Anchorage
Regional ITS Architecture

SUMMARY REPORT

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1. INTRODUCTION

1.1 WHAT IS ITS?

The Municipality of Anchorage (MOA) initiated the development of a regional Intelligent Transportation System (ITS) architecture to manage implementation of a range of technologies that will improve transportation within the municipality. ITS is the use of advanced sensor, computer, electronics, and communications technologies and management strategies in an integrated manner to increase the safety and efficiency of the surface transportation system, and its interfaces with other modes. An ITS architecture defines the institutional and technical links necessary to plan, design, implement, operate, and maintain ITS.

Coverage of the MOA Regional ITS Architecture

In 2000, the Alaska Department of Transportation and Public Facilities (ADOT&PF) initiated a similar effort to develop a statewide ITS architecture. The statewide initiative also included the development and implementation of roadway weather information systems (RWIS). As the project progressed, it became clear that the development of ITS initiatives in the Municipality of Anchorage would benefit, not only from the development of the statewide ITS architecture, but also from the development of a regional ITS architecture that specifically focuses on the needs and requirements of traveler and transportation agency needs within the geographic boundaries of the Municipality of Anchorage. The development of the regional ITS for Anchorage serves as a logical extension of the statewide initiative, which focuses primarily on the needs, systems, and integration requirements specific to the region defined by the geographic boundaries of the Municipality of Anchorage.

The Anchorage Intelligent Transportation Systems (ITS) Architecture project was conducted as a series of six steps, each with a separate document. The six documents are:

- User Needs Report
- User Services Report
- ITS Concept of Operations
- Regional ITS Architecture
- ITS Architecture Final Report
- Implementation Plan

The final report for this project incorporates these six documents as chapters. This report summarizes the results of the project and the content of final report.

1.2 NATIONAL ITS ARCHITECTURE CONFORMITY: FINAL FHWA RULE AND FTA POLICY

On January 8, 2001, the United States Department of Transportation (USDOT) released the final Federal Highway Administration (FHWA) rule and Federal Transit Administration (FTA) Policy for applying the National ITS Architecture at the regional level. The rule/policy became effective on April 8th, 2001 and requires regions that have yet to deploy ITS to have a regional ITS Architecture in place four years after the first ITS deployment if the deployment is using National Highway Funds. Regions that currently have ITS in place such as the MOA, are required to have a regional ITS architecture in place by four years after the rule policy became effective (April 8th, 2005).

The rule/policy requires regions (i.e., area in which an ITS Plan is developed and is relevant) including the MOA, to develop ITS projects using a systems engineering approach. A systems engineering approach is simply defined as an approach that considers total life cycle costs and value of a project compared to other alternatives. At minimum the systems engineering approach considers the following:

- Portions of the regional ITS architecture being implemented (or if a regional ITS architecture does not exist, the applicable portions of the National ITS Architecture).
- Participating agencies' roles and responsibilities.
- Requirements definitions.
- Analysis of alternative system configurations and technology options to meet requirements.
- Procurement options.
- Applicable ITS standards and testing procedures.
- Procedures and resources necessary for operations and management of the system.

In addition to the above system engineering requirements, the regional ITS architecture must also include the following:

- A description of the region.
- Participating agencies and other stakeholders.
- An operational concept that identifies the roles and responsibilities of participating agencies and stakeholders in the operation and implementation of the systems included in the regional ITS architecture.
- Any agreements (existing or new) required for operations including, at a minimum, those affecting ITS project interoperability, ITS related standards, and the operation of the projects identified in the regional ITS architecture.
- System functional requirements.
- Interface requirements and information exchanges with planned and existing systems and subsystems (for example, subsystems and architecture flows as defined in the National ITS Architecture).
- ITS standards supporting regional and national interoperability.
- The sequence of projects required for implementation.

The federal ITS requirements identified above apply only to projects using funds from the National Highway Trust Fund including the mass transit account. These include funds from such sources as the National Highway System (NHS) Program, Surface Transportation Program (STP), Congestion Management and Air Quality (CMAQ) Program, and Federal Transit Administration (FTA) program.

The following scenarios illustrate how ITS could work in the Municipality of Anchorage:

Traveler Information Scenario

It's the year 2012 and Steve Lindstrom, Vice President of Operations with the Northwest Frontier Fishing Company out of Seattle, Washington, needs to go to Anchorage in late September on business to meet with local boat operators and discuss upcoming fishing season staffing needs. Steve needs to spend three days in Anchorage—Tuesday, Wednesday, and Thursday—and decides to make hotel and rental car reservations for the trip. On a cool and windy Monday afternoon, Steve flies out of SeaTac Airport for Anchorage. Because he is flying on one of Boeing's new Sonic Cruiser jets, he makes the trip to Anchorage in less than three hours—Wow!

Upon arrival at Anchorage International Airport, he proceeds through baggage check and secures his rental car. Immediately adjacent to the rental car area are a series of five-foot-tall electronic kiosks. These kiosks provide real-time traffic conditions, web-based trip planning for the People Mover transit system, and other traveler information for such items as hotels, restaurants, and destination resorts.

After viewing the real time traffic conditions page, Steve makes his way to the rental car holding lot. The car he reserves has on-board telematics[1] whereby Steve can plot his origin (the airport rental car lot) and destination (the hotel). The system guides him on the quickest path between the two points, and he is able to get from the airport to his hotel without the need of a paper map. The system also comes equipped with an on-board global positioning system (GPS), which can interface with the on-board computer to accurately pinpoint where his car in the greater Anchorage area. This system is tied to a database, which provides audio information about restaurants, retail establishments, recreation sites, and other information. Through this system, he was able to find the location of a restaurant that serves a good steak dinner in downtown Anchorage. Being in the fishing industry for many years, Steve has long grown tired of eating fish.

While en-route to the hotel, Steve encounters a road re-surfacing project that is taking place on Minnesota Drive and local traffic is backed up approximately a quarter of a mile. Luckily, the State DOT has installed a portable dynamic message sign upstream and provided a detour route for through travelers. The system came equipped with the ability to send a traffic alert warning to Steve's screen in his rental car. Steve reaches over and touches the screen and the detour message (with suggested alternative route) comes up both in visual and audio formats. Steve listens to the detour message and through the integration of his onboard GPS, is able to take the audio directions and follow the detour route.

Why is this section of the highway being resurfaced at this time? Data from the recycled asphalt system has informed the state that this section of the state highway needs repair presently to minimize further damage to the roadway and to vehicles. Based on good planning, there is budget to complete the resurfacing at this location prior to the onset of winter. The maintenance project is in its last week and traffic operations should be back to normal by the weekend.

As Steve is unpacking in his hotel room, he monitors the Weather Channel on the television. Weather forecasters are predicting a severe early winter storm to hit Anchorage within the next 12-24 hours. At the State Operations Center at Ft. Richardson, detailed weather information has been provided to the state's roadway weather information system (RWIS). (The RWIS website has been updated with the latest weather report). The following morning, it starts to snow lightly. After he looks out the window to see how the roads are (they're clear), Steve checks the website and determines that he can make it to his first meeting across town by car. Upon returning to the hotel later in the afternoon, it is snowing more heavily and the winds are approaching 20 miles per hour. Steve anguishes about having to drive in this weather.

By the next morning, the storm has taken a turn for the worse. Visibility is minimal due to the blowing snow. The snowplows have already been dispatched but can't keep up with the amount of snow that is falling. Prior to leaving his room for his second day of meetings, he listens to the traffic reports on the radio and the "picture" outside is not good. Traffic on the streets is barely moving and there are a number of reports that cars have stalled or slid off of roads. He turns on to the TV and consults the municipality's traffic channel, which provides continuous real-time images of the highway system via a distributed network of closed circuit television cameras (CCTV).

After viewing the images on the TV and consulting the 5-1-1 web site (511.alaska.gov), he determines that traveling by car is too risky and decides to take the bus to his meeting. He consults the People Mover website and using their Trip Planner tool, is able to determine which bus he needs to take to get to his meeting. Luckily for Steve, a bus stop with a shelter is located just outside the front door of his hotel. It has a reader board that announces when his particular bus will arrive. Looking at the reader board, Steve realizes that the bus won't reach the hotel location for another 15 minutes. He takes the time to order a cup of coffee, pick up a local newspaper, and relax in the warmth of the hotel lobby until the bus arrives.

[1] Telematics is an emerging market of automotive communications technology that combines wireless voice and data to provide location-specific security, information, productivity, and in-vehicle entertainment services to drivers and their passengers.

The buses, which have GPS/automatic vehicle location (AVL) capabilities, can transmit location data and automatic passenger counts, make stop announcements on board the bus, and transmit CCTV images back to the central dispatch center, all in real-time mode. Data from this system has helped People Mover transit system plan better service and reduce operating costs.

The advanced weather information via RWIS provides the municipality public works personnel with information to more effectively stage snow removal operations. The CCTV images are fed back to a central operations center where staff work with public safety and maintenance/operations personnel to respond to incidents caused by the storm. Messages to field operations personnel are dispatched to onboard mobile data terminals (MDTs) installed in their trucks. Preprogrammed message sets help to reduce the need for voice communication channels thereby freeing up more radio channels for emergency personnel (police and fire) where needed.

Systems to track snow and ice have been in place for five years and public works staff is using output reports to support operations. In fact, data gathered from the system has helped the municipality plan ahead and store enough de-icing chemicals to handle a severe winter storm like the one currently taking place in the Anchorage area. This data has led to the savings of on average $200,000 per year in operations costs since the system was established five years earlier. The system paid for itself within the first year of operation.

The staff easily accesses much of the data supporting the municipality maintenance and operations functions. Efforts a few years ago to integrate files and build off of a common GIS base layer has made it much easier to conduct “what if” scenarios during the storm. Sure, there was a struggle to coordinate the data files from a number of departments. However, a study eight years earlier stated that the municipality could coordinate its databases and GIS among its many Departments and achieve greater functionality to provide more analyses to support planning, operations, and maintenance functions citywide. It took a few years to fix the data so that it was coordinated and to set up the maintenance procedures for new and edits layer files. However, despite the time it took to do the work, there is general consensus that the integration project is a success across all municipality departments. Folks wouldn’t have it any other way.

One common “what if” scenario that is being played out using the GIS is the impacts of run-off of melted snow on the municipality’s drainage system. Three years earlier a severe winter storm followed by a warm period saw extreme flooding. The drainage system in some locations was over-taxed, but staff did not have data to help them mitigate the emergency. It was determined that a drainage GIS could have helped the municipality better respond to the incident. Efforts were made at that time to link this set of drainage files to the broader municipality-wide system to ensure consistency and reduce the need to build the system from the ground up, saving thousands of dollars in the process.

By Thursday, the storm has subsided and municipality snow removal teams are hard at work plowing snow and distributing sand and de-icing chemicals on the major thoroughfares. Steve has had a successful trip and is able to take his car back to airport. He leaves with the memory of experiencing a strong winter storm, but content in the realization that he was able to get around and get his work done. Little does he know that a great deal of technology worked behind the scenes to enrich his experience.

Earthquake Incident Scenario

A tired, but enthusiastic state trooper named Amy begins the day at her house in Eagle River. It is a calm sunny day in the low 40’s. On her way to work, she drops off her two-year-old son at daycare. Her son was up frequently the night before and she didn’t get much sleep. Ah, the joys of parenthood! After dropping her son off, she heads for her job as manager of the dispatch unit for the state patrol, which is headquartered at Fort Richardson.

Later that afternoon, around 3:30 p.m., a severe earthquake hits the region. The quake, with a magnitude of 7.2 on the Richter scale, is centered 5 miles northwest of Wasilla. Because the epicenter of the quake is five miles below the surface, the damage isn't as extensive as it could have been. Amy and her co-workers are a "little shook up", but no injuries are reported. The dispatch center communications system is operational. Within seconds, the dispatchers are getting flooded with calls.

The municipality of Anchorage and other federal and state government agencies have immediately initiated their earthquake response plan. It is determined that the central operations center at Fort Richardson has received minor damage and the LAN is still operational. Cellular phone service demand is extreme and most people cannot make calls. Interestingly, five years earlier, a multi-agency committee was established to coordinate protocols on the use of radio channels during emergencies. Those protocols were made a part of the disaster plan. Their foresight is being rewarded as the radio system is working perfectly and there is adequate supply of voice channels to facilitate communication. Messaging capabilities are also engaged with public safety personnel via mobile data terminals installed in their vehicles.

Highway operations personnel at Ft. Richardson are monitoring closed circuit television cameras at key highway and bridge locations. Operators have the ability to use the pan, tilt and zoom features of the cameras to pinpoint incidents and determine the nature of problems on the highway system. A train derailment near Minnesota Drive and W. Tudor Road has caused an accident with some automobiles involved. Cameras in this location have helped determine that there are possible injuries and the local hospital is alerted. Paramedic personnel are dispatched to the scene. The paramedic vehicles come equipped with cameras that can provide a wireless video feed back to the hospital. Because of this capability, doctors are better able to determine the nature of the injuries and prescribed treatment instructions to paramedics on the scene.

Personnel at various operations centers are using a coordinated GIS to analyze scenarios such as impacts to the utility infrastructure (namely, sewer, water, electrical and others) to ascertain possible by-pass routes around damaged systems. Fortunately, there was a backup redundant GIS server in place as the primary server was damaged in the earthquake. Electrical power was out in Palmer and utility crews have been dispatched to repair the downed electrical lines.

On the roadside, the Fort Richardson operations have begun dispatching trucks with emergency supplies to disaster spots around the area. En route, the trucks receive up-to-the-minute travel and disaster response information via mobile data terminals onboard their vehicles.

Severe traffic is backing up city streets. Initially, the traffic signals in the downtown area are not functioning and travelers see only flashing red lights. Within an hour, the central traffic operations center got the signal control system under control and functioning normally. Traffic is anything but normal. Gridlock conditions still exist on many of the city's major arterials. However, bus vehicles equipped with transit signal priority equipment are able to communicate with signal controllers on the street. Signals from the buses to the controllers call for longer green times, thereby allowing the buses to move more quickly through congested intersections.

In other areas not equipped with transit signal priority capability, excessive starts and stops are putting a strain on bus engines. One bus is experiencing high engine temperatures, and breakdown is imminent. This information is fed directly to the People Mover maintenance department where another bus is deployed to intercept the ailing bus and to transfer passengers in a timely manner. Once the bus operator informs the perplexed passengers about why they need to transfer buses, they are greatly relieved that they won't get stranded on a disabled bus.

Across town, the Knik River Bridge has received structural damage and large commercial vehicles and buses are temporarily precluded from crossing. The state's structural engineers have inspected the bridge and determined that heavy loads on the bridge pose a high risk to the facility. Dynamic message signs (DMS) are immediately deployed upstream to warn travelers of this fact. To facilitate the flow of heavyweight vehicles, the folks back at Fort Richardson, use their GIS to define an appropriate detour route. Signage and traffic control crews are dispatched to the area to install temporary DMS that inform travelers of the detour. This message is also broadcast over Highway Advisory Radio and the 511 web site.

Amy is able to get through to the daycare facility back in Eagle River. Her neighbor, Susan, was able to pick up her son and take him back home until Amy could leave the office. Because of the emergency, Amy has to work two extra hours, but it could have been worse. The upfront planning, coordination, and technology has been working well, despite the earthquake. The general situation has stabilized within a few hours after the quake.

Months later, various personnel from the military, state and municipality receive commendations from the Governor and the head of the Federal Emergency Management Agency (FEMA) for their professional response to the emergency. Amy's team received a commendation from the Governor for their efforts in keeping the lines of communication open with essential State Patrol field officers and other support personnel. Amy was especially proud, as her son and family were in attendance to see her get the commendation.

1.3 MOA'S TRANSPORTATION NEEDS

The first step to a successful ITS deployment is the identification and proper consideration of user needs. User needs specify issues plaguing travelers or transportation agencies that can be satisfied through ITS. User needs defined in this report are from the perspective of those who operate and maintain transportation systems in the Anchorage metropolitan area, as well as those who use the transportation system in the region. The project team wrote the *User Needs Report* using the terminology stakeholders used during the outreach process. The stakeholders identified the following User Needs:

Internal Operations and Management

Several internal operations and management needs that affect travel in the Anchorage metropolitan area. Internal operations and management issues have also been identified as a primary need on a statewide level. The foremost internal operations and management needs addressed were:

Material Usage Tracking
Material Usage Tracking will better track and document the use of road maintenance materials.

Maintenance Operations and Vehicle Management
Maintenance Operations and Vehicle Management will automate the process to track the usage of equipment, document work activities, and identify other maintenance activities required.

Snow and Ice Control
The severe climate in Alaska requires effective and efficient snow and ice control. This is one of the focus areas for the municipality's Street Maintenance Division and has been emphasized on a statewide level as well.

Infrastructure Management and Maintenance
Infrastructure Management and Maintenance in needed to provide the following functions:

- Accurately identifying and inventorying transportation assets,
- Remotely monitoring subsurface temperatures around drainage structures for maintenance planning,
- Tolls to pro-actively manage the roadway system – tracking potholes and other surface damage,
- Utilizing ADOT&PF's laser profiling system to identify rutting in pavements, and
- Seismic monitoring to identify bridges that require emergency maintenance.

Emergency Management

The following needs were identified in interviews:

Field Communications

The primary concern is the lack of a common communication capability in the field for emergency responders to use during emergency operations.

Current Roadway Conditions

Responders need access to current roadway conditions when they are in their vehicles, especially for incident information.

Tsunami Warnings

Accurate and timely Tsunami warnings are needed, including advance public warnings to prepare for Tsunami evacuations, real-time information during the actual evacuation operations, and signal priority for buses to foster expedient evacuations in the event of a Tsunami, earthquake, or windstorm.

Inter-agency Communications

Inter-agency communications is an over-riding need and is critical to support a number of transportation functions, including both routine and emergency operations.

Inter-agency Data Sharing

Shared databases and a common Geographic Information System were cited by numerous stakeholders as the primary desired elements of inter-agency data sharing.

Traffic Operations

Enhanced surveillance is a primary need to support traffic operations in Anchorage.

Traveler Information

Distributing transportation information to travelers could enhance the efficiency and safety of travel and increase the efficiency of travel in Anchorage. (Enhanced traveler information dissemination was also identified as a need on the statewide level.)

Transit Management

Stakeholders in Anchorage recognized the benefits of providing enhanced transit services to travelers. The following defines the identified needs as they relate to transit management.

Needs Study for Transit Signal Priority

Transit signal priority to improve transit operations in Anchorage can enhance on-time arrival, ensure service reliability, and assist with emergency response when transit vehicles are used during disasters for evacuation, triage, etc.

Smart Fare Box
A smart fare box system to foster efficiency and enhance transit services in operations would automate passenger counting, and obtain fare and run data so that it can be compared to route data.

Transit Vehicle Management
An automated maintenance system on transit vehicles would transmit engine diagnostics to the maintenance shop and enable mechanics in the shop to identify potential equipment problems sooner, thereby potentially reducing overall maintenance costs.

Commercial Vehicle Operations

Needs pertaining to commercial vehicle operations have been explored in detail as part of the statewide ITS project. However, as it relates to commercial vehicle operations in Anchorage, commercial vehicle operators would benefit from enhanced traveler advisories, including information on closures, construction activities, weight restrictions, and traffic information.

2. USER SERVICES

The National ITS Architecture identifies User Services, or ITS functions, that meet various user needs. "Mapping" or connecting **user needs** to the applicable **user services** documented in the National ITS Architecture explains how each need will be ultimately satisfied. Since user needs were recorded using terminology expressed by stakeholders, they do not directly match the terminology used by the National ITS Architecture. The "mapping" process rectifies this discrepancy by connecting the two different terminology types used. Identifying the User Services is one part of the vision for ITS in Anchorage. In addition, User Services will identify functions that the regional transportation agencies provide directly, and those that they should support other agencies in providing (such as enforcement activities).

The purpose of mapping user needs to ITS user services is to clearly illustrate that ITS solutions can satisfy stakeholder needs. The User Services Chapter of the final Anchorage ITS Architecture report presents user services documented in the National ITS Architecture, describing the ITS-related services that travelers and transportation agencies can expect after the Anchorage ITS architecture is complete. The National ITS Architecture user services presented were developed to address the types of needs that stakeholders identified in the interview process. Only the user services defined by the National ITS Architecture that satisfy a user need are provided in the User Services Chapter. This prevents the inclusion of irrelevant user services, and ensures that every ITS-related user need can be satisfied through the National ITS Architecture.

The U.S. Department of Transportation defined 31 user services. These user services are identified in the National ITS Architecture where they are classified into seven user service bundles. These user service bundles are as follows:

- Travel and Traffic Management
- Public Transportation Management
- Electronic Payment
- Commercial Vehicle Operations
- Emergency Management
- Advanced Vehicle Safety Systems
- Information Management

MOA's user services have been adapted from the National ITS Architecture to ensure consistency with other state and national ITS plans and deployments. In most cases, needs expressed by stakeholders were mapped (i.e., converted) to user services in the National ITS Architecture. In a few cases however, a new user service had to be used to clearly state how user needs will be satisfied.

New or updated user service bundles and/or user services may be added to the National ITS Architecture in the future. An example of a new user service bundle that has been created but not yet adopted to the National ITS Architecture focuses on maintenance and construction operations. In addition, user services in the maintenance and construction operations user service bundle are applicable to Anchorage. Therefore, the maintenance and construction operations user service bundle has been included in this report. The applicable user service bundles and user services that meet Anchorage needs are described below.

2.1 TRAVEL AND TRAFFIC MANAGEMENT

The travel and traffic management user service bundle consists of ten user services, seven of which map to needs expressed by stakeholders. These seven user services are listed below.

- Pre-Trip Traveler Information
- En Route Driver Information
- Traveler Services Information
- Route Guidance
- Traffic Control
- Incident Management
- Highway-Rail Intersection

2.2 PUBLIC TRANSPORTATION MANAGEMENT

The public transportation user service bundle consists of four user services. Three public transportation management user services will partly satisfy ITS-related needs for Anchorage:

- Public Transportation Management
- En Route Transit Information
- Personalized Public Transit

2.3 COMMERCIAL VEHICLE OPERATIONS

The commercial vehicle operations user service consists of six user services. Two of these user services are required to meet the needs of stakeholders in Anchorage. Additional commercial vehicle operations user services are included in the statewide ITS architecture.

- Commercial Fleet Management
- Hazardous Material Incident Response

2.4 EMERGENCY MANAGEMENT

The emergency management user service bundle consists of the emergency notification and personal security and emergency vehicle management user services. The latter will in part satisfy stakeholder needs.

- Emergency Vehicle Management

2.5 INFORMATION MANAGEMENT

The archived data function is the only user service in the information management user service bundle.

- Archived Data Function

2.6 MAINTENANCE AND CONSTRUCTION OPERATIONS USER SERVICE

As mentioned previously, this user service bundle has yet to be included in the National ITS Architecture. This bundle, however, is useful in defining the ITS functions needed to meet the unique needs expressed by stakeholders. Two of the four user services contained in this user service bundle will partly satisfy stakeholder needs. These user services are described below.

- Maintenance Vehicle Fleet Management
- Roadway Treatment Management

2.7 ROADWAY MAINTENANCE CONDITIONS AND WORK PLAN DISSEMINATION

This user service is responsible for scheduling maintenance activities through identification of infrastructure conditions. This task involves center-to-vehicle dispatching to improve vehicle dispatching.

3. LONG-RANGE VISION

Mapping the current and future User Needs to the User Services, the ITS Long-Range Vision for the Municipality of Anchorage (MOA) is to:

- Ensure public safety
- Support public security
- Support the community vision
- Deliver services effectively

The ITS plan is supportive of the mission of the various departments of the MOA and the surrounding communities within the Anchorage Metropolitan Area Transportation Study (AMATS) region. The following describes the goals of the ITS plan. Figure SR-1 represents the relationships between the goals. Developing a strong community is at the center of the goals. Meeting the community's safety and security needs helps to protect the core community values. Because all services must be provided effectively, that goal forms the outer ring.

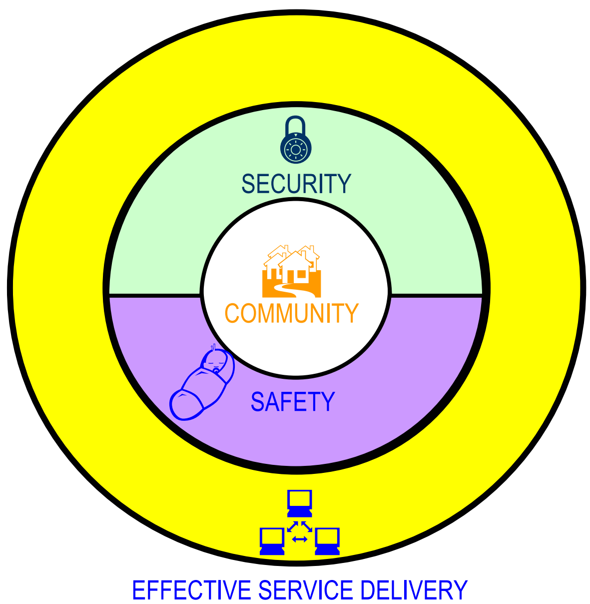

Figure SR-1: Anchorage ITS

FUTURE ITS ELEMENTS

The ITS strategy for Anchorage consists of four key program areas:

Year Round Operations

Several ITS elements will provide year round information that will improve mobility and traveler safety in and around Anchorage.

Incident and Emergency Management Systems

Identifying and reporting incidents soon after they occur can decrease response time, improve safety, and minimize delays and other traffic related effects. The impact of incidents on travel safety and roadway efficiency can be minimized through several ITS technologies. These technologies enhance incident identification, verification, notification, and response. Thus, these systems enable operators to dispatch appropriate personnel and equipment quickly, clearing incidents and treating victims in an efficient and timely manner.

Traveler Information Systems

In the future, travelers will utilize land-line and wireless communications for obtaining travel-related information. Wireless communications will provide access to traveler information at all times and in most locations.

Systems for Internal Operations

ITS can help facilitate better internal operations. ITS provides the capability for agencies to minimize the use of financial and physical resources. The following technologies will help streamline operations, reduce costs, and improve the safety and efficiency of the roadway network.

The ITS-related elements are illustrated in Figure SR-2.

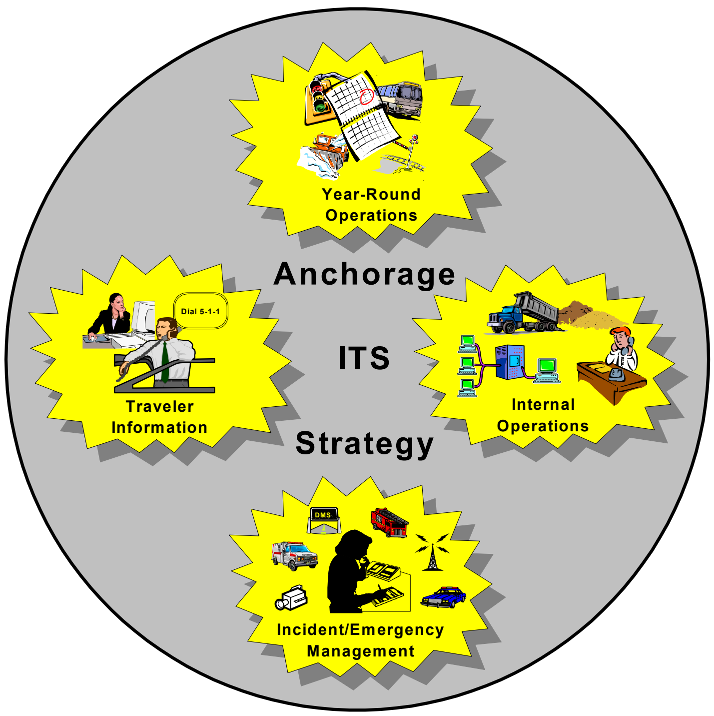

Figure SR-2: Anchorage ITS Strategy

4. CONCEPT OF OPERATIONS

The project team developed the Concept of Operations for the Municipality of Anchorage (MOA) as part of its effort to create a regional Intelligent Transportation System (ITS) plan and architecture. The Concept of Operations defines operational and institutional relationships, as well as communication elements of the municipality's regional ITS architecture.

4.1 CURRENT MOA OPERATIONS

Functions currently performed by the municipality and partner agencies are:

- Municipality of Anchorage – Traffic Engineering
- Municipality of Anchorage – Information Technology Department
- Municipality of Anchorage – Project Management
- Municipality of Anchorage – Emergency Management
- Municipality of Anchorage – Purchasing Department
- Municipality of Anchorage – Public Transportation
- Municipality of Anchorage – Office of Planning, Development, & Public Works Project Management & Engineering Department
- Municipality of Anchorage – Street Maintenance
- Municipality of Anchorage Police Department
- Municipality of Anchorage Fire Department
- Alaska Trucking Association
- United States Air Force – Elmendorf Air Force Base
- United States Army – Fort Richardson
- University of Alaska Anchorage
- ADOT&PF Central Region Traffic and Safety
- ADOT&PF Division of Statewide Design and Engineering (Bridge Design and Materials)
- ADOT&PF Maintenance and Operations
- ADOT&PF Division of Statewide Planning – Highway Data
- Alaska Department of Administration – Division of Motor Vehicles
- Department of Environmental Conservation – Division of Air and Water Quality
- Department of Military and Veterans Affairs – Division of Emergency Services
- ADOT&PF Division of Statewide Planning – Highway Safety Office
- Alaska Department of Community and Business Development
- Alaska Department of Public Safety – Division of Alaska State Troopers

4.2 FUTURE MOA STRATEGIES

Needed Future Operational Strategies

To realize the ITS vision provided in the previous section various additional operational strategies will need to be implemented by both the municipality and their stakeholders. Table SR-1 summarizes the functions that will be required in the future to realize the vision. In addition, this table illustrates the relationship of required functions to the program area. The first column identifies the ITS program area supported by the function. The second column identifies the functions that are identified in the vision. The third column identifies the current status of the functions that are required to support the ITS strategy. The fourth column identifies the functions that will need to be implemented in the future.

Table SR-1: Future Operational Strategy

ITS Program Area	ITS Strategy	Required Functions	Existing System Requiring Enhancements/ Expansion	Future Functional Needs
Year-Round Operations	Weather and Pavement Sensors	Measure: • Ambient air and pavement temperature • Wind speed and direction • Relative humidity • Visual observations		Measure: • Ambient air and pavement temperature • Wind speed and direction • Relative humidity • Visual observations
	Smart Snowplows	• Measure road surface friction • Compile data from roadway sensors • Calibrate appropriate amount of chemical and sand • Track snow and ice operations including use of sand by rate and vehicle • Snowplow guidance		• Measure road surface friction • Compile data from roadway sensors • Calibrate appropriate amount of chemical and sand • Track snow and ice operations including use of sand by rate and vehicle • Snowplow guidance
	Traffic Signal System	• Integrated and remote signal control	• Existing centrally controlled signal system	• Integrated and remote signal control
	Highway Rail Intersection Warning System	• Advance warning of trains to motorists		• Advance warning of trains to motorists
	Transit Signal Priority	• In-field Signal Control		• In-field signal control

ITS Program Area	ITS Strategy	Required Functions	Existing System Requiring Enhancements/ Expansion	Future Functional Needs
Year-Round Operations, Cont.	Smart Fare Box	Collect: • Origin/destination, and passenger characteristics		Collect: • Origin/destination, and Passenger characteristics
	Transit Vehicle Management	• Track real-time location of transit vehicles • Collect ridership data		• Track real-time location of transit vehicles • Collect ridership data
Incident and Emergency Management	Hazardous Materials Tracking and Reporting	• Monitor movement of vehicles caring hazardous materials		• Monitor movement of vehicles caring hazardous materials
	Closed Circuit Television	• Monitor and confirm, incidents, and roadway surface conditions	• Monitor and confirm weather conditions	• Monitor and confirm, incidents, and roadway surface conditions
	Vehicle Detection	• Detect and classify vehicles		• Detect and classify vehicles
	Dynamic Message Signs	• Provide en route traveler information		• Provide en route traveler information
	Highway Advisory Radio	• Provide en route traveler information		• Provide en route traveler information
Traveler Information	5-1-1	• Provide en route traveler information		• Provide en route traveler information
	Internet	• Provide pre-trip traveler information		• Provide pre-trip traveler information
	Wireless Web	• Provide pre-trip traveler information		• Provide pre-trip traveler information

ITS Program Area	ITS Strategy	Required Functions	Existing System Requiring Enhancements/ Expansion	Future Functional Needs
Internal Operations	Mobile Data Terminals	• In-field communications	APD's MDTs	• In-field communications
	Materials Usage Tracking	• Inventory materials used		• Inventory materials used
	Asset Management	• Inventory and management of infrastructure		• Inventory and management of infrastructure
	Automatic Vehicle Location	• Provide real-time vehicle location data • Monitor vehicle movements		• Provide real-time vehicle location data • Monitor vehicle movements
	Condition Acquisition and Reporting System	• Provide near real-time weather data		• Provide near real-time weather data
	Shared Traveler and Traffic Information Database	• Data storage and retrieval		• Data storage and retrieval
	Common Geographic Information System	• Data storage and analysis	• Data storage and analysis	• Establishment of common platform (file type).

5. REGIONAL ITS ARCHITECTURE

This section presents a synthesis of that information as a next stage—represented as a top-level graphical illustration of each of the four key program areas.

5.1 FOUR PROGRAM AREAS: A HIGH-LEVEL VIEW

The four figures that follow illustrate the integration of the one or more market packages to meet the stated needs for: year round operations, incident and emergency management systems, traveler information systems or internal operations. For continuity, the user services that will be enabled are listed beside each figure.

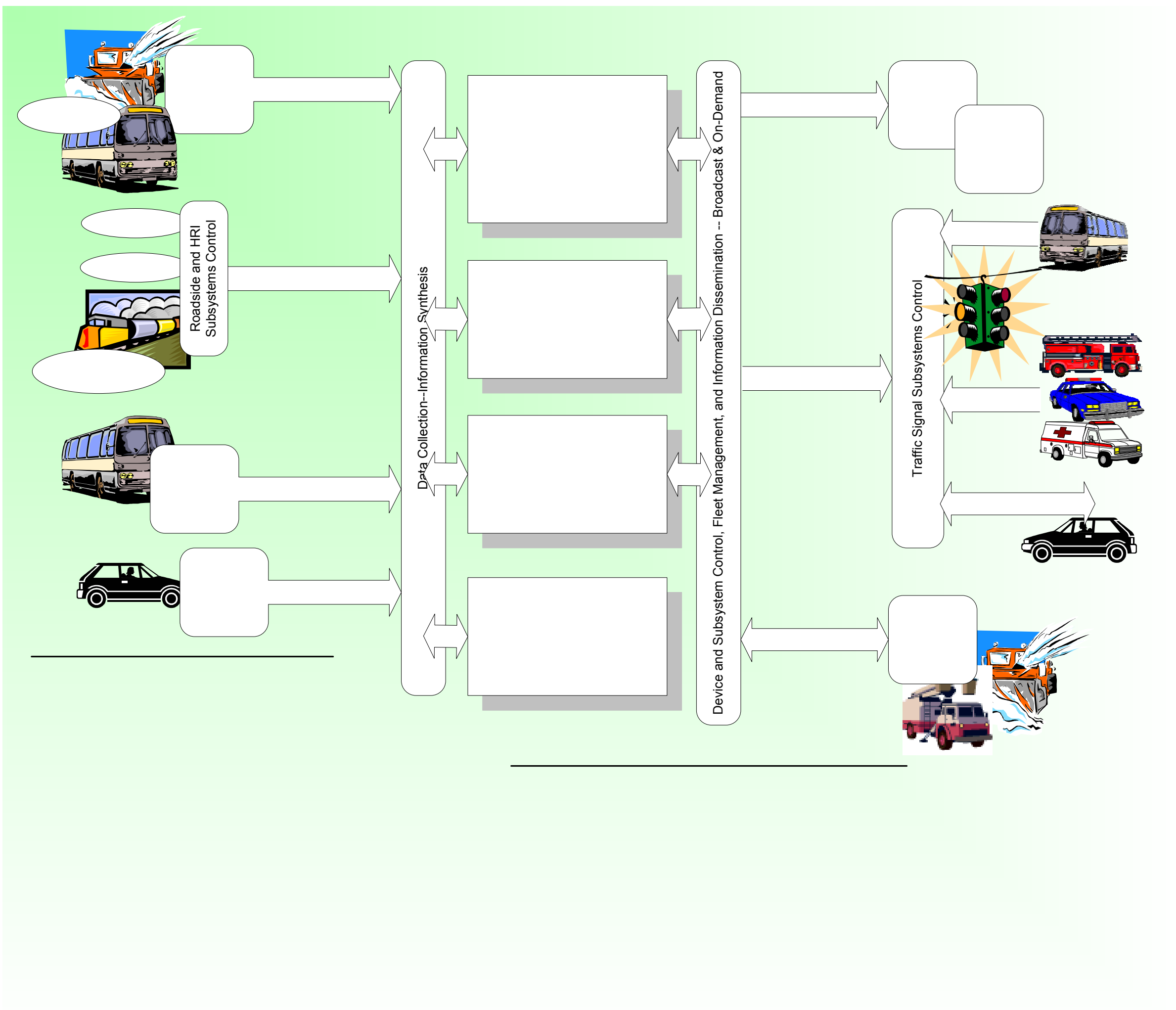

Figure SR-3: Year-Round Operations -- High-Level View

Snow Plows

Year-Round Operations

The left side of the figure shows the sensors and mechanisms for data collection, visual surveillance of the roadway for weather conditions, and vehicle emissions monitoring. It also illustrates that MOA maintenance crews and transit vehicles will serve as sources to relay roadway environmental conditions using on-board sensor systems. MOA will also acquire rail-roadway intersection data for standard and high-speed rail crossings.

The right side of the figure shows several mechanisms for dissemination of roadway and weather conditions. The MOA can use CARS to disseminate information directly to drivers en-route using the 5-1-1 telephone service or through information sharing with the commercial broadcast media. The figure also illustrates the MOA's mechanism for snowplow and fleet vehicle management.

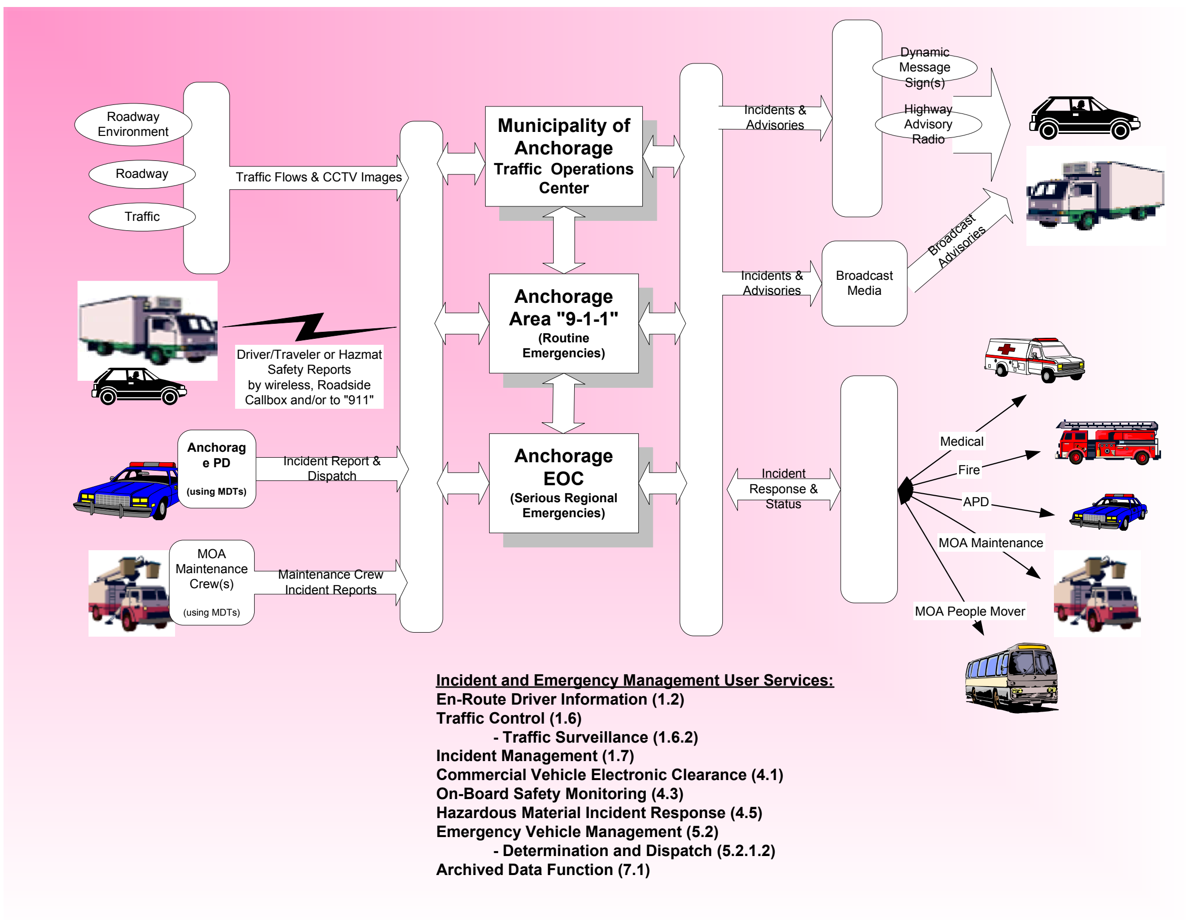

Figure SR-4: Incident and Emergency Management Systems -- High-Level View

Incident and Emergency Management Systems

The left side of the figure shows the sensors that produce the data used to automatically detect traffic anomalies—potential incidents. It also illustrates that drivers and travelers report incidents, and that commercial vehicles operating as Hazmat carriers will be instrumented for cargo safety and pre-credentialed—able to report a Hazmat safety incident should one occur. The Anchorage PD (or any law enforcement agency) and the MOA maintenance fleet operators can discover and report incidents or emergency situations by radio or by using their mobile data terminals (MDTs).

The right side of the figure shows several mechanisms for delivery of the incident or emergency status information that affects regional travel, and the initiation and coordination of incident or emergency response actions by first responders or MOA maintenance crews. The MOA can disseminate directly to the traveling public and commercial fleet operators en-route using public agency-owned roadway signs and advisory radio, or more broadly through the commercial broadcast media. The EOC, 911 or the first responder agencies use the incident report, regional status data, and then on-scene reports to manage and tailor their coordinated incident or emergency response resources as needed.

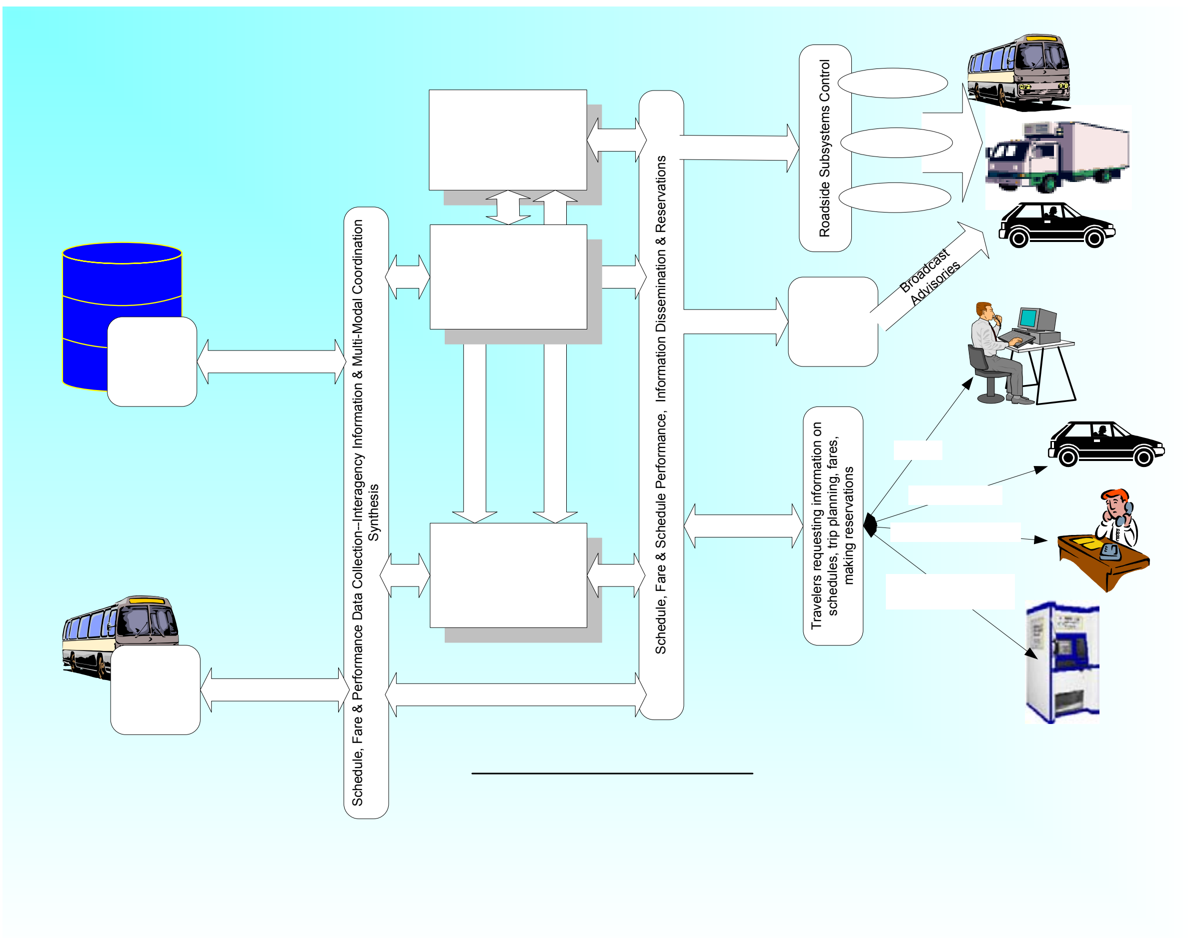

Figure SR-5: Traveler Information Systems -- High-Level View

Traveler Information Systems

The left side of the figure shows the specific sources of information, including real-time or archived (near real time) traffic, weather, accidents, and roadway conditions that could affect safe, efficient travel. It includes provisions for use of data and information stored in the common regional archive or for direct interaction between a traveler and Anchorage transit. The information resident in the regional archive is produced by the Internal Operations capability (see next figure and discussion).

The right side of the figure shows several mechanisms for delivery of the collected or archived travel, weather, and roadway conditions information to the traveler. The MOA can disseminate directly to drivers en-route using public agency-owned roadway signs, in-vehicle systems and advisory radio, or through the broadcast media. Additionally, the information can be disseminated via the Internet to fixed or mobile users, by pre-recorded or interactive telephone systems (e.g., 511), or to remote fixed facilities (e.g., an airport or rest stop kiosk).

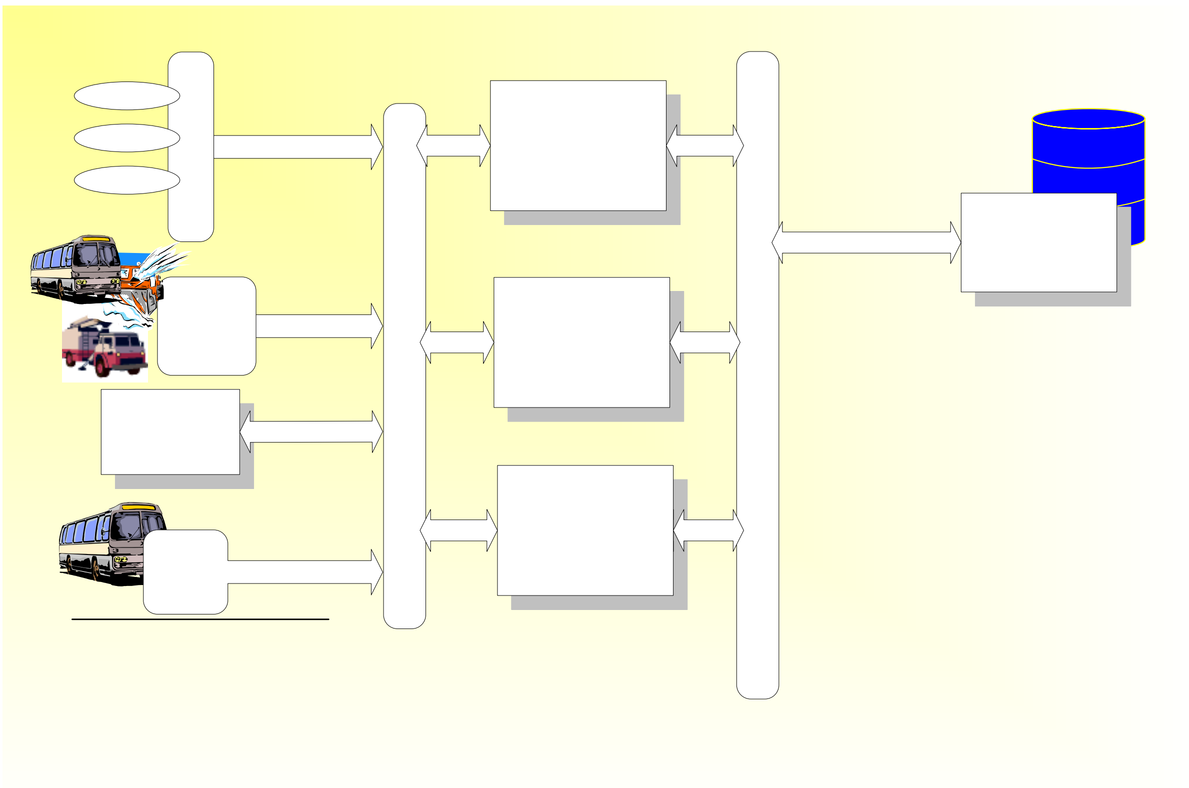

Figure SR-6: Internal Operations -- High-Level View

Internal Operations

Figure SR-6 illustrates the Municipality's architecture for Internal Operations, including monitoring and/or examination of the roadways, infrastructure, and surrounding environments (e.g., bridges)—this asset identification, status, and management data then goes into the regional data archive (on the right of the illustration). In general, the left side of the figure shows the several sources for this data and information drawn from roadway surveillance, condition and status reports from MOA maintenance and snowplow crews as they do their work and consume their materials, the status of road construction and maintenance obtained through the Condition Acquisition and Reporting System (CARS), and reports from Anchorage transit's AVL instrumented buses.

The right side of the figure illustrates the Anchorage regional data archive and repository. The data and information stored in this archive is contributed by the operating agencies, and made available

Roadway

Signals

e Subsystems

ure and Assets

Infrastructure L

Condi

for regional use in unfiltered (e.g., between public agencies) or filtered (e.g., to an external ISP) form. It is intended that this process be aided by decision support tools to deploy resources and track use of materials (e.g., treatments) most effectively and efficiently in response to a roadway situation. These decision support tools are perhaps supported by the response models and empirical data that have and will accumulate in the DOT&PF archive.

6. ANCHORAGE ITS IMPLEMENTATION PLAN

Over the next several years the MOA may have difficulty implementing all the systems outlined in the Anchorage ITS Concept of Operations. ITS projects must compete for funding with other more traditional transportation, construction, and improvement projects. With this in mind, phased ITS implementation will prove effective and help the Plan's recommended ITS technologies meet Anchorage's unique needs.

The purpose of the Implementation Plan is to define a set of projects that are proposed for implementation in the MOA over the next ten years and the criteria that has been developed to prioritize the projects.

This report focuses on implementing ITS strategies that enhance travel safety and efficiency in the MOA. The report fully considers the resources available to implement technologies and the existing and planned systems that enhance the transportation system's operations and management.

6.1 PROJECT DESCRIPTIONS

This section describes approved and potential ITS projects for the MOA. The first section provides a detailed description of projects that the MOA has already selected for deployment. The next section describes other potential projects that have been evaluated and prioritized for deployment, based on the criteria defined in the Architecture section.

Approved Projects

DMV&I/M Program Data Link (now complete)
This link allows for real-time transmission of a passing inspection to DMV, thus allowing for a "paperless" certificate of inspection.

I/M Enhancement Program (now complete)
The EPA-mandated On-Board Diagnostic (OBD) test for 1996 and newer vehicles where a vehicle's computer determines an I/M pass/fail.

People Mover
This system automates operation of the fixed route buses, including vehicle location, operating characteristics, customer real-time information, passenger counting equipment, and improved management reporting capability.

AnchorRIDES
This project improves the system by collecting real-time vehicle location information and further automates the scheduling/dispatch functions that will substantially improve the system.

Fleet Improvement
This project funds improvements to existing transit and paratransit fleets. Projects could include a ticket reader and issue attachment; security systems; transit/signal improvements for headway enhancements; mobile display terminals; and vehicle communications and locations systems.

Management Information Systems
These systems are necessary for efficient management of the public transportation system. Typical projects include: Geographic Information Systems (GIS) capabilities; upgrades to the automated maintenance, refueling, and inventory systems; a new computerized dispatch system; upgrades to the scheduling/run-cutting process, customer information, and telephone communications system; and desktop computers.

Area-wide Study for Emergency Response Preemption (now complete)
While emergency response preemption is installed at select locations within the Municipality and projects have been identified to provide additional installations, an area-wide study will allow for a planned, phased implementation of a complete emergency response preemption system.

Downtown Traffic Signal System Project
First-year design money has been allocated for the rehabilitation of the traffic signal system in downtown Anchorage. The project will include repair of existing electrical deficiencies, mast arm and foundation replacement where necessary, and installation of emergency response preemption.

Potential ITS Projects

Municipality of Anchorage Traffic Operations Center
The center will enhance traffic operations and interagency data sharing/communication. This will enable agencies to communicate more effectively with the Emergency Operations Center and other agencies.

Highway-Rail Intersection (HRI) Warning and Preemption Systems
These systems may increase motorist safety by reducing the number of train/vehicle conflicts. HRI Warning Systems determine the probability of a collision at an equipped intersection and provide timely warnings to drivers and train operators.

Needs Study for Transit Signal Priority
The use of transit versus personal vehicle may be greatly strengthened through the deployment of Transit Signal Priority Systems. These systems extend traffic signal “green time” to transit vehicles in an effort to reduce delay, maintain schedule adherence, and assist with emergency response when transit vehicles are used during disasters for evacuation, triage, etc.

Smart Fare Box
Smart Fare Box Systems may be installed on transit vehicles to collect ridership, fare, and origin-destination information, streamlining transit operations by enabling better route assignment, equipment usage, and route planning.

Transit Vehicle Management
If implemented in the future, these systems may significantly enhance transit operations and roadway safety by automatically detecting vehicle mechanical problems and transmitting the relevant data to the maintenance department.

Hazardous Materials Tracking and Reporting Systems
Since September 11th, 2001, the importance of hazardous materials tracking has taken on a new meaning. Tracking systems deployed at weigh stations enable drivers to process manifests and weigh their vehicles without stopping. This will enable staff at the weigh station to identify commercial vehicles carrying hazardous materials and, if necessary, divert them to alternate routes.

5-1-1 for Traveler Information
The 5-1-1 telephone number has recently been approved for the dissemination of traveler information. The MOA will tie into the State 5-1-1 project. Drivers can call the 5-1-1 number on their cell phones to obtain near real-time traveler information (e.g., weather information, road closures, event information).

Condition Acquisition and Reporting System (CARS)
CARS is a web-based software tool that allows authorized staff within the Municipality to input accident, construction, delay, and other roadway and weather information into statewide databases. This information can be displayed spatially on a web or similar application.

Mobile Data Terminals (MDTs)
These systems can greatly enhance internal agency communication by providing personnel in the field with greater flexibility to collect and report information. MDTs also provide easier means to disseminate information from the field to the operation center.

Material Usage Tracking System
A Material Usage Tracking System may be used to track and store data on resources consumed by various maintenance activities. Tracking materials will allow the MOA to reduce overspending on unnecessary material purchases.

Asset Management System
An Asset Management System stores pavement and infrastructure condition information. This information can be integrated into a GIS and used to easily identify the condition of infrastructure at desired locations. This allows funding to be allocated among roadways and/or structures in the most need of repair.

Automatic Vehicle Location (AVL)
AVL sensors installed on transit and maintenance vehicles will communicate with Global Positioning Systems (GPS) to provide dispatchers with real-time vehicle locations and movements. Maintenance vehicles can use this information to locate streets that have/have not been cleaned or plowed, reducing costs and the time needed to complete these activities. This technology can also be used to quickly locate a stalled or disabled vehicle and to provide real-time bus arrival information to transit users via the Internet, kiosks, or message boards at transit stops.

Shared Traveler and Traffic information Database
Individual agency data is a valued asset not only to the agency itself but to other agencies as well. A shared traveler and traffic information database allows agencies to share their electronic data (e.g., GIS data, crash data) in exchange for other agency data. This enhances operations of each participating agency by reducing data collection costs, and increasing data usefulness.

Common Geographic Information System (GIS)
A GIS is a tool used to analyze text and numerical data quickly by displaying it in spatial format. Many agencies in Anchorage already own a GIS, however, these systems are not compatible and are operated in an isolated or "stove-pipe" manner. This project will specify a common GIS for the MOA, resulting in reduced operating costs through more efficient use and exchange of existing data. This project has received earmark funding and is currently slated to start in June 2003.

Traffic Signal System Upgrade
The existing traffic signal system is aging and communications with the existing controllers are slow and limited. As part of the implementation of the Traffic Operations Center, the existing traffic signal and communication system should be evaluated to determine whether it should be updated or replaced to support full functionality of the Traffic Operations Center.

Closed Circuit Television (CCTV) and Digital Camera Implementation
Projects that install cameras will enhance efficiency, reliability, and mobility by providing travelers with information and operating agencies with information that can use to respond to roadway conditions. Public access to travel conditions (especially visual images seen on television and via the Internet) should enhance public awareness and acceptance of the overall ITS program. CCTV and digital

cameras will be installed at key areas of known traffic congestion to monitor traffic and visually verify incidents. This information helps enable more effective incident response. Transportation system operators can use this equipment to remotely view the roadway system and make more informed operational decisions, and the public can use this to make better travel plans.

6.2 PROJECT SELECTION CRITERIA

This section defines the criteria used to select and prioritize projects for deployment in the MOA. It also presents the MOA's mission statement and policies that guided the development of selection criteria.

Incorporating ITS into the Transportation Planning Process

Federal ITS requirements, including the final FHWA Rule and FTA Policy, were developed to foster integration of regional ITS components through use of the National ITS Architecture and applicable standards. With respect to the federal ITS requirements, the regional ITS architecture, or framework for ITS integration, should, among other things, be consistent with the transportation planning process for statewide and metropolitan planning. Therefore, it will be important that the MOA include ITS projects in the traditional transportation planning process. This will likely require changes to be made to the current project nomination and scoring process.

An ITS project is defined as any project which applies electronics, communications, or information processing used solely or in combination to improve the efficiency or safety of a surface transportation system. Or it is a project that, in whole or in part, significantly contributes to the provision of one or more ITS user services as defined in the National ITS Architecture. Examples include interconnecting traffic signals, transit signal priority systems, variable message signs, closed-circuit television cameras, automatic passenger counters, and traffic control software.

Project Nomination

When nominating projects for inclusion into the transportation planning process, project sponsors should review their project to determine if it contains an ITS element, and determine if it should be considered an ITS project. Project sponsors should also determine how their project (if containing an ITS element) fits into the regional ITS architecture. This may require that existing project nomination sheets be updated to include a question on ITS applicability. If the project contains an ITS element, then project sponsors will be required to fulfill a checklist.

Project Scoring

ITS project scoring can be completed through adaptation of the AMATS Roadway Ranking Criteria (1998-2000). The project scoring process consists of 17 criteria with weighted values ranging from 4 (highest/most important) to 1 (lowest/ least important). Each project is also individually scored and given an un-weighted value between 5 and -3 depending on its characteristics. The maximum score for each project is 5, however, the minimum score for an individual project can assume a value of 0 or -3. The project's score is multiplied by the project's weight to obtain its weighted score. After all weighted scores are calculated, they are added together to obtain the project's total score. After evaluating each project, the projects' total scores are ranked in ascending order to determine the priority of project selection and implementation. Brief descriptions of the criteria and the weight assigned to each are provided in Table SR-2.

Although several of the 17 AMATS roadway ranking criteria are suitable for ranking ITS projects, it is suggested that several criteria be adapted so they are relevant to ITS–related projects. Guidance and recommendations for adapting the criteria are provided following Table SR-2.

Table SR-2: AMATS Project Ranking Criteria

Criterion		Project Scoring Point Values and Guideline				
		5	3	1	0	-3
1	Preservation of Existing System (weight = 4)	Primarily 3-R (resurfacing, rehabilitation, restoration)	Primarily 3-R; a portion of the project addresses serious foundation problems	N/A	Primarily major reconstruction; addresses longer-range rehabilitation	N/A
2	Safety (% of Project that Addresses Safety Concerns) (weight = 4)	Highway safety improvement program priority or 100% - %80 of total (=5) 79% - %60 of total (=4)	59% - 40% (=3) 39%-20% (=2)	19% to %5 (=1)	< %5 of project addresses safety	N/A
3	Bridge Preservation (weight = 4)	Project significantly contributes to bridge preservation	Project moderately contributes to bridge preservation	Project minimally contributes to bridge preservation	Project does not contribute to bridge preservation	N/A
4	Congestion (weight = 4)	Project will help relieve congestion in corridor that operates at level of service “E” or “F” in AM **and** PM peak	Project will help relieve congestion in corridor that operates at level of service “E” or “F” in AM **or** PM peak	Project helps prevent congestion from occurring where it does not yet exist. Level of service at or approaching “D”	Project has no immediate impact on relieving or managing traffic congestion	N/A

	Criterion	Project Scoring Point Values and Guideline				
		5	**3**	**1**	**0**	**-3**
5	Functional Class (Size of Area Served) (weight = 3)	Major arterial	Minor arterial	Collector	Local	N/A
6	Design Standards (weight = 3)	N/A	N/A	N/A	N/A	N/A
7	Benefit Cost* (weight = 3)	Between: $0.00 - $0.10 = 5 $0.11 - $0.25 = 4	Between: $0.26 - $0.50 = 3 $0.51- $0.75 = 2	Between: $0.76 - $1.00 = 1	Between: $1.01+ = 0	N/A
8	Quality of Life (weight = 2)	Project provides significant contribution to health and quality of life	Project contributes to health and quality of life	N/A	Project will have no affect on quality of life issues	Project will have negative affect on quality of life issues
9	Economic Benefits Following Completion (weight = 2)	Project supports significant improvement to the movement of goods and services for areawide benefit	Project supports improvements to the movement of goods and services for local benefit	N/A	Projects supports speculative or temporary economic opportunities or benefits	N/A

* Divide Cost (in thousands of dollars) and further divide by existing annual average daily traffic (AADT) or projected AADT 1st Year of Operation.

Criterion		Project Scoring Point Values and Guideline				
		5	3	1	0	-3
10	Support of Project (weight = 2)	Significant support from community councils, affected users, elected officials and appointed bodies and from responsible local or state agencies	Moderate support from community councils, affected users, elected officials and appointed bodies or from responsible local or state agencies	Support from community councils, affected users, elected officials and appointed bodies or from responsible local or state agencies	N/A	N/A
11	Design Issues/ Amenities (weight = 2)	Project addresses deficiencies relative to design issues/ amenities (landscaping, lighting, pedestrian facilities, drainage or noise)	Project addresses deficiencies relative to design issues/ amenities (landscaping, lighting, pedestrian facilities, drainage or noise)	Project addresses deficiencies relative to design issues/ amenities (landscaping, lighting, pedestrian facilities, drainage or noise)	Project does not address landscaping, lighting, pedestrian facilities, drainage or noise	N/A
12	Recommended In Adopted Plans (weight = 2)	Included in LRTP, comprehensive plan or other adopted state or local plan and project is tied to other CIP project (ASD, AWWU, Etc.)	Consistent with an adopted plan	Not included in adopted plan but developed through a local neighborhood or combined organization effort	Not included in an adopted plan	Conflicts with adopted plan

Criterion		Project Scoring Point Values and Guideline				
		5	**3**	**1**	**0**	**-3**
13	Multi-Modal/ Inter-Modal Characteristics (weight = 2)	Includes significant multi-modal links (transit, bike, pedestrian facilities) **OR** improves access to port or airport	Includes moderate multi-modal improvements **OR** improves access to port or airport	Includes minimal multi-modal or inter-modal improvements	Includes no multi-modal or inter-modal improvements	N/A
14	Project Co-Funding or Leveraging Other Resources (Does not Include State Match for Federal Funds) (weight = 2)	Project is co-funded by responsible or other agency Greater than 25% of total estimated project cost = 5 25% to 16% = 4	15% to 11% = 3 10% to 6% =2	5% to 1% =1	No funding or other resources contributed	N/A
15	Connectivity (weight = 2)	Provides significant roadway connections between large segments of the city such as downtown to midtown, etc.	Addresses improvements in roadway connections between neighborhoods while preserving neighborhood(s) integrity	Addresses improvements in roadway connections within a neighborhood while preserving neighborhood integrity	Isolated section of new roadway	N/A

	Criterion	Project Scoring Point Values and Guideline				
		5	**3**	**1**	**0**	**-3**
16	Project Operations and Maintenance Commitment (weight = 1)	Project will significantly reduce O&M commitment in immediate area of project **OR** project is very high maintenance priority for sponsor	Project will reduce O&M commitment in immediate area of project **OR** project is moderate maintenance priority for sponsor	N/A	Project will have no positive or negative impact on O&M costs in immediate area of project	Project will increase O&M costs in immediate area of project
17	Project Readiness (weight = 1)	Project is ready for construction	Project is ready for any necessary right-of-way or utility work	Project is ready for final design	Project in need of pre-design/ engineering location, or environmental review	N/A

6.3 PROJECT SCORING GUIDANCE & RECOMMENDATIONS

This section provides recommendations for using and adapting the roadway ranking criteria identified in Table SR-2.

Preservation of Existing System –If the project's primary objective is to replace or rehabilitate systems or elements near the end of their useful (design) life, the project should score a 5. If the project significantly contributes to replacing or rehabilitating systems or elements near the end of their useful (design) life, the project should score a 3.

ITS projects that support rehabilitation decision-making should also score points against this criterion. If a project installs systems that provide information **required** by the decision-making process, the project should score a 5. If a project installs systems that provide information that **support** the decision-making process, the project should score a 3.

Safety – AMATS guidelines are satisfactory for ranking ITS Projects.

Bridge Preservation – Only a few ITS projects, such as bridge scour detection, would be relevant for the criterion. Such a project should score a 5. Other ITS projects may develop information critical to determining when a structure needs preservation attention. The team recommends that projects that install systems that provide information **required** by the bridge preservation decision-making process should score a 5. If a project installs systems that provide information that **support** the decision-making process, the project should score a 3.

Congestion – This criterion and its associated guidelines may be used as-is for ranking ITS projects.

Functional Class – This criterion and its associated guidelines may be used as-is for ranking ITS projects.

Design Standards – The guidelines for Design Standards are not relevant for ITS projects, however this criterion can be adapted so projects can be ranked by ITS Standards. Projects will then be ranked based on whether or not a project satisfies such guidelines as; 1) are projects included in the National ITS Architecture and, 2) do projects conform to NTICP and other Standard Development Organization's (SDO) approved standards. Projects clearly meeting both requirements should score a 5. Projects meeting one, but not the other, should score a 3. If it is not clear if these requirements are met, the project should score a 0. If the project clearly meets neither requirement, the score should be –3.

Benefit Cost – The formula provided in Table SR-2 for deriving the benefit cost ratio of roadway projects would be misleading for ITS projects. Deriving a ratio for ITS projects will be difficult to create, but at a minimum should include; 1) Influence on traveler behavior, 2) Influence on safety, 3) Influence on mobility. The project team, as an initial formulation, recommends that the project be given a weight in each of these 3 categories as follows:

Influence on traveler behavior. The project will have a positive influence on:

1.0 – nearly all travelers who use it

0.6 – most of the travelers who use it

0.3 – some travelers who use it

Influence on safety. The project will provide:

1.0 – critical safety benefits

0.6 – significant safety benefits

0.3 – some safety benefits

Influence on mobility. The project will provide:

1.0 – significant mobility benefits

0.5 – some mobility benefits

These factors should then be added and multiplied by the AADT. The product should then be divided into the cost of the project, and the same ratios be used as are shown in table SR-2. In equation form, the formula would be:

Project cost (in thousands)/AADT x (driver behavior factor + safety factor + mobility factor)

While most projects will contribute to only one of these factors, this formulation recognizes the contributions made by projects that contribute to multiple objectives.

If this approach is selected, the team recommends that the MOA planners test this formulation on actual projects and adjust the factors accordingly.

Quality of Life – This criterion is very subjective. It will be difficult to determine how an individual ITS project affects the lives of the general public. For instance a Red Light Camera Enforcement Program, can be viewed by some as improving the safety of an intersection, while others may view it as an infringement of their personal rights. Even if a large percentage of the public believe an ITS project is beneficial, how is it’s significance determined? More needs to be done to give this criterion a quantitative measurement.

Economic Benefits – This criterion and its associated guidelines may be used as-is for ranking ITS projects.

Support of Project – This criterion and its associated guidelines may be used as-is for ranking ITS projects.

Design Issues/ Amenities – If the ITS project addresses pedestrian, bicycle, or environmental needs, the project can be scored in the same manner as a roadway project. The team recommends that the criterion be broadened to include projects that provide the foundation for other projects, such as communication and network infrastructure and geographic information systems. Thus, if a project supplies the support need by other projects, it would be scored the same as if it were providing any other amenity.

Recommended in Adopted Plans – This criterion and its associated guidelines may be used as-is for ranking ITS projects.

Multi-Modal/ Inter-Modal Characteristics – This criterion and its associated guidelines may be used as-is for ranking ITS projects.

Project Co-Funding or Leveraging Other Resources - This criterion and its associated guidelines may be used as-is for ranking ITS projects.

Connectivity – For ITS projects, the team recommends that this criterion be viewed as Integration, and the following guidelines be adopted to judge how a project influences regional integration of systems and stakeholders.

5 – Provides significant integration between several systems identified in the Municipality’s architecture

3 – Supports significant integration between several systems identified in the Municipality’s architecture

1 – Provides limited integration between systems identified in the Municipality’s architecture

0 – Isolated project that neither contributes to nor hinders integration.

-3 – Hinders integration

Project Operations & Maintenance Commitment – This criterion and its associated guidelines may be used as-is for ranking ITS projects.

Project Readiness – This criterion and its associated guidelines may be used as-is for ranking ITS projects.

Additional Scoring and Process Recommendations

The project team recommends that the AMATS consider adding a scoring criterion specifically for contribution to security. Projects that monitor or protect transportation assets should be scored highly. Projects that aid in response to security threats or breaches should be scored highly as well.

Initially, it may prove difficult for those who normally score projects to score ITS projects. The project team recommends that AMATS form an ITS technical advisory team to help scorers make decisions on ITS projects. Members of the technical advisory team should be familiar with different aspects of ITS systems. Ideally, members would represent the following disciplines:

- Information technology
- Communications
- Traffic engineering
- Transportation planning
- Maintenance

Additional disciplines should be added as deemed necessary. The technical advisory team should test the scoring system on actual projects and determine if any adjustments are needed. The team would then provide training and/or assistance to those who score all of the AMATS transportation projects.

6.4 INTEGRATION STRATEGY

An ITS produces the greatest benefits when individual systems or applications are integrated to form a single complete system. A complete system versus many isolated systems will maximize the potential, observed benefits in terms of safety, efficiency, and cost savings.

This section provides recommendations on how to integrate the individual ITS systems planned for deployment in the MOA. This section also defines the recommended steps and actions that foster integrated ITS in the MOA. The extent of integration defined is based on the required functionality of projects and systems, as defined in the ITS Concept of Operations. Lastly, this section identifies the issues that may affect ITS integration.

ITS integration can be viewed from two very distinct and interrelated perspectives: institutional and technological.

Institutional Integration

To achieve a regional ITS Architecture that is seamless from one agency's systems to another, institutional integration must occur. Institutional integration involves coordination and cooperation among the various departments within the MOA. Integration may occur if departments discuss and informally agree on the following issues:

- Benefits to be derived from the various systems
- Shared operational and maintenance responsibilities
- Functionality to be realized with system deployment
- Technologies and applicable standards to be implemented
- Operating procedures
- Opportunities for future system enhancements

Technical Integration

Technical integration is the process of developing, implementing, operating, and maintaining the systems that enable various users and other systems to collect, process, store, access, and use electronic information. Technical integration can also include integrating existing systems with other existing and planned systems. Achieving technical integration is complicated when various components are owned and operated by multiple agencies. It is further complicated when these systems are not designed to be "open," thereby making integration more difficult. Institutional structures and agreements that support systems integration must be in place in order to achieve technical integration.

Anchorage's migration towards an integrated system of systems and services will occur over time. Integration in Anchorage will result from an evolutionary process that considers both technical and institutional issues.

A concerted effort needs to be made to integrate ITS standards compliant systems in Anchorage. Being compliant with ITS standards helps ensure that one system can be fully integrated with another. Systems that are not standards compliant risk being used in an isolated or stove pipe manner, thus making it much more difficult to maintain a system, or replace it when it fails.

Actions Fostering Integration

To foster ITS integration in the MOA, it will be important to explore existing policies that relate to procuring, implementing, and operating ITS. Policies that can potentially foster the integration and interoperability of ITS are discussed below.

Integrating ITS with Regional Plans

The ITS Architecture and Standards Conformity Rule contains a provision that requires ITS-related decision making to be mainstreamed into the transportation planning process. The rationale for this requirement is to ensure that key ITS projects and initiatives are targeted early in the planning process, which in turn facilitates more effective integration. It is important that Anchorage develop and adopt policies that include ITS initiatives and conform to traditional transportation planning activities.

Role of the Private Sector

Private sector agencies may enhance the provision of ITS services. Public/private partnerships could significantly benefit the traveling public, the MOA, and the public sector, especially as it relates to tourism and telecommunications for the area. For example, an Internet website administered by the MOA could provide a variety of traveler-related information and links to other websites.

Updating the Regional ITS Architecture

Anchorage's ITS architecture will need to be updated periodically. Transportation challenges and user needs will change over time. As with current ITS deployments, future initiatives must focus on prevailing needs. As ITS is deployed over time in Anchorage, new opportunities for integration and functionality will be created.

Secondly, these updates provide an opportunity to ensure that emerging technological solutions are considered when identifying strategies to enhance travel safety and efficiency in Anchorage. This will help to ensure that the transportation systems in Anchorage continue to adequately meet travelers' needs. Based on these issues, the MOA needs to consider developing and adopting policies that require architecture and associated documentation to be updated when needed.

Before a new ITS project is funded, officials need to determine whether or not the project fits into the regional ITS Architecture. If all aspects of the project are completely covered then no action is needed and the project can be implemented. However, if some or all aspects are not accounted for in the Architecture, then a determination of whether or not the project actually satisfies a transportation need for the region. If so, then the Regional ITS Architecture should be updated to include the new project.

Conceptual Integration

As mentioned previously, ITS can not be integrated all at once. Various systems, both existing and new, can be integrated over time. The following section illustrates how various ITS components in Anchorage can be integrated over time to maximize the benefits of each system. The section discusses integration from the perspective of each program area, or function, that is enabled or enhanced by ITS deployment (e.g., snow and ice control). The functionality described in the following section is based on the individual project descriptions. This functionality is also predicated on the assumption that adequate and reliable communications will be provided.

<u>*NOTE:</u> Project sequencing is for conceptual integration only, and is not a ranking for program funding. Projects shown with an (*) have been programmed for funding at various levels in the AMATS Transportation Improvement Program (TIP.) Projects without an (*) have not yet been programmed for funding.

<u>Near-Term (0-3 Years)</u>

In the next three years, ITS integration will be limited, in part because of limited ITS deployment. During this time, emphasis will be placed on deploying ITS elements that show the greatest potential to provide benefits, or that enable the implementation of other systems, thus forming the foundation for future ITS applications. The following are projects recommended for the near-term (for details of the individual projects, please refer to the Implementation Plan):

Year Round Operations

- MOA Traffic Operations Center
- Needs Study for Transit Signal Priority
- Traffic Signal System Upgrade*

Traveler Information

- 5-1-1 for Traveler Information (incorporate with Statewide 5-1-1 program)*

Internal Operations

- Mobile Data Terminals*
- Tie-in to State's Condition Acquisition and Reporting System*
- Automatic Vehicle Location (AVL) Systems*
- Common Geographic Information System (GIS)*
- Shared Traveler Information and Traffic Database*
- Asset Management System*

Incident/Emergency Management

- Hazardous Materials Tracking and Reporting*

Medium Term (3-5 Years)
It is within the five-year horizon that ITS deployments will begin to migrate into an integrated system. In part, this will be fostered by an increasing number of ITS deployments and by the development of certain enabling technologies that will provide the basis for multiple functions. The following are projects recommended for the medium-term (for details of the individual projects, please refer to the Implementation Plan):

Year Round Operations

- Highway-Rail Intersection (HRI) Warning and Preemption Systems
- Smart Fare Box Systems*

Internal Operations

- Material Usage Tracking System

Incident/Emergency Management

- Closed Circuit Television (CCTV) and Digital Cameras

Long Term (5-10 Years)
It is within the ten-year horizon that ITS deployments will reach optimal levels of robustness in terms of both functionality and integration. The following are projects recommended for the long-term (for details of the individual projects, please refer to the Implementation Plan):

Year Round Operations

- Transit Vehicle Management*

6.5 FUNDING NEEDS AND OPPORTUNITIES

The costs associated with designing, deploying and operating an ITS requires jurisdictions to be flexible in their use of federal, state and local revenues. Since the advent of the Intermodal Surface Transportation Efficiency Act of 1991, and its successor the Transportation Equity Act for the 21st Century, the federal government has provided states with unprecedented flexibility and discretion in how Federal Highway Trust Fund money can be used to enhance the surface transportation system. However, this distributed responsibility results in more demands from all sectors of the transportation community. Furthermore, budgets are becoming more and more limited as local revenues are restrained due to economic shortfalls or other factors. Because of this, ITS projects will encounter greater competition with other types of both traditional and non-traditional transportation projects.

Funding Needs

This section describes the specific items that must be funded in order to successfully develop, implement, operate, and maintain ITS.

Planning and Design
As with most capital projects, ITS projects require planning and design work to determine what will be built, how it will be built, what level of mitigation (if any) is required. Special attention needs to be paid to ensure that enough funds are allocated for planning and design. This is crucial for adequately defining the project, so that cost estimates are reasonably accurate to budget for the construction, operations, and maintenance phases.

Project Capital
Capital expenditures for ITS will include, but are not limited to:

- Infrastructure, including roadside devices, communications media (e.g., fiber-optic cable), and the infrastructure required for the Integrated Transportation Operations and Communications Center.
- Software and other materials directly tied to the project implementation (e.g., marketing, training materials, etc.). These are generally one-time charges.

Operations and Maintenance
Adequate operations and maintenance funding is needed for effective system development. The level of sophisticated technical and software systems inherent in most ITS projects is substantial. The MOA needs to account for routine maintenance to ensure a full design lifecycle for each system. These investments need to be protected to avoid premature system(s) replacement.

One positive attribute of ITS standards adoption will be the development of more interoperable equipment and common system platforms, which will encourage more choices among vendors, thus helping to reduce replacement costs.

Training
As the MOA continues to deploy ITS, it will be increasingly important to ensure that the staff responsible for operating and maintaining these devices receive adequate training. Training will be required for all existing and new employees who will be responsible for operating and maintaining ITS. Providing proper and adequate training will help ensure that maximum benefits are derived and that system life is maximized.

Funding Opportunities

Opportunities to fund ITS design, implementation, and operation in Anchorage are identified below.

Traditional Funding Mechanisms

The following traditional funding mechanisms need to be examined before implementing ITS in Anchorage:

Federal – Transportation funding at the federal level, unlike most other federal programs, is authorized as a massive nation-wide package every six years. The current package, which was signed into law in 1998, is the “Transportation Equity Act for the 21st Century” (TEA-21). TEA-21 authorizes $217 million in funds for deploying multimodal transportation projects, including ITS, over a six-year period. This national package includes the following funding programs that may be tapped to support the ITS deployment:

- National Highway System (NHS)
- Surface Transportation Program (STP)
- Congestion Mitigation Air Quality (CMAQ)

This program funds improvements to rural and urban roadways that are part of the NHS. Under the NHS Designation ACT of 1995, over 160,995 miles of roads, which are most critical to interstate travel and national defense, those that connect with other transportation modes, and those essential for international trade are eligible for funding. Until 1991, the NHS funding program limited the period in which funding could be used for traffic management and control to two years. However, TEA-21 and its predecessor (ISTEA) eliminated this limitation. This is inclusive of start-up and operating costs. TEA-21 also includes “infrastructure-based intelligent transportation system capital improvements” as eligible projects for NHS funding. Additionally, as defined in 23 USC 103(b)(6), the term “operating costs for traffic monitoring, management, and control” now includes a much broader range of eligible expenditures, including the following:

- Labor costs
- Administrative costs
- Utilities and rent
- Other costs associated with the continuous operation of traffic control, such as integrated traffic control centers

Operating expenses are now defined to include hardware and software upgrades, as well as major systems maintenance activities (i.e., those undertaken to ensure peak performance). The replacement of defective or damaged computer components and other traffic management system hardware, including street-side hardware, is also eligible. However, restrictions still preclude the use of these funds for the routine maintenance of computer components and system hardware.

The **Surface Transportation Program (STP)** is a block-grant type program that can be used by state and local governments on any road (including NHS) that is functionally classified as a local or rural minor collector or higher. Infrastructure-based intelligent transportation system capital improvements are eligible for STP funding. STP funds can be used for capital and operating costs for traffic monitoring, management, and control facilities. However, as with NHS funding, they cannot be used for maintenance.

As part of the federal Clean Air Act, the **Congestion Mitigation and Air Quality Program (CMAQ)** channels air quality improvement resources to non-attainment areas for ozone, carbon monoxide, and particulate matter. Traffic and congestion management strategies are eligible for CMAQ funding, provided that the sponsor can demonstrate that these strategies will improve air quality.

Operating expenses for traffic monitoring, management, and controls are eligible for CMAQ funding under the following conditions:

- The project produces demonstrable air quality benefits
- Project expenses are incurred as the result of new or additional service levels
- Previous funding mechanisms, such as fees for services, are not replaced

In addition to the funds authorized specifically for ITS, ITS activities are eligible for funding from other programs. Both NHS and STP funds may be used for infrastructure-based ITS capital improvements and CMAQ funding may be used for implementing ITS strategies to improve traffic flow, which contributes to air quality improvement. Transit-related ITS projects are defined to be capital projects and are therefore eligible for funding under specific transit capital programs, such as the Urbanized Area Formula Grant Program and the formula grant program for non-urbanized areas. This is in addition to the STP, NHS and CMAQ programs.

ITS Earmarks – ITS earmarks will continue to be another source for ITS project funding. Although the predictability of this funding is somewhat limited, this source can provide supplemental resources for various ITS projects in the pipeline for implementation, or help start ITS projects that haven't faired well through other more established TEA-21 funding programs. After the State receives ITS earmark monies the MOA applies to the State to receive funding. The DOT ITS Policy Committee decides how the Earmark money is allocated.

Innovative Funding Mechanisms and Special Programs

"Innovative financing" refers to changing the traditional federal highway financing process from a single strategy of funding on a "grants reimbursement" basis, to a diversified approach that provides new options. Many of these ideas come from the most innovative financing concepts developed in the public and private sectors. A prime objective of innovative financing is to maximize the states' ability to leverage federal capital for needed investment in transportation systems and to foster the efficient use of funds.

Transportation Infrastructure Finance and Innovation Act of 1998 (TIFIA) – TEA-21 established a new innovative financing program called the "Transportation Infrastructure Finance and Innovation Act of 1998" (TIFIA). Eligibility for TIFIA extends to projects that are of critical national importance such as intermodal facilities, border crossing infrastructure, multi-state highway trade corridor expansion, and other investments that have regional and national benefits. The TIFIA credit program is designed to fill market gaps and leverage substantial private co-investment, thru supplemental and subordinate capital.

TIFIA permits USDOT to provide financial assistance to projects in the form of direct loans, loan guarantees, and lines of credit. Almost any project that costs over $100 million is eligible for this program. ITS projects are specifically included for costs of $30 million or more. Federal credit assistance may not exceed 33% of the total project cost.

Partnerships – A public/private partnership is a business relationship between the public and private sectors. Both entities, to a specific degree, share responsibilities and the costs, risks, and rewards associated with delivering goods and/or services. From a transportation standpoint, a public/private partnership is a form of service delivery with a collaborative approach based on reallocating traditional responsibilities, costs, risks, and rewards between the public agency and private entities.

6.6 PROCUREMENT STRATEGY

This section identifies the potential challenges associated with procuring the ITS software and hardware that will be required to realize the Municipality's ITS Vision. In addition, potential ITS procurement strategies that the MOA may apply to most effectively achieve the ITS Vision are also identified.

Procurement Challenges

This section is meant to serve as a reminder to those who have used non-traditional methods to procure technologies in the past. It documents some of these options for those who have not been involved with ITS or technology procurement.

It can be very challenging for the MOA to procure ITS software and hardware. Methods (such as low-bid) that have traditionally been employed to procure transportation infrastructure (such as bridges and roadways) are not generally applicable to ITS hardware or software due of the dynamic nature of ITS project scopes. Furthermore, because of this dynamism, ITS projects often require more flexibility in the procurement process than other more traditional transportation improvement projects. This flexibility is necessary for responding to changes in the environment, which frequently come with ITS projects. For example, one of the most common reasons for many failed ITS software development projects is that the original project definition changes due to advances in technology. Another reason is users often want to seek new or refined changes to system requirements. With this in mind, it is very important that the MOA allow for flexibility in procuring ITS.

The MOA also has access to the State's software task order contract. This contract allows an agency to work with a software team that was chosen on the basis of qualifications. Generally, tasks are written to determine a detailed scope, and cost estimates are written to determine the effort.

Traditional construction procurement methods are useful for projects where construction processes are standardized and fairly predictable, and cost estimates for equipment and services are available and reliable. This is not the common scenario for ITS projects. In simple terms, for traditional construction projects, its proponents generally know what they are facing, and risks for scope changes are fairly low. Construction procurements require low-bid (rather than qualifications-based) selections, have difficult change-order processes, and include liability and completion clauses that do not apply well to the dynamic nature of software development. These aspects of construction procurements, among others, resulted in the issuance of a USDOT memorandum to all FHWA Division Administrators noting that ITS software development should never be procured as "low bid."

Effective ITS Procurement Methods

Although there are no current procurement processes designed specifically for ITS, existing methods can be applied to better respond to ITS project needs. This section describes why ITS projects can have uncertain outcomes, and describes the available procurement methods that can be used given various levels of uncertainty.

ITS is different from traditional road and bridge projects. The key differences relate to the following factors:

Maturity of the Technology
ITS technologies are relatively new and rapidly changing. In contrast, roads and bridges have been constructed for many years and have a long history of lessons learned.

Design Criteria and Standards
Because ITS is new and dynamic, few design or process criteria and standards exist to guide implementation. In contrast, significant design criteria and standards information is available for traditional transportation capital projects.

The Ability to Innovate
Since the technology industry is constantly introducing new systems, software solutions, and systems concepts, ITS sparks our imaginations and spurs innovation.

Potential ITS Procurement Strategies

The U.S. Codes outline how traditional road and bridge projects must be procured. A condensed and simplified description of available procurement methods follows. Key concepts in the law that are pertinent to ITS are:

Engineering and Design Services

No licenses are required for software and systems engineering. Therefore, Engineering and Design Services is not the required method for procuring ITS, which relies primarily on those services. However, Engineering and Design Services procurement methods are often appropriate.

Construction

Many ITS projects should not be defined as construction, although some (e.g., those that share the same certainty in installation as road and bridge projects, such as off-the-shelf software) can be defined as construction. Today, most field device projects are successfully procured as construction projects. The exception is when an experimental device, communications, or other uncertainty is introduced. If this is the case, consideration needs to be given to procuring the uncertain elements separately. It is also appropriate to contract site preparation work (for example, trenching for conduits and installing equipment cabinet bases) as construction, and procure the equipment and software necessary using a procurement process that will allow the MOA to select a vendor using a variety of criteria (not cost alone).

Common Rule

The U.S. Code allows agencies (other than federal agencies) to procure projects that are NOT defined as construction (per the U.S. code), using their own laws and rules. This is referred to as the Common Rule. In addition, if no federal funds are included in the project, agencies can use their own procurement methods. Most agencies have adopted some form of the American Bar Association's Model Procurement Code. There are three common categories under that code: Construction, Goods, and Services.

Additional Tools

For all types of procurements (except construction procurements), two tools are available that can be very useful in managing dynamic, quick turn-around, uncertain ITS projects that require many decisions.

Indefinite Quantity Contracts

Indefinite Quantity Contracts (IQCs) are used to procure both goods and services. They help reduce the length of time between advertising and Notice to Proceed, by pre-qualifying and signing contracts with one or more contractors to supply required goods or services with no guaranteed minimum. Because the process of advertising, awarding and contracting is already complete, when a service or good is required it can be procured expeditiously by simply defining the service or good and agreeing on the price.

Task Order Methods

Task Order contracts are used when the project goal can be reasonably well defined, but the processes and methods used to accomplish the goal cannot be clearly defined initially. For example, a project can be procured to implement a freeway management system on a specific portion of freeway, and include central control software. The project can be divided into small tasks to help reduce uncertainty, and to better manage overall costs.

Policy Considerations

Because most agencies do not have appropriate policies and standards to guide ITS procurement, they often find that software deliveries will fail to meet functional requirements, be over budget, and/or be delivered late. As such, software procurement policies should rely on good management practices.

Alaska procurement laws and Municipality procurement rules appear sufficiently flexible to deploy new approaches. Federal procurement requirements, applicable when federal-aid highway funds are used to procure future ITS projects, may be more restrictive. Generally, the Federal Highway Administration has shown growing latitude in this area and has sponsored national courses addressing the unique aspects of ITS procurement.

6.7 SUMMARY

ITS shows significant potential to improve safety and efficiency of travel in the MOA. In part, the need for ITS in the MOA revolves around improving internal operations and management, emergency management, traffic operations, and year round operation. This Implementation Plan has outlined a set of projects identified by various stakeholders in the MOA to enhance traffic operations. Further, it has focused on identifying potential strategies and policies that will foster integration of ITS services in the MOA.