April 19, 2002

Final

Greater Yellowstone
Regional Traveler and Weather Information System
Evaluation Plan

Submitted to:
U.S. Department of Transportation
Dr. Joseph Peters

Submitted by:
Science Applications Intl. Corp.
209 Larkwood Drive
Richmond, KY 40475

NOTICE

Comments on this report should be provided to the Evaluation Team in written form via email, fax, or mail to:

Robert Sanchez
SAIC
209 Larkwood Drive
Richmond, KY 40475
Phone: 859-626-5109
Email: Robert.R.Sanchez@saic.com

GLOSSARY OF ABBREVIATIONS

AASHTO	American Association of State Highway and Transportation Officials
APTA	American Public Transportation Association
ATIS	Advanced Traveler Information System
CCTV	Closed-Circuit Television
COTR	Contracting Officers technical Representative
FCC	Federal Communications Commission
FHWA	Federal Highway Administration
GYRITS	Greater Yellowstone Rural Intelligent Transportation System
GYRTWIS	Greater Yellowstone Regional Traveler and Weather Information System
ITS	Intelligent Transportation Systems
ITS America	Intelligent Transportation Systems of America
JPO	Joint Program Office
MOE	Measures of Effectiveness
MOU	Memorandum of Understanding
PAWG	Program Assessment Working Group
P-P	Public-Private
RWIS	Road Weather Information System
SAIC	Science Applications International Corporation
U.S. DOT	United States Department of Transportation
VMS	Variable Message Sign
WTI	Western Transportation Institute

TABLE OF CONTENTS

1.0 Introduction and Background

1.1 Introduction

The ITS Integration Program is being conducted to accelerate the integration and interoperability of intelligent transportation systems in metropolitan and rural areas. Projects approved for funding have been assessed as supporting the improvements of transportation efficiency, promoting safety, increasing traffic flow, reducing emissions, improving traveler information, enhancing alternative transportation modes, building on existing ITS projects, and promoting tourism. A small number of these projects have been selected for national evaluation. The Greater Yellowstone Regional Traveler and Weather Information System (GYRTWIS) was among the selected projects.

A team led by SAIC, under direction from the USDOT ITS Joint Program Office (JPO), was selected to evaluate GYRTWIS. Three areas will be investigated for this evaluation:

- System Impact Study of 511 usage and customer satisfaction.
- Pavement Thermal Model Accuracy
- Case Study of the business model, institutional issues, and 511 implementation issues,

The purpose of this evaluation is to determine whether the project goals are met, and to assist others who may be considering similar deployments. The evaluation plan presented here is to serve as a planning and guidance document from which a successful evaluation can be implemented.

1.2 Background

Annually, three million travelers visit Yellowstone National Park. Adjacent to the park is three states: Montana to the north & west, Idaho to the southwest, and Wyoming to the south and east. Yellowstone National Park and portions of the surrounding states and principle roadways are shown in Figure 1. The mountainous corridors in Montana, Idaho, and Wyoming can be difficult to travel, especially during adverse weather conditions. It is during the fall, winter, and early spring seasons that weather conditions can impact traveler safety and security and be challenging to road maintenance operations. The Greater Yellowstone region receives an excess of snowfall with some areas averaging 200-300 inches of snow per year. Periods of high winds, fog, and heavy rain are also common in the region.

The Montana, Idaho, and Wyoming DOTs have been proactive in deploying road weather information systems (RWIS) to capture/interpolate road condition information and predict travel conditions. Surface and atmospheric conditions are also measured at various sites (e.g., airports, cities, etc.) and by other agencies (e.g., National Weather Service, National Oceanographic and Atmospheric Administration, Agrimet, avalanche organizations, etc.). Despite these efforts, the information is often unavailable to travelers in a timely and consistent fashion. Furthermore, the information is difficult for maintenance decision makers to use in an effective manner to maintain the roadways.

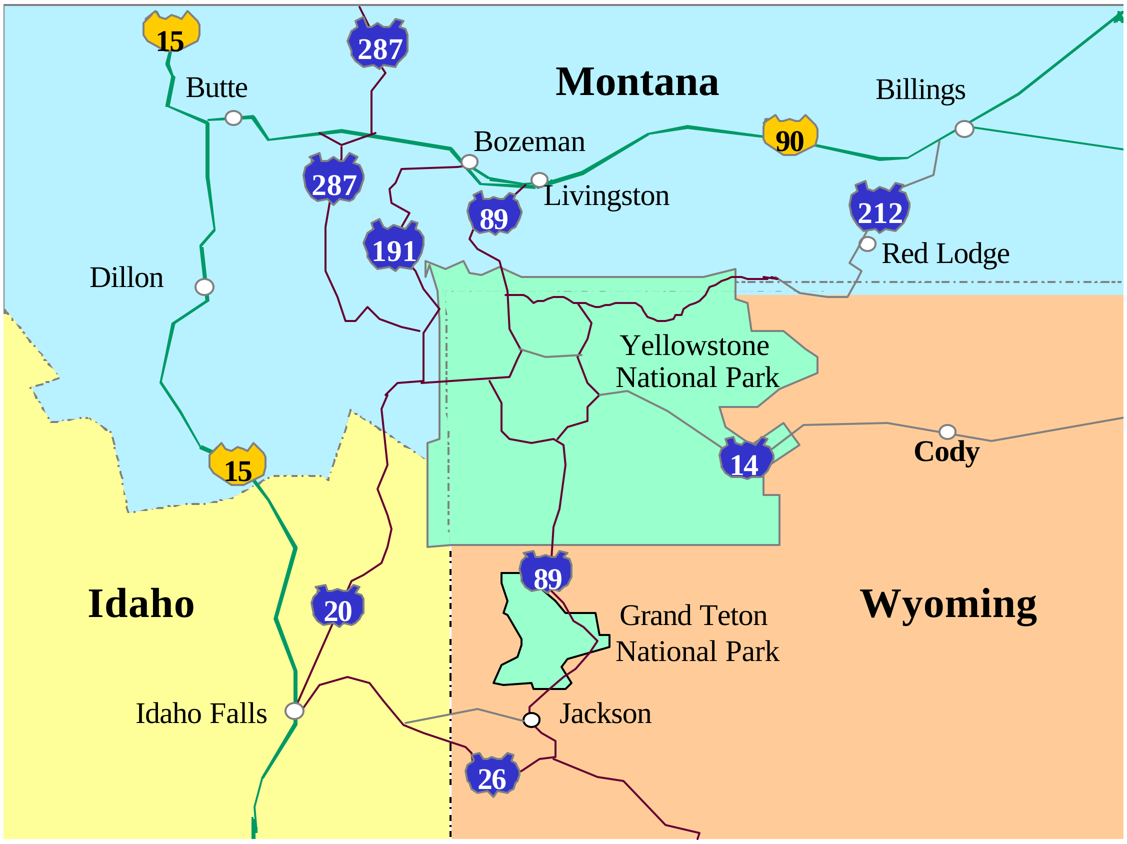

Figure 1. Greater Yellowstone Region

GYRTWIS is being deployed to assist Montana DOT maintenance operations and provide traveler information and weather conditions to travelers in Montana. The system will provide detailed forecasts to Montana DOT maintenance personnel that should benefit maintenance operations and improve the utilization of personnel, snow removal equipment, and anti-icing/de-icing activities. The system should result in fewer and less severe accidents related to poor road surface conditions.

The system will also provide Montana DOT the means to disseminate weather and road condition information to the traveling public. It is anticipated that travelers in Montana will find the 511 service a more useful and satisfying means to obtain weather and road condition information over the currently available *ROAD telephone service.

GYRTWIS is Phase 3 of the Greater Yellowstone Rural Intelligent Transportation System (GYRITS) project which began in 1995 when the Western Transportation Institute (WTI) at Montana State University-Bozeman secured funding for "research, testing, and evaluation of advanced technologies" for the corridors leading to/from the Greater Yellowstone region. GYRTWIS will integrate the #SAFE weather forecasting system and regional multi-modal traveler information service used in North and South Dakota with WTI/MSU's Pavement Thermal Model and deploy the integrated system in Montana as part of the 511 national traveler information number currently being implemented for the state.

2.0 Regional Traveler and Weather Information System Description

The GYRTWIS project is being deployed to assist Montana DOT personnel with maintenance operations and provide travel information and weather conditions to travelers in Montana. The system will provide detailed forecasts to Montana DOT maintenance personnel that should benefit maintenance operations and improve the utilization of personnel, snow removal equipment, and anti-icing/de-icing activities. This should result in fewer and less severe accidents related to poor road surface conditions. The system will also provide Montana DOT the means to disseminate weather and road condition information to the traveling public.

2.1 GYRTWIS Project Goals and Objectives

The goals and objectives that have been identified for the GYRTWIS project are shown in Table 2-1 below. The success of this project will be evaluated by determining how well each of these goals and objectives are met. WTI/MSU has documented a procedure for evaluating the GYRTWIS project in their document titled “Greater Yellowstone Regional Traveler Weather Information System Evaluation Plan Version 1.0”. Requests for additional information regarding this document should be forwarded to Mike Bousliman, Montana DOT (Mbousliman@state.mt.us).

Table 2-1: Project Goals and Objectives

Goals	Objectives
Inform the traveler of adverse weather conditions	Provide accurate and timely road weather conditions to the traveler
	Provide road and weather information in a format that is useful to the traveler
	Inform the public that the information is available
Improve information available for maintenance ice and snow removal activities	Provide accurate and timely road weather conditions to maintenance personnel
	Provide road and weather information in a format that is useful to the maintenance user
Improve coordination of road information dissemination across jurisdictional boundaries and project boundaries	Provide easy access for the traveler to out-of-state information
	Improve coordination between state information providers
	Exchange data with other sources of road information

The GYRTWIS project consists of three components: (1) #SAFE, the Regional Multi-Modal Traveler Information Service, (2) Pavement Thermal Model, and (3) 511 national traveler information telephone system. The output from both #SAFE and the Pavement Thermal Model will initially be disseminated through phone and Internet. In the future, the information will also be packaged for availability to kiosks, variable message signs (VMS), and other devices in Montana and adjoining states.

The #SAFE, Pavement Thermal Model, and 511 system are described in more detail in the following sections.

2.2 #SAFE

Meridian Environmental Technologies of Grand Forks, North Dakota developed #SAFE, the traveler information component of the GYRTWIS project in Montana. The #SAFE system will provide the traveler weather forecasts and road conditions from mesoscale meteorological data via cellular, PCS, and landline telephone. The weather and road information will also be available over the Internet.

The telephone service (shown graphically in Figure 2) works by interfacing coded weather information with a computer telephony system located in either Montana or North Dakota (depending on the caller's location). The system provides location-specific information through an interactive process with the traveler. Under GYRTWIS, #SAFE will be expanded into Montana and accessible to Montana travelers using the 511 system (in the future Wyoming and Idaho may also be added). Data from Montana DOT's 59 Remote Weather Information System (RWIS) stations will be integrated and used to provide the weather nowcast/forecast and road condition information (see Pavement Thermal Model for additional detail on this subject).

Montana travelers calling the 511 number will after answering three to four questions about their location, will hear a site-specific road conditions report and a six-hour weather forecast. This forecast is not designed for the area the roadway is located within, but for a location 60 miles in front of the traveler's reported location.

Both North and South Dakota have implemented the #SAFE system from which cellular and PCS telephone users can access the information. After the initial deployment of the system in those states, the federal government designated 511 as the national traveler information number. Montana plans to use this new nationally designated phone number for dissemination of weather and road condition information under the GYRTWIS project.

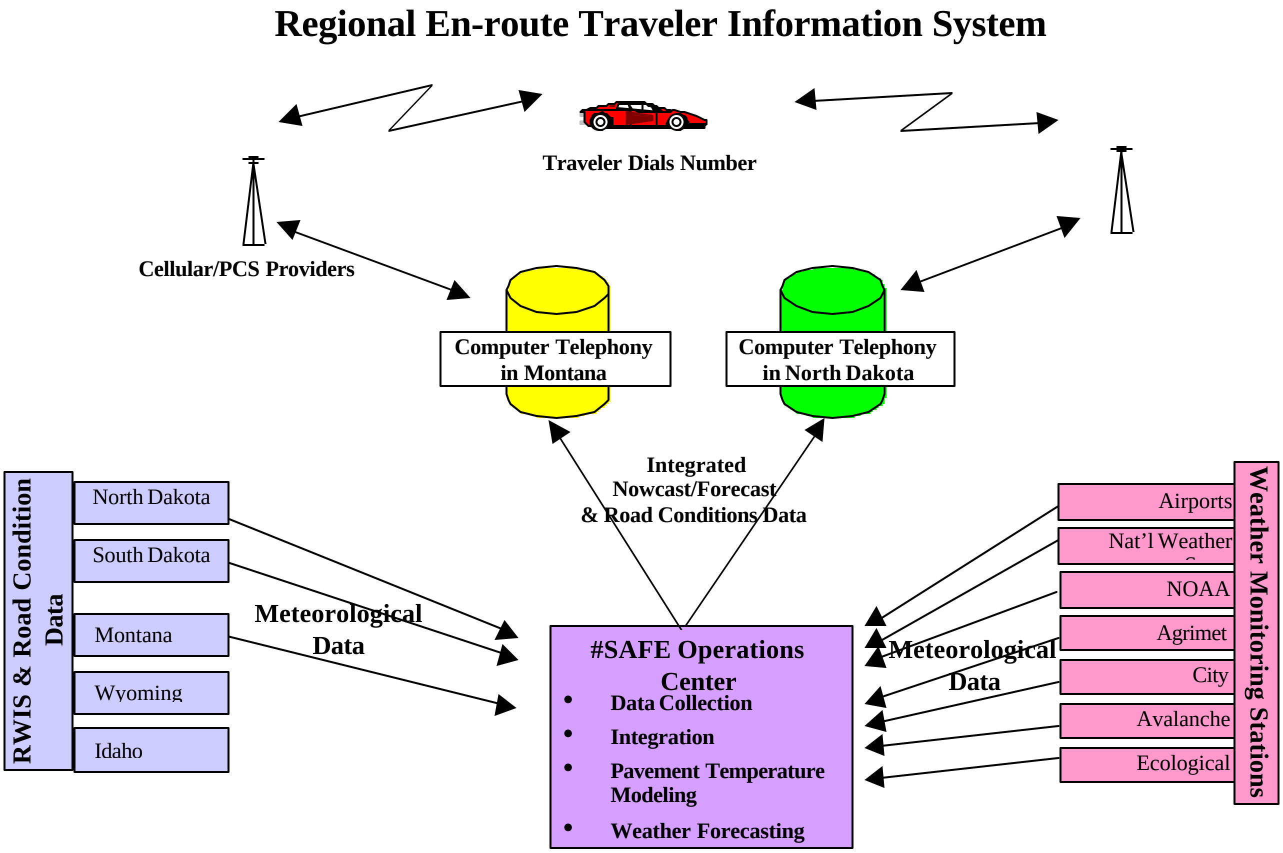

Figure 2. #SAFE System

2.3 Pavement Thermal Model

A second component of the GYRTWIS project is the Pavement Thermal Model that provides predictions of the current road surface conditions. The pavement Thermal Model began in 1996 when WTI/MSU, in conjunction with Montana Department of Transportation, began work on the Safe-Passage project. This project employed Intelligent Transportation System (ITS) technology to improve the safety of travel through Bozeman Pass (between Bozeman and Livingston, Montana).

As part of GYRTWIS, researchers at WTI/MSU are developing a Pavement Thermal Model that uses forecasted wind, air temperatures, humidity, and radiation, as well as the topography of the landscape to predict pavement temperatures. This type of modeling has its greatest utility in areas with complex topography, such as mountain passes and coulees. The computer model has the potential of forecasting road surface conditions where no RWIS sites exist. In addition to Bozeman Pass, the GYRTWIS project plans to expand this thermal model to two new locations in Montana (the 19th Street Bridge in Bozeman, and Lookout Pass in northwest Montana). The Pavement Thermal Model's pavement predictions will be integrated at the #SAFE Operations Center to provide forecasted road surface conditions to Montana travelers and state DOT maintenance personnel.

2.4 511 Traveler Information System

In March 1999, the U.S. DOT petitioned the FCC to adopt a new, national three-digit telephone number to allow easy access to transportation and travel information. The nationally-designated number would allow travelers a standard number to call in order to receive highway information (such as traffic conditions, construction, and weather), public transit information (like transit buses, ferries, light rail), and other optional content (such as services and attractions, tourist information, special events, etc.)

In July 2000, the FCC designated 511 as the United States' national traveler information telephone number. The FCC ruling leaves nearly all implementation issues and schedules to state and local agencies and telecommunications carriers. In an effort to assist state and local agencies with the development of 511 systems, the 511 Deployment Coalition was established. The Coalition consists of representatives from The American Association of State Highway and Transportation Officials (AASHTO), in conjunction with many other organizations including the American Public Transportation Association (APTA), and the Intelligent Transportation Society of America (ITS America), with support of the U.S. Department of Transportation.

In November 2001, the 511 Deployment Coalition released a set of guidelines to assist those implementers developing 511 systems. The purpose of the guidelines is to assist transportation agencies in establishing the service in the best possible manner by reducing the chances of service confusion and inconsistency. The Coalition recognizes that 511 services will be developed in a bottom-up fashion with state and local transportation agencies establishing services in areas and timeframes determined by them. The Coalition has developed the "Implementation Guidelines for Launching 511 Services" to assist implementers in their efforts to develop quality systems and to lay the foundation for ultimately establishing a consistent nationwide 511 service.

The guidelines focus on two main areas – service content and service consistency. The service content describes basic and optional content. The basic content provides information that every 511 system should have, such as highway and public transportation information. The optional content provides information that is at the discretion of the system implementers and may be supported by public and/or private sector supported services. The service consistency guidance provides implementers a blueprint in 14 areas:

1. User Interface
2. Initial Greeting
3. Commercial Advertising and Sponsorship
4. Fee Notification of Premium Services
5. Multi-lingual Capabilities
6. Time stamping of Information
7. System Access Quality
8. Hours of System Operation

9. Americans with Disabilities Act (ADA) Implementation
10. Environmental Justice
11. Use of Standards
12. Privacy
13. 511 Branding
14. Number Allocation and Service Coordination

To illustrate how a 511 system could operate, the guidelines provide the following example based upon a fictitious implementation in the State of “East Dakota”. Figure 3 provides a logical progression through both the public transportation and highway content until each reaches an automated report.

"Welcome to East Dakota's Traveler Information Service"

"For specific information, please select from one of the following categories. You can press the desired key or say the desired command at anytime"

- ***Press "1" or Say "Highway Information"***
  - Press or Say the Number of the Route you are interested in:
    - Please Select the following segment of ***I-99*** you are interested in:
    - Press or Say 1 for the South Dakota state line to Metropolis
    - ***Press or Say 2 for Metropolis to Edge City***
      - *"Here is the report for I-99 between Metropolis to Edge City. Snow is forecasted for the Edge City area this evening, please proceed with caution as reduced visibility and roadway icing is a possibility. Eastbound travel may experience construction-related delays for roadway resurfacing between milemarkers 339 to 342 during the evening hours of 10:00 p.m. to 5:00 a.m., as traffic will reduce to one lane."*
    - Press or Say 3 for Edge City to Resortville
    - Press or Say 4 for Resortville to the North Dakota state line
    - Press or Say 9 for help or to repeat the route segments
    - Press * to return to the previous menu
  - Press "9" or Say "Help" or "Available Routes"
  - Press "*" or Say "Previous Menu"
- ***Press "2" or Say "Public Transportation Information"***
  - Press "1" or Say "East Suburban Transit"
  - ***Press "2" or Say "Metropolis Transit Agency"***
    - *"The Metropolis Transit Agency, MTA, provides scheduled bus service and curb-to-curb service by reservation in the Greater Metropolis area. All routes are reported on schedule, except for route 14 which is reporting 15 minute delays due to an accident along Pershing. If you would like to speak with an MTA customer service agent, please press or say "2" . All fares for scheduled bus services are $1. We encourage riders to be at their pick-up point five minutes before scheduled times. Detailed information on fares, schedules and specific programs are available on line at www.metropolistransitagency.com"*
  - Press "3" or Say "East Dakota Commuter Rail"
  - Press "9" or Say "Help" or "Repeat these instructions"
  - Press "*" or Say "Previous Menu"
- ***Press "9" or Say "Help" for system information***

Figure 3. 511 System Example

3.0 Evaluation Plan

3.1 Evaluation Objectives

This evaluation builds upon and complements the ongoing GYRTWIS evaluation being conducted by WTI/MSU. The WTI/MSU evaluation of GYRTWIS examines traveler perceptions of accuracy, usefulness, etc., the accuracy and usefulness of the information for maintenance operations, and perceptions of project success.

This evaluation complements WTI/MSU's GYRTWIS evaluation by investigating three areas:

- System impacts of 511 on usage and customer satisfaction
- Pavement Thermal Model accuracy
- Case study of the business model, institutional issues, and 511 implementation issues

The three study areas and respective objectives are shown in Table 3-1. The System Impacts study will compare the baseline ("Before") usage of Montana's *ROAD traveler information service to the "After" 511 usage. In addition, Before and After perceptions of customer satisfaction will also be compared. The Before perceptions will focus on satisfaction with currently available travel information and perceived needs. The After perceptions will investigate satisfaction with the 511 service and how well the pre-511 needs were satisfied.

The Pavement Thermal Model accuracy will be reported. Predicted versus actual pavement temperatures will be compared to determine the accuracy and reliability of the Pavement Thermal Model.

The case study will examine the GYRTWIS business model for Montana's 511 system, what the model is, how they are paying for the services, and where they hope to obtain funding for ongoing operations. A second objective is to identify the institutional benefits, challenges, and lessons learned of the effort to deploy 511 in Montana. The third objective is to investigate the challenges to integrating the technologies and the role of 511 guidelines and ITS Architecture standards in system design and implementation. Special consideration and emphasis on the advantages/limitations, and suggested changes will be noted.

Table 3-1. Evaluation Study Areas and Objectives

Study Areas	Objective
System Impacts Study: System Usage Test	Compare traveler usage of Montana's new 511 service to existing *ROAD phone service. Compare maintenance personnel usage of the new pavement and weather forecasts to existing information.
Customer Satisfaction Test	Compare traveler satisfaction with Montana's new 511 service to the existing *ROAD phone service. Compare maintenance personnel satisfaction with the new pavement and weather forecasts to the existing information available.
Pavement Thermal Model Accuracy Study:	Examine the accuracy of the Pavement Thermal Model to be used for Montana's new 511 service.
Case Studies: GYRTWIS Business Model	Examine the GYRTWIS business model, what it is, how they are paying for the services, and where they hope to obtain funding for ongoing operations.
Institutional Lessons Learned	Identify the institutional benefits, challenges, and lessons learned from the GYRTWIS project.
511 Implementation Challenges, Guidelines & Standards	Develop a case history of implementation challenges, the role of 511 guidelines/ITS Architecture standards, and the advantages, limitations, & suggested changes.

3.2 System Impacts Study

The objective of evaluating GYRTWIS system impacts is to assess the impact of the deployment on both travelers and maintenance personnel. This study investigates impacts in terms of system usage and customer satisfaction. To assess system usage and customer satisfaction by travelers and maintenance personnel, six hypotheses were derived:

- Travelers will use the 511 service more than the existing phone service.
- Travelers will like the 511 service better than the existing phone service.

- Travelers will perceive the 511 service provides useful weather, road condition, & safety information.
- Maintenance Personnel will use the road and weather information more than the existing system.
- Maintenance Personnel will perceive the pavement and weather forecasts as useful.
- Maintenance Personnel will perceive the pavement and weather forecasts as accurate.

The Hypotheses, MOE's, and Data Sources for the System Usage and Customer Satisfaction tests are shown in Table 3-2.

Table 3-2. System Impacts Evaluation

Hypotheses	MOE's	Data Source
System Usage Test:		
Travelers will use the 511 service more than the existing phone service.	Number of Calls	WTI/MSU/Montana DOT call tracking
Maintenance Personnel will use the road and weather information more than the existing system.	Number of Users	WTI/MSU/Montana DOT tracking
Customer Satisfaction Test:		
Travelers will like the 511 service better than the existing phone service.	Perceived accuracy, timeliness	WTI/MSU Traveler Surveys
Travelers will perceive the 511 service provides useful weather, road condition, & safety information.	Perceived usefulness	WTI/MSU Traveler Surveys
Maintenance Personnel will perceive the pavement and weather forecasts as useful.	Perceived usefulness	WTI/MSU Maintenance Interviews
Maintenance Personnel will perceive the pavement and weather forecasts as accurate.	Perceived accuracy, timeliness	WTI/MSU Maintenance Interviews

Data Collection and Analysis

The data for the baseline or Before condition has been collected and archived by Montana DOT and WTI/MSU. Montana DOT has archived several years of call volume data for their existing *ROAD telephone service. The usage data for the After condition will be collected and made available by Montana DOT. This evaluation will obtain copies of the Before and After data and aggregate/dis-aggregate as needed to perform meaningful analysis and reporting. It is anticipated that the usage data will be reported either by month or week.

WTI/MSU has conducted traveler surveys under the GYRITS project. The surveys were completed and reported in a 1997 WTI/MSU report: Greater Yellowstone Rural Intelligent Transportation System Priority Corridor Project, Rural Traveler Needs Survey, Volume I. The data collected from this survey will serve as baseline data for the GYRTWIS customer satisfaction test. After deployment of GYRTWIS, WTI/MSU will collect traveler survey data and conduct maintenance personnel interviews as part of their self-evaluation effort. It is anticipated that a portion of the WTI/MSU surveys and interviews will be analyzed and reported for this evaluation.

3.3 Pavement Thermal Model Accuracy Study

The objective of the Pavement Thermal Model Accuracy study is to assess the accuracy of the model being integrated into Montana's 511 service. Earlier versions of the Pavement Thermal Model have been previously tested at Bozeman Pass in Montana (i.e., Montana's Safe-Passage project). For GYRTWIS, the Pavement Thermal Model is being deployed at three locations: Bozeman Pass, Lookout Pass, and the 19th Street bridge in Bozeman. This study will investigate the accuracy of the Pavement Thermal Model predicted temperatures compared to the actual (measured) pavement temperatures.

The hypothesis for this study is that the GYRTWIS Pavement Thermal Model will accurately predict pavement thermal conditions. The measure of effectiveness will be the variance between the predicted pavement temperatures and the actual (measured) temperatures. The source of the data for this study will be provided by WTI/MSU. It is anticipated that data for Bozeman Pass will be available in late June or early July of 2002. The Hypotheses, MOE's, and Data Sources are summarized in Table 3-3.

The Bozeman Pass location is anticipated to be the first location for which the Pavement Thermal Model will be integrated with Meridian's meteorological models. Consequently, the Bozeman Pass location will be the initial focus of the study. Other locations (i.e., Lookout Pass, 19th Street Bridge) may follow depending on the implementation dates and availability of data at the sites.

Table 3-3. Pavement Thermal Model Accuracy Evaluation

Hypotheses	MOE	Data Source
The GYRTWIS Pavement Thermal Model will accurately predict pavement thermal conditions.	Temperature variance between the GYRTWIS Pavement Thermal Model and actual pavement temperatures.	WTI/MSU

Data Collection and Analysis

As part of the GYRTWIS, WTI/MSU will collect the data necessary to evaluate the GYRTWIS Pavement Thermal Model, including the actual pavement temperatures needed for the comparisons. The data for Bozeman Pass will be collected after initial testing and integration with Meridian's meteorological models. The variance of predicted versus actual temperatures will be compared to determine the accuracy of the GYRTWIS Pavement Thermal Model. The hypothesis will be accepted if the GYRTWIS Pavement Thermal Model variance is small and appears to reasonably predict pavement temperatures during the test period. Depending on the implementation dates and availability of data, similar assessments may be performed for the Lookout Pass and the 19th Street Bridge sites.

3.4 Case Studies

3.4.1 GYRTWIS Business Model Study

The purpose of the GYRTWIS Business Model case study is to examine the GYRTWIS business model. ATIS Business Models have been studied in many urban ITS deployment areas (e.g., San Francisco, Seattle, Phoenix, New York, Miami, and New England). However, little is known about rural ATIS Business Models and even less is known about rural Business Models for the 511 service.

For this evaluation, the focus will be on developing a qualitative assessment of the GYRTWIS business model, how they are paying for the services, and where they hope to obtain funding for ongoing operations. The goal will be to present the findings and lessons learned such that valuable information may be passed onto other regions considering similar systems.

Table 3-4 presents the evaluation approach including the objective, measures of effectiveness, data sources, and proposed analysis.

Table 3-4. Rural 511 Business Model Evaluation

Objective	MOE	Data Source	Proposed Analysis
Examine the rural ATIS business model, how they are paying for the services, and the source of funding for ongoing operations.	For GYRTWIS what is the: -revenue sources -marketing/outreach plans, -P-P partnership agreements, -sharing infrastructure or services, -level & type of financial support.	GYRTWIS documents -MOU's, -Contracts, -Policy Statements. Before/After interviews with key project personnel.	Case study analysis of interviews and documents

Data Collection and Analysis

The data collection for the case study will begin with a review of relevant project documents (MOU's, contracts, policy statements, minutes of meetings, etc.) to understand: 1. the nature of the public-private partnership agreements, 2. agency policies and procedures, and 3. identify business model topics/issues discussed during project meetings.

Next, a series of questions will be developed for interviews with key project personnel. The key project personnel are comprised of project management personnel from both public agencies and private entities. Those to be interviewed are: Mike Bousliman, Montana Department of Transportation, Steve Albert, Lisa Ballard, Western Transportation Institute, Montana State University, and Mark Owens, Meridian Environmental Technology Inc.

Both Before and After deployment interviews will be conducted. The Before deployment interviews will provide an opportunity to capture pre-deployment concerns and provide guidance for the topics addressed in the After deployment interviews. Both Before and After interviews are expected to provide insight into the differences between the GYRTWIS 511 business model and that of urban 511 business models.

As an example, the following types of questions are likely to be asked during the interviews:

- Is the GYRTWIS 511 service self-supporting? If not, is it expected to be self-supporting? When?
- Are there advantages and disadvantages to this funding arrangement? What are they?
- Is the service expected to generate any revenues? If so, when?
    - (After Question) Has the service generated revenues as planned?
- How would you describe the business model that is used to fund the GYRTWIS 511 service?

- (After Question) Has the business model worked as planned? What changes need to be made in order to improve it?

3.4.2 Institutional Lessons Learned Study

GYRTWIS is a rural project in Montana that will implement a 511 service using the #SAFE system located in North Dakota and WTI/MSU's Pavement Thermal Model. The information from both these systems will be integrated and disseminate road conditions and weather forecasts through the telephone and Internet. In the future, the information will also be available to kiosks, VMS, and other devices in Montana. Because GYRTWIS is a public-private partnership with operation centers in two states (Montana and North Dakota), it is important to document the institutional benefits and challenges that are encountered during GYRTWIS development and implementation. Problems arising during a deployment are not only technical, but also institutional, especially when the project involves participants from multiple states. The goal of this evaluation will be to present findings and lessons learned to provide insight and guidance to others. Areas to be explored include:

- Project team coordination and cooperation,
- Information sharing and how gaps were accommodated,
- Management approach to overcoming obstacles,
- Benefits, advantages, challenges, and drawbacks.

Table 3-5 summarizes the evaluation approach including the objective, measures of effectiveness, data sources, and proposed analysis.

Table 3-5. Institutional Lessons Learned Evaluation

Objectives	MOE	Data Source	Proposed Analysis
Identify the institutional benefits, challenges, and lessons learned of the 511 deployment.	Perceptions of: -coordination issues, -information sharing/gaps, -approach to overcoming obstacles, -benefits, advantages, challenges, & drawbacks.	Review GYRTWIS documents -meeting minutes -other relevant docs Before/After interviews with key project personnel.	Case study analysis of interviews and documents

Data Collection and Analysis

For the institutional benefits evaluation, the data collection will involve Before and After deployment interviews with the project's key personnel and reviews of meeting minutes and other relevant project documentation. The Before deployment interviews will provide an opportunity to capture pre-deployment concerns and provide guidance for the topics addressed in the After deployment interviews. Both Before and After interviews are expected to provide insight into the issues that arose, methods to overcome obstacles, benefits and efficiencies to working together, and overall lessons learned.

A series of questions will be developed for interviews with GYRTWIS key personnel. They are: Mike Bousliman, Montana DOT, Steve Albert, Lisa Ballard, Western Transportation Institute, Montana State University, and Mark Owens, Meridian Environmental Technology Inc.

Below is an example of the types of questions are likely to be addressed during the interviews:

Coordination/Cooperation

- What activities or methods are used to promote communication and coordination?
  - (After Question) How effective were the activities/methods? Did the efforts improve cooperation between agencies/organizations?
  - (After Question) When was communication between the two agencies at its best? Please provide examples of activities/areas where communication was effective.
  - (After Question) When was communication between the two agencies at its worst? Please provide examples of activities/areas where communication was ineffective.

Information Gaps

- What type of information do you need to be shared in order for the agencies to work together?
  - (After Question) Was the information adequately shared? If not, how was the information gap overcome?
  - (After Question) What, if any, institutional challenges or concerns were raised when information needed to be shared?

Overcoming Obstacles/Benefits/Advantages/Challenges/Drawbacks

- What methods were put in place by management to overcome obstacles?
  - (After Question) Were the methods effective?
  - (After Question) Was any method particularly effective?
  - (After Question) Do you have any suggestions for improvement?

- What are some of the expected benefits in working together?
    - (After Question) What were the key benefits in working together?
- What are some of the areas you expect to encounter challenges?
    - (After Question) What were the key challenges?
    - (After Question) Have there been any unexpected challenges or drawbacks?

3.4.3 511 Implementation Challenges, Guidelines and Standards Study

This study will investigate the GYRTWIS implementation challenges and the role of 511 guidelines and ITS Architecture standards in system design and implementation. The integration challenges that are encountered during design and development of the system architecture will be documented. Special attention to the role of 511 Content and Consistency guidelines and ITS Architecture Standards and the advantages, limitations, and suggested changes will also be explored and highlighted in the report. Interviews of the key Montana DOT and Meridian personnel will be conducted following reviews of system engineering and architecture documents.

Table 3-6 summarizes the evaluation approach including the objective, measures of effectiveness, data sources, and proposed analysis.

Table 3-6. 511 Implementation Challenges, Guidelines and Standards Evaluation

Objectives	MOE	Data Source	Proposed Analysis
Develop a case history of implementation challenges, the role of 511 guidelines/ITS Architecture standards, and the advantages, limitations, & suggested changes.	Usefulness of 511 content/ consistency guidelines Advantages/limitations Suggested changes	System engineering and architecture documents Before/After interviews with key project personnel.	Case study analysis of: -implementation challenges, -role of guidelines & standards, -guidelines / standards advantages, limitations, suggested changes.

Data Collection and Analysis

The data collection for the Implementation Challenges, Guidelines and Standards case study will involve reviewing system engineering documents and interviews with key personnel developing GYRTWIS. Both Before and After deployment interviews will be conducted. The Before deployment interviews will provide an opportunity to capture pre-deployment implementation challenges and perceptions of the 511 Guidelines and ITS Architecture Standards. The After interviews will capture additional challenges and focus on the system developers' perceptions of the role of guidelines and standards, advantages, limitations, and any suggested improvements.

A series of questions will be developed for interviews with GYRTWIS key personnel. They are: Mike Bousliman, Montana DOT, Lisa Ballard, Western Transportation Institute, Montana State University, and Mark Owens, Meridian Environmental Technology Inc.

The following questions are a sample of the questions to be asked during the interviews:

Role and Usefulness

- Are you using the 511 Implementation Guidelines in the design of the 511 service? If so, overall, how helpful were the guidelines? How was it helpful?
- Do you think any portion of the Service Content or Consistency information is particularly helpful for the design of the 511 service?
  - (After Question) Was any portion of the Service Content or Consistency information particularly helpful in the development of the 511 service?
  - (After Question) Overall, how understandable were the guidelines?
  - (After Question) Overall, how easy to use were the guidelines?
- Did you design GYRTWIS to be compliant with the ITS Architecture Standards? If so, overall, how helpful were the ITS Standards in designing the system? How was it helpful?
  - (After Question) Was any portion of the ITS Architecture Standards particularly helpful in the development?
  - (After Question) Overall, how understandable were the Standards?
  - (After Question) Overall, how easy to use were the Standards?

Implementation Challenges/Advantages/Limitations/Suggested Changes

- What challenges do you foresee in integrating the technologies?
  - (After Question) What were some of the major challenges you encountered in integrating the technologies?
  - (After Question) Were the challenges something you expected or had foreseen coming? Was there something you could have done to mitigate or minimize them?
- Do you expect the 511 Implementation Guidelines to help in overcoming challenges? If so, in what challenges?

  - (After Question) Did the Guidelines help overcome any challenges? What were they?
- Do you expect the 511 Guidelines to present any new challenges in developing the system? If so, what are they?
  - (After Question) Did the 511 Implementation Guidelines present any challenging issues? What were they?
- Do you expect the ITS Architecture Standards to help in overcoming specific challenges? If so, what challenges?
  - (After Question) Did the ITS Standards help in overcoming any challenges? What were they?
  - (After Question) Did the ITS Architecture Standards present any challenging issues? What were they?
- What advantages have there been in using the 511 Implementation Guidelines?
  - (After Question) What were the limitations?
  - (After Question) What areas could be improved? How?
- What advantages have there been in using the ITS Architecture Standards?
  - (After Question) What were the limitations?
  - (After Question) What areas could be improved? How?

4.0 Evaluation Management Plan

4.1 Evaluation Organization

The management organization for the Greater Yellowstone Regional Traveler Weather Information System evaluation effort is presented in Table 4-1. Personnel of Science Applications International Corporation (SAIC) are conducting this evaluation project. The project team reports directly to Dr. Joseph Peters of the FHWA ITS Joint Program Office.

Table 4-1. Greater Yellowstone Regional Traveler Weather Information System Evaluation Project Organization

Role	Personnel
FHWA Evaluation Oversight	Joseph Peters – FHWA/JPO
Evaluation Team Management	Nick Owens – SAIC (Evaluation Coordinator) Mark Carter – SAIC (National Evaluation Manager)
Analysis & Support	Bob Sanchez – SAIC (Primary Analyst) Bobby Haas – SAIC (Support Analyst)

4.2 Overview of Evaluation Deliverables

The deliverables to be developed from this evaluation will be as follows:

- **Final Report – "Greater Yellowstone, MT Phase II Final Report**." This document will report the analyses of the baseline data collected for the System Usage Test, Customer Satisfaction Test, and Case Study interviews. If data is available, the results of the Pavement Thermal Model Accuracy Test for Bozeman Pass will also be reported. This report will document the methodology and the preliminary results of the evaluation. The preliminary results will address:
  - System impacts in terms of usage, customer satisfaction, and needs,
  - How the system was integrated and any integration challenges,
  - Identification of any suggested changes to 511 guidelines/ITS Architecture Standards,
  - Institutional lessons learned and challenges

Conclusions and recommendations will be drawn and reported. The Final Report will consist of the following six major sections:

- Executive Summary
- Introduction
- Methodology
- Results
- Conclusions
- Recommendations

The Methodology and Results sections would each be further divided into subsections focusing on each study area. The report is expected to be around 20 to 30 pages, with more detailed information on the analyses to be included in Appendices if necessary.

4.3 Schedule

The Evaluation Schedule is provided in Table 4-2. The major deliverables are discussed above in Section 4.2.

Table 4-2. Evaluation Schedule

Date	Milestone or Deliverable
Early-Jan 02	Draft Evaluation Plan
Mid-Feb 02	Develop Interview Questions
Late-Feb 02	Conduct "Before" Interviews
Late-Mar 02	Analyze Interview Data
Mid-Apr 02	Final Evaluation Plan
Apr-May 02	Collect/Analyze Before Data
Mid-Jun 02	Briefing to Program Assessment Working Group (PAWG)
Early July 02	Draft Phase II Report to COTR
Late-July 02	Receive Phase II Report Comments
Late Aug 02	Final Phase II Evaluation Report
TBD	Conduct "After" Interviews
TBD	Analyze Interview Data
TBD	Final Evaluation Report

4.4 Level of Effort and Work Breakdown

Table 4-3 presents the work breakdown structure highlighting the major tasks to be completed and the anticipated level of effort needed to complete the tasks. Since there is a great deal of overlap in responsibilities for developing and implementing the evaluation activities, the different study areas have not been divided out as separate line items.

Table 4-3. Level of Effort and Work Breakdown

Task	**Estimated Level of Effort (hours)**	**Percent of Total**
Develop *Evaluation Plan*	80	26%
Develop interview questions based on evaluation plan	40	13%
Collect baseline data (interview, usage and customer satisfaction)	80	26%
Data analysis of baseline data and additional data collection (if necessary)	24	8%
Conduct risk assessment of project completion and ability to provide system impact performance data	16	6%
Develop *Draft Phase II Evaluation Report*	40	13%
Develop *Final Phase II Evaluation Report*	24	8%
TOTAL	304*	100%

*Preliminary Estimated Hours