Greater Yellowstone Rural ITS Priority Corridor Project

Technical Memorandum 12, Strategic Plan

Prepared for

MONTANA DEPARTMENT OF TRANSPORTATION

and

**U.S. DEPARTMENT OF TRANSPORTATION,
FEDERAL HIGHWAY ADMINISTRATION**

In Cooperation with

IDAHO TRANSPORTATION DEPARTMENT,

WYOMING DEPARTMENT OF TRANSPORTATION,

and

U.S. DEPARTMENT OF INTERIOR, YELLOWSTONE NATIONAL PARK

Prepared by

**Western Transportation Institute
Montana State University-Bozeman
Bozeman, Montana**

February 2000

IMPLEMENTATION STATEMENT

This study is sponsored by the Montana Department of Transportation in cooperation with the U.S. Department of Transportation, Federal Highway Administration. The major objective of this document is to detail a plan for the short and long term demonstration and implementation of intelligent transportation systems (ITS) in the Greater Yellowstone Rural Intelligent Transportation Systems Project.

DISCLAIMER

The opinions, findings and conclusions expressed in this publication are those of the authors and not necessarily those of the Montana Department of Transportation or the U.S. Department of Transportation, Federal Highway Administration.

ALTERNATIVE ACCESSIBLE FORMATS

The Montana Department of Transportation attempts to provide reasonable accommodations for any known disability that may interfere with a person participating in any service, program or activity of the Department. Alternative accessible formats of this document will be provided upon request. For further information call (406) 444-9248 (V) or 1-800-335-7592 (T).

ACKNOWLEDGMENTS

Table of Contents

Table of Contents (cont)

List of Figures

List of Tables

Introduction

This document is to function as the Strategic Plan for the Greater Yellowstone Rural Intelligent Transportation Systems (GYRITS) Project. This report is a result of *Task 12, Develop ITS System Architecture and Operations Report*, for the GYRITS Project. The purpose of this Task is to document findings of the study to date as well as offer realistic and implementable strategies. Specifically, this task will (1) develop a strategic deployment plan, (2) finalize project descriptions, (3) estimate costs and benefits, (4) identify funding sources and (5) define organizational roles and responsibilities. This report is to function as the Strategic Plan for the project. This is not the final report for Phase One of the project.

Background and Description

The Greater Yellowstone Rural ITS Project (GYRITS Project) was initiated to move rural ITS forward by demonstrating and evaluating ITS in a rural environment. GYRITS began in January, 1997 with a Congressional Earmark to fund (1) the development of a Regional ITS Strategic Deployment Plan, (2) the implementation of "early winner" projects, and (3) the development of supporting documentation. During this process, local needs were defined, existing and planned "legacy" ITS systems were inventoried, stakeholder input was solicited, potential ITS projects were identified through the development of a regional architecture, an ITS architecture training course was conducted, and early winner projects were selected. With this groundwork laid, the GYRITS project can continue to pool resources in order to demonstrate rural ITS.

The Greater Yellowstone Rural Intelligent Transportation System Project is a 200-mile long, 100-mile wide, heavily utilized rural transportation corridor between Bozeman, Montana and Idaho Falls, Idaho (Figure 1). This area includes:

- three states: Montana, Idaho and Wyoming;

- two national parks: Yellowstone (YNP) and Grand Teton (GTNP); and

- a variety of transportation facilities ranging from Interstate freeway to low-volume, two-lane rural highways.

Primary transportation facilities include:

- Interstate 90 and Interstate 15 from Bozeman, Montana to Idaho Falls, Idaho through Butte, Montana;

- U.S. Highway 191 and U.S. Highway 20 from Bozeman, Montana to Idaho Falls, Idaho; and

- U.S. Highway 89 and U.S. Highway 26 from Livingston, Montana through Jackson, Wyoming to Idaho Falls, Idaho.

Additionally, highways added to the project at the March 1998 Steering Committee meeting include:

- Highway 212 from Red Lodge, Montana, through Cooke City, Montana and into Yellowstone National Park;

- Highway 14 from Cody, Wyoming, through the east entrance of Yellowstone National Park and into the Park interior; and

- Highway 31 from Swan Valley Idaho, over Teton Pass to Jackson, Wyoming.
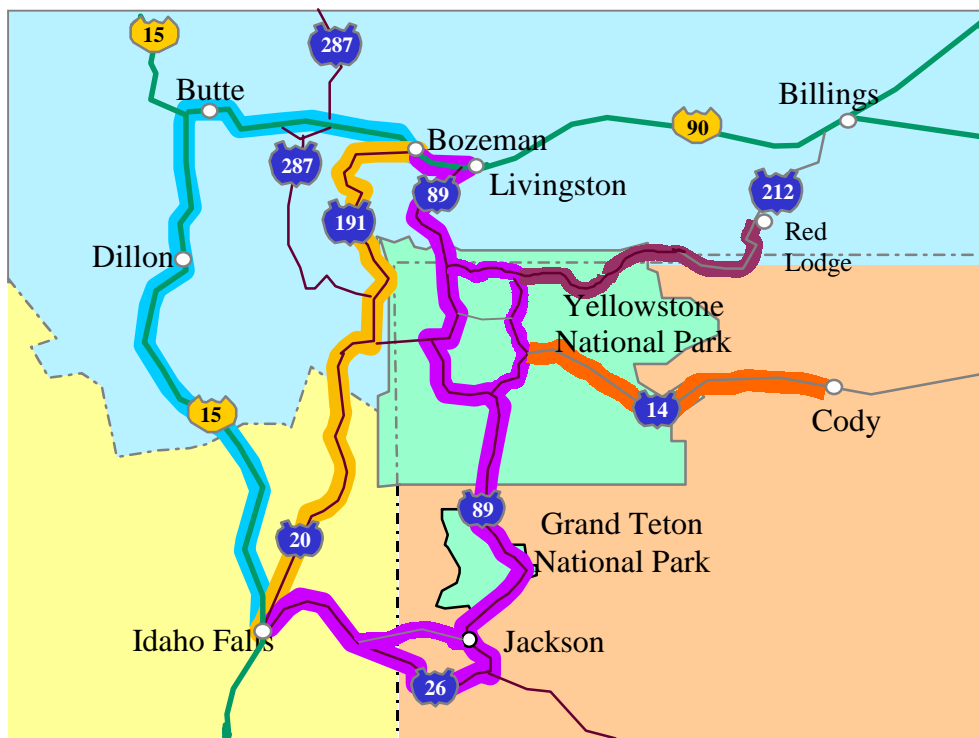
Figure 1: GYRITS Study Area

These routes represent vital transportation links for the economy and well being of the three-state area of Montana, Wyoming and Idaho. They also serve the recreational and resource needs of a growing number of individuals seeking to enjoy the Greater Yellowstone ecosystem and Grand Teton National Park. The national importance of the project area is further emphasized by its function as the connector for the trucking industry between the upper Midwest markets along Interstate 90 and the Intermountain and Southwest markets accessible by Interstate 15.

Report Organization

This document is organized into seven (7) sections as follows.

Vision: The vision provides detailed goals and objectives of the GYRITS Project.

Strategic Plan Implementation: This section describes how the GYRITS Project is organized and how the plan is updated.

Strategic Plan Development: A history is given of how the plan was initially developed. Specifically it details how potential projects were identified and prioritized for the first version of this document.

Regional GYRITS Architecture: An overview of the architecture developed for the GYRITS Project is provided. Since much of this information in this section comes from a more detailed account of the architecture, the reader is encouraged to review the *Task 11 Regional Architecture* document and accompanying Microsoft Access Database.

Fiscal Considerations: This section describes both the existing funding for the project as well as potential funding sources for continued project efforts.

Legacy Projects: A list of ITS projects and programs within the area is included in this section. This section also includes ITS projects and programs that were not funded through GYRITS but are located in the area.

Candidate Projects: This section provides information on potential projects to be deployed in the short and long term. It also details projects currently in development or deployment.

Vision

A vision was developed in order to provide general guidance for the GYRITS project. The vision is summarized by (1) a mission statement, (2) eight (8) goals listed below along with the objectives of each goal, and (3) a vision graphic (Figure 2). Any action of the GYRITS Steering Committee should be taken with this vision in mind.

The mission statement for the GYRITS project is as follows

> "The Greater Yellowstone Rural ITS Project is a cooperative public-public and public-private sector project that will develop a comprehensive ITS strategic plan. This plan will address unique rural regional and local challenges to provide for safety, mobility, travel demand management, tourism information and services, commercial vehicle operations, electronic payment, economic viability and ensure the ability to fuse and exchange data regionally."

The traveling public, operating agencies and gateway communities will ultimately benefit from the realization of the following goals.

Goal 1: Improve the safety and security of the Greater Yellowstone Region rural transportation system users.

Objectives:

- Provide sustainable traveler information improvements that disseminate credible and accurate "real-time" information.

- Provide improvements that advise transportation system users of slow-moving vehicles, obstructions and weather conditions.

- Provide improvements that advise unfamiliar motorists of alignment and speed conditions, tourist attractions, services, construction, weather and provide for the ability to request assistance.

- Coordinate public fleet responses to unsafe conditions (weather, incidents, detour routes) to provide for improved regional movement.

- Reduce severity and fatality rates through improved emergency response times.

- Reduce exposure to unsafe situations through motorist-aid devices.

- Provide improved methods for commercial vehicle monitoring, and hazardous material identification.
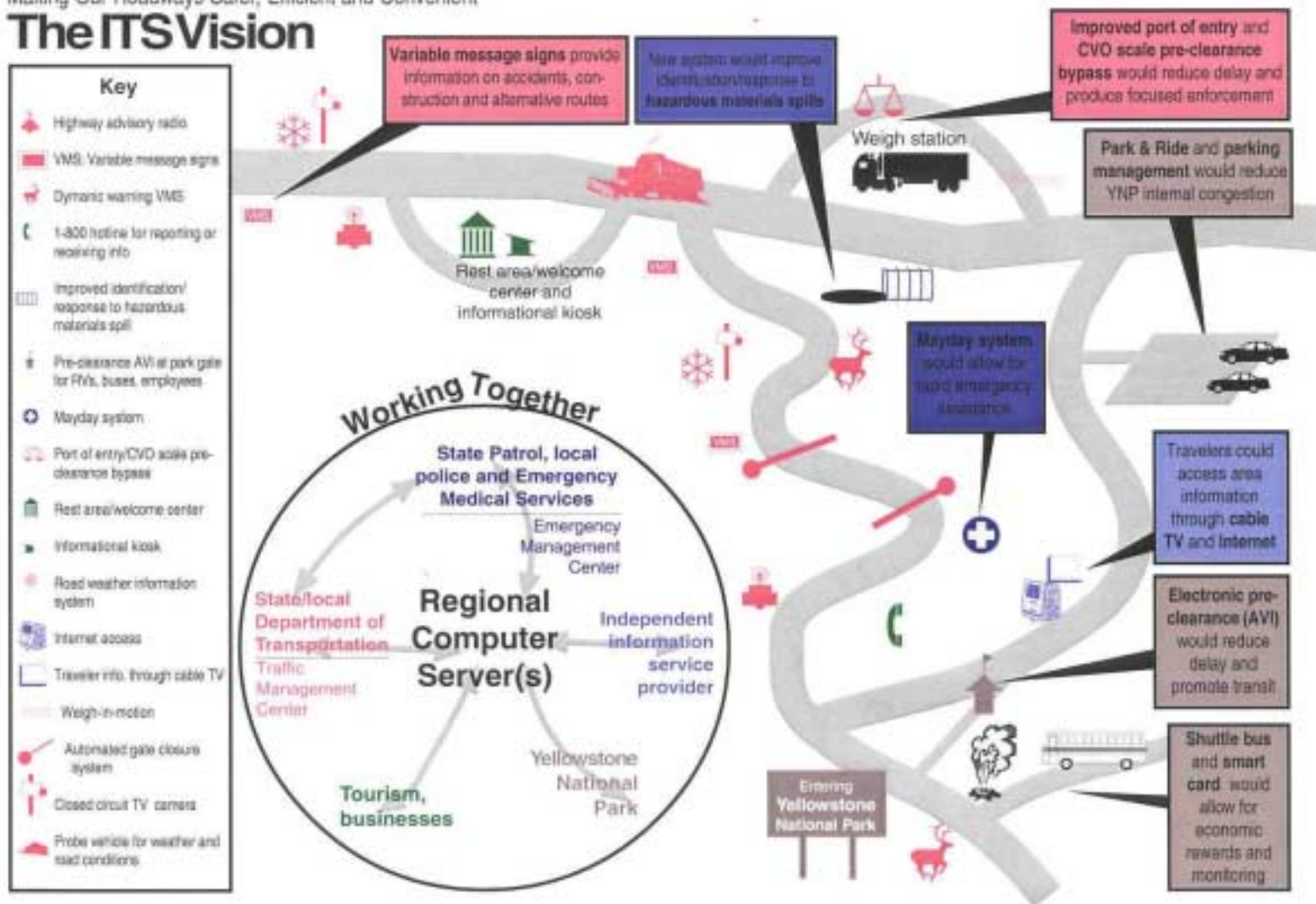
Figure 2: GYRITS Vision

Goal 2: Enhance personal mobility and accessibility to services and enhance convenience and comfort of travelers destined for Yellowstone National Park, Grand Teton National Park, and other regional attractions.

Objectives:

- Increase public awareness of public transportation alternatives to and within the Parks.

- Encourage and provide incentives for increased transit utilization.

- Improve access to services and tourist areas through expanded information availability.

- Coordinate transit services and availability to Parks.

- Provide parking information to reduce internal Park congestion.

Goal 3: Increase operational efficiency and productivity of the transportation system focusing on system providers.

Objectives:

- Collect, process and share data between local, state, and federal agencies to increase efficiency and resources utilization.

- Provide automated notification of conditions that may impact operations and maintenance of regional roadways to improve resource management and allocation.

- Improve communication network capabilities to provide for increased coordination of services (i.e. radio, wire-line/wireless).

Goal 4: Enhance economic productivity of individuals, businesses and organizations.

Objectives:

- Develop projects that meet local needs and provide for national "showcase".

- Improve identification of goods, services, and opportunities in regional communities (i.e., en-route information, transportation service information, etc.)

- Provide mechanism by which tourism industry, transportation and transit services can work more closely together.

- Provide opportunity for commercial vehicles and goods to be moved more efficiently (i.e. pre-clearance improvements).

Goal 5: Reduce energy consumption, environmental costs and negative impacts.

Objectives:
- Improve hazardous material incident response.

- Promote and encourage the use of alternative fuels and the use of transit in the Parks.

Goal 6: Develop and foster long-term partnerships that will result in the deployment of ITS initiatives and traditional solutions that address rural needs of the region.

Objectives:
- Establish formal and informal opportunities to inform public and private sector decision-makers on initiatives for the Greater Yellowstone Rural ITS Project.

- Gain support for ITS efforts from key stakeholders.

- Facilitate a technical and financial group for the promotion of partnership projects.

- Develop opportunities for public-public and public-private partnerships for operations and maintenance.

Goal 7: Ensure compatibility with statewide and national ITS initiatives.

Objectives:

- Coordinate Greater Yellowstone project with statewide efforts.

- Provide for technology transfer between state agencies.

Goal 8: Incorporate ITS into the State Transportation Improvement Program planning efforts.

Objective:
- Provide for the incorporation of advanced technology applications to be considered in the Transportation Improvement Plan (TIP) process.

The Greater Yellowstone Rural ITS Project can serve as a catalyst for agency leadership in ITS through research, deployment, evaluation and training. The project will also increase the knowledge and understanding of issues facing the respective agencies, allowing them to incorporate a philosophy of "acting locally, but thinking regionally" into their transportation decisions and giving the traveling public state-of-the-art mobility and real-time information.

Strategic Plan Implementation

This section provides an overview of (1) the organization of the GYRITS Project, (2) how projects are included in the GYRITS Project, and (3) how the strategic plan is updated.

GYRITS Organization

The structure and organization of the GYRITS Project must be understood to ensure the continued success of the project. The organizational structure outlined in this section was developed in the GYRITS *Business Plan*. The organizational structure is arranged to maximize the group's ability to meet its objectives and minimize bureaucratic impediments. To ensure all interests are represented the following structure was adopted (Figure 3).

GYRITS Organizational Chart
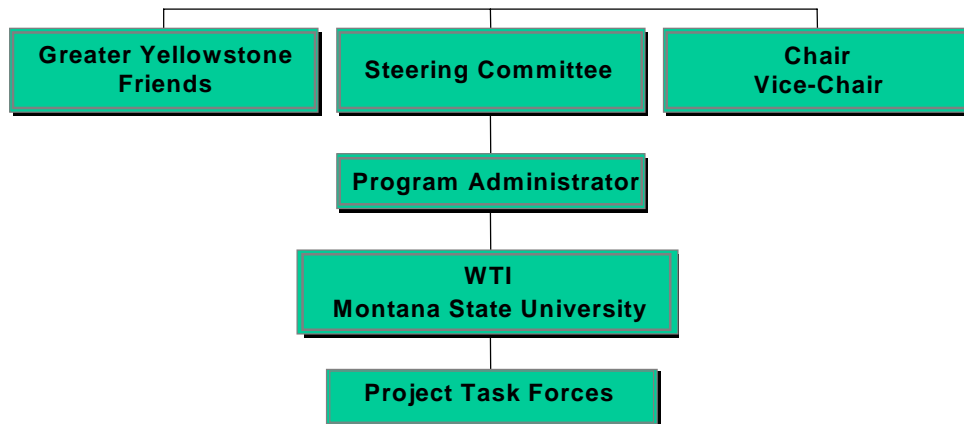
Figure 3. Organizational Structure and Relationships

Steering Committee

The role of the Steering Committee is to work with the Western Transportation Institute (WTI) by:

- reviewing project progress,

- reviewing and providing input on project deliverables such as technical memorandum,

- participating in outreach workshops, and

- providing assistance in the encouragement of community business and agency leaders in project participation.

The Steering Committee consists of one voting representative for each active member agency or participant. The Steering Committee is responsible for the overall policy direction and project

development approval as well as organizing itself, establishing rules and conducting business. The current Steering Committee members are shown in Table 1.

Table 1. Steering Committee Members

Name	Affiliation
Albert, Stephen	Western Transportation Institute, Montana State University
Barna, Basil	Idaho National Engineering and Environmental Laboratory
Gaulke, Glenn	Wyoming Department of Transportation
Holmstrom, Lance	Idaho Transportation Department
Jackson, Craig	Jackson County Road Department
McDonald, Patrick	Idaho State Police
Peterson, Shawn	Travel Montana
Rose, Gary	Idaho Falls Fire Department
Sacklin, John	Yellowstone National Park
Schaap, Bill	Three Bear Lodge
Seliskar, Robert	Federal Highway Administration, Montana Division
Stockstad, Ralph	Advanced Technology Applications Associates
Tervo, Ross	Montana Department of Transportation
Trimels, Keith	Federal Highway Administration, Wyoming Division
VanOver, Larry	Idaho Transportation Department

Steering Committee Chairperson and Vice-Chairperson

The Steering Committee, while composed of public and private sector representatives, will have a Chairperson from the public sector serving for a period of two years. The duties of the Chairperson include developing meeting agendas, in cooperation with the Western Transportation Institute, and chairing meetings. The Chairperson and Program Administrator may be the same individual. After two years, a new Chairperson will be selected by the Steering Committee.

The Vice-Chairperson is elected by the Steering Committee. The Vice-Chairperson is responsible for supporting the Chairperson, including temporarily assuming the duties of the Chairperson during his or her absence. After two years a new Vice-Chairperson will be selected by the Steering Committee.

Program Administrator

The Program Administrator operates under advisement of the Steering Committee and is responsible for contract management of the Western Transportation Institute, Montana State University – Bozeman (MSU). The Program Administrator is an employee from the lead administrative state that controls expenditures from the funding source. The Program Administrator is responsible for contract administration, recommending contract preparation, contract requests authorizing payments and informing the Steering Committee of all contract progress.

Task Forces

Task forces study, in detail, those areas of interest identified by the Steering Committee. Potential task force activities include problem definition, private sector participation, and future program planning. Voting authority on task forces issues is limited to Steering Committee member agencies. This authority may be given to an agency's full Steering Committee member or a designated representative.

Project Implementation

Those seeking to have the GYRITS coalition consider a project must present the project idea to the Steering Committee. The Steering Committee will then decide whether or not to include the nominated project in the Strategic Plan. All projects listed in the Strategic Plan are eligible for sponsorship and funding through the GYRITS coalition. A member of the Steering Committee will choose to sponsor a project for implementation. As funding becomes available, the sponsor will propose implementation of the project. Although the nomination cycle will vary depending on available funding and potential projects, as a general rule the timeline will include (1) adding new candidate projects to the plan at the January meeting of the Steering Committee (2) selecting projects to receive funding in May, and (3) updating the plan every fall. An illustration of this timeline appears in Figure 4.
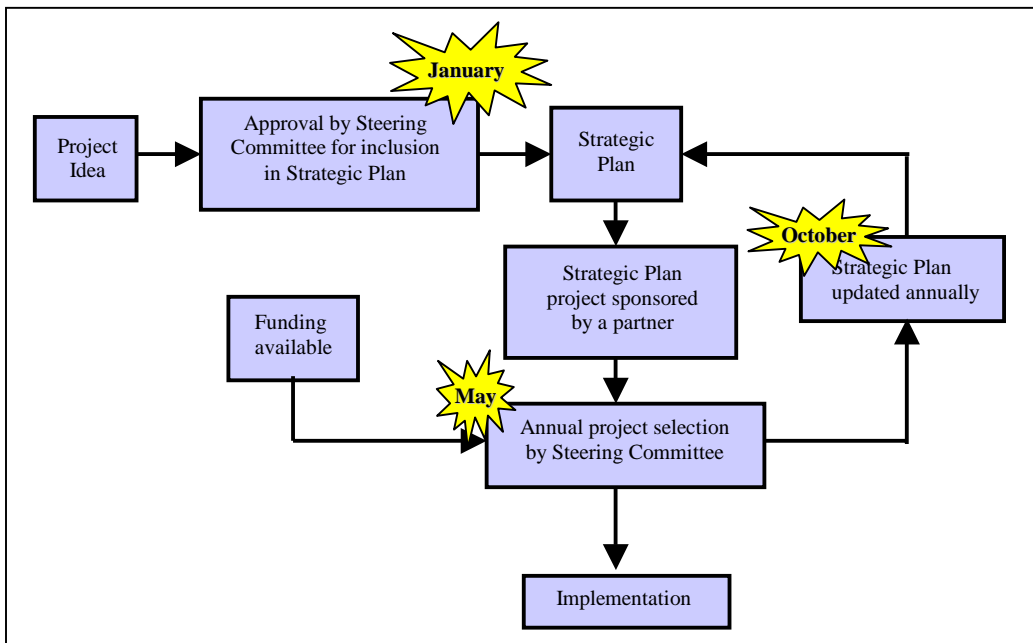
Figure 4. Project Implementation Process

Strategic Plan Update Process

The Strategic Plan is intended to be a living document. As such, it will be updated annually so long as there is significant project progress. When a project is chosen by the Steering Committee for implementation, it will moved from the *Candidate Projects* section of this document to the *Legacy Projects* section. If the Steering Committee deems it necessary, a candidate project may also be removed completely from the Strategic Plan.

Strategic Plan Development

This section provides background the initial plan development and how projects were initially identified and ranked for inclusion into the plan as shown in Figure 5. The process described below was used to identify the initial candidate projects for this document. The candidate projects identified by this process only represent a starting point. Subsequent project additions/changes are modified through the process described in the preceding section.

Project prioritization was accomplished by (1) identifying all feasible ITS infrastructure elements and locations, (2) ranking of these elements and locations by the partner agencies, (3) identifying projects based on these rankings, and (4) prioritizing this list of projects by the Steering Committee. For more details on this effort refer to *Task 9, Preliminary Project Identification and Evaluation*.

Infrastructure Identification Process

A document was developed entitled *Greater Yellowstone Rural ITS Priority Corridor Project Infrastructure (Infrastructure)* which detailed potential ITS infrastructure elements within the area. For each element, this report gave:

- a description;

- a list of objectives and potential benefits;

- location selection criteria; and

- a map of potential locations.

Potential infrastructure elements were identified based on previous tasks including *Task 6: Identify and Screen Market Packages*, which provided a comprehensive list of potential ITS projects and *Task 3: ITS Related Inventory and Regional Needs Assessment*, which helped narrow this list of ITS projects based on the qualitative and quantitative challenges identified within the project area.

Build Coalition

Traveler Needs Survey

Regional Needs Assessment

Corridor Challenges

Project Prioritization

Identify Potential Infrastructure

Identify and Screen Market Packages

Rank Infrastructure

Develop Regional Architecture

Infrastructure Grouping and Project Identification

Rank Projects

Strategic Deployment Plan
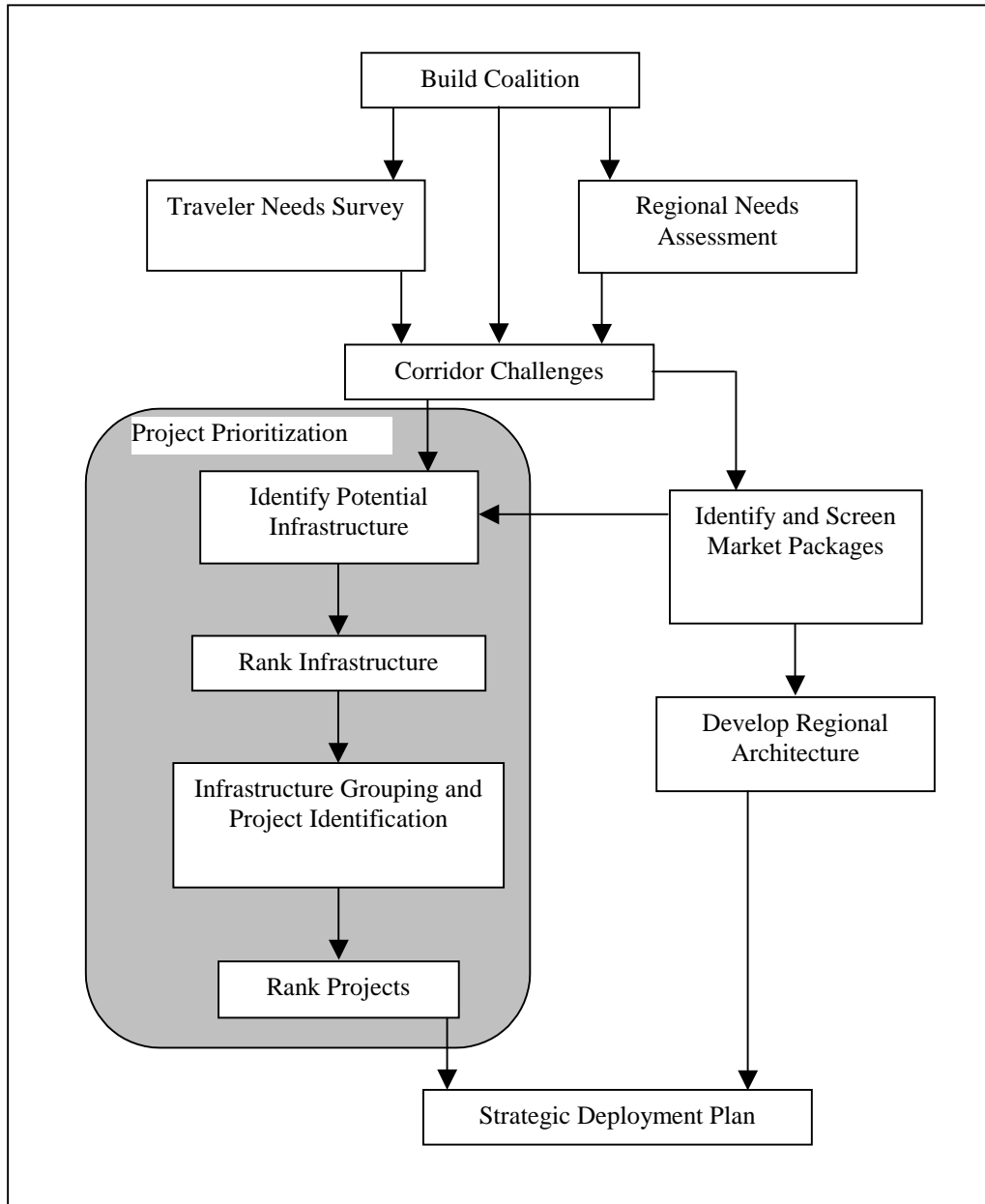
Figure 5 Plan Development Process

Infrastructure Ranking

The above-mentioned *Infrastructure* document was mailed to all partners on March 2, 1998, along with three ranking tables, each listing all the potential infrastructure elements. The first table queried project partners as to which agencies they felt should be responsible for owning, operating, and maintaining the infrastructure element. With the second table, project partners ranked infrastructure elements as short-term, medium-term, or long-term projects. Those identified as short-term were considered potential early winners. The third table provided project partners the opportunity to suggest other potential locations for each of the infrastructure elements. Between March 8 and March 20, 1998 WTI staff personally met with a majority of the

project partners. During these meetings, an overview of the GYRITS project was given, the results of *Task 3, ITS Related Inventory and Regional Needs Assessment* were presented, and an open discussion was facilitated regarding the *Infrastructure* document and the ranking tables. Due to time and travel constraints, personal contacts with all partner agencies were not feasible. However, an opportunity to provide input was given to all agencies through telephone and mail correspondence. The table values were collected and averaged, giving an equal weight to each state and each partner agency.

Project Identification

Based on the ranking tables' results and input from the partner agencies, the ITS infrastructure elements were prioritized and grouped into logical projects. Infrastructure elements were selected if they received an average rating of less than 2 (1=short-term, 2=medium-term and 3=long-term). Additional elements were added if, based on meetings with partner agencies, they were identified as a major priority to an agency. Because of size or complexity many projects were spaced out over two or three priority groups. Based on these results, an internal document was developed entitled *Greater Yellowstone Rural ITS Priority Corridor Projects (Projects)*. For each project, this document contained, project description, potential project benefits, project partners, and project limits (recommended implementation sites).

Project Prioritization

At the March 1998 Steering Committee meeting in West Yellowstone, MT participating committee members completed a criteria-ranking form for each project identified in the *Projects* document. For each criteria a project was ranked between 1 (met criteria poorly) and 10 (met criteria well). These results were tabulated and an average score was determined for each project (Table 2).

Table 2: Project Ranking Results

Project	Total Weighted Average
Traveler Safety and Security	
Cellular Incident Hotline Reporting Signing	8.0
Dynamic Warning Variable Message Signs	7.8
Animal-Vehicle Collision Warning System	6.6
Pre-Trip Information on Road Closures	6.5
Portable Mayday Notification System	5.3
Enhanced Emergency – 911 Service	5.8
Weather Information and Roadway Management	
RWIS-Activated Pager System	7.1
Safe Passage	6.3
Probe Vehicle Instrumentation	5.0
New RWIS Sites	6.6
Travel and Tourism Information and Services	
Interactive Kiosks	8.0
Commercial Vehicle Operations	
Electronic Pre-clearance/AVI	6.1
YNP/GTNP Demand Mgmt and Net. Surveillance	
AVI/Smart Card	7.7
Parking Management System	5.0
Transit Shuttle Service to YNP	3.9
Transit Shuttle Service; Jackson, Wyoming	3.7
Network Monitoring	6.0
Regional Management and Coordination	
Incident Mgmt. Plan and Haz. Mat. Tracking	7.8
Regional Server	7.5
Rural Emergency Management Center	5.6
Rural Coordinate Addressing	5.1

After discussion and evaluation of preliminary cost estimates, a motion was made to move forward with the five projects receiving the highest scores. These projects include:

1. Interactive Touch Screen Kiosks,

2. Cellular Incident Hotline Reporting Signing,

3. Dynamic Warning Variable Message Signs,

4. Incident Management Plan and Hazardous Materials Tracking, and

5. Advanced Vehicle Identification (AVI)/Smart Card at Park entrances.

All other projects were grouped into prioritized phases. Projects ranking in the top half (Table 2) were designated as short term. These projects are scheduled for implementation within the next

one to five years. Long term projects had scores in the final third of the ranking table. Long term projects are scheduled for completion in five to twenty years. Based on the recommendation of the Steering Committee, the ranking of some projects was altered.

This process was used to initially identify and prioritize projects. Although this provides a viable starting point, future projects will be identified and selected as described in the previous section.

Regional GYRITS Architecture

A regional architecture for the GYRITS Project can guide ITS deployments in the region in a manner that is compatible with national efforts including the National ITS Architecture and ITS standards. A regional architecture helps agencies and other stakeholders to identify and plan for the many integration and information sharing opportunities ITS offers. A regional architecture that conforms with the National ITS Architecture and identifies ITS standards enables other ITS systems that will be developed for use throughout the U.S. to operate in the Yellowstone region.

This architecture is based on the national architecture and is summarized in the *Task 11, Regional Architecture* document (Appendix B). The regional architecture document is also a living document and by virtue of its inclusion is part of the Strategic Plan. The regional architecture should be reviewed for any projects deployed to evaluate which national standards apply and what other existing and potential projects share similar data flows to best utilize communication infrastructure. Based on the initial screening the following market packages were carried forward in the architecture development:

- Animal-Vehicle Collision Mitigation
- Broadcast Traveler Information
- CVO Fleet Maintenance
- Demand Responsive Transit Operations
- Driver Safety Monitoring
- Driver Visibility Improvement
- Dynamic Ridesharing
- Dynamic Warning System
- Electronic Clearance
- Electronic Clearance Enrollment
- Emergency Response
- Emergency Routing
- Facility Use/ Parking Fee Management
- Fleet Administration
- Freight Administration
- HAZMAT Management
- Incident Management System
- Interactive Traveler Information
- Intersection Collision Avoidance
- Intersection Safety Warning

- Lateral Safety Warning
- Longitudinal Safety Warning
- Mayday Support
- Mobile Traffic Management/Enforcement
- Multimodal Coordination
- Network Surveillance
- On-board CVO Safety
- Pre-Crash Restraint Deployment
- Probe Surveillance
- Roadside CVO Safety
- Safe Speed Advisory
- Traction Control
- Traffic Information Dissemination
- Transit Fixed-Route Operations
- Transit Passenger and Fare Management
- Transit Vehicle Tracking
- Vehicle Tracking and Dispatch
- Virtual TMC
- Weigh-in-motion
- Yellow Pages and Reservation

As an overview the regional architecture determines how agencies fit within each center designation, as shown in Figure 6. Also, the National ITS Architecture's general communications diagram commonly referred to as the "sausage diagram" was modified to better fit the GYRITS region, as shown in Figure 7. For a more detailed look at the architecture the reader is encouraged to refer to Appendix B.

DOT Headquarters/District Offices
County Road Departments

Mayday Message Answering Points
Public Safety Answering Point
Incident Command/Dispatch Systems

Yellowstone National Park
Fee Administration

State DOT Systems

Center

| Traffic Management | Emergency Management | Fee Administration | Commercial Vehicle Administration |

| Information Service Provider | Emissions Management | Transit Management | Fleet and Freight Management | Planning |

State DOTs
Research Organizations

Wireless Communications

Individual Trucking Companies

Regional Server
Kiosk Data Server
Traveler Information Systems
Visitor Information Services

Yellowstone National Park
Grand Teton National Park

Paratransit Dispatch Systems
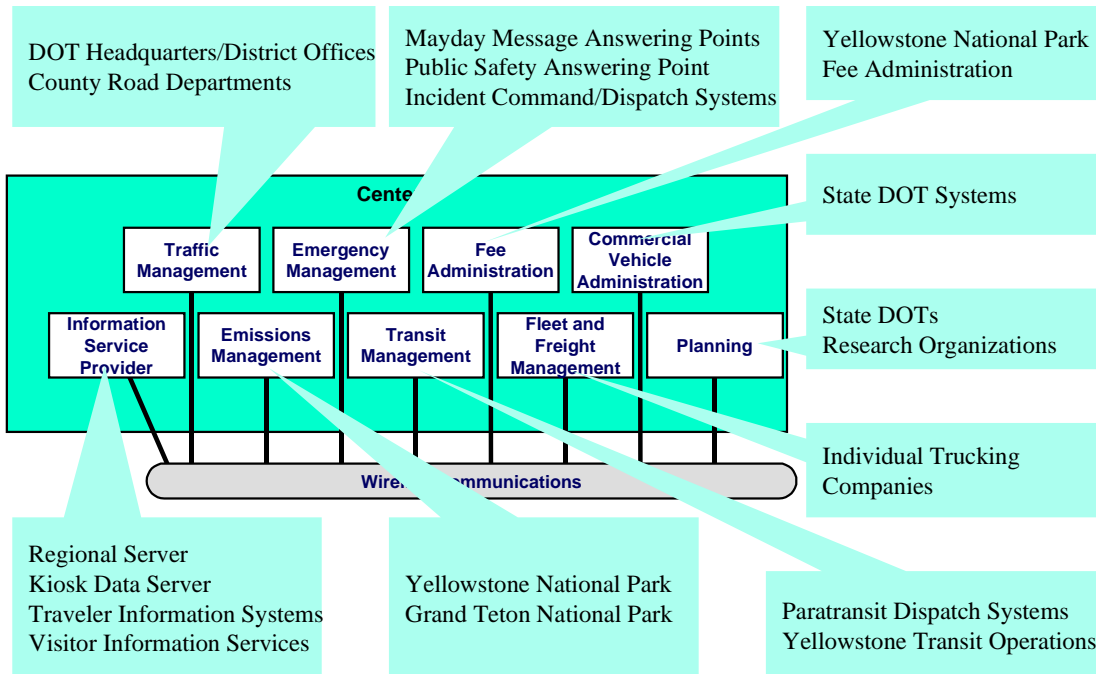Yellowstone Transit Operations

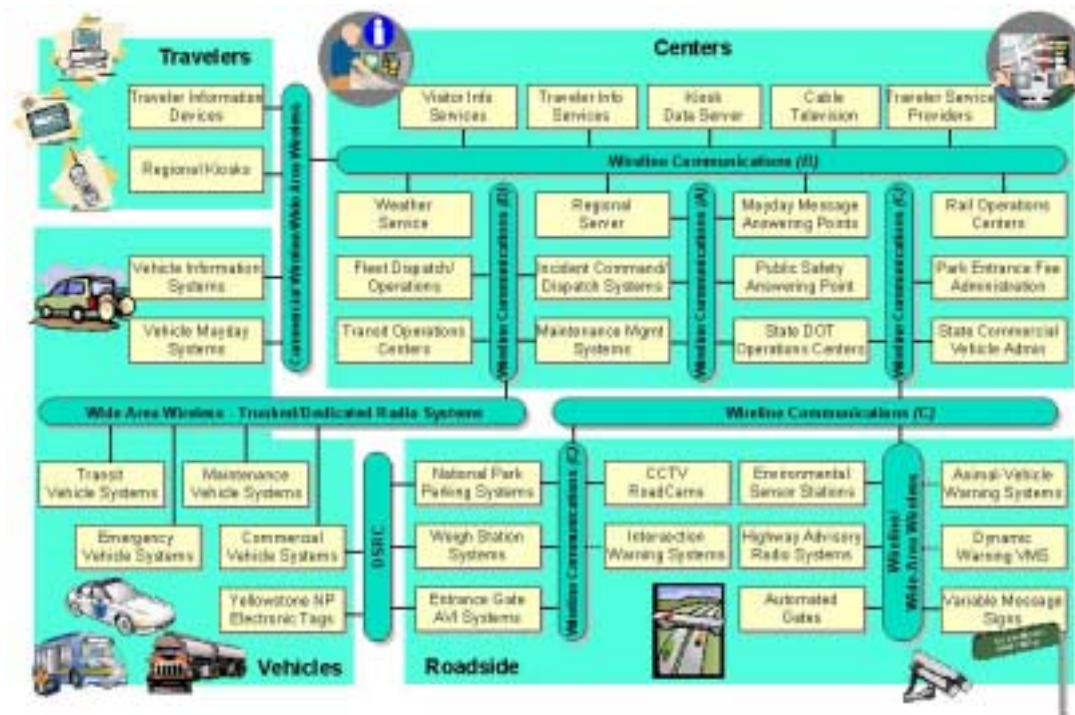Figure 6: Greater Yellowstone Regional Centers

Figure 7: Greater Yellowstone Regional Architecture Systems and Interconnects

Fiscal Considerations

GYRITS projects can be funded through a variety public and private funding sources. Currently 80% of GYRITS projects are funded through congressional earmarks while the other 20% is attained through a variety of sources including Idaho, Montana and Wyoming Departments of Transportation; Yellowstone National Park and Travel Montana. The intent of this section is to discuss some potential funding sources for future GYRITS projects.

The largest source of funding comes from **federal sources**. Specifically the Transportation Equity Act of the 21st Century (TEA 21) enacted June 9, 1998 as Public Law 105-178. TEA 21 provides for six years of funding for a majority of transportation needs. Table 3 shows some of the major funding areas/programs of TEA 21. In order for a GYRITS project to compete for most of these programs it would have to compete with traditional transportation projects through each State's statewide planning process (i.e., Statewide Transportation Improvement Program). However, some of the funding is available through national competitive grants, specifically, most of the areas under Transportation Research.

It may be possible for GYRITS projects to also receive **state, county or city** transportation funding. However, like much of the federal funding would require competing with traditional transportation improvements for inclusion in transportation plans.

It may be possible to share costs with **other organizations and programs** in order to move GYRITS projects forward. Such organizations could include Clean Cities Coalition, state police, media, traveler services, etc. It is necessary to show the benefit to these agencies in order to receive funding.

User Fees and Advertising may be able to offset the cost of some systems. User fees for use of the Automated Vehicle Identification at Park entrances, or advertising on touch screen kiosks, for example could provide revenues.

In some cases vendors will fund part of the costs in exchange for **selling data rights** collected by the system. For example, a vendor may split the cost with a state department of transportation for installing cameras for viewing road and traffic conditions. The State Departments of Transportation (DOT's) would be able to use the cameras to monitor the roadway, but the vendor would be able to sell these real-time video feeds to media, Internet sites, or anyone willing to pay for them. It is important to be cautious when pursuing these situations as they can lock an agency into using a specific vendor for all future expansions. Additionally, the general road users may not have free access to this information, which may reduce the benefits gained.

Table 3: Potential Funding Sources from TEA 21 (amounts are in millions of dollars) (1)

Program	National Authorized Level	Eligibility
Title I: Federal Aid Highways (i.e., interstate maintenance, surface transportation, national highway system, federal land highways)	FY98 $23,816 FY99 $28,191 FY00 $28,910 FY01 $29,487 FY02 $30,065 FY03 $30,636	Mostly distributed through state departments of transportation through statewide transportation planning process.
Title III: Federal Transit Administration Programs (i.e., formula grants, capital grants, planning, research, clean fuels)	FY98 $4,643 FY99 $6,341 FY00 $6,810 FY01 $7,274 FY02 $7,737 FY03 $8,194	Funds for capital and operations of transit agencies are mostly distributed through state departments of transportation. Research grants are distributed mostly through national programs such as Transit Cooperative Research Program
Title IV: Motor Carrier Safety	FY98 $85 FY99 $100 FY00 $105 FY01 $112 FY02 $117 FY03 $125	Distributed to states for motor carrier safety enforcement and information systems
Title V: Transportation Research	$2,881 total	See below for more detail on some programs
ITS Standards, Research, Operational Tests and Development	FY98 $95 FY99 $95 FY00 $98 FY01 $100 FY02 $105 FY03 $110	
ITS Deployment	FY98 $101 FY99 $105 FY00 $113 FY01 $118 FY02 $120 FY03 $122	Administered mostly through FHWA for integration and interoperability $482 or commercial vehicle infrastructure $184. All projects must: • Develop guidelines on procurement • Independent evaluation • Use Software Capability Maturity Model • Life-cycle cost analysis • Be consistent with the national architecture and available standards
University Transportation Centers	FY98 $26 FY99 $26 FY00 $27 FY01 $27 FY02 $27 FY03 $27	Funding distributed to 10 regional centers and 23 other centers for use in transportation research, education and outreach
Technology Deployment Initiatives and Partnerships	FY98 $35 FY99 $35 FY00 $40 FY01 $45 FY02 $45 FY03 $50	

Legacy Projects

The GYRITS Project was designed to be an ongoing dynamic project. Therefore, any plan must accommodate both past and future project activities. The Strategic Plan will be updated as existing projects are completed and new projects are selected. This section of the Strategic Plan consists of completed GYRITS projects and other related ITS projects in the area. As projects are finished they will be added to this section. A current list of existing ITS projects within the area include:

- Highway Advisory Radio,

- Variable Message Signs,

- Road Weather Information Systems,

- Weigh in Motion,

- Safe Passage,

- Interactive Kiosks,

- HELP Inc. Prepass, and

- Greater Yellowstone/Teton Clean Cities Coalition.

Locations of existing legacy systems are shown in Figure 8.
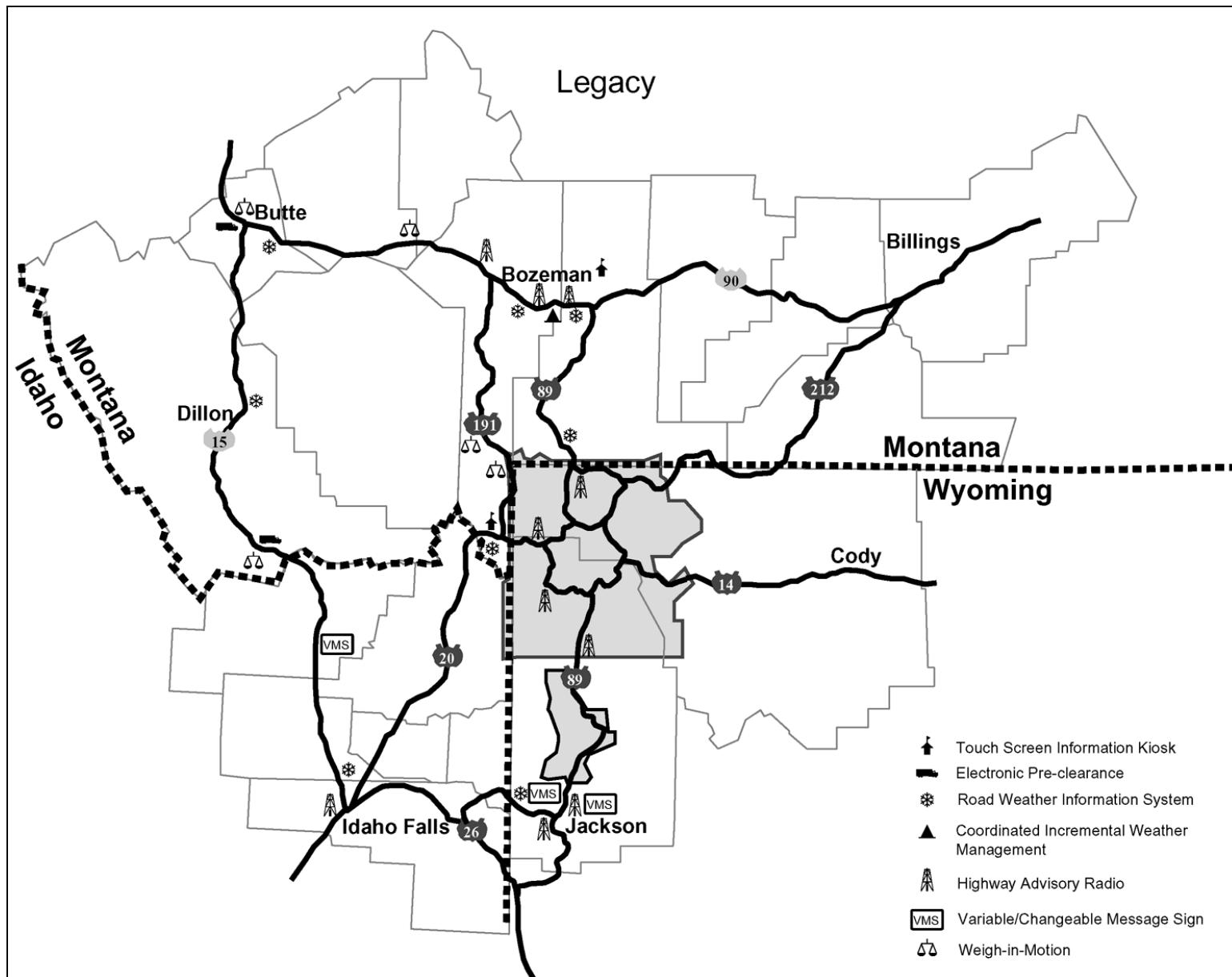
Figure 8: Legacy Project Locations

Highway Advisory Radio

Highway Advisory Radio (HAR) technology uses low range radio to convey information to travelers as they approach or pass through a particular area. In the GYRITS Project, HAR is used around mountain passes and places of high vehicular traffic.

Existing Locations

HAR is currently in use in the following locations:

- Yellowstone National Park;

    - Old Faithful
    - Mammoth Hot Springs
    - Madison Junction
    - South Entrance

- Three sites serving the Bozeman Pass on I-90;
- Two site serving Jackson, WY; and
- Two sites serving Idaho Falls.

Agency Roles

The departments of transportation own and operate the radio systems within their state. Park staff operates the HAR units located within Yellowstone National Park.

For further information contact the following personnel:

- Jerry Dupler, Montana Department of Transportation (406) 444-6305
- John Greene, Wyoming Department of Transportation (307) 777-4440
- Idaho Transportation Department (208) 334-8000
- Linda Young, Yellowstone National Park (307) 344-2248

Variable Message Signs

A variable or changeable message sign (VMS) allows the operators to display dynamic information to travelers. Several types of VMS's are available at this time. Variable message signs are a proven demonstration project for ITS technologies. Similar to highway advisory radio, the signs are located around mountain passes and areas of high tourism.

Existing Locations

There are plans for adding several variable message signs on Interstate 90 around Bozeman Pass (refer to Legacy Project - Safe Passage for more detail). Variable message signs currently are located:

- near the city of Dubois, ID (upstream of Monida Pass), and

- near Jackson, WY (two signs).

Agency Roles

The Departments of Transportation own and operate the variable message signs within their state.

For further information please contact the following people:

- Jim Montuoro, Wyoming Department of Transportation (307) 352-3000

- Idaho Transportation Department (208) 334-8000

Road Weather Information Systems

Road Weather Information Systems (RWIS) consist of a remote site that monitors road and weather conditions. This information can be used by the operating agency to plan for inclement weather. Information from these sites is a useful tool for maintenance operations and the traveling public.

Existing Locations

Currently RWIS sites are located:

- I-90 east of Bozeman, MT

- U.S. 89 near Corwin Springs, MT

- I-90 west of Livingston, MT

- I-90 west of Butte, MT

- I-15 near Dillon, MT

- U.S. 191 near West Yellowstone, MT

- I-15 near Idaho Falls, ID

- I-15 near Jackson, WY

Agency Roles

The departments of transportation own and operate the RWIS sites within their state. In some cases a contract with the vendor exists in which the vendor controls the data, repackages it and sends it to the State Department of Transportation.

For further information contact Mile Bousliman, Montana Department of Transportation at (406) 444-6159.

Weigh in Motion

Weigh in motion (WIM) uses in pavement technology to weigh commercial vehicles. This technology allows the vehicles to be weighed at normal highway speeds. The components of the detectors vary with manufacturer and function. WIM allows for more efficient use of motor carrier enforcement personnel and resources. Data is also useful for planning as it is a strong factor in pavement life.

Existing Locations

In addition to portable weigh in motion units, permanent sites are either under construction or are presently located on:

- US-191 within Gallatin canyon (2 sites);

- I-90 near Three Forks;

- I-15 near Lima; and

- I-15 near Butte.

A currently funded program in Montana titled State Trucking Activities Reporting System (STARS) has funding for an additional 26 permanent sites and 64 portable units.

Agency Roles

The departments of transportation install and manage these systems.

For further information contact Drew Livesay, Montana Department of Transportation at (406) 444-6146.

Safe Passage

The overall goal of the Safe Passage project is to optimize motorist safety and incident management on Interstate 90 between Livingston and Bozeman, Montana. The project will employ ITS technology to (1) validate and implement a computer model to micro-forecast pavement temperatures and roadway conditions; (2) provide real-time motorist information through the implementation and effective operation of an on-roadway communication system incorporating VMS/HAR/cellular phone mediums; and (3) establish a rural traffic management center for reception, coordination, and dissemination of all relevant data between responsible agencies. The objective of the project will be to document the benefits of the Safe-Passage system. These benefits primarily will be to increase traveler safety through a reduction in accidents, improve operations and maintenance through more effective and timely utilization of resources, and apply more efficient traffic management methods with optimal coordination and communication procedures.

Existing Locations

The system will utilize existing highway advisory radio and remote weather monitoring stations on Interstate 90 near Bozeman Pass. Additionally variable message signs will be located in this area. In addition to running the weather model, roadside equipment will be monitored/controlled by a rural traffic management center located at the Montana Department of Transportation Maintenance Shop in Bozeman, MT.

Agency Roles

Montana Department of Transportation will own and operate the system. The Western Transportation Institute is developing the weather/pavement conditions forecasting model and coordinating the development and evaluation of the project. Additionally the following agencies will coordinate in the sharing of information; the Montana Highway Patrol, county road departments, local police, sheriff, fire departments, towing, media, chambers of commerce, disaster and emergency services and Yellowstone National Park.

For further information contact John Mounce, Western Transportation Institute, Montana State University (406)-994-1770.

Interactive Kiosks

The Montana Tourism and Recreation Initiative (MTRI) a group composed of Travel Montana, Montana Department of Transportation, and many others initiated an effort to deploy touch screen kiosks. A database of properties was collected, multi-media elements were added, and the software was developed. The database developed is also used by Travel Montana in their Travel and Tourism Webpage. The lead agency in this effort was Travel Montana, who since the initial effort have taken the full operation and maintenance costs. The kiosks enable travelers to access information on recreation facilities, hotels, trails, rivers, lakes, construction zones, and weather.

Existing Locations

Kiosks are presently at 14 sites throughout the State of Montana. The kiosks are located at traveler stops such as rest stops, visitor information centers, and convenience stores.

Agency Roles

Travel Montana currently manages the program, with regular data updates to the kiosks, maintenance of the units, and improvements to the software. This existing system is being utilized as a starting point for one of the current GYRITS projects.

For further information contact Shawn Peterson, Travel Montana at (406) 444-3759.

HELP Inc. Prepass

Heavy Electronic Vehicle License Plate Inc. (HELP Inc.) manages a weigh/inspections station automation system known as Prepass. This system will allow those carriers who comply with the requirements to bypass the weigh station saving time and resources for both the carrier and the enforcement agency. When a vehicle is approved for the program a transponder will be placed on their vehicle. As the vehicle approaches the weigh station, it is weighed at mainline speed with weigh in motion and the data is read from the transponder and processed at the weigh station. If the parameters are met a message is sent back to the vehicle transponder giving them a signal that they will not have to stop at the weigh station.

Existing Locations

Currently two sites in Montana are funded and construction has begun. Only one lies within the GYRITS project limits. It is located near Lima northbound on Interstate 15 near the Idaho Montana Border. An additional 5 sites in Montana are planned but are currently not funded. Of these, only one lies within the GYRITS area. It is located near Butte westbound at the junction of Interstate 15 and 90.

Agency Roles

The Montana Department of Transportation installed and operates the weigh station equipment. HELP Inc. manages the database, signs up carriers and provides technical/design assistance with the weigh station equipment.

For further information contact Drew Livesay, Montana Department of Transportation at (406) 444-6146.

Greater Yellowstone/Teton Clean Cities Coalition

The Greater Yellowstone/Teton Clean Cities Coalition was formed in 1998 with the following mission:

> "It is our mission to protect the unique natural environment of the region, preserve the quality of life for current and future residents and promote economic vitality by expanding the use of alternative fuels and alternative energy in mobile and stationary applications."(2)

This coalition may provide a useful partner in pursuit of several potential projects such as coordinated transit service to recreational destinations.

Existing Locations

The coalition is focusing on the similar geographic area as the GYRITS Project. The Coalition's boundaries generally follow what is known as the Greater Yellowstone Ecosystem.

Agency Roles

The coalition is made up of a numerous organizations including Yellowstone and Grand Teton National Parks, energy and utility representatives, city/county/state governments, and public and private vehicle fleet owners. The coalition is part of a national effort to promote the use of alternative fuel vehicles through the Department of Energy – Idaho National Engineering and Environmental Laboratory (INEEL).

For further information contact Basil Barna, INEEL, (208) 526-0690.

Candidate Projects

Projects listed in this section have been identified through the planning process and by the Steering Committee as candidate projects. Candidate projects may be added to this plan at any time so long as they:

- satisfy the goals of the GYRITS Project;

- are nominated and sponsored by a member of the GYRITS Steering Committee; and

- are approved by the Steering Committee.

For each project listed in this section (1) a brief description is given, (2) proposed locations are suggested, (3) potential agency roles are discussed, (4) potential benefits are identified, and (5) estimated costs are stated. Costs are estimated from similar projects in other areas of the county or the national ITS cost database (3). When similar projects are identified a contact name and phone number is given for this project.

Table 4 shows potential ITS demonstration projects identified in this plan. Projects are divided into three timeframes.

- Current projects include those projects that have funding and are currently under development.

- Short-term projects include those potential projects that have not received funding but are a priority when funding becomes available. As a general rule, these projects should be implemented within 1-5 years.

- Long term projects include those potential projects that are of less importance, or due to their nature will require larger amounts of funding or development time. As a general rule these projects should be implemented within 5-10 years.

Figures 9, 10, and 11 summarize the potential locations of the candidate projects, short term projects and long term projects respectively.

Table 4. Candidate Projects

	Project
Current	Touch Screen Information Kiosks
	Dynamic Warning Variable Message Signs
	Incident Management Plan
	Automated Vehicle Identification / Smart Card
Short Term	Animal-Vehicle Collision Warning System
	Electronic Pre-clearance / AVI
	Network Monitoring
	New RWIS Sites
	Pre-trip Information on Road Closures
	Regional Server
	RWIS-Activated Pager System
	Coordinated Inclement Weather Management for Mountain Passes
	En-Route Information on Road Closures and Conditions
Long Term	Enhanced Emergency-911 Service
	Parking Management System
	Probe Vehicle Instrumentation
	Portable Mayday Notification System
	Rural Coordinate Addressing
	Rural Emergency Management Center
	Coordinated Transit Shuttle Service to Recreational Destinations

CURRENT CANDIDATE PROJECTS

	Project
Current	Touch Screen Information Kiosks
	Dynamic Warning Variable Message Signs
	Incident Management Plan
	Automated Vehicle Identification / Smart Card
Short Term	Animal-Vehicle Collision Warning System
	Electronic Pre-clearance / AVI
	Network Monitoring
	New RWIS Sites
	Pre-trip Information on Road Closures
	Regional Server
	RWIS-Activated Pager System
	Coordinated Inclement Weather Management for Mountain Passes
	En-Route Information on Road Closures and Conditions
Long Term	Enhanced Emergency-911 Service
	Parking Management System
	Probe Vehicle Instrumentation
	Portable Mayday Notification System
	Rural Coordinate Addressing
	Rural Emergency Management Center
	Coordinated Transit Shuttle Service to Recreational Destinations

Figure 9: Potential Locations of Current Projects

Touch Screen Information Kiosks

Touch screen interactive kiosks will be placed at strategic locations where travelers stop in the GYRITS area. These kiosks will have a video "grabber" screen to entice travelers to use the system to access information on events, points of interest, services and real-time road and weather conditions. The system will be based on the Montana Tourism and Recreation Initiative Kiosk system. The system will be developed in such a manner as to allow for the three-state integration of the system with an open architecture that allows for a web-based delivery system of data.

Proposed Project Locations

Kiosks will initially be installed at locations in Montana with future locations in Yellowstone and Grand Teton National Parks and gateway communities in Idaho and Wyoming. Kiosks will be housed in indoor locations that experience a substantial amount of tourist traffic and have attendants willing to assist with the project. Potential locations are listed in Table 5.

Table 5: Touch Screen Information Kiosk Locations

STATE	Locations	Type of Facility
Montana *(initial)*	Belgrade	Airport
	Big Sky	Convenience Store
	Bozeman	Museum of the Rockies
	Bozeman	Visitor Information Center
	Butte	Rocker Convenience Store
	Butte	Visitor Information Center
	Columbus	Town Pump
	Dillon	Visitor Information Center
	Ennis	Convenience Store
	Four Corners	Convenience Store
	Gardiner	Convenience Store
	Livingston	Visitor Information Center
	Quake Lake	Visitor Center
	Red Lodge	
	Three Forks	Wheat Montana
	Virginia City	
	West Yellowstone	Visitor Information Center
Idaho*(future)*	Idaho Falls	Visitor Information Center
Wyoming *(future)*	Jackson Hole	
National Parks *(initial)*	4-5 locations to be determined	

Proposed Agency Roles

Travel Montana will be the lead agency in constructing, installing and maintaining the kiosks with WTI coordinating the effort.

- **Travel Montana:** Travel Montana will coordinate obtaining and retrofitting the kiosk units, customizing and upgrading the software, installing a dedicated phone line at each location, developing "grabber" screen video, collecting and inputting data and images for Montana and Yellowstone National Park, and installing and maintaining the units.

- **Idaho and Wyoming Departments of Tourism:** The respective Departments of Tourism will coordinate the collection and input of data and images for the gateway communities in their respective states. Travel Montana will provide a database entry system for this information.

- **Western Transportation Institute:** The WTI will coordinate funding, location selection and finalization of appropriate agreements with location facility owners.

Estimated Project Costs and Potential Benefits

Costs of the kiosk system are detailed in Table 6. These costs are based on information provided by Travel Montana for the 14 kiosks planned for installation. The estimated cost to the GYRITS project will amount to approximately $120,000. Travel Montana is matching a sizeable amount of financial resources, as well as making considerable donations of both manpower and equipment as shown in Table 6. The Idaho and Wyoming Departments of Tourism will donate staff time to collect data and images for properties in the gateway communities of their respective states.

Table 6: Cost Breakdown for Kiosks (4)

Task	GYRITS Funded	Travel MT Funded	Yellowstone/ Grand Teton	ID/WY Dept of Tourism
Kiosk Units		Donated		
Retrofit Hardware	$88,800			
Upgrade Software		$56,000		
Customize Software	$17,500	$17,500		
Dedicated Phone Lines		Donated		
Phone Line Charges (3 yr.)	$18,000			
Develop "Grabber" Screen		Donated		
Montana and Yellowstone Data and Images		Donated	Coordinate w/ Travel MT	
ID/WY Data and Images				Donated
Installation and Maintenance		Donated		
Total	$119,800	$38,000		
			Total	**$157,800**

Objectives of touch screen kiosks as previously identified in the GYRITS Business Plan include:

- providing sustainable traveler information systems that disseminate credible and accurate "real-time" information;

- providing systems that advise regional transportation system users of weather conditions;

- providing systems that advise unfamiliar motorists of tourist attractions, services, construction and weather;

- increasing public awareness of public transportation alternatives to and within the Parks;

- improving accessibility to services and tourist areas through expanded information availability;

- improving identification of goods, services, and opportunities in regional communities (i.e. en-route information, transportation service information, etc.); and

- providing a mechanism by which the tourism industry, transportation and transit services can work more closely together.

By improving the identification of goods and services, tourists may be more likely to extend their stay in the area, which would potentially generate more tourist dollars spent in the communities. The extent to which economic indicators can be incorporated into the evaluation is unknown at this time.

By providing regional information on road closures and weather conditions through the kiosks, it is conceivable that travelers could change their travel behavior to avoid problem areas. Theoretically, such changes in travel behavior could result in a reduction in weather-related crashes due to travelers avoiding severe weather areas, reduced traveler delay caused by road closures, or reduced traveler delay caused by construction zones. Estimates of either potential or actual changes in travel plans resulting from information obtained at kiosks may be obtained via user surveys, but such subjective assessments would be difficult to quantify in terms of economic benefits.

The contact person for this project is Shawn Peterson, Travel Montana, (406) 444-3759.

Dynamic Warning Variable Message Sign

Dynamic Warning VMS's will utilize real-time road condition information collected by sensors in order to give immediate warnings at spot locations. The advisory will consist of warning of safe speeds in advance of curves and downgrades. This technology may or may not utilize pavement sensors and weigh-in-motion to assist in determining safe speed advisories.

Proposed Project Locations

Locations were determined based on the safety problems identified in *Task 3 ITS Related Inventory: Regional Needs Assessment*. The locations experienced crashes that involved icy/slippery roads and the driver reportedly driving too fast for conditions. These locations fall in the general areas of major mountain passes and canyons, including

- Gallatin Canyon, US 191, MT;

- Monida Pass, I-15, ID; and

- Teton Pass, WY-22, WY.

These locations will be prioritized in order to reduce the number of locations to meet funding constraints (one per state).

Proposed Agency Roles

Specific pre-construction, construction, and operational roles will be negotiated with each individual State Department of Transportation.

- **MT/WY/ID Departments of Transportation:** May assist with the pre-construction, construction, and operational duties such as developing plans, specifications and estimates, developing environmental impact statements, preparing the bid package, letting the project, and monitoring construction activities. Additionally, State Departments of Transportation will be required to maintain the systems.

- **Western Transportation Institute:** WTI will coordinate pre-construction, construction, and operational efforts. Where State Departments of Transportation are unwilling or unable to complete pre-construction, construction, and operational activities WTI will complete them in-house or hire a consultant, as appropriate, within available funding limits.

Estimated Costs and Potential Benefits

It is anticipated that construction costs will be approximately $110,000 per site (4). Although costs depend on specific system configurations these costs are comparable to costs of similar deployments in Colorado and California. The pre-construction, construction, and operational costs will vary depending on the specific role assumed by each State Department of Transportation.

Based on the objectives from the GYRITS Business Plan, dynamic warning variable message signs are designed to:

- disseminate credible and accurate "real-time" information;

- advise unfamiliar motorists of alignment, speed conditions, and weather; and

- reduce exposure to unsafe situations through motorist aid devices.

The warnings provided on the variable message signs would alert travelers to potentially hazardous conditions at spot locations. Ideally, drivers will reduce their speeds in response to these advisories of hazardous conditions. Spot speed studies conducted before and after the installation of the variable message signs will be used to determine the effectiveness of the signs at reducing vehicle speeds. Traffic accident reports will be analyzed, as well, to assess changes in such factors as crash frequency, severity, contributing factors, weather conditions, and first harmful event. Given the inherent instability of accident data, it is imperative that data be collected for a sufficient period of time after the variable message signs are installed in order to meaningfully interpret any trends in the data. This is particularly true if a simple before/after analysis (i.e., without comparison sites) is used in the evaluation.

The contacts for each state deployment are:

- John Becker, Idaho Transportation Department (208) 745-5630,

- Ross Tervo, Montana Department of Transportation (406) 444-9248, and

- Glen (Jim) Gaulke, Wyoming Department of Transportation (307) 777-4166.

Incident Management Plan

This project will involve developing an incident management plan for the entire area or regional areas of the project. The plan would be to provide a coordinated response to incidents, thus reducing the negative impacts of those incidents.

Proposed Project Locations

The incident management plan would involve an area-wide effort. This effort may affect the entire states of Wyoming, Idaho and Montana. As such the project will make an effort to include the entire states in the process. However, the plan will initially focus on road closures that occur in the locations listed in Table 7.

Table 7: Road Closure Locations

State/NP	Location
Montana	Bozeman Pass: Interstate 90 between Bozeman and Livingston
	Interstate 90 from west Livingston interchange to east Livingston interchange
	Gallatin Canyon: Highway 191 from Four Corners to West Yellowstone
	Monida Pass: Interstate 15 at Idaho Border
	Homestake Pass: Interstate 90 east of Butte
Idaho	Interstate 15 between Idaho Falls and Roberts
	Monida Pass: Interstate 15 between Dubois and Montana State Line
	Highway 20 between Ashton and West Yellowstone, MT
	Highway 26 between Swan Valley or Palisade and Alpine Junction, WY
Wyoming	Highway 89 between Alpine Junction and Hoback Junction
	Highway 89 between Hoback Junction and Jackson
	Teton Pass: Highway 22 west of Jackson
Grand Teton	Highway 89 north of Moose
Yellowstone	Entirely closed to rubber tire vehicles in winter

Proposed Agency Roles

- **Western Transportation Institute:** Some or all of this work may be performed by WTI. A work plan will be prepared by WTI and approved by the Steering Committee.

- **All Involved Partner Agencies:** Agencies will make available to WTI existing incident management plans and be available for input into these plans.

Estimated Costs and Potential Benefits

Project cost will vary depending on the magnitude of the effort. Based on staff experience, it is anticipated that this effort will cost $100,000 depending on the scope of the project (4).

Based on the objectives from the GYRITS Business Plan this project will help to:

- coordinate public fleet responses to unsafe conditions (weather, incidents, detour routes) to provide for improved regional movement;

- reduce emergency response times;

- provide improved methods for commercial vehicle monitoring, and hazardous material identification;

- collect, process and share data between local, state, and federal agencies to increase efficiency and resources utilization; and

- improve communication system capabilities to provide for increased coordination of services (i.e. radio, wire-line/wireless).

Quantifiable potential benefits could be based on a reduction in response times to road closures. However, with other factors involved and the small data set, it is difficult to determine what portion of a change in response times is actually due to an incident management plan. Potential benefits could include: (1) improved coordination between agencies based on interviews with such agencies and (2) reduced impact of road closures based on case studies.

The contact for this project is Steve Albert, Western Transportation Institute (406) 994-6126

Automated Vehicle Identification (AVI) / Smart Card

An AVI System will be installed at two of the Yellowstone National Park entrance gates (Cooke City and Gardiner) for transit users, employees, concessionaires and local residents who are impacted by tourist congestion. Future phases may include a Yellowstone National Park gate in West Yellowstone or other entrances and gates in Grand Teton National Park at Moran and Moose. It is our hope to create an electronic pass that will be a prototype in Yellowstone National Park and then expanded to other Parks.

Proposed Agency Roles

- **Yellowstone National Park:** Yellowstone National Park with the assistance of WTI will develop the pre-construction documents. As this will probably be a design-build contract, the pre-construction documents will be minimal. Yellowstone National Park will facilitate the operations of the system and the disbursement of the windshield tags.

- **Western Transportation Institute:** WTI will facilitate funding and assist Yellowstone National Park, as needed.

- **Design-Build Contractor:** A contractor will be selected to design and build the system. Their duties will be further defined in a Request for Proposal.

Estimated Costs and Potential Benefits

It is anticipated that the design-build cost of each site will be $150,000 based on a previous estimate determined by Amtech Corporation (4). Yellowstone National Park will supply resources for staffing the operations of the system. An extra fee may be assessed to each purchaser of an electronic in order to offset some of the costs for the windshield transponder tags.

The following objectives for the AVI system were reported in the GYRITS Business Plan:

- to increase awareness of public transportation alternatives to and within the Parks, and

- to encourage and provide incentives for increased transit utilization.

Potential benefits of the AVI system include reduced delay at Park gates and reduced staffing requirements at those same entrances. Additionally, this may allow Yellowstone National Park to provide better service to their Park patrons.

Table 8 provides data on the number of persons entering Yellowstone National Park in 1999. Of visitors entering the Park, 14% enter through the north entrance and 4% enter through the northeast entrance.

Table 8: 1999 Visitors Entering Yellowstone National Park

MODE OF TRANSPORTATION	Recreational	All Including Non-Recreational
North Entrance	548,331	557,172
Northeast Entrance	172,172	175,194
Total	3,131,384	4,123,664

At this time, quantifying potential benefits based on reduced delay times at Park gates is difficult because of the lack of information on current delay times, peak hour traffic volumes, and potential market penetration. It can be assumed that an AVI system may reduce the staffing requirements at the Park gates because of fewer vehicles requiring staff time to check passes, sell passes and provide Park information. However, there may actually be a shift in staffing, as the AVI system will require staff time. It is difficult to say at this point what overall affect this system will have on staff requirements at Park gates.

The contact person for this project is John Sacklin, Yellowstone National Park (307) 344-2020

SHORT TERM CANDIDATE PROJECTS

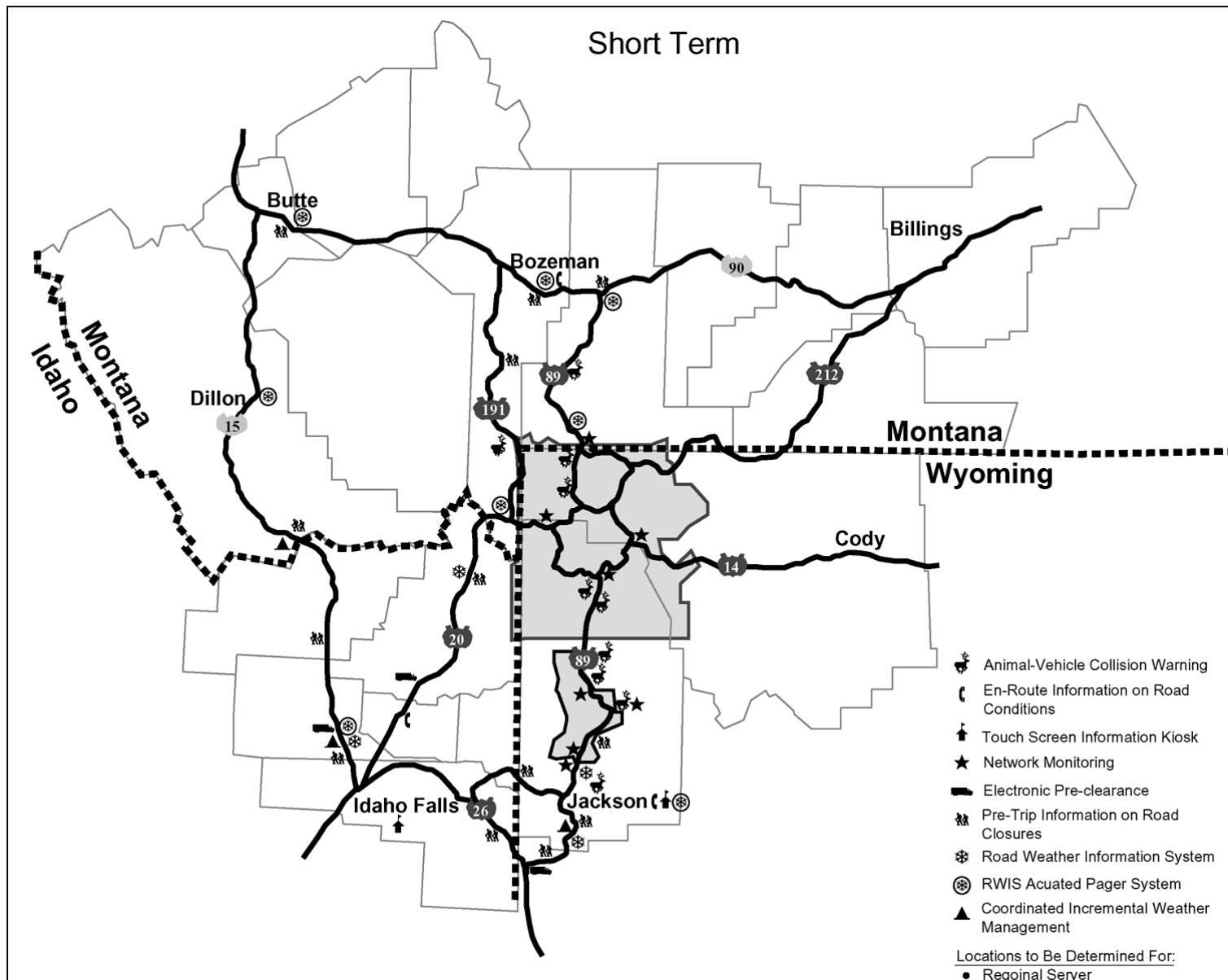|	Project
Current	Touch Screen Information Kiosks
	Dynamic Warning Variable Message Signs
	Incident Management Plan
	Automated Vehicle Identification / Smart Card
Short Term	Animal-Vehicle Collision Warning System
	Electronic Pre-clearance / AVI
	Network Monitoring
	New RWIS Sites
	Pre-trip Information on Road Closures
	Regional Server
	RWIS-Activated Pager System
	Coordinated Inclement Weather Management for Mountain Passes
	En-Route Information on Road Closures and Conditions
Long Term	Enhanced Emergency-911 Service
	Parking Management System
	Probe Vehicle Instrumentation
	Portable Mayday Notification System
	Rural Coordinate Addressing
	Rural Emergency Management Center
	Coordinated Transit Shuttle Service to Recreational Destinations

Figure 10: Potential Locations of Short Term Projects

Animal-Vehicle Collision Warning System

This project will include the implementation of a system that will provide advance warning and notification of animal presence on or near the roadway through the use of an electronic barrier fence (sensing technology). The system will provide detection of animal encroachments in areas of high migration routes/habitat areas and transmit a signal to an upstream dynamic signal or sign, thereby providing advanced warning to the driver.

Proposed Project Locations

Potential locations were selected based on data of animal-vehicle collisions. These locations are often in areas of high migration routes or habitat areas. Locations are areas where high numbers of animal-vehicle collisions have occurred. Possible locations are:

- Highway 89:   North of Gardiner (4sites),

                       North of Jackson (3 sites in Grand Teton National Park),

- Snake River Canyon (exact locations to be determined)

- Gallatin Canyon (exact locations to be determined)

Proposed Agency Roles

- **MT/WY/ID Department of Transportation**: may assist with the pre-construction, construction, and operational duties such as preparing the bid package, letting the project, and monitoring construction activities. Maintenance of the system would also be the responsibility of the state DOT where they reside.

- **Grand Teton National Park:** may assist with the pre-construction, construction, and operational duties such as preparing the bid package, letting the project, and monitoring construction activities. It would also be the responsibility of the Park to maintain the units located within their jurisdiction.

- **Western Transportation Institute:** WTI will coordinate pre-construction activities such as developing plans, specifications and estimates, developing environmental impact statements. Where State Departments of Transportation are unwilling or unable to complete pre-construction, construction, and operational activities, WTI will complete them in-house or hire a consultant, as appropriate, within available funding limits.

Estimated Cost and Potential Benefits

Several vendors have developed an animal-vehicle warning system such as the prototype developed by Frasier & Halbe Engineering Company in Colorado, which costs roughly $230,000 (5). For further information, contact Lyman H. Frasier at (303) 375-1608.

A system has been installed in Nugget Canyon, Wyoming (US 30 between Kemmerer and Cokeville) called Flashing Light Animal Sensing Host (FLASH).

It has been estimated that roughly 15% of accidents on rural roads can be attributed to animal-vehicle interaction. The benefits of this project would be to, reduce the number and severity of animal-vehicle accidents, and safeguard animals whose habitats are divided by highways. The benefits of the project may be readily attained. The change in animal-vehicle related crashes may be quantified using standard crash data.

For further information on the FLASH system contact Kevin Powell, Wyoming Department of Transportation at (307) 777-3997.

Electronic Pre-clearance/AVI

This project includes automation, or semi-automation of ports-of-entry through implementing pre-clearance systems at selected sites. This project may be done in accordance to existing and planned HELP/Pre-PASS sites, or other similar programs.

Proposed project Locations

This project would include existing ports-of-entry within the GYRITS area. Other weight stations may be included. Some possible project locations are:

- Butte, MT (planned Prepass site)

- Lima, MT (current Prepass site)

- Sage Junction, ID

- Alpine, WY

- Potential Joint Port of Entry (POE) at Henry's Lake, ID

Proposed Agency Roles

- **MT/ID/WY Department of Transportation:** The DOT will coordinate pre-construction, construction, and operational activities with HELP, Inc.

- **HELP, Inc.:** Help Inc. will serve as the design build contractor for the project. Their responsibilities include, design of automated pre-pass functions, both hardware and software; assistance with integration to existing or proposed WIM sites; and complete construction of pre-pass project, including all necessary pre-construction, construction, and operational permits and documentation.

Estimated Cost and Potential Benefits

This project will have an initial deployment cost of approximately $800,000 per site. This figure includes all costs associated with the design, construction, and deployment. The operation and maintenance annual cost will be $12,000 per site (6).

It has been estimated that every minute a truck sits at a weigh station the trucker loses $1. The pre-clearance project will benefit the GYRITS Project by decreasing the time truck drivers and their cargo spends at weigh stations, thus increasing the efficiency of commercial vehicle operations. Additionally, motor carrier enforcement agencies may be able to better utilize their resources to provide better customer service.

For further information on the Prepass System contact HELP Inc. at (800) PRE-PASS.

Network Monitoring

This project will implement traffic detection at critical junctions to help determine traffic flows and level or service on National Park roadways. Traffic monitoring devices will be located where communications infrastructure exists, and will help to improve operations and management of traffic within the National Parks. These devices may potentially record traffic volume, vehicle class, and/or vehicle speed. These devises could possibly assist Park personnel in routing traffic around congested areas. It may be possible for this project to utilize the AVI at Park Entrances. An AVI reader could collect origin destination information for those vehicles participating in the program.

Proposed project Locations

This project would be implemented in key transportation intersections within the National Parks. Some possible project locations include:

- Mammoth (YNP);

- Tower Falls Madison (YNP);

- West Thumb (YNP);

- Lake (YNP);

- Jackson Lake Junction (GTNP);

- Moran Entrance Station (GTNP);

- Moose Visitor Center (GTNP); and

- Gros Ventre Junction (GTNP).

Proposed Agency Roles

- **Yellowstone National Park and Grand Teton National Park:** The Parks would install and maintain the detection devices. Each Park would monitor the system for incident detection and congestion and gather and utilize the data in planning activities.

Estimated Cost and Potential Benefits

This system has been deployed in several urban areas around the United States. Average cost is shown is estimated at $44,000 with an annual operations cost of $5,200. The cost shown assumes the project would utilize existing communications infrastructure and computers at Park headquarters. (3)

Network monitoring has the following potential benefits:

- information dissemination to Park visitors concerning traffic delays and travel times;

- allow Park officials to more efficiently manage traffic by routing visitors around problem

areas; and

- increase traffic data for planning applications.

New RWIS Sites

This project involves installing and integrating new remote weather and road surface monitoring sites at critical locations. These sites will improve coverage of existing monitoring systems and provide information for other ITS applications such as advanced weather modeling and forecasting.

Proposed project Locations

Some critical locations as defined by the selection process include:

- Island Park, ID

- North of Idaho Falls, ID

- Snake River Canyon, WY

- North of Jackson, WY

Proposed Agency Roles

- **Idaho and Wyoming Transportation Department:** The DOT would be responsible for installing and maintaining the RWIS sites.

Estimated Cost and Potential Benefits

A new RWIS site has an initial cost of $75,000. The annual operations and maintenance cost for each site is roughly $2,000 (3). These costs vary based on the infrastructure available (power and communication) and the features of the RWIS site needed.

New RWIS sites would allow officials to:

- use real time road information to increase efficiency of maintenance operations;

- disseminate road condition information to the traveling public; and

- provide a source of road condition data for planning utilization.

Pre-Trip Information on Road Closures and Conditions

This project would implement a pre-trip information system for areas of common inclement weather. Information regarding road and weather conditions including road closures would be the primary focus of the system. The system could utilize FM side band, Internet, and cable TV as its media. One of the most promising elements of this project could include a dedicated television channel showing current images of closed circuit television cameras (CCTV).

Proposed project Locations

The location of this project would initially focus on Teton Pass, however, other areas may be applicable including:

- Bozeman Pass: Interstate 90 between Bozeman and Livingston

- Interstate 90 from west Livingston interchange to east Livingston interchange

- Gallatin Canyon: Highway 191 from Four Corners to West Yellowstone

- Monida Pass: Interstate 15 at Idaho Border

- Homestake Pass: Interstate 90 east of Butte

- Interstate 15 between Idaho Falls and Roberts

- Monida Pass: Interstate 15 between Dubois and Montana State Line

- Highway 20 between Ashton and West Yellowstone

- Highway 26 between Swan Valley or Palisade and Alpine Junction

- Highway 89 between Alpine Junction and Hoback Junction

- Highway 89 between Hoback Junction and Jackson

- Teton Pass: Highway 22 west of Jackson

- Highway 89 north of Moose

The locations listed above represent potential routes for which data will be made available (i.e., locations of CCTV). However, information delivery, such as cable television channel will be spread much further.

Proposed Agency Roles

- **Wyoming Department of Transportation:** As Teton Pass is located within Wyoming, WYDOT would be responsible for operating and maintaining weather monitoring equipment such as closed circuit television cameras. Additionally WYDOT would provide updates to the pre-trip information pipelines regarding road closures.

- **Montana and Idaho Transportation Department:** ITD/MDT will receive information concerning the pass and activate appropriate traveler information systems and update their webpages and other pre-trip information dissemination.

- **Cable Companies:** Supply local cable channel to serve as traveler information channel.

Estimated Cost and Potential Benefits

Although not specifically defined this system could consist of several possible alternatives. A broadcast fax service could instantly disseminate information to the media and involved agencies. A dedicated cable channel could be developed that would cycle through current images of specific roadways. The costs of a dedicated cable channel is negligible if there are a sufficient number of cameras available. The only cost to the state is formatting and sending the images to the cable provider. The cable provide will take care of all costs associated with providing the channel. For an example of a pre-trip information webpage refer to www.tripcheck.com, which fuses information from a variety of sources into a user-friendly source of information. Potential costs for these potential elements are listed in Table 9.

Table 9. Pre-Trip Information Costs (3), (7)

Infrastructure Element	Capitol Cost	O & M Costs
Broadcast fax	$250	$0.25 per minute
CCTV	$5, 000	$90
Dedicated Cable Channel	$10,000	Includes O&M of CCTV
Webpage Development	$50,000 equipment 2040 hours development	Half time webmaster

Pre-trip information on Teton Pass would benefit the GYRITS Project by providing the visitors and area residents with accurate road information. This service may increase the safety of the pass and provide increased service to the travelers.

For information on weather information broadcast fax contact Michele Kayen, Colorado Department of Transportation (303) 239-5808.

For information on a dedicated cable channel for CCTV images contact Dave Neys, Oregon Department of Transportation (541) 388-6220.

For information on the TripCheck webpage project contact Chuck Larson, Oregon Department of Transportation (503) 986-3676.

Regional Server

This project will be to develop a Regional Server to provide a central point for coordination between agencies. It would enable interagency coordination, control of information, and increased communication between agencies. Information managed by the server could include:

- weather and road reports,

- CCTV images,

- current traffic volumes,

- road closures and incidents, and

- planned construction activities.

Proposed project Locations

The Regional Server(s) should be located at an existing Department of Transportation district or headquarter office.

Proposed Agency Roles

- **Yellowstone National Park and Grand Teton National Park:** Both Parks would have the ability to send and receive information to and from the Regional Server.

- **MT/ID/WY Department of Transportation:** One or all of the state DOT's would be responsible for operating and maintaining the server. All state DOT's would be able to access and update information on the server.

- **Montana/Wyoming Highway Patrol and Idaho State Police:** The state police would be connected to the server. Information would be sent to and received from the server.

Estimated Cost and Potential Benefits

Costs are dependent on the specific configuration of several available options. Potential costs are shown in Table 10.

Table 10. Costs Data for Regional Server (3)

Component	Capital Cost ($K)	O & M ($K/yr.)
Hardware	45.0	0.9
Software	412.5	20.6
Integration	100.0	0.0
Labor	0.0	212.5
Totals:	557.5	234.0

This project is one of the keystones to achieving the goals of the GYRITS Project. A regional server would benefit the project by:

- increasing communication between agencies;

- providing a central point for coordination of interagency activities; and

- allowing for control of sensitive information throughout the area.

RWIS-Activated Pager System

This project will involve installing software that will monitor existing RWIS sites and either page, or e-mail maintenance personnel when inclement weather exists.

Proposed project Locations

This system would be implemented in areas where RWIS sites already exist. Sites which could be served by this project include:

- Bozeman, MT

- Corwin Springs, MT

- Livingston, MT

- Butte, MT

- Dillon, MT

- West Yellowstone, MT

- Idaho Falls, ID

- Jackson, WY

Proposed Agency Roles

- **MT/ID/WY Department of Transportation:** It would be the responsibility of the DOT to equip and train all personnel involved with the project.

- **Private Vendors:** The private vendor would develop the necessary hardware and software for the project. They may also be retained as a temporary service and maintenance provider.

- **National Oceanic & Atmospheric Administration (NOAH):** NOAH would facilitate information dissemination from its recording stations to the necessary server.

Estimated Cost and Potential Benefits

The costs would involve installing an auto-dialer in the existing control cabinet of the existing RWIS site(s). Although the cost is expected to be minimal, the researcher could find no cost data at this time.

This project will allow maintenance personnel to respond more quickly to snow removal and potential road closure activities. The RWIS sites within the area may also be utilized more effectively since maintenance personnel would be alerted if a site malfunctioned.

Coordinated Inclement Weather Management for Mountainous Areas

This project will encompass the expansion of the Safe Passage project on Bozeman Pass (See Legacy Systems) to other passes in the area. This project will integrate RWIS, HAR, and VMS, and automated gate closures to inform travelers of chain requirements, road and weather conditions, and enable efficient road closures. The use of a traffic management center is beneficial. This project will be similar to the SAFE-PASSAGE project being deployed by the Montana Department of Transportation and the Western Transportation Institute.

Proposed project Locations

Due to frequent and inefficient road closures, this project is increasingly valuable in mountain passes and canyons. Some possible locations for this project include:

- Monida Pass

- Idaho Falls North

- Snake River Canyon

Proposed Agency Roles

- **Montana Department of Transportation:** The Montana Department of Transportation will own and operate the system.

- **Western Transportation Institute:** WTI is developing the weather/pavement conditions forecasting model and coordinating the development and evaluation of the project.

- Additionally the following agencies will coordinate in the sharing of information; the highway patrol, county road departments, local police, sheriff, fire departments, towing, media, chambers of commerce, disaster and emergency services and Yellowstone National Park.

Estimated Cost and Potential Benefits

Based on the Safe Passage project near Bozeman Pass, the cost of installing new devices, and integrating existing systems is expected to be in the range of $300,000 - $800,000 (8). Costs vary with the scope and extent of the project.

This project will benefit the GYRITS effort by increasing the communication lines between highway agencies and the traveling public. By informing the public they can make travel decisions before approaching areas of inclement weather. This project will also increase the coordination between state DOT's and state police when closing a roadway.

En-Route Information on Road Closures and Conditions

This system would provide real-time and forecasted road and weather information to the driver while en-route. This system could consist of several different elements. First existing road conditions would be collected and formatted for use in the automated system. Existing methods of collection road conditions information should be utilized. Second a weather and pavements model would be developed and utilized to predict conditions for the next 24-hour period. This model could utilize inputs from existing RWIS sites. Third a dedicated cellular phone number would be dedicated and signed for. Motorists could use this phone number to call an automated phone menu and access the information on predicted and existing conditions for the specific section of roadway that they are travelling.

Proposed Project Locations

This project will be deployed incrementally on an area-wide basis starting with regional automated phone service where most appropriate, potentially at:

- Bozeman, MT;

- Rigby, ID; and

- Jackson, WY.

Proposed Agency Roles

- **State DOT's** would be responsible for collecting existing road conditions and supplying this data to the weather information center. Additionally any installation of static signing of the phone number would be the responsibility of the state.

- **A Regional Weather Information Center (RWIC)** would be developed to manage the information, automated phone system and weather models. This system could be managed by a partner agency or as an extension of the #SAFE Advanced Traveler Information System developed by the University of North Dakota.

- **Cellular telephone providers** will designate the specified number.

Estimated Cost and Potential Benefits

Costs may vary depending on the number of road miles and other factors. An entire state may be able to be equipped for $125,000 (9).

This project will improve traveler information available. Additionally, more informed travelers may make better travel decisions in inclement weather which may lead to a reduction in weather related crashes and stranded motorists.

For further information on the #SAFE Advanced Traveler Information System contact Mark Owens at (701) 777-6519.

LONG TERM CANDIDATE PROJECTS

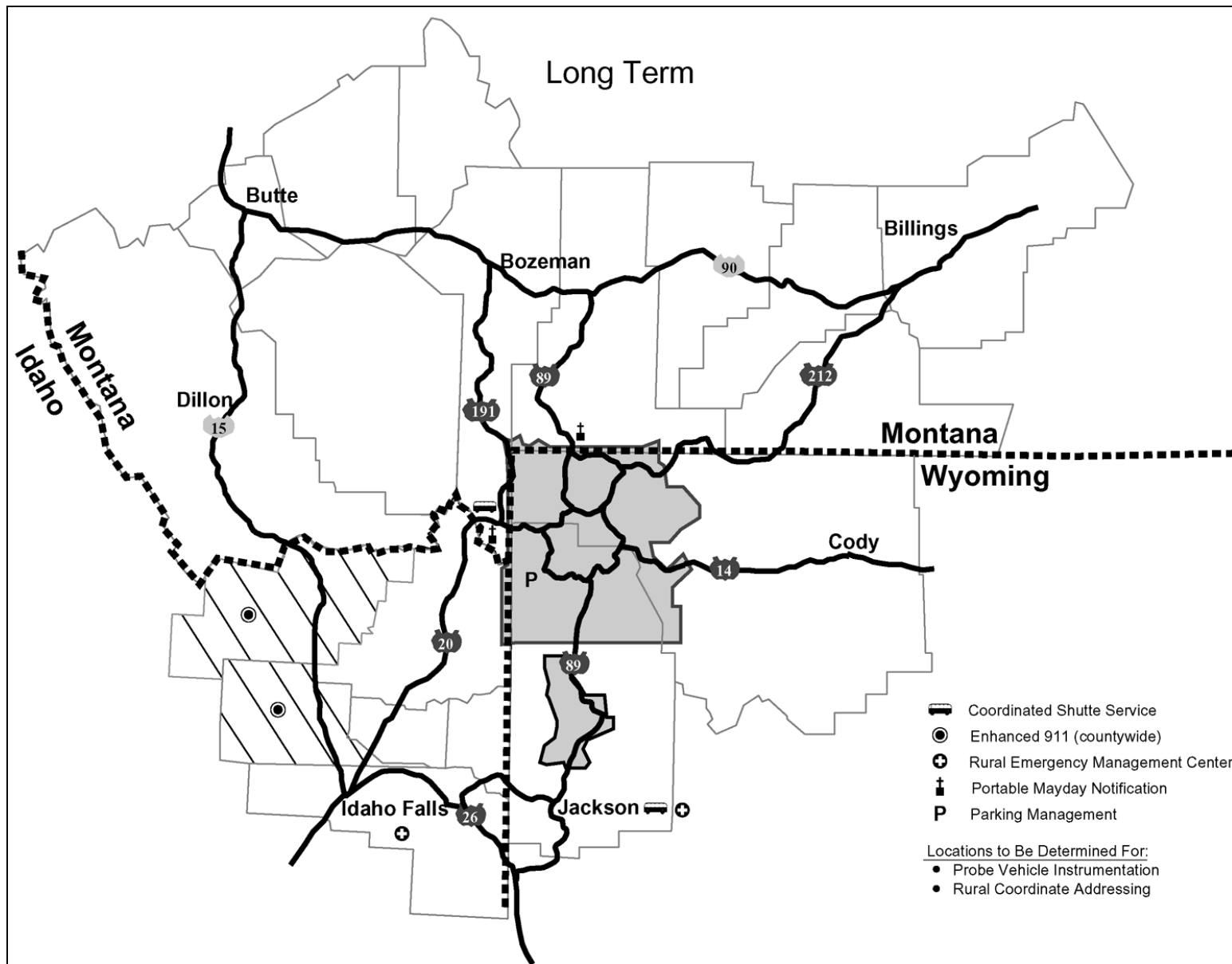|	Project
Current	Touch Screen Information Kiosks
	Dynamic Warning Variable Message Signs
	Incident Management Plan
	Automated Vehicle Identification / Smart Card
Short Term	Animal-Vehicle Collision Warning System
	Electronic Pre-clearance / AVI
	Network Monitoring
	New RWIS Sites
	Pre-trip Information on Road Closures
	Regional Server
	RWIS-Activated Pager System
	Coordinated Inclement Weather Management for Mountain Passes
	En-Route Information on Road Closures and Conditions
Long Term	Enhanced Emergency-911 Service
	Parking Management System
	Probe Vehicle Instrumentation
	Portable Mayday Notification System
	Rural Coordinate Addressing
	Rural Emergency Management Center
	Coordinated Transit Shuttle Service to Recreational Destinations

Figure 11: Potential Locations of Long Term Projects

Enhanced Emergency-911 Service

This project would involve the installation of equipment at existing cell towers allowing the geo-location of cellular telephone signals. This will allow correct routing of 911 calls to appropriate response centers, and allow emergency responders to geo-locate the signal to improve response.

Proposed project Locations

The project could be instituted in any county within the area. The effort must evolve in conjunction with statewide plans for enhanced 911. Based on notification and response times, Interstate 15 near the Idaho/Montana Border would be a beneficial area.

Proposed Agency Roles

- **Montana/Wyoming Highway Patrol, Idaho State Police and Ambulance:** It would be the responsibility of emergency responders to ensure the geo-locations would be usable to the responding officer. This would likely include training officers and upgrading their on-board equipment to accept and process geo-location information.

- **Local Sheriff Departments, Local Police, and Emergency Responders:** Similar to the state police, the local emergency response agencies must ensure that geo-locations would be usable to the responding personnel. Additionally the Public Safety Answering Point (PSAP) would have to be equipped to handle the 911 calls from these cell towers.

- **Cellular Service Provider:** Phone providers would have to be an active participant in this project by allowing equipment to be added to their towers and in routing the calls. Additionally, they may be able to share some of the cost.

Estimated Cost and Potential Benefits

The cost of this project is separated into communication costs and equipment costs. The communication costs cover the voice and data line charges which is dependant on the number of telephone subscribers in the area. The equipment costs cover the actual 911 stations. Equipment costs are approximately $45,000 per station (10).

This project will benefit the project by decreasing the response time to accidents on Interstate 15 near the Idaho / Montana Border. This decrease in response time may decrease the severity of injuries by allowing emergency services to arrive sooner.

For information on enhanced 911 development in Gallatin County contact Jenny Hanson, Gallatin County 911 Coordinator, (406) 582-2092.

Parking Management System

This project would implement a system that would enable automated management of selected parking facilities, campgrounds, and major attractions through the use of automated gates and possibly AVI tags and readers. The system may allow only vehicles with the tags to enter and/or use facilities. The system would automatically close parking areas that have reached their maximum parking capacity. Additionally, information could be given to the motorist regarding congested areas. The system should be utilized in conjunction with travel demand management alternatives in high visitation areas.

Proposed project Locations

This project is focused on the two National Parks within the GYRITS Project. Places within the Parks which have severe parking problems are possible locations for the project, including:

- Old Faithful

- Large campgrounds and parking area within the National Parks

Proposed Agency Roles

- **Yellowstone National Park and Grand Teton National Park:** The Park would be responsible for installing, operating, and maintaining any components of the project.   Some of these responsibilities may be handled by the contractor/vendor, which may design the system.

Estimated Cost and Potential Benefits

The researcher could find no specific cost data for this system. However, as an estimate a equipped parking area could utilize the following elements:

- 8 inductive loops $10,000

- 3 roadside message signs $200,000

- lane control gates $125,000

- total $335,000

During peak tourist seasons, National Parks can encounter heavy parking problems. This project will attempt to relieve such congestion by managing existing parking facilities more effectively. With this technology in place visitors would be directed to parking lots with parking spaces available and would spend less time searching for parking. In addition, parking spaces reserved for Park employees would be reserved automatically, thus increasing their ability to provide service to park patrons.

Probe Vehicle Instrumentation

This project involves instrumentation of vehicle fleets to measure air temperature, surface temperature, precipitation, travel time and other environmental factors. This information can either be relayed to a central location, or stored and downloaded at a central location for further analysis.

Proposed project Locations

The initial locations of this project would be restricted to existing vehicle fleets including DOT maintenance vehicles, highway patrol, etc. Other vehicle fleets could be added subsequently if it is deemed necessary.

Proposed Agency Roles

- **MT/ID/WY Department of Transportation:** The DOT would be required to equip its vehicles with the appropriate equipment. They would also be responsible for relaying and storing the information.

Estimated Cost and Potential Benefits

The research and development of probe vehicles has been completed by the Idaho National Environmental and Engineering Laboratory, and is available for use at no cost. The equipment costs of this project will depend on how many vehicles are equipped with the probe sensors. However, an average cost of $4,000 per vehicle can be expected (11).

Accurate, real time road condition information would benefit the project by:

- allowing snow removal resources to be allocated more efficiently,

- informing travelers about road conditions in the specific area they are interested in, and

- providing more complete road weather data for future planning applications.

For more information on the probe vehicles developed at INEEL contact Basil Barna, (208) 526-0690.

Portable Mayday Notification System

This project would involve the development of a portable device that would be made available for winter travelers in Yellowstone National Park during the snowmobile season. There may also be potential for use in rental car fleets. The device would enable geo-location of the traveler in case of emergency.

Proposed project Locations

This project relies on the availability of transmitters near Yellowstone National Park. Therefore the project should be based in the areas near the Park where most winter users enter the Park. Possible locations include Mammoth and West Yellowstone.

Proposed Agency Roles

- **Yellowstone National Park:** The Park would be responsible for installing and maintaining the communications devices required to receive signals from the Mayday units. The emergency personnel in Yellowstone would receive and respond to Mayday signals.

- **Cellular Service Provider:** Cellular providers will assist in ensuring the proper cellular/radio infrastructure is in place to operate the system in the Park. They will also ensure that Mayday signals are transferred to the proper center.

- **Private Vendor:** A private vendor, to be chosen at a later date will design, manufacture, and distribute the actual Mayday devises. They would also assist the Park in acquiring the technology necessary to operate the system.

- **Snowmobile rental fleets:** Rental agents serving Yellowstone will provide the Mayday devices with the snowmobiles to be rented. They would also sell or rent the devices to those owning their own snowmobile.

Estimated Cost and Potential Benefits

Systems similar to this project are currently available from most major automobile manufactures. The system cost an average of $700 (12). A typical system has service provider cost of $200 annually. These systems are currently available and cost should drop as their prevalence increases. For further information contact the General Motors Onstar program at (800) ONSTAR-7. It should be noted that these devices are installed in the vehicle and an after-market device should be used for this project.

This project would lead to an increase in the safety of winter visitors to Yellowstone who become stranded or are involved in an accident. Vehicles equipped with this technology would experience lower emergency notification and response times. This difference may mean saved lives and less sever injuries.

Rural Coordinate Addressing

This project will implement a GPS/GIS compatible rural addressing system to help emergency response and enforcement personnel locate rural residences and businesses.

Proposed project Locations

Any county within the study area is appropriate for this project. This effort should be coordinated with existing similar State and County efforts.

Proposed Agency Roles

- **Emergency Responders:** Highway patrol, ambulance, and fire departments must ensure the coordinate information would be usable to the responding personnel. This would likely include training of personnel in the system.

- **Local Sheriff Departments:** Similar to the other agencies, sheriffs must ensure the addressing would be usable to the responding personnel. Additionally the Public Safety Answering Point (PSAP) would have to be equipped with the addressing database and software.

Estimated Cost and Potential Benefits

This technology is being implemented currently by some counties within the area. Therefore costs associated with this project will be lower. The cost is figured on a per county basis, at $50,000 per county (10).

This project will decrease both emergency response times and police response times to emergencies. These changes may make the services provided by emergency and law-enforcement agencies more effective.

For more information on rural coordinate addressing efforts in Montana contact Jenny Hanson, Gallatin County 911- Coordinator, (406) 582-2092.

Rural Emergency Management Center

This project will provide a central point for emergency management, response, and coordination within the region.

Proposed project Locations

The location of this project should be located within existing PSAP's, highway patrol dispatchers, or other emergency response headquarters.

Proposed Agency Roles

- **Idaho Transportation Department and Wyoming Department of Transportation:** These DOT's would assist with incident management response when needed.

- **Wyoming Highway Patrol and Idaho State Police:** The state police would coordinate all activities related to this project.

- **Idaho and Wyoming Emergency Response Agencies:** Emergency response agencies including fire, ambulance, etc. would train staff and provide staff to the center should the incident require that agency's involvement.

Estimated Cost and Potential Benefits

Costs for the center are based on initial capital cost and annual operations and maintenance costs. A break down of the costs for the center is tabulated in Table 11. If an existing facility can be used for this project, the building cost (basic facilities as shown in Table 11) does not apply.

Table 11. Cost Data for Rural Emergency Management Center (3)

Component	Capital Cost ($K)	O & M Cost ($K/yr.)
Basic Facilities	2800	410
Response Center Labor	0	107.5
Software & Hardware	282.5	8.3

A rural emergency management center may create a safer environment for rural residents of the GYRITS Project area. The coordination of agencies will lead to more efficient use of emergency response resources.

Coordinated Transit Shuttle Service to Recreational Destinations

This project would provide shuttle service between communities and common recreational destinations such as service into Yellowstone National Park from West Yellowstone, Montana. This project would not fund a separate transit service but rather coordinate efforts and provide incentives for involvement in the service. Potential groups that may pool resources to provide shuttle service include; hotels/motels, cities and counties, Yellowstone National Park, ski resorts, retirement homes, and tour companies.

Proposed project Locations

Areas where congestion occurs from visitors to recreational destinations including

- West Yellowstone into Yellowstone National Park, and

- into Jackson, Wyoming from satellite communities including Victor and Driggs, Idaho.

Proposed Agency Roles

- **Yellowstone National Park:** The Park would make arrangements for advanced entry fee payment with the Transit provider.

- **Partner Agencies:** Agencies involved in the shuttle service would advertise and promote the shuttle services and provide funding, vehicles or drivers.

Estimated Cost and Potential Benefits

An example of a software program used to aid dispatchers in coordinating rides more efficiently is titled "Rides Unlimited". The cost of this system depends heavily on the size of the system, number of dispatchers integrated, training required, etc., but can range from $10,000 to $200,000. (13)

The utilization of a computer aided dispatch system for transit in Sweetwater County, Wyoming has increased its ridership from 5,000 to 9,000 without an increase in dispatching staff while reducing its cost per ride by 50% over a five-year period. (14)

This project would decrease the number of vehicles operating in Yellowstone Park and other areas which may benefit the project by:

- decreasing the number of motor vehicle accidents,

- reduce congestion and delay,

- reduce pollution caused by the large number of vehicles, and

- create a safer environment for the wildlife of the Park by reducing animal-vehicle collisions.

For further information on Rides Unlimited contact Todd Schoenrock, Community Transit – Delaware County at (610) 490-3960.

REFERENCES

1.   US Department of Transportation *TEA21 A Summary* [http://www.fhwa.dot.gov/tea21/index.htm] 1998

2.   Ruby Mountain Inc. *Greater Yellowstone/Teton Clean Cities Coalition Market Development and Action Plan.* October 1999

3.   United States Department of Transportation's Joint Program Office for Intelligent Transportation Systems, *ITS Cost Elements*. [http://www.mitretek.org/its/BeneCost.nsf/images/Reports/$File/costelements.xls]. 1999

4.   *Greater Yellowstone Rural ITS Corridor Task 9: Preliminary Project Identification and Evaluation.* Western Transportation Institute, Bozeman, MT, March 1998.

5.   Frasier, Lyman, Frasier & Halbe Engineering Company [memo], 1998

6.   Castle Rock Consultants, Western Transportation Institute, Advanced Technologies Applications Associates, *Montana ITS Strategic Plan.* Montana Department of Transportation, June 1999.

7.   Larsen, Chuck, *State Advanced Travelers Information System: Opportunity Evaluation*, Oregon Department of Transportation 1995

8.   Mounce, John, Western Transportation Institute, Bozeman, MT [interview], 2000.

9.   *Remote Weather Information Center, University of North Dakota,* #SAFE Advanced Traveler Information System Brochure

10.   Latham, Surry, State of Montana, 911-Coordinator [phone interview] (406)-444-2700, 1999.

11.   Barna, Basil, Idaho National Engineering and Environmental Laboratory [phone interview] (208)-526-0690, 1999.

12.   General Motors, OnStar Program [phone interview] (800)-667-8277, 1999.

13.   Schoenrock, Todd, Community Transit Delaware County [phone interview] (610)-490-3960, 2000

14.   Cases, Robert, Volpe Transportation Center *Benefits of ITS Technology for Rural Transit.* Proceedings for the 1996 Rural ITS Conference Spokane, WA. 1996

Appendix A

Summary of Project Locations

Table A-1: Summary of Locations for Legacy Systems

Phase	Project	Lead Agency	Location
Legacy	HAR	ITD	Idaho Falls
Legacy	HAR	ITD	Idaho Falls
Legacy	HAR	MDT	I-90 Bozeman Pass
Legacy	HAR	MDT	I-90 Bozeman Pass
Legacy	HAR	MDT	I-90 Bozeman Pass
Legacy	HAR	WDOT	U.S. 89 Jackson
Legacy	HAR	WDOT	U.S. 89 Jackson
Legacy	HAR	YNP	Old Faithful
Legacy	HAR	YNP	Mammoth
Legacy	HAR	YNP	Madison Junction
Legacy	HAR	YNP	South Entrance
Legacy	Kiosk	Travel MT	
Legacy	Kiosk	Travel MT	
Legacy	Kiosk	Travel MT	
Legacy	Kiosk	Travel MT	
Legacy	Kiosk	Travel MT	
Legacy	Kiosk	Travel MT	
Legacy	Kiosk	Travel MT	
Legacy	Prepass	MDT	I-15 Lima
Legacy	Prepass	MDT	I-90 Jct. I-15
Legacy	RWIS	ITD	I-15 near Idaho Falls, ID
Legacy	RWIS	MDT	I-90 east of Bozeman, MT
Legacy	RWIS	MDT	U.S. 89 near Corwin Springs, MT
Legacy	RWIS	MDT	I-90 west of Livingston, MT
Legacy	RWIS	MDT	I-90 west of Butte, MT
Legacy	RWIS	MDT	I-15 near Dillon, MT
Legacy	RWIS	MDT	U.S. 191 near West Yellowstone, MT
Legacy	RWIS	WDOT	I-15 near Jackson, WY
Legacy	SAFE	MDT	I-90 Bozeman Pass
Legacy	VMS	ITD	I-15 Dubois
Legacy	VMS	WDOT	U.S. 89 Jackson
Legacy	VMS	WDOT	U.S. 89 Jackson
Legacy	WIM	MDT	U.S. 191 Gallatin Canyon
Legacy	WIM	MDT	U.S. 191 Gallatin Canyon
Legacy	WIM	MDT	I-90 Three Forks
Legacy	WIM	MDT	I-15 Lima
Legacy	WIM	MDT	I-15 Butte

Table A-2: Summary of Locations for Current GYRITS Projects

Phase	Project	Lead Agency	Location	Cost**
Current	AVI	YNP	North Entrance	$150
Current	AVI	YNP	Northeast Entrance	$150
Current	DWS	ITD	I-15 Monida Pass	$110
Current	DWS	MDT	U.S. 191 Gallatin Canyon	$110
Current	DWS	WDOT	WY-22 Teton Pass	$110
Current	IM Plan	Several	Corridor Wide	$100
Current	Kiosk	Travel MT	Belgrade Airport	$10*
Current	Kiosk	Travel MT	Big Sky Convenience Store	$10*
Current	Kiosk	Travel MT	Bozeman Museum of the Rockies	$10*
Current	Kiosk	Travel MT	Bozeman Visitor Information Center	$10*
Current	Kiosk	Travel MT	Butte Rocker Convenience Store	$10*
Current	Kiosk	Travel MT	Butte Visitor Information Center	$10*
Current	Kiosk	Travel MT	Columbus Town Pump	$10*
Current	Kiosk	Travel MT	Dillon Visitor Information Center	$10*
Current	Kiosk	Travel MT	Ennis Convenience Store	$10*
Current	Kiosk	Travel MT	Four Corners Convenience Store	$10*
Current	Kiosk	Travel MT	Gardiner Convenience Store	$10*
Current	Kiosk	Travel MT	Livingston Visitor Information Center	$10*
Current	Kiosk	Travel MT	Quake Lake Visitor Center	$10*
Current	Kiosk	Travel MT	Red Lodge	$10*
Current	Kiosk	Travel MT	Three Forks Wheat Montana	$10*
Current	Kiosk	Travel MT	Virginia City	$10*
Current	Kiosk	Travel MT	West Yellowstone Visitor Center	$10*
Current	Kiosk	Travel MT / YNP	Mammoth	$10*
Current	Kiosk	Travel MT / YNP	Old Faithful	$10*
Current	Kiosk	Travel MT / YNP	Canyon Village	$10*
Current	Kiosk	Travel MT / YNP	West Thumb and Grant Village	$10*

*Kiosks costs are based on the average of a lump sum for all kiosk locations. Reducing the number of locations may increase the unit cost.

**Costs in thousands of dollars and are based on estimates and may vary depending on specific project conditions

Table A-3: Summary of Locations for GYRITS Short-Term Candidate Projects

Phase	Project	Lead Agency	Location	Cost**
Short	Animal	YNP	U.S. 89 North of South Entrance 21 mi.	$230
Short	Animal	YNP	U.S. 89 North of South Entrance 36 mi.	$230
Short	Animal	YNP	U.S. 89 North of South Entrance 79 mi.	$230
Short	Animal	YNP	U.S. 89 North of South Entrance 87 mi.	$230
Short	Animal	WYDOT	U.S. 89 MP 153 North of Jackson	$230
Short	Animal	WTDOT	U.S. 89 MP 185 North of Jackson	$230
Short	Animal	WYDOT	U.S. 89 MP 195 North of Jackson	$230
Short	Animal	WYDOT	U.S. 89 MP 202 North of Jackson	$230
Short	Animal	MDT	U.S. 89 MP 25 North of Gardiner	$230
Short	Animal	MDT	U.S. 191 Gallatin Canyon milepost 28	$230
Short	En-route	ITD	Rigby, ID	$125
Short	En-route	MDT	Bozeman, MT	$125
Short	En-route	WDOT	Jackson, WY	$125
Short	KIOSK	Travel MT / ID DOC	Idaho Falls Visitor Information Center	$10*
Short	KIOSK	Travel MT / WBC	Jackson Chamber of Commerce	$10*
Short	Network Monitoring	GTNP	Jackson Lake Junction	$44
Short	Network Monitoring	GTNP	Moran Entrance Station	$44
Short	Network Monitoring	GTNP	Moose Visitor Center	$44
Short	Network Monitoring	GTNP	Gros Ventre Junction	$44
Short	Network Monitoring	YNP	Mammoth	$44
Short	Network Monitoring	YNP	Tower Falls Madison	$44
Short	Network Monitoring	YNP	West Thumb	$44
Short	Network Monitoring	YNP	Lake	$44
Short	Prepass	ITD	I-15 Sage Junction (jct. with ID 22)	$800
Short	Prepass	ITD / MDT	U.S. 20 Henry's Fork (near St. Anthony)	$800
Short	Prepass	WDOT	U.S. 26/89 Alpine Junction	$800
Short	Pre-Trip	GTNP	U.S. 89 north of Moose	$5
Short	Pre-Trip	ITD	I-15 North of Idaho Falls	$5
Short	Pre-Trip	ITD	I-15 north of Dubois	$5
Short	Pre-Trip	ITD	U.S. 20 Island Park	$5
Short	Pre-Trip	ITD	U.S. 26 east of Swan Valley	$5
Short	Pre-Trip	MDT	I-90 Bozeman Pass	$5
Short	Pre-Trip	MDT	I-90 Livingston	$5
Short	Pre-Trip	MDT	U.S. 191 Gallatin Canyon	$5
Short	Pre-Trip	MDT	I-90 Homestake Pass	$5
Short	Pre-Trip	MDT / ITD	I-15 Monida Pass	$5
Short	Pre-Trip	WDOT	U.S. 89 north of Alpine Junction	$5
Short	Pre-Trip	WDOT	U.S. 89 north of Hoback Junction	$5
Short	Pre-Trip	WDOT	U.S. 22 Teton Pass	$5
Short	Regional Server	ITD / MDT / WDOT	tbd	$600
Short	RWIS	ITD	U.S. 20 near Island Park	$75
Short	RWIS	ITD	I-15 North of Idaho Falls	$75

* Kiosks costs are based on the average of a lump sum for all kiosk locations. Reducing the number of locations may increase the unit cost.

**Costs in thousands of dollars and are based on estimates and may vary depending on specific project conditions.

Table A-3: Summary of Locations for GYRITS Short-Term Candidate Projects (cont.)

Phase	Project	Lead Agency	Location	Cost**
Short	RWIS	WDOT	U.S. 89 Snake River Canyon (south of Hoback)	$75
Short	RWIS	WDOT	U.S. 89 North of Jackson	$75
Short	RWIS Pager	ITD	I-15 near Idaho Falls, ID	TBD
Short	RWIS Pager	MDT	I-90 east of Bozeman, MT	TBD
Short	RWIS Pager	MDT	U.S. 89 near Corwin Springs, MT	TBD
Short	RWIS Pager	MDT	I-90 west of Livingston, MT	TBD
Short	RWIS Pager	MDT	I-90 west of Butte, MT	TBD
Short	RWIS Pager	MDT	I-15 near Dillon, MT	TBD
Short	RWIS Pager	MDT	U.S. 191 near West Yellowstone, MT	TBD
Short	RWIS Pager	WDOT	I-15 near Jackson, WY	TBD
Short	Safe2	ITD	I-15 North of Idaho Falls	$500
Short	Safe2	ITD / MDT	I-15 Monida Pass	$500
Short	Safe2	WDOT	U.S. 89 Snake River Canyon (south of Hoback)	$500

* Kiosks costs are based on the average of a lump sum for all kiosk locations. Reducing the number of locations may increase the unit cost.

**Costs in thousands of dollars and are based on estimates and may vary depending on specific project conditions.

Table A-4: Summary of Locations for GYRITS Long-Term Candidate Projects

Phase	Project	Lead Agency	Location	Cost*
Long-Term	Coordinated Transit	Several	West Yellowstone	$100
Long-Term	Coordinated Transit	Several	Jackson	$100
Long-Term	E911	Sheriff - PSAP	Clark County, ID	$45
Long-Term	E911	Sheriff - PSAP	Jefferson County, ID	$45
Long-Term	Emergency Management	Several	Idaho Falls, ID	$280
Long-Term	Emergency Management	Several	Jackson, WY	$280
Long-Term	Mayday	YNP	Mammoth	$700
Long-Term	Mayday	YNP	West Yellowstone	$700
Long-Term	Parking	YNP	Old Faithful	TBD
Long-Term	Probe	Several	Existing Available Fleets	$4/veh
Long-Term	Rural Addressing	Several	Any County Interested	$50/Co.

*Costs in thousands of dollars and are based on estimates and may vary depending on specific project conditions.

Appendix B

Regional Architecture Document