) ¹ (N=16)
Q24	Agree/Disagree Information Increased Safety	Strongly Disagree	3 (18.8%)
		Disagree	2 (12.5%)
		Neutral	7 (43.8%)
		Agree	4 (25.0%)
Q25	Agree/Disagree Information Increased Efficiency	Strongly Disagree	3 (18.8%)
		Disagree	2 (12.5%)
		Neutral	4 (25.0%)
		Agree	5 (31.3%)
		Strongly Agree	2 (12.5%)
Q26	Agree/Disagree Will Continue to Use FORETELL	Strongly Disagree	3 (18.8%)
		Neutral	4 (25.0%)
		Agree	5 (31.3%)
		Strongly Agree	4 (25.0%)

1. Percentages are calculated based on the non-missing responses.

**APPENDIX D:
SCHOOL ADMINISTRATORS —
DATA COLLECTION INSTRUMENTS
AND
SUMMARY TABLE**

ACTIVITY/WEATHER LOG



U.S. Department
of Transportation
Federal Highway
Administration

FORETELL Activity/Weather Log for School Administrators

**Please mail or fax to Amy Thomas at Battelle Memorial
Institute, 505 King Ave., Columbus, OH 43201, (614)424-4250 (fax).**

ID Number 01301

Event Date

 / /

Administrator's Name:

School District:

Event* Conditions (Please ☐ all that apply)

- | | |
|--|--|
| ☐ Fog | ☐ Sleet |
| ☐ Freezing rain | ☐ Rain |
| ☐ Snow | ☐ Hail |
| ☐ Accumulation ☐ Drifting ☐ Frost | |
| ☐ Black ice | ☐ Extreme temperature |

Information Used During Event

Did you use: (☐ all that apply)

- ☐ Accumulation
☐ Road Decision Support
☐ Precipitation
☐ Atmospheric Temperature
☐ Road Snow Depth
☐ Road Conditions
☐ Radar
☐ Visibility
☐ Other

Type (☐ all that apply) Source (☐ all that apply)

- | | | | |
|-----------------------------------|--|-----------------------------------|--------------------------------|
| ☐ Forecast | ☐ Actual ☐ | ☐ FORETELL | ☐ Other |
| ☐ Forecast | ☐ Actual ☐ | ☐ FORETELL | ☐ Other |
| ☐ Forecast | ☐ Actual ☐ | ☐ FORETELL | ☐ Other |
| ☐ Forecast | ☐ Actual ☐ | ☐ FORETELL | ☐ Other |
| ☐ Forecast | ☐ Actual ☐ | ☐ FORETELL | ☐ Other |
| ☐ Forecast | ☐ Actual ☐ | ☐ FORETELL | ☐ Other |
| ☐ Forecast | ☐ Actual ☐ | ☐ FORETELL | ☐ Other |
| ☐ Forecast | ☐ Actual ☐ | ☐ FORETELL | ☐ Other |

Decisions Made

(Please ☐ all that apply)

- ☐ Delayed start of school
☐ Cancelled school for the day
☐ Released school early
☐ Cancelled AM Kindergarten
☐ Cancelled PM Kindergarten
☐ Rerouted bus(es)
☐ Other
☐ None

How far in advance was
decision made?
(e.g., night before, 4 hrs, 2 hrs)

Event Outcomes

(Please ☐ all that apply)

- ☐ Bus(es) delayed
☐ Bus accident(s)
☐ Student(s) injured
☐ Other
☐ None

How Many?

* A weather event can include fog, precipitation, extreme atmospheric temperatures, etc. ☒ A nowcast provides actual information.

Comments:

QUESTIONNAIRE

FORETELL™ School Administration Field Operational Test

Final Questionnaire

This survey is designed to evaluate your use of the FORETELL system during the 2001-2002 winter season. Instructions are provided as needed for each question. Please complete the following questionnaire and return it to Battelle (505 King Avenue, Columbus, OH 43201) in the enclosed postage-paid return envelope by April 30, 2002. If you have any questions, please contact Shawna Collins at (614) 424-7486. Thank you for your participation in the evaluation of the FORETELL system.

1. Did you use the FORETELL system this past winter?

☐ Yes

☐ No

If you did not use the FORETELL system, please indicate why.

2. Have you attended a FORETELL training class?

☐ Yes

☐ No

3. What information do you use in making weather-related management decisions?

If YES, please go to box A.

A. Do you use actual readings, forecast information, or both? (Please check the appropriate box(es))

Do you use:

	YES	NO	Actual Readings	Forecast Information
a. Accumulation	☐	☐	☐	☐
b. Precipitation	☐	☐	☐	☐
c. Atmospheric temperature.....	☐	☐	☐	☐
d. Radar	☐	☐	☐	☐
e. Road conditions	☐	☐	☐	☐
f. Visibility	☐	☐	☐	☐
g. Other measure <i>(Please specify below)</i>	☐	☐	☐	☐

SPECIFY: _____

SOURCES OF INFORMATION

4A. Please check the box corresponding to the source you rely on most heavily for obtaining each type of information. If you do not use a given type of information to make decisions, please check "Do not use."

	Do Not use	Automated weather station (e.g. RWIS, AWOS)	CNN	FORETELL	Intellicast	Local Weather	National Weather Service	Weather Channel	*Other
a. Accumulation?	☐	☐	☐	☐	☐	☐	☐	☐	☐
b. Precipitation?	☐	☐	☐	☐	☐	☐	☐	☐	☐
c. Atmospheric temperature?	☐	☐	☐	☐	☐	☐	☐	☐	☐
d. Radar?	☐	☐	☐	☐	☐	☐	☐	☐	☐
e. Road conditions?	☐	☐	☐	☐	☐	☐	☐	☐	☐
f. Visibility?	☐	☐	☐	☐	☐	☐	☐	☐	☐
g. Other measure?	☐	☐	☐	☐	☐	☐	☐	☐	☐

Please specify: _____

*Please specify for other: _____

4B. For the types of information that you do **not** rely on FORETELL to provide, please describe the reason(s) why:

- a. Accumulation: _____
- b. Precipitation: _____
- c. Atmospheric temperature: _____
- d. Radar: _____
- e. Road conditions: _____
- f. Visibility: _____
- g. Other, please specify: _____

IF YOU DID NOT USE FORETELL THIS PAST WINTER, YOU MAY STOP HERE. Thank you for taking the time to complete the survey.

5. Please indicate how strongly you disagree or agree with the following statements. Circle 'N/A' if you have not used FORETELL.

The information from the FORETELL system was:

	<u>Strongly Disagree</u>				<u>Strongly Agree</u>
a. Understandable	1	2	3	4	5
b. Usable	1	2	3	4	5
c. Accurate	1	2	3	4	5
d. Easily Obtainable	1	2	3	4	5
e. Useful	1	2	3	4	5

6. **How often do you obtain information from the FORETELL System?**

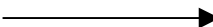
(Please check all that apply.)

How Often?

	YES	NO	TWICE A DAY	4 TIMES A DAY	EVERY OTHER HOUR	EVERY HOUR
a. Daily?.....	☐	☐	☐	☐	☐	☐
b. Weekly?.....	☐	☐	NOT APPLICABLE			
c. In advance of a weather event*?	☐	☐	☐	☐	☐	☐
d. During a weather event*?	☐	☐	☐	☐	☐	☐
e. After a weather event*?	☐	☐	☐	☐	☐	☐

*A weather event can include fog, precipitation, extreme atmospheric temperatures, etc.

7. For each of the following school management decisions, please indicate whether information from FORETELL helped you to make more effective decisions. Please circle one number for each school management decision or Not Applicable (NA) if you were not faced with a given decision.

		NOT HELPFUL  HELPFUL				
a. Delay the start of schools.....	NA	1	2	3	4	5
b. Close schools early.....	NA	1	2	3	4	5
c. Close schools for the day.....	NA	1	2	3	4	5
d. Change bus routing or scheduling	NA	1	2	3	4	5
e. Other <i>Please specify</i>		1	2	3	4	5

For questions 8 through 14, think about your experience before FORETELL was implemented compared to your present experience. Please indicate how strongly you disagree or agree with the following statements by circling the appropriate number.

	Strongly Disagree				Strongly Agree
8. You are more confident in making weather-related management decisions when you use information from the FORETELL system.	1	2	3	4	5
9. The FORETELL system provides timely information for making weather-related management decisions.	1	2	3	4	5
10. You are able to improve vehicle routing and avoid travel delay when you use information from the FORETELL system.	1	2	3	4	5
11. Information obtained on the FORETELL web site improves the overall efficiency of your operations.	1	2	3	4	5
12. Having information from the FORETELL system improves safety/reduces accidents.	1	2	3	4	5
13. The FORETELL system provides valuable information that is not available from other sources	1	2	3	4	5
14. You would be willing to pay for the benefit of having information from the FORETELL system, assuming it is reasonably priced.	1	2	3	4	5

15. Would you like to use information from the FORETELL system in the future?

☐ Yes

☐ No

16. Do you have suggestions for ways to improve the FORETELL system?

17. Do you have any other comments?

SUMMARY TABLE

Table D.1 Frequency and Percentage Distribution for Questions from the School Administrator's Survey

SAS Variable Name	Label	Response Category	Number (%) ¹ (N=5)
Q1a	Use Foretell System This Past Winter	Yes	2 (40.0%)
		No	3 (60.0%)
Q2	Attended a FORETELL Training Class	Yes	5 (100.0%)
Q3Aa	Use Accumulation Information for Decisions	Yes	4 (100.0%)
		Refused	1
Q3Ab	Use Actual Readings for Accumulation	Yes	3 (75.0%)
		No	1 (25.0%)
		Refused	1
Q3Ac	Use Forecast Information for Accumulation	Yes	4 (100.0%)
		Refused	1
Q3Ba	Use Precipitation Information for Decisions	Yes	4 (100.0%)
		Refused	1
Q3Bb	Use Actual Readings for Precipitation	Yes	3 (75.0%)
		No	1 (25.0%)
		Refused	1
Q3Bc	Use Forecast Information for Precipitation	Yes	4 (100.0%)
		Refused	1
Q3Ca	Use Atmospheric Temperature Information for Decisions	Yes	4 (100.0%)
		Refused	1
Q3Cb	Use Actual Readings for Atmospheric Temperature	Yes	3 (75.0%)
		No	1 (25.0%)
		Refused	1
Q3Cc	Use Forecast Information for Atmospheric Temperature	Yes	3 (75.0%)
		No	1 (25.0%)
		Refused	1
Q3Da	Use Radar Information for Decisions	Yes	4 (100.0%)
		Refused	1
Q3Db	Use Actual Readings for Radar	Yes	4 (100.0%)
		Refused	1
Q3Dc	Use Forecast Information for Radar	Yes	2 (50.0%)
		No	2 (50.0%)
		Refused	1
Q3Ea	Use Road Condition Information for Decisions	Yes	3 (100.0%)
		Refused	2
Q3Eb	Use Actual Readings for Road Condition	Yes	3 (100.0%)
		Refused	2
Q3Ec	Use Forecast Information for Road Condition	Yes	2 (66.7%)
		No	1 (33.3%)
		Refused	2
Q3Fa	Use Visibility Information for Decisions	Yes	3 (100.0%)
		Refused	2
Q3Fb	Use Actual Readings for Visibility	Yes	3 (100.0%)
		Refused	2

1. Percentages are calculated based on the non-missing responses.

Table D.1 Frequency and Percentage Distribution for Questions from the School Administrator's Survey (continued)

SAS Variable Name	Label	Response Category	Number (%)¹ (N=5)
Q3Fc	Use Forecast Information for Visibility	Yes	2 (66.7%)
		No	1 (33.3%)
		Refused	2
Q3Ga	Use Other Information for Decisions	No	1 (100.0%)
		Refused	4
Q3Gb	Use Actual Readings for Other	Refused	4
		No. of Appropriate Skip	1
Q3Gc	Use Forecast Information for Other	Refused	4
		No. of Appropriate Skip	1
Q4Aaa	Do Not Use Accumulation Information	No	2 (100.0%)
		Refused	3
Q4Aab	Use Automated Weather Staton Most for Accumulation Information	No	2 (100.0%)
		Refused	3
Q4Aac	Use CNN Most for Accumulation Information	No	2 (100.0%)
		Refused	3
Q4Aad	Use FORETELL Most for Accumulation Information	Yes	1 (50.0%)
		No	1 (50.0%)
		Refused	3
Q4Aae	Use Intellicast Most for Accumulation Information	No	2 (100.0%)
		Refused	3
Q4Aaf	Use Local Weather Most for Accumulation Information	No	2 (100.0%)
		Refused	3
Q4Aag	Use National Weather Service Most for Accumulation Information	No	2 (100.0%)
		Refused	3
Q4Aah	Use Weather Channel Most for Accumulation Information	No	2 (100.0%)
		Refused	3
Q4Aai	Use Other Most for Precipitation Information	No	2 (100.0%)
		Refused	3
Q4Aba	Do Not Use Precipitation Information	No	2 (100.0%)
		Refused	3
Q4Abb	Use Automated Weather Station Most for Precipitation Information	No	2 (100.0%)
		Refused	3
Q4Abc	Use CNN Most for Precipitation Information	No	2 (100.0%)
		Refused	3
Q4Abd	Use FORETELL Most for Precipitation Information	Yes	1 (50.0%)
		No	1 (50.0%)
		Refused	3
Q4Abe	Use Intellicast Most for Precipitation Information	No	2 (100.0%)
		Refused	3
Q4Abf	Use Local Weather Most for Precipitation Information	Yes	1 (50.0%)
		No	1 (50.0%)
		Refused	3
Q4Abg	Use National Weather Service Most for Precipitation Information	No	2 (100.0%)
		Refused	3
Q4Abh	Use Weather Channel Most for Precipitation Information	No	2 (100.0%)
		Refused	3

1. Percentages are calculated based on the non-missing responses.

Table D.1 Frequency and Percentage Distribution for Questions from the School Administrator's Survey (continued)

SAS Variable Name	Label	Response Category	Number (%)¹ (N=5)
Q4Abi	Use Other Most for Precipitation Information	No	2 (100.0%)
		Refused	3
Q4Aca	Do Not Use Atmospheric Temperature Information	No	2 (100.0%)
		Refused	3
Q4Acb	Use Automated Weather Station Most for Atmospheric Temperature Information	No	2 (100.0%)
		Refused	3
Q4Acc	Use CNN Most for Atmospheric Temperature Information	No	2 (100.0%)
		Refused	3
Q4Acd	Use FORETELL Most for Atmospheric Temperature Information	No	2 (100.0%)
		Refused	3
Q4Ace	Use Intellicast Most for Atmospheric Temperature Information	No	2 (100.0%)
		Refused	3
Q4Acf	Use Local Weather Most for Atmospheric Temperature Information	Yes	2 (100.0%)
		Refused	3
Q4Acg	Use National Weather Service Most for Atmospheric Temperature Information	No	2 (100.0%)
		Refused	3
Q4Ach	Use Weather Channel Most for Atmospheric Temperature Information	No	1 (100.0%)
		Refused	4
Q4Aci	Use Other Most for Atmospheric Temperature Information	No	1 (100.0%)
		Refused	4
Q4Ada	Do Not Use Radar Information	No	2 (100.0%)
		Refused	3
Q4Adb	Use Automated Weather Station Most for Radar Information	No	2 (100.0%)
		Refused	3
Q4Adc	Use CNN Most for Radar Information	No	2 (100.0%)
		Refused	3
Q4Add	Use FORETELL Most for Radar Information	Yes	2 (100.0%)
		Refused	3
Q4Ade	Use Intellicast Most for Radar Information	No	2 (100.0%)
		Refused	3
Q4Adf	Use Local Weather Most for Radar Information	No	2 (100.0%)
		Refused	3
Q4Adg	Use National Weather Service Most for Radar Information	No	2 (100.0%)
		Refused	3
Q4Adh	Use Weather Channel Most for Radar Information	No	2 (100.0%)
		Refused	3
Q4Adi	Use Other Most for Radar Information	No	2 (100.0%)
		Refused	3
Q4Aea	Do Not Use Road Condition Information	No	1 (100.0%)
		Refused	4
Q4Aeb	Use Automated Weather Station Most for Road Condition Information	No	1 (100.0%)
		Refused	4
Q4Aec	Use CNN Most for Road Condition Information	No	1 (100.0%)
		Refused	4
Q4Aed	Use FORETELL Most for Road Condition Information	Yes	1 (100.0%)
		Refused	4

1. Percentages are calculated based on the non-missing responses.

Table D.1 Frequency and Percentage Distribution for Questions from the School Administrator's Survey (continued)

SAS Variable Name	Label	Response Category	Number (%) ¹ (N=5)
Q4Aee	Use Intellicast Most for Road Condition Information	No	1 (100.0%)
		Refused	4
Q4Aef	Use Local Weather Most for Road Condition Information	No	1 (100.0%)
		Refused	4
Q4Aeg	Use National Weather Service Most for Road Condition Information	No	1 (100.0%)
		Refused	4
Q4Aeh	Use Weather Channel Most for Road Condition Information	No	1 (100.0%)
		Refused	4
Q4Aei	Use Other Most for Road Condition Information	No	1 (100.0%)
		Refused	4
Q4Afa	Do Not Use Visibility Information	Yes	1 (50.0%)
		No	1 (50.0%)
		Refused	3
Q4Afb	Use Automated Weather Station Most for Visibility Information	No	2 (100.0%)
		Refused	3
Q4Afc	Use CNN Most for Visibility Information	No	2 (100.0%)
		Refused	3
Q4Afd	Use FORETELL Most for Visibility Information	Yes	1 (50.0%)
		No	1 (50.0%)
		Refused	3
Q4Afe	Use Intellicast Most for Visibility Information	No	2 (100.0%)
		Refused	3
Q4Aff	Use Local Weather Most for Visibility Information	Yes	1 (50.0%)
		No	1 (50.0%)
		Refused	3
Q4Afg	Use National Weather Service Most for Visibility Information	No	2 (100.0%)
		Refused	3
Q4Afh	Use Weather Channel Most for Visibility Information	No	2 (100.0%)
		Refused	3
Q4Afi	Use Other Most for Visibility Information	No	2 (100.0%)
		Refused	3
Q4Aga	Do Not Use Other Information	No	1 (100.0%)
		Refused	4
Q4Agb	Use Automated Weather Station Most for Other Information	No	1 (100.0%)
		Refused	4
Q4Agc	Use CNN Most for Other Information	No	1 (100.0%)
		Refused	4
Q4Agd	Use FORETELL Most for Other Information	Yes	1 (100.0%)
		Refused	4
Q4Age	Use Intellicast Most for Other Information	No	1 (100.0%)
		Refused	4
Q4Agf	Use Local Weather Most for Other Information	Refused	5
Q4Agg	Use National Weather Service Most for Other Information	No	1 (100.0%)
		Refused	4
Q4Agh	Use Weather Channel Most for Other Information	No	1 (100.0%)
		Refused	4

1. Percentages are calculated based on the non-missing responses.

Table D.1 Frequency and Percentage Distribution for Questions from the School Administrator's Survey (continued)

SAS Variable Name	Label	Response Category	Number (%) ¹ (N=5)
Q4Agi	Use Other Most for Other Information	No	1 (100.0%)
		Refused	4
Q5A	Agree/Disagree FORETELL Information Understandable	Strongly Agree	1 (100.0%)
		Refused	1
		No. of Appropriate Skip	3
Q5B	Agree/Disagree FORETELL Information Usable	Strongly Agree	2 (100.0%)
		No. of Appropriate Skip	3
Q5C	Agree/Disagree FORETELL Information Accurate	Agree	1 (50.0%)
		Strongly Agree	1 (50.0%)
		No. of Appropriate Skip	3
Q5D	Agree/Disagree FORETELL Information Easily Obtainable	Agree	1 (50.0%)
		Strongly Agree	1 (50.0%)
		No. of Appropriate Skip	3
Q5E	Agree/Disagree FORETELL Information Useful	Strongly Agree	2 (100.0%)
		No. of Appropriate Skip	3
Q6Aa	Obtain Information from FORETELL - Daily	No	1 (100.0%)
		Refused	1
		No. of Appropriate Skip	3
Q6Ab	How Often Daily	No. of Appropriate Skip	5
Q6B	Obtain Information From FORETELL - Weekly	Yes	2 (100.0%)
		Refused	3
Q6Ca	Obtain Information From FORETELL - Before Event	Yes	2 (100.0%)
		No. of Appropriate Skip	3
Q6Cb	How Often Before Event	4 Times a Day	1 (50.0%)
		Every Hour	1 (50.0%)
		No. of Appropriate Skip	3
Q6Da	Obtain Information From FORETELL - During Event	Yes	2 (100.0%)
		No. of Appropriate Skip	3
Q6Db	How Often During Event	Every Other Hour	1 (50.0%)
		Every Hour	1 (50.0%)
		No. of Appropriate Skip	3
Q6Ea	Obtain Information From FORETELL - After Event	Yes	1 (50.0%)
		No	1 (50.0%)
		No. of Appropriate Skip	3
Q6Eb	How Often After Event	Refused	1
		No. of Appropriate Skip	4
Q7A	FORETELL Information Helpful for Delay the Start of Schools Decisions	Neutral	1 (50.0%)
		Somewhat Helpful	1 (50.0%)
		No. of Appropriate Skip	3
Q7B	FORETELL Information Helpful for Close Schools Early Decisions	Somewhat Helpful	1 (50.0%)
		Helpful	1 (50.0%)
		No. of Appropriate Skip	3
Q7C	FORETELL Information Helpful for Close Schools for Day Decisions	Somewhat Helpful	1 (50.0%)
		Helpful	1 (50.0%)
		No. of Appropriate Skip	3

1. Percentages are calculated based on the non-missing responses.

Table D.1 Frequency and Percentage Distribution for Questions from the School Administrator's Survey (continued)

SAS Variable Name	Label	Response Category	Number (%) ¹ (N=5)
Q7D	FORETELL Information Helpful for Change Bus Routing/Scheduling Decisions	Somewhat Helpful	1 (50.0%)
		Helpful	1 (50.0%)
		No. of Appropriate Skip	3
Q7E	FORETELL Information Helpful for Other Decisions	Refused	2
		No. of Appropriate Skip	3
Q8	Agree/Disagree More Confident with Decisions Using FORETELL Information	Agree	1 (50.0%)
		Strongly Agree	1 (50.0%)
		No. of Appropriate Skip	3
Q9	Agree/Disagree FORETELL Provides Timely Information for Decisions	Agree	1 (50.0%)
		Strongly Agree	1 (50.0%)
		No. of Appropriate Skip	3
Q10	Agree/Disagree Improves Vehicle Routing and Travel Delay with FORETELL Information	Neutral	1 (50.0%)
		Strongly Agree	1 (50.0%)
		No. of Appropriate Skip	3
Q11	Agree/Disagree FORETELL Information Improves Overall Efficiency of Operations	Agree	2 (100.0%)
		No. of Appropriate Skip	3
Q12	Agree/Disagree FORETELL System Improves Safety/Reduces Accidents	Agree	2 (100.0%)
		No. of Appropriate Skip	3
Q13	Agree/Disagree FORETELL Provides Exclusive Information	Neutral	1 (50.0%)
		Strongly Agree	1 (50.0%)
		No. of Appropriate Skip	3
Q14	Agree/Disagree Will Pay for FORETELL if Reasonably Priced	Neutral	1 (50.0%)
		Agree	1 (50.0%)
		No. of Appropriate Skip	3
Q15	Use FORETELL Information in the Future	Yes	2 (100.0%)
		No. of Appropriate Skip	3

1. Percentages are calculated based on the non-missing responses.

**APPENDIX E:
TRANSIT OPERATORS —
DATA COLLECTION INSTRUMENT**

INTERVIEW GUIDE

TRANSIT/PARATRANSIT INTERVIEW GUIDE

Name _____ Organization _____
Title _____ Location _____
Location _____ Date _____
Scheduled time of interview _____ am/pm

I'm a member of the Battelle Memorial Institute's team that is under contract to the Federal Highway Administration to evaluate the FORETELL weather information system usage by transit and paratransit agencies. We understand that you have used this system and we would like to have your assistance in providing us information that we can use to try to quantify the benefits of FORETELL. The results of our evaluation will be used to improve the FORETELL system and the information it provides to help you make weather-related decisions.

1. Data from FORETELL indicate you have been using the FORETELL system.
(Skip to ★)

OR

1. Data from FORETELL indicate your agency has **NOT** been using the system. Why not?

*Thank the interviewee for answering the question and **END** the interview.*

★ Are you willing to help us in this evaluation? This interview may take as much as 20 minutes. Also, be assured that company and individual information will be kept confidential. The following information will be used for the purpose of this survey only. Is this a good time to talk or would you prefer to talk at a different time?

Now is OK ☐ Would prefer a different time. Date/Time: _____

If you would like to interrupt the interview at any time, please let me know.

2. How many miles of transit service do you provide from this location?

Commuter routes _____	Urban routes _____
Daily routes _____	Rural routes _____
Nighttime routes _____	Weekend routes _____
Suburban routes _____	Paratransit routes _____

3. How many full time employees do you supervise (FTEs)?

4. What is your work email address? _____

Thank you. Now I'd like to ask the evaluation questions. There are five central objectives for evaluation. They are user acceptance of the concept and the technology, decision effectiveness, improvements in traffic or operational efficiency, safety, and environmental conservation. I will be asking questions related to each of these areas. You may or may not be able to determine how FORETELL has affected you in all of these areas, but we will do our best. I'll begin with User Acceptance.

5. We'd like to find out what information you use in making weather-related management decisions.

If YES,
complete box

Do you use actual readings,
forecast information, or both?
(Please check the appropriate
box[es])

Do you use:	YES	NO	Actual	Forecast
a. Wind speed or direction?	☐	☐	☐	☐
b. Precipitation?	☐	☐	☐	☐
c. Atmospheric temperature?	☐	☐	☐	☐
d. Pavement temperature?	☐	☐	☐	☐
e. Pavement conditions?	☐	☐	☐	☐
f. Dewpoint?	☐	☐	☐	☐
g. Some other indicator?	☐	☐	☐	☐
Please Specify _____:				

6. On a scale of 1 to 5, please indicate how strongly you disagree or agree with the following statements, where 1 means Strongly Disagree and 5 means Strongly Agree.

The information from the FORETELL system was:

			Strongly Disagree				Strongly Agree
a.	Understandable	N/A	1	2	3	4	5
b.	Usable	N/A	1	2	3	4	5
c.	Accurate	N/A	1	2	3	4	5
d.	Easily Obtainable	N/A	1	2	3	4	5

7. Before introduced to the FORETELL web site, what information sources did you use for road surface and weather information? I'm going to read a list of different information sources. Please indicate whether the sources were available, how often you used them, and when you used them (e.g., before a trip or en-route).

Source of Information	Not Avail	Frequency of Use				Type of Use	
		Often	Some times	Rarely	Never	Pre-trip	En-route
AM/FM Radio	☐	☐	☐	☐	☐	☐	☐
CB Radio	☐	☐	☐	☐	☐	☐	☐
TV	☐	☐	☐	☐	☐	☐	☐
Cell Phone	☐	☐	☐	☐	☐	☐	☐
Satellite Delivery	☐	☐	☐	☐	☐	☐	☐
DOT Call-in	☐	☐	☐	☐	☐	☐	☐
Highway Patrol Call-in	☐	☐	☐	☐	☐	☐	☐
Internet	☐	☐	☐	☐	☐	☐	☐
Private Forecasting Service	☐	☐	☐	☐	☐	☐	☐
Word of Mouth	☐	☐	☐	☐	☐	☐	☐
Other(s) Specify: _____	☐	☐	☐	☐	☐	☐	☐

8. How often do you obtain information from the FORETELL System?
(Allow multiple answers.)

If YES, please
go to box A.

A. How Often?

	YES	NO	TWICE A DAY	4 TIMES A DAY	EVERY OTHER HOUR	EVERY HOUR
a. Daily?	☐	☐	☐	☐	☐	☐
b. Weekly?	☐	☐	NOT APPLICABLE			
c. In advance of a weather event*?	☐	☐	☐	☐	☐	☐
d. During a weather event*?	☐	☐	☐	☐	☐	☐
e. After a weather event*?	☐	☐	☐	☐	☐	☐

*A weather event can include high winds, precipitation, extreme atmospheric temperatures, frost, etc.

9. Which feature(s) of FORETELL do you like most? (Allow multiple answers.)

- ☐ Animation
☐ Long-term forecast
☐ Scroll labeling
☐ Information Options
☐ Other (SPECIFY) _____
- ☐ Zoom capability
☐ Map display
☐ Current Conditions

10. Which feature(s) of FORETELL do you like least? (Allow multiple answers.)

- ☐ Animation
☐ Long-term forecast
☐ Scroll labeling
☐ Information Options
☐ Other (SPECIFY) _____
- ☐ Zoom capability
☐ Map display
☐ Current Conditions

11. What types of decisions do you make using FORETELL information?
(Allow multiple answers.)

- Type of Decision**
- ☐ Route changes
☐ Schedule changes
☐ Chain up fleet
☐ None
☐ Other (Specify) _____

How often?

12. For each of the following weather-related management decisions, please indicate whether information from FORETELL helped you to make more effective decisions. *Please circle one number for each management decision or Not Applicable (NA) if they were not faced with a given decision.*

		NOT HELPFUL	—————▶			HELPFUL
a. Route changes	NA	1	2	3	4	5
b. Schedule changes	NA	1	2	3	4	5
c. Chain up the fleet	NA	1	2	3	4	5
d. Other <i>Please specify</i>		1	2	3	4	5

13. What decisions do you make differently using the FORETELL information?

For the next four questions, on a scale of 1 to 5, please indicate how strongly you disagree or agree with the following statements, where 1 means Strongly Disagree and 5 means Strongly Agree.

		Strongly Disagree	—————▶			Strongly Agree
14.	The FORETELL system provides valuable information that is not available from other sources.	1	2	3	4	5
15.	You received the information from the FORETELL system in time to incorporate it into weather-related management decisions.	1	2	3	4	5
16.	The information provided by the FORETELL system is sufficient for making weather-related management decisions.	1	2	3	4	5
17.	Your agency would be willing to pay for the benefit of having information from the FORETELL system, assuming it is reasonably priced.	1	2	3	4	5
18.	You are more confident in making weather-related management decisions when you use information from the FORETELL system.	1	2	3	4	5

	Strongly Disagree	—————→			Strongly Agree
19. You are able to improve vehicle routing and avoid travel delay when you use information from the FORETELL system.	1	2	3	4	5
20. Having information from the FORETELL system improves safety and/or reduces accidents.	1	2	3	4	5

21. Would you like to use information from the FORETELL system in the future?

☐ Yes

☐ No

22. Do you have suggestions for ways to improve the FORETELL system?

23. Please provide us with any other comments you have relative to FORETELL.

Thank you for taking the time to participate in this interview. Your information will be held in confidence and only included in data summaries. If you can think of anything else, or if you have any questions concerning the evaluation, please call me at 636/230-5672, or if you have access to e-mail, you can reach me at:

boselly@weathersolutions.com

**APPENDIX F:
TRAFFIC MANAGERS —
DATA COLLECTION INSTRUMENT
AND
SUMMARY**

INTERVIEW GUIDE

TRAFFIC MANAGERS INTERVIEW GUIDE

Introduction for discussion:

- We are assisting Battelle Memorial Institute to conduct an FHWA-sponsored independent evaluation of a new road surface/weather information system called FORETELL.
- We are conducting telephone interviews to evaluate who has used the FORETELL web site, how well the system works (accuracy), for what purpose the information is being used (e.g., routing or timing alterations), and whether or not it provides improvements in operations, mobility, and safety. The results of our evaluation will be used to improve the FORETELL system and the information it provides to help you make weather-related decisions.
- You were contacted previously as a potential user and identified as one who is interested in using (or trying) the FORETELL web site and assisting us in this evaluation process.
- Have you had an opportunity to familiarize and use the FORETELL system (if not, thank you for your time; this questionnaire was developed for evaluation of those who have experience in some minimal amount of FORETELL products). Are you willing to help us in this evaluation?

Be assured that company and individual information will be kept confidential. The following information will be used for the purpose of this survey only.

- This will take 15-25 minutes. Is this a good time to talk or would you prefer to talk at a different time? Would it be more appropriate to speak to a dispatcher, driver, or other person in your company?
- I appreciate your time. If you would like to interrupt the interview at any time, please let me know.

Name: _____ Title: _____

Organization: _____ Operating Area: _____

Office Location: _____ Number of Employees: _____

Date/Time: _____

The first set of questions pertain to information available prior to your use of the FORETELL web site.

1. Before introduced to the FORETELL web site, what information sources did you use to obtain road surface and weather information? I'm going to read a list of different information sources. Please indicate whether the sources are available, how often you used them, and when you used them (e.g., before a trip or en-route).

Source of Information	Not Avail	Frequency of Use				Type of Use	
		Often	Sometimes	Rarely	Never	Operate	Disseminate
AM/FM Radio	☐	☐	☐	☐	☐	☐	☐
CB Radio	☐	☐	☐	☐	☐	☐	☐
TV	☐	☐	☐	☐	☐	☐	☐
Cell Phone	☐	☐	☐	☐	☐	☐	☐
DOT Call-in	☐	☐	☐	☐	☐	☐	☐
Highway Patrol Call-in	☐	☐	☐	☐	☐	☐	☐
Internet	☐	☐	☐	☐	☐	☐	☐
Private Forecasting Service	☐	☐	☐	☐	☐	☐	☐
Word of Mouth	☐	☐	☐	☐	☐	☐	☐
Other(s) Specify: _____	☐	☐	☐	☐	☐	☐	☐

Note: If no previous sources were used to access road surface and weather information, skip to question 8 of this questionnaire.

Please indicate how strongly you disagree or agree with the following statements based on a scale of 1 to 5, 1 being strongly disagree and 5 being strongly agree.

Strongly Disagree → Strongly Agree

2. The information sources used were easy to access and readily available.
3. The content (information) from the above sources was easy to understand.
4. Of the information sources your organization accessed, the information was accurate and up to date.
5. The road surface and weather information obtained was useful for performance of your work.

1	2	3	4	5
1	2	3	4	5
1	2	3	4	5
1	2	3	4	5

How? _____

6. Information pertained to your coverage area with the necessary detail.
7. Obtained information assisted you in carrying out specific actions.

1	2	3	4	5
1	2	3	4	5

What actions? _____

How? _____

8. What information do you use in making weather-related management decisions?

If YES, please go to box A.

Do you use actual readings, forecast information, or both? (Please check the appropriate box[es])

Do you use:

	YES	NO	Actual Readings	Forecast Information
a. Wind speed or direction?	☐	☐	☐	☐
b. Precipitation?	☐	☐	☐	☐
c. Atmospheric temperature?	☐	☐	☐	☐
d. Pavement temperature?	☐	☐	☐	☐
e. Pavement conditions?	☐	☐	☐	☐
f. Dewpoint?	☐	☐	☐	☐
g. Some other indicator? Please specify...	☐	☐	☐	☐

SPECIFY: _____

The remaining questions pertain to information obtained through your use of FORETELL.

9. a) Have you or your organization received any training or training material regarding the FORETELL system?

☐ Yes

☐ No

- b) Was it useful?

☐ Yes

☐ No

10. Do you obtain the following information from FORETELL?

YES NO

- a. Wind speed or direction ☐ YES ☐ NO
- b. Precipitation ☐ YES ☐ NO
- c. Atmosphere temperature ☐ YES ☐ NO
- d. Pavement temperature..... ☐ YES ☐ NO
- e. Pavement conditions ☐ YES ☐ NO
- f. Dewpoint..... ☐ YES ☐ NO

If you don't use the information, why not?

11. How often do you obtain information from the FORETELL System...

(please check all that apply)

	YES	NO	TWICE A DAY	4 TIMES A DAY	EVERY OTHER HOUR	HOURLY
a. Daily?	☐	☐	☐	☐	☐	☐
b. Weekly?.....	☐	☐	NOT APPLICABLE			
c. In advance of a weather event*? ..	☐	☐	☐	☐	☐	☐
d. During a weather event*?.....	☐	☐	☐	☐	☐	☐
e. After a weather event*?	☐	☐	☐	☐	☐	☐

**A weather event can include high winds, precipitation, extreme atmospheric temperatures, frost, etc.*

Again, please rate the following statements based on a scale of 1 to 5, 1 being strongly disagree and 5 being strongly agree. [Interviewer: If an answer is Disagree or Strongly Disagree, ask the respondent to please explain.]

		Strongly Disagree		→	Strongly Agree	
		1	2	3	4	5
12.	Information received from the FORETELL system is understandable.					
13.	Information received from the FORETELL system is usable.					
14.	Information received from the FORETELL system is easily obtainable.					
15.	The FORETELL web site was easy to navigate.					

Comment: _____

16.	Information received from the FORETELL system is accurate.					
-----	--	--	--	--	--	--

Explain: _____

17.	Information received from the FORETELL system is useful.					
-----	--	--	--	--	--	--

Comment: _____

18.	Information provided by the FORETELL web site was up to date.					
-----	---	--	--	--	--	--

19.	You received the information from the FORETELL System in time to incorporate it into weather-related management decisions.					
-----	--	--	--	--	--	--

20.	The road surface and weather information obtained on the FORETELL web site was useful for the performance of your work.					
-----	---	--	--	--	--	--

How? _____

21.	Obtained information assisted you in carrying out specific actions.					
-----	---	--	--	--	--	--

How? _____

22.	Road surface and weather information is compiled and disseminated more efficiently.					
-----	---	--	--	--	--	--

Explain: _____

23. Notifications of road closures or restrictions are issued more efficiently with FORETELL information. 1 2 3 4 5

Comment: _____

24. You are more confident in making weather-related management decisions when you use information from the FORETELL System. 1 2 3 4 5

Explain: _____

25. Having information from the FORETELL System increases safety and/or reduces accidents. 1 2 3 4 5

How? _____

26. Information obtained on the FORETELL web site improved the overall efficiency of your operations. 1 2 3 4 5

Explain: _____

27. Your organization will likely continue to access information on the FORETELL web site and rely on it more over time than you do on other alternative sources. 1 2 3 4 5

Do you have other comments (e.g., ways to improve FORETELL)?: _____

Thank you for taking the time to participate in this interview. If you have any questions concerning the evaluation, please call me at 208-345-4630. Do you think it would be beneficial to speak to operations personnel?

Name: _____ Title: _____ Phone: _____

INTERVIEW SUMMARY

TRAFFIC MANAGERS INTERVIEW GUIDE

Introduction for discussion:

- We are assisting Battelle Memorial Institute to conduct an FHWA-sponsored independent evaluation of a new road surface/weather information system called FORETELL.
- We are conducting telephone interviews to evaluate who has used the FORETELL web site, how well the system works (accuracy), for what purpose the information is being used (e.g., routing or timing alterations), and whether or not it provides improvements in operations, mobility, and safety. The results of our evaluation will be used to improve the FORETELL system and the information it provides to help you make weather-related decisions.
- You were contacted previously as a potential user and identified as one who is interested in using (or trying) the FORETELL web site and assisting us in this evaluation process.
- Have you had an opportunity to familiarize and use the FORETELL system (if not, thank you for your time; this questionnaire was developed for evaluation of those who have experience in some minimal amount of FORETELL products). Are you willing to help us in this evaluation?

Be assured that company and individual information will be kept confidential. The following information will be used for the purpose of this survey only.

- This will take 15-25 minutes. Is this a good time to talk or would you prefer to talk at a different time? Would it be more appropriate to speak to a dispatcher, driver, or other person in your company?
- I appreciate your time. If you would like to interrupt the interview at any time, please let me know.

Title: **Traffic Manager**

Operating Area: **Wisconsin**

Number of Employees: **6**

The first set of questions pertain to information available prior to your use of the FORETELL web site.

1. Before introduced to the FORETELL web site, what information sources did you use to obtain road surface and weather information? I'm going to read a list of different information sources. Please indicate whether the sources are available, how often you used them, and when you used them (e.g., before a trip or en-route).

Source of Information	Not Avail	Frequency of Use				Type of Use	
		Often	Sometimes	Rarely	Never	Operate	Disseminate
AM/FM Radio	☐	☐	☒	☐	☐	☒	☐
CB Radio	☒	☐	☐	☐	☐	☐	☐
TV	☐	☒	☐	☐	☐	☒	☒
Cell Phone	☐	☐	☐	☐	☒	☐	☐
DOT Call-in (us)	☐	☒	☐	☐	☐	☒	☐
Highway Patrol Call-in	☐	☒	☐	☐	☐	☒	☐
Internet	☐	☐	☒	☐	☐	☒	☒
Private Forecasting Service/ DTN	☐	☒	☐	☐	☐	☒	☐
Word of Mouth	☐	☒	☐	☐	☐	☒	☐
Other(s) Specify: <u>SSI</u>	☐	☒	☐	☐	☐	☒	☐

Note: *If no previous sources were used to access road surface and weather information, skip to question 8 of this questionnaire.*

Please indicate how strongly you disagree or agree with the following statements based on a scale of 1 to 5, 1 being strongly disagree and 5 being strongly agree.

	Strongly Disagree	→ Strongly Agree			
2. The information sources used were easy to access and readily available.	1	2	3	④	5
3. The content (information) from the above sources was easy to understand.	1	2	③	4	5
4. Of the information sources your organization accessed, the information was accurate and up to date.	1	2	3	④	5
5. The road surface and weather information obtained was useful for performance of your work.	1	②	3	4	5

How? **Usually not that much road surface information provided. This road information was not detailed or area specific enough**

6. Information pertained to your coverage area with the necessary detail.	1	②	3	4	5
7. Obtained information assisted you in carrying out specific actions.	1	②	3	4	5

What actions? **Use information for DMS indications, ramp metering, signal timing adjustments, and etc.**

How? **Need better route specific information for taking these actions.**

8. What information do you use in making weather-related management decisions?	If YES, please go to box A. →		Do you use actual readings, forecast information, or both? (Please check the appropriate box[es])	
			Actual Readings	Forecast Information
Do you use:	YES	NO		
a. Wind speed or direction?	☐	☒	☐	☐
b. Precipitation?	☒	☐	☒	☐
c. Atmospheric temperature?	☒	☐	☒	☐
d. Pavement temperature?	☒	☐	☒	☐
e. Pavement conditions?	☒	☐	☒	☐
f. Dewpoint?	☐	☒	☐	☐
g. Some other indicator? <i>Please specify...</i>	☐	☒	☐	☐
SPECIFY: _____				

The remaining questions pertain to information obtained through your use of FORETELL.

9. a) Have you or your organization received any training or training material regarding the FORETELL system?

☒ Yes

☐ No

- b) Was it useful?

☒ Yes

☐ No

10. Do you obtain the following information from FORETELL?

YES NO

- a. Wind speed or direction ☒ YES ☐ NO
- b. Precipitation ☒ YES ☐ NO
- c. Atmosphere temperature ☒ YES ☐ NO
- d. Pavement temperature ☒ YES ☐ NO
- e. Pavement conditions ☒ YES ☐ NO
- f. Dewpoint ☐ YES ☒ NO

If you don't use the information, why not? **We don't have a use for dewpoint specifically.**

11. How often do you obtain information from the FORETELL System...
(please check all that apply)

	YES	NO	TWICE A DAY	4 TIMES A DAY	EVERY OTHER HOUR	HOURLY
a. Daily?	☒	☐	☐	☒	☐	☐
b. Weekly?	☐	☒	NOT APPLICABLE			
c. In advance of a weather event*? ..	☒	☐	☒	☐	☐	☐
d. During a weather event*?	☒	☐	☒	☐	☐	☐
e. After a weather event*?	☐	☒	☐	☐	☐	☐

** A weather event can include high winds, precipitation, extreme atmospheric temperatures, frost, etc.*

Again, please rate the following statements based on a scale of 1 to 5, 1 being strongly disagree and 5 being strongly agree. [Interviewer: If an answer is Disagree or Strongly Disagree, ask the respondent to please explain.]

		Strongly Disagree	→	Strongly Agree	
12.	Information received from the FORETELL system is understandable.	1	2	3	④ 5
13.	Information received from the FORETELL system is usable.	1	2	3	④ 5
14.	Information received from the FORETELL system is easily obtainable.	1	2	③	4 5
15.	The FORETELL web site was easy to navigate.	1	2	3	④ 5

Comment: **Dependent on internet access. FORETELL is not necessarily integrated into our systems. We would have to pull away from our common tools to look at the separate FORETELL graphic map.**

16.	Information received from the FORETELL system is accurate.	1	2	3	④ 5
-----	--	---	---	---	-----

Explain: **Not able to check the accuracy.**

17.	Information received from the FORETELL system is useful.	1	2	③	4 5
-----	--	---	---	---	-----

Comment: **Dependent on internet access. FORETELL is not necessarily integrated into our systems. We would have to pull away from our common tools to look at the separate FORETELL graphic map.**

18.	Information provided by the FORETELL web site was up to date.	1	2	3	④ 5
19.	You received the information from the FORETELL System in time to incorporate it into weather-related management decisions.	1	2	③	4 5
20.	The road surface and weather information obtained on the FORETELL web site was useful for the performance of your work.	1	2	3	④ 5

How? **1) Adapting traffic control timing; 2) Closures; 3) Warning signs; and 4) Integrating w/ other entities.**

21.	Obtained information assisted you in carrying out specific actions.	1	2	3	④ 5
-----	---	---	---	---	-----

How? **1) Adapting traffic control timing; 2) Closures; 3) Warning signs; and 4) Integrating w/ other entities.**

22.	Road surface and weather information is compiled and disseminated more efficiently.	1	2	3	④ 5
-----	---	---	---	---	-----

Explain: **We didn't use it in this detail but sure could if we needed to.**

23. Notifications of road closures or restrictions are issued more efficiently with FORETELL information. 1 2 ③ 4 5

Comment: **Didn't feel like we had an opportunity to integrate into our daily operations to verify improved efficiency.**

24. You are more confident in making weather-related management decisions when you use information from the FORETELL System. 1 2 3 ④ 5

Explain: **We could be more confident from quick access to a good weather and road condition source.**

25. Having information from the FORETELL System increases safety and/or reduces accidents. 1 2 3 ④ 5

How? **It very well could; we did not use the system for this purpose nor checked it for this purpose.**

-
26. Information obtained on the FORETELL web site improved the overall efficiency of your operations. 1 2 3 ④ 5

Explain: **I see that it has great potential to improve the overall efficiency if used as a primary source of road and weather information.**

27. Your organization will likely continue to access information on the FORETELL web site and rely on it more over time than you do on other alternative sources. 1 ② 3 4 5

Do you have other comments (e.g., ways to improve FORETELL)? **I would rather pursue a system that can be integrated into our current operating systems and tools rather than add yet another, more complicated layer to our personnel and operations. Have one more weather related repository superimposed as another source on top of the existing system we deal with.**

Thank you for taking the time to participate in this interview. If you have any questions concerning the evaluation, please call me at xxx-xxx-xxxx. Do you think it would be beneficial to speak to operations personnel?

Name: None Title: _____ Phone: _____

Note: Please send the results!

APPENDIX G:

**FORETELL USER MANUAL
AND TRAINING GUIDE**

USER MANUAL

FORETELL

User Manual

October, 2001

Welcome to FORETELL

FORETELL is a multi-state initiative integrating Intelligent Transportation Systems (ITS) with advanced weather systems prediction to create operational highway maintenance management and traveler information systems throughout North America. As the first project of its kind, and one of the first major rural ITS initiatives in the United States, *FORETELL* is playing a major role in the development of rural ITS architecture. Overall goals include reducing winter-condition related road deaths by at least 15%, and creating a viable road and weather information network across the continent, both within 5 years. Operators will use *FORETELL* to access information on a wide range of weather and pavement condition information for any road or region in their state.

This document will provide an overview of the various functions within *FORETELL* and explain how to use them.

How does FORETELL work?

FORETELL realizes that effective winter maintenance needs accurate future information to make plans on how to tackle an oncoming storm as well as detailed current information to track the storm's location and intensity over the past few hours. *FORETELL* works by combining three sources of weather information to provide the most accurate current data and forecasts available.

The first source of information is the **30 hour forecast** created four times per day and show you the conditions expected in the future. These forecasts are updated starting at 4:00 AM, 10:00 AM, 4:00 PM and 10:00 PM (all times in Eastern Standard Time – EST). The second source of information provided by *FORETELL* is called a **nowcast**. A nowcast is a display that shows the actual weather conditions over the entire region as recorded at the top of the hour. The nowcast is available every hour at 30 minutes past the hour (i.e. 1:30, 2:30, 3:30, etc.). The third source is live **Radar** information,

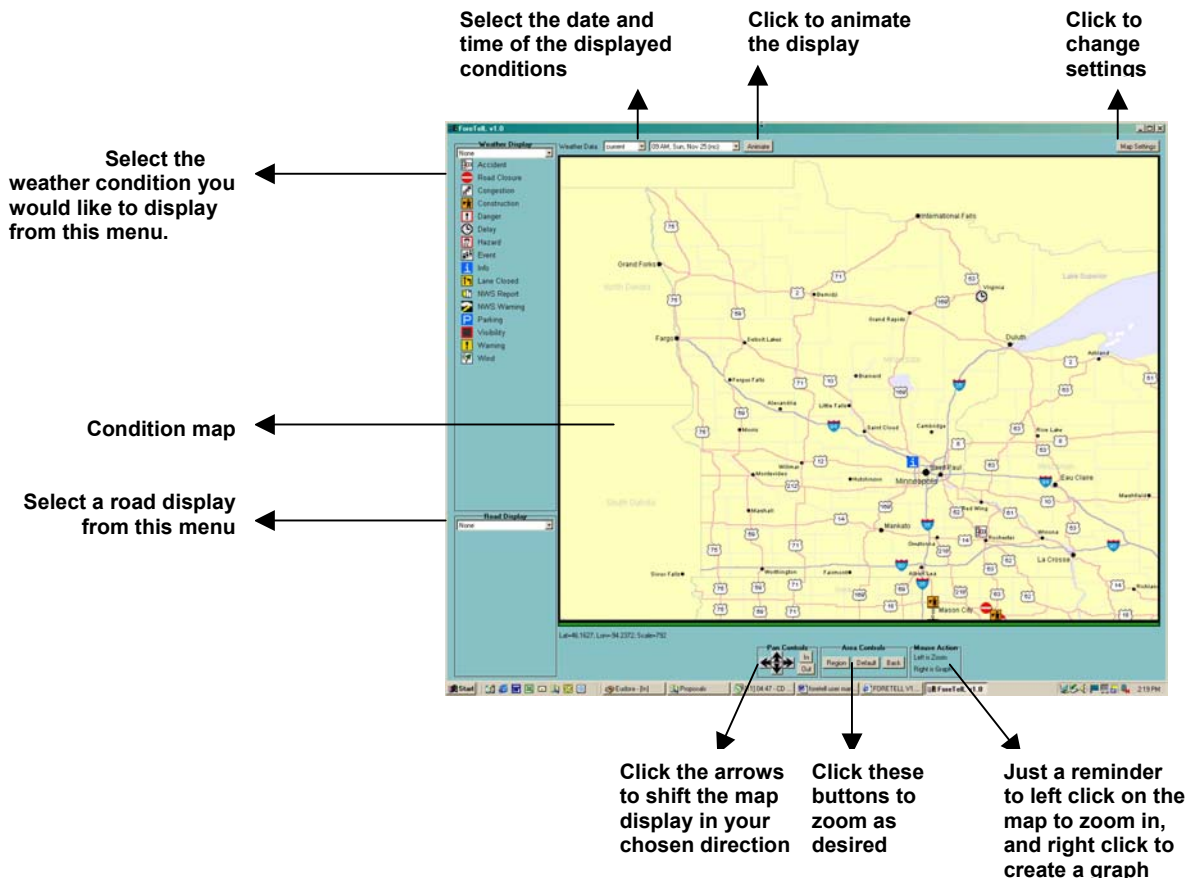
In *FORETELL*, when a nowcast becomes available, it **replaces** the forecast for that hour. This allows you to see the actual conditions for each past hour and the forecasts for hours still to come. In addition to this, as *FORETELL* creates one new hour worth of forecast at each of the four startup times, *FORETELL* replaces the old forecast weather information for the new ones, therefore updating the information available to users as soon as possible. The graphic below shows how this influences the information available.

The *FORETELL* Schedule graphic illustrates the time range that the nowcast and each of the forecasts operate. The *FORETELL* Forecast Times shows an example of the files available for viewing at 10am, 12pm and 2pm. Users should recognize that over time, new weather data files are available (e.g 10am files) and replace the existing forecast files (e.g. 43am), thus providing the most up to date information to users.

Getting Started with FORETELL

FORETELL is an internet-based system. That means that you will use an internet browser such as Internet Explorer or Netscape to access it and keep it running while you use FORETELL. You are able to view other web pages while logged into FORETELL.

1. Log onto the Internet using whatever Internet service provider you have chosen, and open either Netscape or Internet Explorer.
2. Access the FORETELL web site at www.foretell.com.
3. Save this location to either your Favorites (if using Microsoft Internet Explorer) or to your Bookmarks (if using Netscape).
4. Select the **LAUNCH** button to start the program.
5. Enter your userid and password provided to you by your network administrator. These are case sensitive, so make sure you don't accidentally use capital letters. Then left click on the **LOGIN** button.
6. You will now enter a page that shows a map and several menus. This is FORETELL.



About the Conditions Map

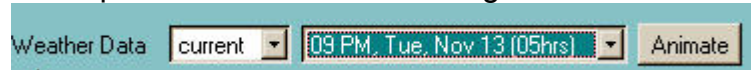
At the default zoom level, FORETELL displays all of area where FORETELL information is available and the interstates running through each region. From the map, you have the ability to zoom in and out, move your display in all directions and select the time frame and type of information you want to see.

Zoom and Pan

There are two ways to zoom. You may also **click and hold** the left mouse button while dragging the mouse over a region on the map to zoom in. When you release the mouse button, the new zoomed map will appear. You can keep doing this until you get to the zoom level you prefer. You can also use the **Zoom Controls** buttons to zoom in and out to a regional map or a default map set up for your user ID.

Time Frame Viewing options

FORETELL enables you to view various levels of road and weather conditions both in terms of detail and time ranges. The pull-down menus shown below control the time period and the type of information that you can display on the map. The Weather Data menu provides users with the range of situations available.



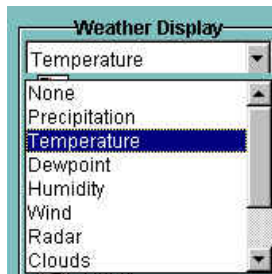
The **CURRENT** option provides you with the ability to see the weather conditions for at least a 24-hour period into the future as well as a historical view of the past few hours in hourly increments. Weather data under this option is shown at a six-mile spacing, meaning that FORETELL determines the conditions at points no more than six miles apart. The time periods available under this option are displayed in the time menu.

The **REGIONAL** option provides information at a lower resolution but over a greater area. The data is displayed at an 18-mile resolution but shows an area at least twice the size of the CURRENT option. This information is also available in hourly time increments as shown in the time menu.

The **RADAR** option provides access to near-live radar information at a 2.5 mile spacing using 10 minute intervals for the past two hours. This information only contains radar information and must be used in conjunction with the radar weather type discussed later in this manual. The time menu displays the options a user can choose from.

The FORETELL system requires that a user update their display periodically to ensure that they have the latest information. To check for updates, reselect any of the options from the Weather Data menu. In some situations, such as training or demonstrations, past forecasts may be available for viewing.

Viewing weather conditions



As shown here, clicking on the pull-down menu under **Weather Displays** lists the types of forecasts available.

FORETELL displays color-coded forecasts for the following weather conditions:

- **Precipitation:** rate of precipitation in melted inches per hour
- **Temperature:** air temperature in degrees Fahrenheit
- **Dewpoint:** predicted Fahrenheit temperature at which dew will form
- **Humidity:** relative percent moisture in the atmosphere
- **Wind:** arrows indicate wind speed and direction
- **Radar:** forecasted radar in dbZ, or intensity of echoes
- **Clouds:** cloud thickness
- **Pressure:** atmospheric pressure in millibars
- **Precipitation Accumulation:** 30 hour melted accumulation of all precipitation in inches.
- **Frozen Accumulation:** 30 hour melted accumulation of frozen precipitation in inches
- **Measured Accumulation:** 30 hour accumulation of frozen precipitation in inches, measured as seen on the ground.

Selecting one of these conditions brings up a legend for the color codes used, as well as displays the current forecast for that condition on the map. The section **Time Frame Viewing Options** contains information on how to view specific time periods.

The graphics below show what an operator who had zoomed in on Wisconsin and then selected Temperature might see:



Note that by dragging the mouse over the map, individual temperatures (or any other weather selected) may be displayed.

Viewing road conditions

FORETELL can display roadway information from the Road Display pull-down menu for any of the conditions listed below:

- **Road condition:** When completed, this feature will show color coded road indices based on driveability (i.e. Driving conditions good, Driving conditions fair, Driving conditions poor). This display is based on forecasted conditions and uses the assumption that no maintenance activities (plowing, sanding or salting) have been performed.
- **Air temperature @ road:** air temperature above road surface, five feet above ground
- **Pavement temperature:** temperature of the road driving surface
- **Dewpoint @ road:** dewpoint above the roadway surface

To view roadway information, first use the zoom and pan controls as explained above to view the roadways you are interested in. Next, select the type of information you are interested in from the **Road Display** pull-down menu. You will see a legend explaining the color-coding used for that type of information. Roadways shown on the map are now color-coded to reflect the current forecasted conditions.



The graphics above show the road conditions for the Milwaukee area.

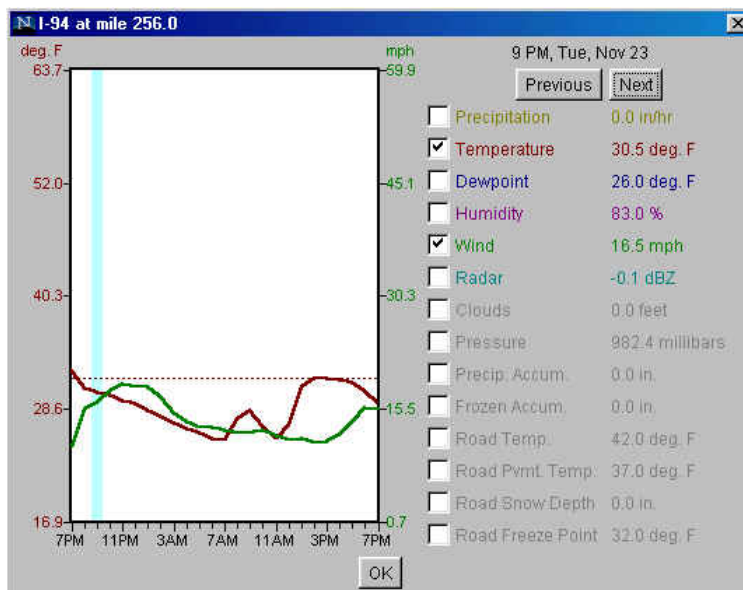
Animating forecasts

Clicking the **Animate** button after selecting a road or weather display will trigger an animation of the forecasted conditions, with one frame corresponding to each of the 30 hours covered by the current forecast. Along the top of the map, you will see a bar that shows the hour of time for the weather data being displayed.

You may freeze the animation by clicking the **Stop** button at any time.

Creating graphs

A key feature of FORETELL is the ability to create graphs of the forecasted conditions over a 30 hour period for any point along any roadway. To begin creating graphs, click on any point on the map using the **right** mouse button. A window will open that shows the name of the road and milepoint you selected, as well as all the current road and weather conditions for that point. If you have selected a point on the map that is not on a roadway, only weather conditions will be graphed--no road conditions or road temperatures will be available.



A graph like the one shown above will not appear until you select one or more conditions that you would like graphed. Above, temperature and wind have been checked. Note that the lines on the graph, the scale, and the condition name are all color-coded for clarity.

Clicking **Previous** and **Next** moves the transparent blue bar along the vertical axis and changes the display of the forecasted conditions to correspond with the hour highlighted by the bar. Also, text is displayed in the gray area to the right of the box to report the exact value at the time selected. Click **OK** to close the window. The graph is not saved.

HELPFUL HINTS:

1. Dew may form as Temperature and Dewpoint get closer, with frost occurring when temperatures below 32 degrees if the surface is also below freezing
2. Horizontal accumulation graph means zero additional expected for that period. The steeper the graph, the more intense the precipitation accumulation expected.
3. Plotting Frozen and Measured Accumulations display water equivalent of frozen precipitation expected and the expected depth. Closer values are together, means that precipitation is increasingly wet and dilution of solution may occur.

Maximizing your Benefit from FORETELL

1. Data is being updated continuously. Be sure to check conditions regularly and update data file list. This should be done prior to manpower and operational decisions to see approaching storm and how storm is changing over time.
2. Remember that the information are the forecasted or actual conditions at the top of the hour, so precipitation and accumulation displayed at 0AM means between 9AM and 10AM precipitation will begin. Other data are expected readings at 10AM.
3. Remember you can access the site from anywhere you have internet access.
4. Understand the currency of the data. Nowcasts (nc) are the actual observed data from sensors around the area. Forecasts (example 25hrs) means that this particular set of data is forecasted 25 hours from the start of the forecast. There will be some variability in forecasts further out in the future.

Medium Term

1. From the **Current** or **Regional** Weather Data options, use the **Animate** button to view **Precipitation** location, rate and type expected over next 24-30 hour period.
2. Select last time frame to and display **Precip Accum.**, **Frozen Accum.** and **Measured Accum.** to determine precipitation type(s), water equivalent amount and total measured frozen amount of precipitation expected over forecast period.
3. Right-click on the map and select the accumulation display(s), air temperature and road temperature to see how conditions will change over time.
 - a. Flat accumulation graph equals no accumulation, sharp graph means heavy accumulation;
 - b. Potential for frost / dew when air and dewpoint temperatures get close;
4. This information provides a basis for making operational decisions such as:
 - c. The length of the storm affecting whether to split shifts and overtime issues;
 - d. The type and water content of precipitation expected determining the type and quantity of chemicals applied;
 - e. The Frozen / Unfrozen precipitation switches affecting timing of anti-icing or brine applications;
 - f. Temperature changes affecting point when chemical application occurs.

Short Term

1. From the **Radar** Weather Data option, use the **Animate** button to view past two hours of live NextRAD data at 10 minute intervals.

- a. Provide real-time indication of locations of precipitation and cell intensity;
 - b. Snow appears at lower readings and tends to be evenly spread over area;
 - c. Allows user to see current detailed storm track.
2. From the **Current** or **Regional** Weather Data options, use the **Animate** button to view if precipitation differs in location or timing between the latest nowcast (nc) and the forecast for the next hour.

Weather and Road Data.

1. The consistency in the flow from Nowcast to Forecast identifies how close the storm is actually moving compared to the forecast. A shift in time or location should be used to gage how close the forecast is and where the storm will track.
2. All precipitation amounts are melted totals other than Measured Accumulation. Use the melted amounts to determine how much water is in the precipitation. Use the measured accumulation to determine how “heavy” the precipitation is. As a general rule 1 inch of water = 10 inches of normal snow.
3. Use this ratio to determine if anti-icing options will be useful, the amount of chemical application to avoid dilution of solution and what type of blading operation will work.

TRAINING GUIDE

FORETELL™

Training Guide

October, 2001

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FORETELL™

Getting Started with FORETELL

7. Open up a web browser, either Netscape or Internet Explorer.
8. Access the FORETELL web site at www.foretell.com
9. Click on the **LAUNCH** button on the screen to start the JAVA version of FORETELL.
10. The JAVA version will require you to enter your UserID and password provided to. When you first log in, the user name and password will be your last name in lower case letters. Once you've entered in the information, then left click on the **LOGIN** button.
11. You will now see another window open to a page that shows a map and several menus. This is FORETELL.

Initial Screen

The initial screen contains several main features. Let's get ourselves familiar with the features of FORETELL.

1. In the center is the map that provides the main information display.
2. The top left contains the weather condition options that can be displayed.
3. The bottom left contains the road condition options that can be displayed.
4. The top center contains the time selection information for data available.
5. The bottom center contains the pan / tilt and zoom functions.
6. The top right button allows users to select the some map characteristics.

Zooming and Panning

FORETELL allows you to zoom to any area that is of most interest to a user. Let's begin using the zoom and pan functions.

1. Move your mouse to the north west corner of your state on the map.
2. Click and hold the left mouse button and drag the mouse over to the south east corner of the state and then release the mouse button. Notice the green line that fills the status bar at the bottom of the map. This reveals the status of the map update.
3. The new map will appear with your state completely filling the map.
4. Let's assume that you made a mistake and zoomed to the wrong area. Use the **BACK** button in the Area Control region to go back to our previous view.

5. Hit the **In** button several (3-4) times, each time waiting for the map to be displayed. This zooms the map in with each time you hit the button. Note that you can keep doing this until you get to the zoom level you prefer or reach the minimum zoom map size.
6. Now, let's use the **Out** button in the Pan Control region to zoom the map out a preset amount. We now see a slightly larger area than the previous screen.
7. Again, perhaps you made a mistake and want to see everything that is going on in the Midwest. Use the **Region** button to zoom the map out to the entire area quickly.

Panning

1. Position your mouse arrow over any city and click the left mouse button without holding the mouse or dragging it.
2. We can also move the screen using the mouse. Click the left mouse button at the edge of the screen in the direction that will move the map over Iowa, each time waiting for the map to redraw.
3. Click the arrows in the Pan Controls to display somewhere else on the map.

Selecting Data to View

1. Each user can control what information they see. The first important step is learning how to get to the data you will want to see. The Weather Data menu is comprised of two components, the Data Type pull down menu and the Time Period pull down menu. Use the Zoom features to show the map you want to see.
2. Select the Data Type pull down menu to reveal other options that may be present other than **CURRENT**. Select the **RADAR** option.

FORETELL now collects live radar information. We provide that to you in two different ways. The first is that each nowcast contains a weather option called Radar and displays the conditions at the top of each hour. We provide an image of the radar for that time here. This allows you to see the actual radar and the forecasted radar display into the future. Note that the actual radar WILL BE more random in location and color. The second location is by providing live radar

images through the RADAR option in the Weather Data. Information is available in 10 minute intervals for the past two hours. Note that you must have RADAR chosen as the Weather Display Type also for this to be viewable.

3. Now select the Time Period pull down menu to reveal the options available and use the scroll bar to review all the times available.
4. Choose one time period listed that you may want to see by clicking the left mouse button on the text of the given time period. This should be highlighted in blue.
5. You can now scan through each time period by using the up and down arrows of your keyboard. This is a simple way to scan through time periods at your own pace.
6. You are not limited to scanning through the times in order and can jump from one set to another, remembering to wait for the map to completely redraw.

Updating the data

Users are interested in knowing the difference when they were looking at a forecast and a nowcast. Remember that a forecast is everything that is expected to happen in the future at the top of each hour, while a nowcast is a snapshot of what happened at the top of an hour. The important difference gives you the ability to see the trends over the past several hours and where the forecast shows the storm tracking.

Usually there will be a very smooth transition between the two, indicating that the forecast is right on. If there is a difference either in location tracking or in time, you can make a judgment of how far off the forecast is. Remember that we update our forecasts 4 times per day, so if the storm begins moving differently near the end of our first forecast, the second forecast will take that into account and correct the difference.

Nowcasts are displayed in the Time Display by the text **(nc)** after the time. In addition, when animating the screen, the Time Bar shows the **(nc)** after the hour.

Forecasts are displayed in the Time Display with the numbers of hours out the information is for. For example, the information for tomorrow at 4:00pm which was forecasted at 10:00am today is 30 hours out **(30hrs)** while today's 4:00pm forecast would only be forecasted 24 hours out **(24hrs)** at 4:00pm tomorrow. The farther out a forecast is, the more there is a potential for slight deviation in time and location of a storm track before it reaches your location.

Four times a day, FORETELL generates a new forecast for the next 30 hours. These forecasts are started at 4:30am, 10:30am, 4:30pm and 10:30pm Eastern Standard Time

(EST) with the last of the 30 hour forecast period completed by 8:30am, 2:30pm, 8:30pm and 2:30am EST. Additionally, FORETELL gives an update of current conditions at 30 minutes past the hour, every hour. You may have accessed FORETELL earlier in the day and still have it running on your computer when it comes time to make an operational decision, or you just want to get an update of the weather conditions. While you may have been logged in to FORETELL, to update the information you see, you will need to do the following.

1. Reselect the option you wish to view from the weather Data Type menu.
2. That's it. This will send a request to the FORETELL website to update the Time Period list with the newest available time information.

Viewing weather conditions

1. Select one of the **Weather Data** options for the type of data to view.
2. Select the Weather Display pull down menu to reveal the type of weather information that is available for viewing.
3. FORETELL displays color-coded forecasts for the following weather conditions:
 - **Precipitation:** rate of precipitation (in melted inches/hour).
 - **Precip & Temperature:** a combined display that overlays the precipitation on top of the air temperature.
 - **Temperature:** air temperature (in degrees Fahrenheit or degrees Celsius).
 - **Dewpoint:** predicted temperature at which dew will form (in degrees Fahrenheit or degrees Celsius).
 - **Humidity:** relative percent moisture in the atmosphere.
 - **Wind:** arrows indicate wind speed and direction (in miles per hour or kilometers per hour).
 - **Radar:** forecasted radar in dbZ, or intensity of echoes.
 - **Clouds:** cloud thickness (in feet or meters).
 - **Pressure:** atmospheric pressure (in millibars or Pascals).
 - **Precipitation Accumulation:** 30-hour accumulation of precipitation (in melted inches or centimeters).
 - **Frozen Accumulation:** 30-hour melted accumulation of frozen precipitation (in inches or centimeters).
 - **Measured Accumulation:** 30-hour accumulation of frozen precipitation as measured out in the field.
4. Select **Temperature** from the Weather Display pull down menu list by clicking the left mouse button on the word and notice the status bar slowly fill with green.
5. The map display should now show a colorful display.
6. Look within the Weather Display to see the color coded legend for the temperatures.

7. Move your mouse over the map slowly from an area with one color to an area with another color. Notice the label with the mouse now appear and providing details regarding the actual value at the location you are pointing at.
8. Let's now select **Precipitation** from the Weather Display menu.
9. Notice that this reveals a new and different looking legend.
10. Move your mouse over various areas on the map.
11. Now try selecting **Winds**.
12. The display and legend changes yet again.
13. Try scanning through the remaining options to see how the various weather conditions are displayed.
14. When finished, use your mouse to select the **None** option in the Weather Display pull down menu.

Viewing road conditions:

1. You should choose one of the **Weather Data** option for the data to view.
2. Select the Road Display pull down menu to reveal the type of weather information that is available for viewing.
 - **Road condition:** This feature will show color-coded road indices based on drivability (i.e. Driving conditions good, Driving conditions fair, Driving conditions poor). This display is based on forecasted conditions and uses the assumption that no maintenance activities have been performed.
 - **Air temp at Road:** Air temperature five feet above road surface.
 - **Dewpoint at Road:** Dewpoint temperature five feet above road surface.
 - **Pavement temperature:** Temperature of the road driving surface.
 - **Road dewpoint:** The dewpoint above the road surface. This information combined with the road pavement temperature can be used to evaluate the potential for frost and dew formation on the road surface.
 - **Road snow depth:** The predicted depth of snow accumulating on the road surface, assuming that no immediate treatment or maintenance activity is undertaken by the Department of Transportation
3. Select **Road Pavement Temperature** from the Road Display pull down menu list by clicking the left mouse button on the word and notice the status bar slowly fill with green.
4. The map display should now show a colorful display on different roadways.
5. Look within the Road Display to see the color coded legend for the temperatures.
6. Move your mouse over the map slowly from an area with one color to a road with another color. Notice the label with the mouse now appear and providing details regarding the actual value at the location you are pointing at.
7. Let's now select **Road Condition** from the Road Display menu.
8. Notice that this reveals a new and different looking legend.
9. Move your mouse over various areas on the map.
10. Try scanning through the remaining options to see how the various weather conditions are displayed.
11. When finished, select the **None** option from the Road Display menu.

Animating forecasts

1. Using our knowledge from the previous sections, use the available zoom and pan functions to select a map that covers the State of Iowa and Chicago.
2. Select any of the **Weather Data** options for the type of data to view.
3. Select **Precipitation** from the Weather Display pull down menu list by clicking the left mouse button on the word and notice the status bar slowly fill with green.
4. Now use the **Animate** button, by clicking on the button. The green status bar should begin to fill across the bottom of the map and once complete, the map should begin to animate.
5. Each frame shown will correspond to one of the 30 hours available from the current forecast.
6. Along the top of the map, you will see a bar that shows the hour of time for the weather data being displayed. This allows a user to see the time for which the current map is referring to.
7. You may stop the animation by clicking the **Stop** button at any time.
8. Select **Winds** from the Weather Display menu.
9. Restart the animation by clicking the **Animate** button.
10. Stop the animation by clicking the **Stop** button.

Creating graphs

A key feature of FORETELL is the ability to create graphs of the forecasted conditions over a 30 hour period for any point along any roadway.

1. With **Dewpoint** selected from the Weather Display menu, use the mouse to click the right mouse button in a location away from roads.
2. A window will open that shows the latitude and longitude of the point you selected, as well as all of the weather data for that point along the right side of the window, but that there is no information for the road-related condition information.
3. Notice that all the data is color coded to make for easier reading of the graph.
4. Clicking the **Previous** and **Next** buttons moves the transparent bar from left to right.
5. As you click these buttons, stop to look at the numbers along the right side of the display. The numbers display the conditions provided by FORETELL.
6. Now let's add **Temperature** to the data we are viewing. To do this, use the mouse to click the left mouse button in the small checkbox to the left of the word **Temperature**.
7. The graph will change to indicate the scales of the data you have chosen, as well as graph both weather condition data points.
8. Click **OK** to close the window. The graph is not saved.
9. Use the mouse to click the right mouse button on a road.
10. The window will open that shows the road name and milepost that you selected, as well as all of the weather data for that point along the right side of the window.

11. Notice that the road-related condition information now shows up.
12. Use the mouse to uncheck the **Dewpoint** from the list and check the options **Air temp at Road, Dewpoint at Road** and **Road Pavement Temperature**.
13. Clicking the **Previous** and **Next** buttons moves the transparent blue bar from left to right and you will notice the numbers once again changing as you click these buttons.
14. The graph will change to indicate the scales of the data you have chosen, as well as graph both weather condition data points.

Keys to Using FORETELL Effectively

General Items

1. Monitor long term forecast periodically. We update our data 4 times per day which allows you to see storms in advance and plan your actions.
2. Remember you can access the site from anywhere you have internet access.
3. Understand the currency of the data. Nowcasts (nc) are the actual observed data from sensors around the area. Forecasts (example 25hrs) means that this particular set of data is forecasted 25 hours from the start of the forecast. There will be some variability in forecasts further out in the future.

Weather and Road Data

4. Animating weather data allows you to see the changes over time.
5. The consistency in the flow from Nowcast to Forecast identifies how close the storm is actually moving compared to the forecast. A shift in time or location should be used to gauge how close the forecast is and where the storm will track.
6. All precipitation amounts are melted totals other than Measured Accumulation. Use the melted amounts to determine how much water is in the precipitation. Use the measured accumulation to determine how "heavy" the precipitation is. As a general rule 1 inch of water = 10 inches of snow.
7. Use this ratio to determine if anti-icing options will be useful, the amount of chemical application to avoid dilution of solution and what type of blading operation will work.
8. Use forecast to get prepared for the size and scope of storm, use RADAR to assist in determining the local effects during the storm.
9. The data identifies the start and end times for the storm, as well as the intensity each hour. Temperatures, winds and other variables display the value or total by that time. Remember that if precipitation shows up at your location at 10:00am that

some time between 9:00am and 10:00am is when the storm should arrive and the accumulation is the total arrived at 10:00am.

10. Graphing data allows you to see many variables at a single shot. Plotting Temperature, Dewpoint and Pavement Temperature shows if dew or frost may form and if the road is cold enough to sustain frost.
11. Graphing Precipitation Accumulation, Frozen Accumulation and Measured Accumulation allows you to see the rate of precipitation by the angle of the line. The steeper the line, the heavier the precipitation. Flat line means no accumulation.