

Colorado Department of Transportation

Intelligent Transportation Systems Strategic Plan



January 2002

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I. Introduction

This document presents Colorado Department of Transportation's (CDOT) Intelligent Transportation Systems (ITS) Strategic Plan. This plan represents a new approach to CDOT's ITS business planning. The plan was developed by a cross-functional team of CDOT headquarters and Region staff (comprising the ITS Steering Committee). The Steering Committee helped to develop a department-wide vision and strategic direction for ITS.

The Plan sets department-wide strategic direction for ITS. The Plan outlines the highest-level strategies and identifies what resources are required to achieve them. In addition, the Plan priorities have received broad-based support from across CDOT. This Strategic Plan will be used to provide guidance and direction for current and future ITS investment and implementation.

This Plan establishes the following:

- CDOT's overall vision and strategic direction for ITS investments.
- CDOT consensus on ITS investment priorities and how to institutionalize ITS into CDOT's business areas and functions.
- Strategies that address the major issues that CDOT's Regions and Headquarters are facing in implementing ITS.
- A framework for evaluating the benefits and costs of ITS that considers capital investments, operating, and maintenance costs, and the contribution of ITS to CDOT's department-wide investment objectives.
- Overall organizational roles and responsibilities for moving towards the vision for ITS.
- Development of ITS core services, and tools, services and a performance-based methodology to measure their contribution to CDOT Investments Categories.

The Plan provides a framework for working with Metropolitan Planning Organizations and other local jurisdictions to assist with development of ITS Regional Architectures, and refine the existing Statewide ITS Architecture. The Plan enables CDOT to integrate ITS planning into the statewide planning process and comply with the applicable federal rules and regulations.

II. The Vision for ITS

The Colorado Department of Transportation's vision for ITS is one in which current and contemporary technologies are used to:

Provide reliable, accurate, and timely traveler information and real-time traffic management and operation of the highway system through fully integrated, coordinated, and maintained Intelligent Transportation Systems, so that users are able to make decisions that enhance and improve their choice of travel, mode, route, and time, thereby resulting in a more productive, efficient, and safe transportation system.

The goal is an overall traveler information and traffic management system that allows for integration and interfacing of existing legacy, as well as future systems, and one in which information is managed as an asset of value to transportation system users and transportation providers of all types. CDOT's role is to provide statewide leadership by deploying the enabling infrastructure, developing partnerships, establishing policies and procedures with stakeholders to ensure integration and seamless access to data, and by providing advocacy for those ITS investments that have a strong business case.

A. Benefits of ITS

Traffic volumes and subsequent related congestion continue to increase on Colorado's highways, while at the same time, travelers demand information concerning road conditions. ITS has the ability to detect, collect, analyze, and disseminate timely and accurate information through a wide range of integrated systems.

The ITS Strategic Plan targets investments to enable CDOT and its customers to realize measurable benefits from ITS:

- **ITS has the potential to provide a highly cost-effective component of CDOT's approach to enhancing and improving the mobility and safety of Colorado's traveling public.**
- **ITS provides economic and quality-of-life benefits to Colorado highway users.**

Using traveler information, highway users can determine which mode will meet their travel demands more effectively, shorten trip times, avoid congested areas, and postpone travel until conditions improve. Traveler information provides value to the traveling public by allowing pre-trip and enroute trip planning. Using the ITS system, CDOT can manage traffic operations to increase the productivity and efficiency of the system.

The vision is one in which ITS is a significant element of CDOT's portfolio of investments providing highly cost-effective strategies for meeting Colorado's current and future transportation needs by:

- **Improving mobility through maximizing the productivity of the transportation system** by using ITS to increase the throughput of passengers and vehicles on the transportation system. This will effectively increase the capacity of the existing transportation system. CDOT would use ITS to continuously manage and fine tune the operation of the transportation system in response to travel demand and in the event of incidents that interrupt their normal operations.
- **Improving mobility through providing travel choices and increasing travel efficiency** through access to comprehensive, reliable, accurate, and timely traveler information, travelers will be able to make informed decisions concerning their travel prior to and during travel. ITS will enable travelers and businesses to choose travel time, mode, and route more efficiently based on real time information regarding travel conditions. This will help spread the volume of travelers among modes and over time, reduce the costs of doing business, and enhance the quality of life in Colorado.
- **Increasing safety for the traveling public** by enabling a faster response to incidents and reducing incidents through active traffic and incident management. A secondary mobility benefit is realized from broadcasting of alternative traffic routings for avoiding incidents and resulting congestion in incident areas. These alternate routings and traffic patterns will be developed as part of Incident Management Plans. CDOT will use a combination of ITS technologies to enhance the safety of the traveling public, by monitoring system operations, planning and managing transportation affected by special events, and providing travel related weather advisory information.
- **Enhancing intermodal connectivity and inter-jurisdictional coordination** by promoting and supporting seamless intermodal transportation connectivity and Colorado's ITS systems. CDOT ITS envisions managing information as a resource that will enhance intermodal connectivity between services provided by public and private transportation providers.

B. Performance Measures

Performance measurement is a key element in achieving CDOT's vision for ITS. CDOT ITS has developed several performance measures for tracking and identifying the mobility and safety benefits of ITS. Exhibit II-1 shows how performance measures demonstrate returns from investments in ITS.

Exhibit II-1: Measuring the Benefits of ITS

Principal Benefits	Selected Performance Measures*
Maximizing productivity of current transportation system	<ul style="list-style-type: none"> • Increase in vehicle and passenger throughput. • Reduction in total lost productivity due to incidents and congestion.
Increasing travel efficiency	<ul style="list-style-type: none"> • Use of travel information to reduce travel time and costs (through use of pre-trip and enroute travel information).
Increasing safety	<ul style="list-style-type: none"> • Shorten incident response times. • Reduction of secondary accidents due to incidents.

Note (): See ITS Branch Performance Measurement documents for details.*

Performance measures provide accountability for the role of ITS in meeting CDOT’s business objectives. For example, CDOT has the objective of improving mobility. Through active freeway management (ramp meters, variable message signs and other mechanisms) ITS can support mobility. Indeed in many urbanized areas ITS is a very cost-effective mechanism for improving mobility. The logic is as follows: the measurable outcome that traffic management can affect the productivity of the current system. Therefore, the Strategic Plan establishes maximizing freeway system throughput as an ITS objective. ITS services such as traffic management, traveler information, and incident management are provided to support the mobility objective.

This Plan also specifies the strategies and actions required for CDOT to provide these ITS core services to maximize freeway system throughput and hence improve mobility. The intent of the Strategic Plan is to move CDOT’s overall decision-making to the position where mobility investments include consideration of the benefits of ITS compared to the mobility benefits of other improvements.

III. Background

CDOT has recognized the importance of deploying intelligent transportation systems (ITS) to improve the productivity of the transportation system and to provide services that enhance the mobility and safety of Colorado's traveling public.

At the statewide level, CDOT is investing in enabling infrastructure, applying proven contemporary technologies and cost-effective solutions, to address immediate and long-term transportation needs. In addition, CDOT has established partnerships with the private sector to leverage resources to deploy a communications backbone for use by ITS devices. At the region level, variable message signs have been selectively included into projects and put into service as ITS devices on a project-by-project basis. This occurs mainly where project funding will allow. CDOT's ITS investments, among others, include:

- Traffic operations centers.
- Telecommunications infrastructure.
- Traveler information through the CDOT Web site and other mechanisms.
- Dynamic (Variable) message signs (DMS), close-circuit TV cameras (CCTV), highway advisory radios (HAR), road-weather information systems (RWIS), etc.

To date, ITS has been approached mainly as a stand-alone activity within CDOT. The central purpose of this plan is to establish an overall framework that will institutionalize ITS into decision-making at all levels within the organization.

A. Strategic Plan Framework

The ITS Strategic Plan framework is designed to enable CDOT to make strategic department-wide decisions regarding ITS. When implemented, the Strategic Plan will enable CDOT management to make ITS planning and budgeting decisions based on the following:

- The contribution that ITS makes to meeting CDOT's overall business objectives that have been established for each of CDOT's Investment Categories.
- The cost-effectiveness of ITS solutions in meeting CDOT's mobility and safety objectives.
- The relative improvements to transportation system performance from investments in ITS.
- The link between the level of ITS services provided and the level of investment in ITS.

1. Plan Contents

The Strategic Plan includes:

- **ITS Core Services.** These are the major ITS programs and functions that support CDOT objectives. The performance of these functions is evaluated against their contribution to accomplishing CDOT's business objectives. The ITS performance measurement program monitors the contribution that these functions make to CDOT mobility, safety, system quality, and program delivery objectives.
- **ITS Objectives.** Measurable objectives for ITS investments are set. ITS performance measurement will help to monitor and evaluate cost-effective accomplishment of these objectives. The intent is to tie action implementation to the CDOT budget process.
- **CDOT ITS Strategies.** Fourteen strategies are specified for enhancing, improving, and achieving ITS objectives. These strategies identify; the statewide investments, policy and procedural changes, planning and institutionalization areas, and implementation assistance that will position Colorado to benefit from ITS.
- **Implementing Actions.** The ITS Business Plan, specifies and prioritizes 33 implementing actions that fall under each strategy described in the Strategic Plan. The individual actions will guide CDOT's ITS work program. Each action has a high-level work plan that includes; implementation responsibilities, implementation steps, a timeline for implementation, estimated implementation costs, benefits of implementation, and implementation risks.

The actions fall into three broad categories:

- Enabling policies and procedures.
- Strategic statewide investments.
- Technical assistance with ITS planning, project prioritization, and implementation.

2. Planning Process and Partner Involvement

The ITS Strategic Plan is intended primarily for use by CDOT internally to set strategic direction and as a tool for annual business planning. The Plan belongs to all of CDOT.

Statewide ITS Steering Committee. Policy direction and plan strategies have been developed by a cross-functional statewide steering committee

representing headquarters and Region staff. The ITS Branch has provided staff support and is responsible for developing and maintaining the plan.

Region Involvement. Representatives from the ITS Steering Committee have met with senior management and the key functional disciplines in each of the CDOT regions to identify their; issues, implementation priorities, and perspective on how to make the ITS Strategic Business Plan most valuable. These meetings have been used to set plan priorities. They also indicate considerable statewide consensus on CDOT's ITS strategic direction.

CDOT's Business Partners. This plan is intended to be a business plan for CDOT. It is anticipated that CDOT's partners and customers will have broad involvement regarding ITS policies and planning decisions through other mechanisms. This will occur as part of their involvement in action implementation and in CDOT's overall statewide, regional, and other planning and project prioritization activities.

3. Strategic Issues and Barriers to Success

The ITS Steering Committee conducted meetings in the Regions, with the RTDs, traffic engineers, maintenance superintendents, planners, and other Region staff. The following key issues were identified and are addressed in the plan:

- **Need to address maintenance, operations, and replacement costs concerning ITS devices.**

ITS devices, for the most part, are implemented as part of project costs. The Regions have virtually no mechanisms for funding preventative maintenance, repair, and replacement. As the maintenance liability grows, this issue becomes more pressing, and puts more pressure on resources that exist to maintain infrastructure.

- **Customers value traveler information and there is a need to ensure statewide coverage.**

Traveler information needs to be viewed and managed from the corridor and statewide perspective. Device and communication infrastructure deployment should consider the diverse needs of both urban and rural areas.

- **The current project prioritization and programming process is not likely to implement ITS through regional plans.**

Currently committed projects do not address ITS in most Regions. The Regions do not believe that ITS will be incorporated in planned projects

due to extremely tight financial constraints. Project budgets currently make minimal allowance for ITS components.

- **Need to develop policies and procedures that improve coordination between headquarters and the Regions and that improve the effectiveness with which ITS services are provided.**

At the regional and statewide level, there are many examples where improved procedures are necessary to ensure that ITS core services are provided as effectively as possible. These range from operational consistency issues to the need to develop statewide ITS standards and procurement specifications, as well as transmitting of timely information (e.g., dispatch of CDOT Maintenance Forces by the Colorado State Patrol (CSP); reporting of road conditions from CSP to traffic operations centers for update of CDOT Web site).

- **Connectivity to the high-speed fiber backbone is imperative to successfully meet CDOT ITS goals and objectives.**

This effort is recognized as fundamental to the operational success, as well as to fully utilize and efficiently manage a statewide traveler information and traffic management system. Currently, there are no allocated funds to perform this task on a system-wide basis.

B. Plan Elements

As mentioned, the Plan includes 14 strategies and 33 implementing actions that address the issues identified by the ITS Steering Committee. These fall into three categories: Policy and procedural change, investment, and technical assistance.

1. Policy and Procedures – Institutionalizing ITS

- **Develop and implement policies and procedures for ITS activities, including: statewide traveler information, asset management and maintenance, replacement planning, and budgeting.**

At the regional and statewide level, there are many examples where improved policies and procedures are necessary to ensure that ITS core services are provided as effectively as possible. These range from operational consistency issues, to the need to develop statewide ITS standards and procurement specifications, as well as transmitting of timely information (such as dispatch of CDOT Maintenance Forces by the Colorado State Patrol (CSP); reporting of road conditions from CSP to traffic operations centers for update of CDOT Web site). This also involves accounting for preventative maintenance, repair, and lifecycle

costs in investment decisions, specifying maintenance responsibilities, and developing ITS maintenance finance mechanisms.

The ITS Branch in conjunction with the ITS stakeholders will review the ITS operations manual regarding collection and dissemination of traveler information and the ITS Quality Assurance Review Team will review the ITS maintenance manual to ensure operational consistency and uniformity statewide.

- **Institutionalize ITS into CDOT's business practices through policy and procedural change.**

This involves incorporating ITS into: planning and project prioritization, the project development process, and maintenance management.

The ITS Branch has been working in this area, incorporating important ITS policy tenants into the following documents: Training Modules for Integrating Modal Projects into the Planning Process, Policy Guidance Considerations for Project Priority Programming Process (4P) and the Corridor Optimization Guidelines.

- **Ensure that CDOT's project programming and financing mechanisms enable ITS to be funded as part of projects or as stand alone investments where cost-effective.**

Most of the currently committed projects do not address ITS in most CDOT Regions. The Regions do not believe that ITS will be incorporated in planned projects due to extremely tight financial constraints. Project budgets currently make minimal allowance for ITS components. The ITS Branch will work to explore various funding scenarios to ensure that ITS devices are incorporated into project costs, and funded where warranted, by their contribution to system performance.

2. Statewide Strategic Investments

- **As a strategic statewide priority, continue to invest in the deployment of the ITS enabling infrastructure.**

This includes completion of the traffic management centers and implementation of the communications infrastructure that ITS devices will use, resulting in more reliable communication links and a substantial reduction in cost over time. This effort is recognized as fundamental to the operational success, as well as to fully utilize and efficiently manage a statewide traveler information and traffic management system. Currently, funding is in place to construct a Traffic Management Center, which includes deployment of the Advanced Traffic Management

System/Advanced Traveler Information System software. A key action will be to determine the most cost-effective way to make the lateral connections to the backbone and how to fund these connections.

- **Continue to plan and invest in the statewide traveler information systems to support CDOT mobility and safety objectives.**

The traveler information system is a strategic statewide system involving the deployment and integration of ITS devices and communication infrastructure to disseminate information. The system includes: the CDOT Web site, the statewide use of dynamic message signs, close-circuit television cameras, highway advisory radios, road-weather information systems, and other systems, equipment, and tools. Device and communication infrastructure deployment will consider the diverse needs of both urban and rural areas.

The ITS Branch will perform analysis to selecting optimum equipment and devices, and locations for placing devices for collecting and disseminating traveler information. The result of the analysis will be a statewide/corridor “blueprint” or standard. As part of the analysis, the ITS Branch will evaluate the relevance of the Highways of Statewide Significance and tiering (stratifying) of the State Highway System as they apply to statewide traveler information corridors.

3. Technical Assistance

- **Provide support for ITS planning and project delivery.**

This involves the ITS Branch continuing to provide technical support for ITS as it is institutionalized into CDOT’s business areas and functions. This ranges from establishing standards and providing systems planning, to supporting benefit/cost analysis and performance measurement.

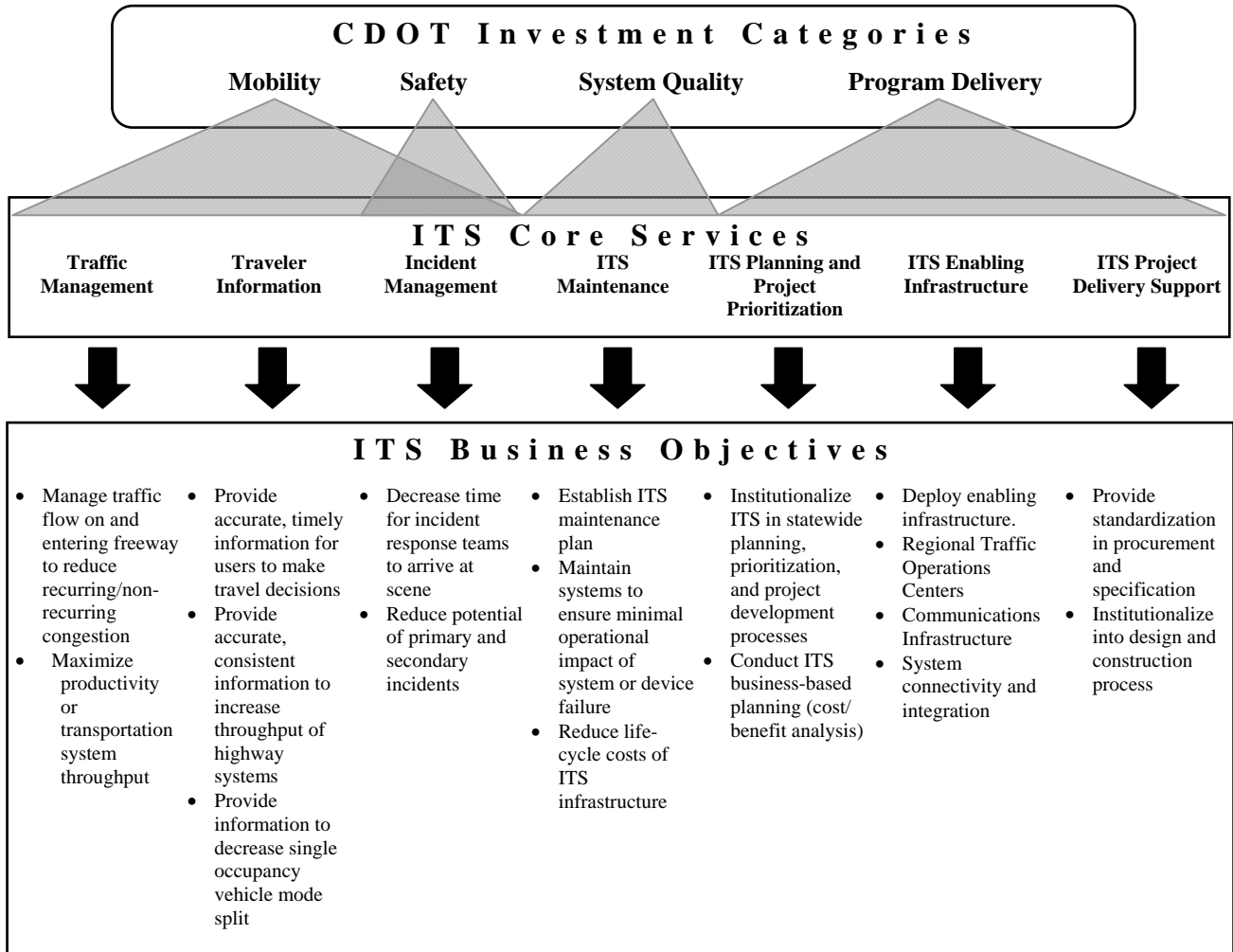
C. ITS Core Services and Business Objectives

To make investment decisions that are more cost-effective and that enhance accountability, the Transportation Commission and CDOT senior management developed a transportation investment strategy and established five Investment Strategies: System Quality, Safety, Mobility, Program Delivery, and Strategic Projects. In addition, for each Investment Strategy, the Transportation Commission has identified goals, and objectives to guide and direct CDOT in accomplishing the goals.

Exhibit III-1 presents how the CDOT-wide core services and business objectives for ITS are linked to CDOT investment categories. The Core Services identify the

major ITS program areas and functions that support CDOT objectives and CDOT Investment Strategies.

Exhibit III-1: ITS Core Services and Business Objectives



1. ITS Core Services

The four CDOT investment categories of Mobility, Safety, System Quality, and Program Delivery Investment Strategies are supported by seven ITS Core Services. These core services and the work activities within them are:

- **Traffic Management** – Involves the management of highway traffic flow to ensure the highest utilization of the transportation infrastructure, during both normal (congested/non-congested) and unusual (incidents, weather) conditions. The primary objective of managing the traffic flow is to

improve mobility. Installing ramp meters is one way to control the number of vehicles entering the freeway over a set time.

- **Traveler Information** – Refers to the collection and dissemination of data regarding road conditions and utility. The primary objective of traveler information is to improve the mobility of the travelers using the transportation system. This is accomplished by collecting traffic condition data and disseminating information to transportation users both before and during their trips. Several programs and activities are in development or underway to collect and report information to the public, including closed-circuit television cameras, dynamic message signs, and the CDOT Web site.
- **Incident Management** – Relates to the management of an incident and highway traffic in response to an incident. Like traveler information and freeway management, mobility is also the primary objective of incident management; however, there is a safety aspect as well. The goal of incident management is to reduce the response times for incidents and clear roads of obstructions, keep traffic moving, and minimize related secondary incidents.
- **ITS Maintenance** – Inventory devices, develop database to track performance and repairs. Establish criteria for devices, equipment/systems regarding mean-time failure and life cycle cost projections and a capital replacement program.
- **ITS Planning and Project Prioritization** – Refers to those support functions that enable the delivery of CDOT's ITS programs and services. The goal of this program area is to ensure that CDOT deploys ITS systems and devices and to institutionalize and facilitate the consideration of ITS systems in statewide planning and development.
- **ITS Enabling Infrastructure** – Refers to the deployment of the statewide strategic ITS investments. This includes traffic management centers and fiber optic network.
- **ITS Project Delivery Support** – Involves ensuring that CDOT business procedures for preconstruction and construction incorporate ITS requirements. For example, this includes establishing standards and specifications for ITS devices.

2. ITS Business Objectives

For each of the ITS core services, CDOT has developed several business objectives. These objectives identify the role ITS plays in accomplishing

CDOT's strategic investments. ITS performance measurements will be used to monitor the accomplishment of these objectives.

IV. ITS Strategies

The Strategic Plan presents fourteen strategies that will enable CDOT to move to a situation in which the organization can evaluate and make business-based decisions regarding ITS capital, maintenance, and operating expenditures. These strategies recognize that there is work yet to do in order for CDOT to transition to this new situation. This work involves continuing with the deployment of the enabling infrastructure and institutionalizing the use of ITS to meet CDOT’s overall business objectives. Exhibit IV-1 below, summarizes these strategies.

Exhibit IV-1: CDOT ITS Strategies

Core Services	Strategies
Traffic Management	<ul style="list-style-type: none"> • Establish active traffic management in priority corridors.
Traveler Information	<ul style="list-style-type: none"> • Continue statewide deployment of ITS devices used for collecting pre-trip and enroute travel planning information. • Develop the Advanced Traveler Information System and use the System to disseminate statewide traveler information.
Incident Management	<ul style="list-style-type: none"> • Use real-time road condition information to deploy and assist with incident response. • Use active traffic management capabilities to reduce congestion arising from recurring/non-recurring incidents and provide traveler information about incidents.
ITS Maintenance	<ul style="list-style-type: none"> • Establish a statewide ITS maintenance planning, replacement, and budgeting process.
ITS Planning and Project Prioritization	<ul style="list-style-type: none"> • Conduct statewide ITS deployment planning and provide leadership for implementing the statewide ITS enabling infrastructure. • Use performance measures to evaluate ITS’ contributions to CDOT investment categories. • Institutionalize ITS into the statewide and regional planning processes. • Institutionalize ITS into CDOT's project scoping processes.
ITS Enabling Infrastructure	<ul style="list-style-type: none"> • Deploy ITS enabling infrastructure on a statewide basis.
ITS Project Delivery Support	<ul style="list-style-type: none"> • Establish statewide ITS device procurement specifications and guidelines. • Establish policies, procedures, and provide guidelines for inspection and acceptance of ITS components. • Develop and establish statewide design standards for ITS systems and devices.

A. Implementation Priorities

The priorities for implementing these strategies are presented below.

1. Strategic Investments in the ITS Enabling Infrastructure

The Strategic Plan identifies the statewide strategic investments that are required on a statewide basis to continue and complete the deployment of the ITS enabling infrastructure.

Strategy: Deploy ITS enabling infrastructure on a statewide basis.

This strategy involves investing, as a statewide priority, in completing the enabling infrastructure that can then be used to realize the mobility and safety benefits from ITS project level investments. The enabling infrastructure includes continued deployment and staffing of major traffic management centers, and the communications infrastructure (wireless, wireline, and fiber optic) used for delivery of ITS services.

Implementation considerations. There is statewide support for this strategy. However, deployment needs to address basic communications needs of rural regions such as Durango. In addition, continued private deployment of fiber optic network has been placed on hold due to local economic conditions.

2. Strategic Investment in Statewide Traveler Information Systems

In meetings with the Regions, there was agreement that providing traveler information should be a priority and a statewide function. Provision of information to travelers on a statewide and a regional basis continues to be a key service provided by CDOT to improve mobility and safety. Maintaining and enhancing statewide traveler information remains a strategic statewide investment.

Strategies: Continue statewide deployment of ITS devices used for collecting pre-trip and enroute travel planning information.

Develop the Advanced Traveler Information System and use the System to disseminate statewide traveler information.

These strategies prioritize the continued development of the capability to provide statewide traveler information. This includes the use of the CDOT web site, DMS, CCTVs, HARs, RWIS, and other mechanisms used on a statewide or corridor-level basis. They involve the ITS Branch developing a “blueprint” for the statewide traveler information system and supporting its implementation. CDOT will plan for and finance the statewide traveler information as a statewide strategic investment that meets regional and statewide needs.

Implementation considerations. There is statewide consensus that traveler information provides a high payback customer service and mobility benefit for all regions. Further, there is agreement that the statewide umbrella approach to traveler information services should be enhanced. Again, it is important that connectivity and implementation addresses needs identified in both the urban and rural parts of the state.

3. Technical Assistance in Developing Policies and Procedures to Institutionalize ITS

The plan places strategic importance on incorporating ITS into CDOT's business practices. Strategies address how to incorporate ITS into planning, design and construction engineering, procurement, and maintenance practices.

Strategy: Establish a statewide ITS maintenance planning, replacement, and budgeting process.

The strategy is to develop and institutionalize a CDOT-wide approach to maintenance management and planning for ITS devices. This includes developing policies and procedures for maintaining devices, and considering lifecycle costs and service life in investment decisions. Implementation will resolve outstanding issues regarding ITS maintenance responsibilities. The strategy will address maintenance funding and responsibilities.

Implementation Considerations. Establishing CDOT's ITS maintenance management practices and procedures is a high priority for CDOT regions. This includes addressing preventative maintenance, repair, and lifecycle costs in planning decisions and budgeting for ITS devices and systems.

Strategy: Institutionalize ITS into the statewide and regional planning processes.

The strategy is to incorporate planning and decision making regarding the contribution of ITS to meeting mobility and safety objectives into existing statewide, corridor, and regional planning processes. This will involve the identification and prioritization of ITS projects on their own merits as part of these processes.

Implementation Considerations. Given fiscal constraints and the extent of the competing system preservation needs, the CDOT regions do not think that ITS projects or the inclusion of ITS devices in reconstruction projects will be prioritized and addressed through the regional planning process. It will be important to focus implementation attention on ensuring that there are mechanisms to fund stand-alone ITS projects where their performance benefits compete with other project types.

Strategy: Institutionalize ITS into CDOT's project scoping processes.

The strategy is to amend the current guidelines and procedures that are used for project delivery including scoping, design and construction engineering so that they address ITS. The strategy ranges from establishing procedures for evaluating and including ITS unit costs as part of project development through to procedures for inspection and acceptance testing of ITS applications during construction.

Implementation Considerations. Current project funding practices and priorities are not likely to result in the inclusion of ITS devices as part of preservation projects. Implementation will require establishing standards for including ITS in the project scope and as part of the costs for reconstruction projects that are approved for the TIP.

4. Technical Assistance in ITS Planning and Project Prioritization

The plan calls for the benefits of ITS investments to be evaluated as part of the planning process. However, ITS planning work will remain. This will include evaluating the business benefits of ITS investment and conducting ITS performance measurement. This will provide technical input into the statewide and regional planning process.

Strategy: Conduct statewide ITS deployment planning and provide leadership for implementing the statewide ITS enabling infrastructure.

Many of CDOT's ITS services systems and devices require statewide planning and coordination. A decision made in one region or corridor can impact the effectiveness of the system. Therefore, this strategy includes establishing a blueprint for statewide systems such as dynamic message systems and other statewide or multi-regional systems.

Strategy: Use performance measures to evaluate ITS' contributions to CDOT investment categories.

This strategy will implement several performance measures needed to provide CDOT the means to evaluate the effectiveness of ITS systems and devices for future planning or implementation decisions.

Implementation Considerations. The blueprint will provide the basis for locating ITS devices in corridors and regions to develop statewide traveler information systems. This will ensure an integrated state and regional ITS architecture. Implementation will then take place through the planning process.

5. Technical Assistance for ITS Implementation

The plan recognizes that the design, installation, acceptance testing, and maintenance of ITS devices will require specialized knowledge and expertise. The plan identifies strategies and actions for providing technical assistance for implementation.

Strategies: Establish statewide ITS device procurement specifications and guidelines.

Establish policies, procedures, and provide guidelines for inspection and acceptance of ITS components.

Develop and establish statewide design standards for ITS systems and devices.

These strategies will develop and institutionalize policies and procedures that will support the implementation of ITS.

Implementation Considerations. A number of CDOT's business areas will be involved in implementing these strategies. This will require the allocation of staff time.

CDOT ITS has been actively involved in implementing portions of these strategies.

B. Implementing Actions

The Strategic Plan includes 33 implementing actions. These actions implement the ITS strategies. They have been developed and refined through CDOT-wide committee discussions. Exhibits IV-2 through IV-7 below list these actions. Attachment A provides a brief description and specifies implementation responsibilities, work steps, and resource requirements for each action.

Exhibit IV-2: Traffic Management/Traveler Information Strategies and Actions

Strategy 1: Establish active traffic management in priority corridors.
<u>Action</u> 1.1: Establish policies requiring the implementation of ITS devices to achieve traffic management in priority corridors.
Strategy 2: Continue statewide deployment of ITS devices used for collecting pre-trip and enroute travel planning information.
<u>Actions</u> 2.1: Manage and coordinate deployment of systems and devices (such as CCTV, ATRs, weather information systems, probe vehicles) for collecting road condition information.
Strategy 3: Develop the Advanced Traveler Information System and use the System to disseminate statewide traveler information.
<u>Actions</u> 3.1: Modify and enhance communication plans for providing traveler information to the public. 3.2: Operate and further develop the role of the CDOT Web site in disseminating traveler information. 3.3: Collect and disseminate travel information. 3.4: Coordinate and maintain partnerships with media outlets (radio, TV, Cable TV, etc.) to disseminate traveler information.

Exhibit IV-3: Incident Management Strategies and Actions

Strategy 4: Use real-time road condition information to deploy and assist with incident response.
<u>Actions</u> 4.1: Participate with other agencies in development and review of incident management plans. 4.2: Establish procedures governing CDOT ITS activities in support of incident management plans, deployment of incident dispatch, and emergency management services.
Strategy 5: Use active traffic management capabilities to reduce congestion arising from recurring/non-recurring incidents and provide traveler information about incidents.
<u>Actions</u> 5.1: Refine, and provide training in procedures for providing pre-trip and enroute information to travelers (alternate routes, different traffic patterns, cautions, etc.) regarding planned and unplanned incidents. 5.2: Define policies, procedures, roles, and responsibilities for Traffic Management Centers.

Exhibit IV-4: ITS Maintenance Strategies and Actions

Strategy 6: Establish a statewide ITS maintenance planning, replacement, and budgeting process.
<u>Actions</u>
6.1: Develop processes for overseeing the management of maintenance activities supporting current and planned ITS equipment and device deployment.
6.2: Develop and maintain lifecycle maintenance and service life cost information on CDOT ITS devices.
6.3: Review current in-house and contracted ITS maintenance practices, and develop cost effective approaches for meeting ITS device level of service standards.
6.4: Develop and implement training programs for CDOT and contractor personnel to maintain ITS devices.
6.5: Establish a recommended list of products and parts for maintenance and replacement of ITS components and devices.

Exhibit IV-5: ITS Planning and Project Prioritization Strategies and Actions

Strategy 7: Conduct statewide ITS deployment planning and provide leadership for implementing the statewide ITS enabling infrastructure.
<u>Actions</u>
7.1: Maintain and update the statewide ITS enabling infrastructure plan.
7.2: Develop and refine the statewide and regional ITS architectures.
Strategy 8: Use performance measures to evaluate ITS' contributions to CDOT investment categories.
<u>Actions</u>
8.1: Implement ITS performance measures.
8.2: Use ITS performance measures for business planning and budgeting.
Strategy 9: Institutionalize ITS into the statewide and regional planning processes.
<u>Actions</u>
9.1: Incorporate evaluation of ITS components into CDOT's corridor and statewide planning processes.
9.2: Establish guidelines for evaluating ITS components as part of regional transportation planning processes.
9.3: Institute ITS components into the Project Priority Programming Process (4P).
9.4: Develop and maintain Corridor Master Plans incorporating ITS systems and components.
9.5: Provide technical support and advocacy for consideration of ITS in CDOT and multi-jurisdictional planning.
Strategy 10: Institutionalize ITS into CDOT's project scoping processes.
<u>Actions</u>
10.1: Establish standard guidelines and procedures for determining ITS needs during project scoping.
10.2: Evaluate and amend project scoping activities and documents to include ITS devices and systems.

Exhibit IV-6: ITS Enabling Infrastructure Strategies and Actions

Strategy 11: Deploy ITS enabling infrastructure on a statewide basis.
<u>Actions</u>
11.1: Implement communications backbone.
11.2: Implement Traffic Management Centers.

Exhibit IV-7: ITS Project Delivery Support Strategies and Actions

Strategy 12: Establish statewide ITS device procurement specifications and guidelines.
<u>Actions</u>
12.1: Establish statewide specifications and performance standards for ITS devices.
12.2: Establish statewide procurement practices and mechanisms based on lifecycle management activities of ITS components.
Strategy 13: Establish policies, procedures, and provide guidelines for inspection and acceptance of ITS components.
<u>Actions</u>
13.1: Establish a working group to develop ITS standard procedures for test and acceptance of ITS devices.
13.2: Provide training for construction inspections and acceptance procedures for ITS systems and devices.
Strategy 14: Develop and establish statewide design standards for ITS systems and devices.
<u>Action</u>
14.1: Determine and incorporate ITS design considerations, within the framework of the ITS National and Colorado Architecture specifications, into CDOT's design policies and manuals.

C. Action Status

The Strategic Plan actions include work that is underway and new work areas. The status of these actions at time of the Strategic Plan finalization is summarized in Exhibit IV-8 below.

Exhibit IV-8: Action Item Status

Action	Type of Activity	Status		Categories		
		Started	Not Started	Investment	Policy and Process	Technical Assistance
1.1	Establish policies and standards	✓			✓	
2.1	Deploy equipment	✓				✓
3.1	Maintain communications plans	✓			✓	
3.2	Define role of ITS systems	✓				✓
3.3	Collect and disseminate data	✓			✓	
3.4	Maintain and coordinate partnerships	✓				✓
4.1	Develop plans	✓			✓	
4.2	Develop procedures	✓			✓	
5.1	Develop procedures	✓			✓	
5.2	Develop procedures	✓			✓	
6.1	Develop processes and procedures	✓			✓	
6.2	Maintain data		✓			✓
6.3	Review procedures	✓				✓
6.4	Develop procedures	✓				✓
6.5	Establish standards	✓			✓	
7.1	Maintain plan	✓				✓
7.2	Review and modify ITS architecture	✓				✓
8.1	Monitor performance	✓				✓
8.2	Utilize performance measures		✓		✓	
9.1	Develop procedures		✓		✓	
9.2	Establish guidelines		✓		✓	
9.3	Integrate planning procedures	✓				✓
9.4	Establish plans		✓		✓	
9.5	Provide technical support for planning		✓			✓
10.1	Establish guidelines		✓		✓	
10.2	Develop procedures		✓		✓	
11.1	Deploy ITS devices	✓		✓		
11.2	Deploy ITS devices	✓		✓		
12.1	Develop standards and specifications		✓			✓
12.2	Establish statewide procurement practices		✓		✓	
13.1	Develop standards and specifications		✓		✓	
13.2	Provide training	✓				✓
14.1	Incorporate design standards		✓			✓

V. Implementation

Implementation involves statewide strategic investments, policy and procedural change, and technical assistance. The Plan identifies 33 actions for implementation. Specifics of the 33 action items presented above are detailed in Attachment A to this Plan. The actions are categorized by statewide strategic investments, policy and procedural change, and technical assistance to assist in planning and implementation. The details of each action item include: a description, scope of work, prioritization, identification of responsibilities, and expected durations. Many of these actions are being implemented through on-going work, but there is considerable volume of work to be performed. The following describes the roles and responsibilities, as well as the level of investment required to implement this Plan.

A. Roles and Responsibilities

There is broad agreement from CDOT Regions that statewide leadership is required to implement ITS activities. Responsibility for implementing the Plan includes:

- **Leadership and support of activities by the ITS Branch.**

There is broad agreement from CDOT Regions that statewide leadership is required to implement this plan. The ITS Branch will take the lead role, be responsible for and facilitate coordination, planning, development, and implementation of statewide strategic investments of ITS systems and devices that pertain to the enabling infrastructure, policies and procedures, standards and specifications, and performance measures.

The ITS Branch will provide support to CDOT staff in completing tasks associated with strategies and actions. In several cases, non-ITS Branch staff will be responsible for completing tasks in support of strategic actions. For example, the Division of Transportation Development will be directly responsible for institutionalizing ITS into CDOT's project scoping processes and conducting statewide ITS deployment planning. In some cases, the ITS Branch will be directly responsible for completing these tasks, such as managing the deployment of ITS enabling infrastructure throughout the state. As part of this Plan, the ITS Branch will perform cost/benefit analysis on selected corridors and produce a plan that addresses device, location, communication and integration issues, cost and options concerning incremental deployment.

- **Implementation of strategies and actions by CDOT Divisions and Regions.**

CDOT staff and divisions located throughout the state will actively participate with implementation of statewide strategic investments, be responsible for implementing Regional strategies and action items, and initiate and facilitate ITS implementation through the regional transportation planning process.

- **Oversight by the Executive Management Team.**

The Executive Management Team (EMT) will conduct oversight activities, including receiving quarterly reports on strategic action tasks completed, set priorities, and approve funding of activities in support of the plan. The ITS Branch will provide progress reports on action implementation status to the CTMC subcommittee and the EMT to ensure accountability and strategy implementation.

- **Documentation of Benefits through Performance Measures.**

The ITS Branch will implement and analyze performance of the various ITS systems and devices to determine the benefits accrued through each system. The ITS Branch will report on action implementation to the CTMC subcommittee and the Executive Management Team. The benefits of investments will be monitored through collection and measurement of ITS system and device performance.

B. Resource Requirements

The ITS Strategic Plan includes recommendations and outlines resource requirements for implementing the Plan actions. There are two major categories addressed in the context of resource requirements: 1) Funding ITS Maintenance and Operations; and 2) Strategic Investments. Resources are required for policies and procedures, strategic investments, and technical assistance. Exhibit V-1 presents a summary of the capital investments necessary to implement this Plan. Implementation will require the continued funding of ITS as a statewide strategic investment. The pace of implementation will be dependent on the level of investments committed by CDOT.

1. Funding ITS Maintenance and Operations

A critical part of the Plan includes actions that will establish procedures and recommend funding mechanisms for replacement and maintenance for ITS devices and systems.

Some operations and maintenance costs have been planned and authorized for the traffic management centers. Planned expenditures are \$2 million per center per year for staff and equipment to perform operations and maintenance functions. The Quality Assurance Review Team (QAR) recently performed an analysis regarding statewide maintenance and replacement of ITS devices. As a guideline, these costs typically range between 10 and 20 percent of the installation costs. The analysis shows that annually between \$13.1 million and \$17.8 million is needed to maintain and replace existing ITS devices statewide. The lower range of estimated costs includes preventative maintenance costs and longer life cycles, and lower overall replacement costs for ITS devices; the

higher figures include greater replacement cost. The ITS Branch and the Regions will continue to work on this effort to develop more accurate estimates. The next step is to define and ensure funding for the maintenance and lifecycle replacement of ITS devices.

2. Strategic Investments

CDOT will invest in the statewide enabling infrastructure as a statewide strategic investment. The statewide enabling infrastructure consists of integrating the Traffic Operation Centers (TOCs) and the Traffic Management Center (TMC), deployment of the fiber optic network (backbone) and high-speed add/drop multiplexers, connection of numerous devices for collecting and disseminating traffic information, and development of a statewide blueprint for traveler information and traffic management systems.

- **Completion and full functionality of the TOCs in Colorado Springs, Eisenhower Tunnel, Hanging Lakes Tunnel, and the TMC in Denver.**

The goal is to provide for center-to-center (C2C) connectivity and redundant fail over communication links among the centers. The Denver center currently operates out of an interim facility. Funds have been approved to acquire the Advanced Traveler Information System/Advanced Traffic Management System operating system and improve the TMC's functionality and expand its capacity. Improving the TMC is anticipated to begin in 2003. Electronic communications equipment has been installed in the Eisenhower and Hanging Lakes Tunnels facilities that will allow for C2C once the communications infrastructure is in place. A workstation exchange between Colorado Springs and Denver has resulted in an "interim C2C" connection. A complete C2C connection will be possible once the communications infrastructure is in place.

Funds have been approved to design, engineer, acquire the ATIS/ATMS operating system, software, firmware, and hardware, perform integration, and relocate and/or enhance the facility.

- **Deployment and installation of the long haul, high-speed fiber optic backbone, and all SONET high-speed equipment necessary for its operation (Tier 1 in Exhibit V-1).**

Fiber has been installed on I-70 from the Kansas/Colorado state line to Denver, various segments of inerduct/conduit have been installed on I-70 from Denver to Glenwood Springs and fiber has been installed on I-25 in the Denver metro area as part of the State's Shared Resources Project. Recently, however, the Project was suspended due to the contractor filing bankruptcy. At the same time as the long haul high-speed fiber backbone is being

deployed, CDOT will deploy high-speed add/drop multiplexers at strategic node/concentration points in order to maximize the fiber optic backbone. (Referred to as Tier 2 in **Exhibit V-1**).

For those areas of the state where fiber will not be available, CDOT will conduct communication needs assessments, and pursue other modes of reliable communication.

- **Connectivity of approximately 500 existing devices to the high-speed backbone is estimated to cost \$20 million dollars (Tier 3).**

This includes all construction, installation, and connection of fiber and conduit, and installation of fiber optic transceivers, to connect devices to the fiber optic backbone.

CDOT will plan for and finance the statewide traveler information as a statewide strategic investment that meets regional and statewide needs. In meetings with the Regions, there was agreement that providing traveler information should be a priority and a statewide function. Within the next year, in order to determine level of deployment and associated costs, the ITS Branch, in working with other stakeholders, will perform cost/benefit analysis on selected corridors and produce a plan that addresses device, location, a thorough assessment of communication needs and integration issues, cost and options concerning incremental deployment.

A preliminary, rough estimate of the cost for statewide traveler information has been developed (see **Exhibit V-1**). This estimate is based on Incident Management Plans and Regional ITS and DMS deployment plans as they pertain to State Significant Corridors, and the Denver Regional ITS Strategic Plan for the Denver regional area.

This cost estimate only includes deployment of DMS, HAR, Video Cameras, and Website dissemination, collectively considered as devices used to interface with end users to provide traveler information. The estimate does not include cost of additional data collection devices. Such devices could be installed either as part of construction projects or as stand alone projects.

- **Development of a statewide blueprint for traveler information and traffic management systems.**

The blueprint will document the planned and actual locations of ITS devices and communication networks used for gathering and disseminating traveler information and managing traffic. Estimates for required investment in the statewide deployment for systems and devices will be developed as part of the blueprint.

3. Policies and Procedures

Institutionalization of ITS into CDOT's business areas and functions will be accomplished through development of new policies, procedures, and standards. Initial development of these new policies and procedures will be assessed to determine if the work can be performed using existing staff, reallocating staff assignments or acquiring temporary assistance. The CDOT ITS Branch is in the process of performing detailed staffing analysis regarding each of the action items to determine the most effective use of resources.

The ITS Branch is already working on a number of the implementing actions that address policies and procedures. The Plan prioritizes these and identifies additional work necessary for integration of ITS into CDOT's core business services.

Implementation of the actions will require additional staff resources to design, implement, and communicate the new procedures. The expectation is that once the new procedures institutionalized into CDOT's business, the processes will be included into existing job descriptions. The Plan estimates one-time additional costs of four FTEs over a two to three year period. CDOT will assess whether the work can be performed using existing staff, temporarily reallocating staff assignments, or acquiring temporary assistance.

4. Technical Assistance

The ITS Branch will continue to provide technical assistance. The Strategic Plan defines the scope of the assistance. The expectation is that this work will mostly be absorbed as new policies and procedures are institutionalized in the workload and responsibilities of existing staff. Assistance will be provided using existing staff, reallocating staff assignments or through contracting with consultants.

Exhibit V-1: CDOT ITS Investments

Preventative Maintenance and Replacement of Existing ITS Infrastructure	
<ul style="list-style-type: none"> Statewide (15 year replacement cycle) 	<ul style="list-style-type: none"> \$3.7 million for preventative maintenance and an additional \$5 million for device replacement on a 15-year cycle beginning in 2002. TREX will require an additional \$1.8 million for preventative maintenance and an additional \$1.1 to replace devices beginning in 2008.
ITS Statewide Enabling Infrastructure Strategic Investments	
Traffic Operation and Management Centers	
<ul style="list-style-type: none"> Denver 	<ul style="list-style-type: none"> \$6.7 million ITS earmark (50/50 federal and state split for integration and full functionality of Denver TMC). \$6.7 million approved by Transportation Commission for construction of Denver TMC. The ITS earmark is programmed to design, engineer, acquire the Advanced Traveler Information System/Advanced Traffic Management System operating system, software, firmware, and hardware, and perform integration activities within the Center.
<ul style="list-style-type: none"> Colorado Springs 	<ul style="list-style-type: none"> \$3 - \$4 million
<ul style="list-style-type: none"> Eisenhower Tunnel 	<ul style="list-style-type: none"> \$4 - \$5 million
<ul style="list-style-type: none"> Hanging Lakes Tunnel 	<ul style="list-style-type: none"> \$4 - \$6 million
Fiber Optic Network	
<ul style="list-style-type: none"> Tier 1 	<ul style="list-style-type: none"> \$34.5 million
<ul style="list-style-type: none"> Tier 2 	<ul style="list-style-type: none"> \$3 – \$4 million
<ul style="list-style-type: none"> Tier 3 	<ul style="list-style-type: none"> \$20 million
Statewide Traveler Information	
<ul style="list-style-type: none"> State Corridors 	<ul style="list-style-type: none"> \$ 36.5 million based on deployment of: <ul style="list-style-type: none"> 44 dynamic message signs, 54 CCTVs, and 7 highway advisory radio systems at strategic locations on state significant corridors interstate highways. 49 dynamic message signs, 34 CCTVs, and 7 highway advisory radio systems on state significant corridors non-interstate highways. Includes cost to connect device to fiber backbone. The estimate to maintain and replace based on a 15-year cycle is approximately 10 to 15 percent of asset capital costs.
<ul style="list-style-type: none"> Denver Metro Area 	<ul style="list-style-type: none"> \$ 41 million. <ul style="list-style-type: none"> Based on Denver Regional ITS Strategic Plan developed by DRCOG, with participation from CDOT ITS Branch. That plan recommended limited device deployment in the Mountains and Plains area of the DRCOG Region. Those device deployments are included in the CDOT ITS Strategic Plan for Statewide Traveler Information and State Corridors. In the area of traveler information, as it pertains to freeways that CDOT operates within the Region, the Plan recommends deployment of 53 DMSs and 172 CCTVs. Estimate includes DRCOG Plan recommendation for \$1 million for improvements to traveler information services and \$4 million for deployment of interactive traveler information services. Includes cost to connect device to fiber backbone. The estimate to maintain and replace based on a 15-year cycle is approximately 10 to 15 percent of asset capital costs.

C. Implementation Timeline

Exhibit V-2 provides a high-level implementation schedule of the strategies presented in this Plan. Attachment A provides an implementation plan for each action.

Exhibit V-2: Strategic Actions Implementation Plan Schedule

Core Services and Strategies	1999				2000				2001				2002				2003				2004			
	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q
<i>ITS Enabling Infrastructure</i>																								
1. Deploy ITS enabling infrastructure on a statewide basis. (11)																								
<i>Traffic Management</i>																								
2. Establish active traffic management in priority corridors. (1)																								
<i>Traveler Information</i>																								
3. Develop the Advanced Traveler Information System and use the System to disseminate statewide traveler information. (3)																								
4. Continue statewide deployment of ITS devices used for collecting pre-trip and enroute travel planning information. (2)																								
<i>Incident Management</i>																								
5. Use real-time road condition information to deploy and assist with incident response. (4)																								
6. Use active traffic management capabilities to reduce congestion arising from recurring/non-recurring incidents and provide traveler information about incidents. (5)																								

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Exhibit V-2: Strategic Actions Implementation Plan Schedule (cont.)

Core Services and Strategies	1999				2000				2001				2002				2003				2004			
	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q
<i>ITS Planning and Project Prioritization</i>																								
7. Conduct statewide ITS deployment planning and provide leadership for implementing the statewide ITS enabling infrastructure. (7)																								
8. Use performance measures to evaluate ITS' contributions to CDOT investment categories. (8)																								
9. Institutionalize ITS into CDOT's project scoping processes. (10)																								
10. Institutionalize ITS into the statewide and regional planning processes. (9)																								
<i>ITS Project Delivery Support</i>																								
11. Develop and establish statewide design standards for ITS systems and devices. (14)																								
12. Establish statewide ITS device procurement specifications and guidelines. (12)																								
13. Establish policies, procedures, and provide guidelines for inspection and acceptance of ITS components. (13)																								
<i>ITS Maintenance</i>																								
14. Establish a statewide ITS maintenance planning, replacement, and budgeting process. (6)																								

Attachment A: Actions Implementation



This attachment provides the detailed descriptions of the tasks needed to implement the action items for accomplishing the ITS Strategic Plan.

The tasks presented on the following pages describes the detailed activities necessary to accomplish the strategic goals for ITS at CDOT. The following information is provided with these action items:

- The category of and priority for accomplishing each action.
- A short description of the action.
- The major steps necessary to complete the action.
- Outcomes and benefits of the action.
- Resources and responsibilities needed to complete the action.
- The status of the action.
- The expected duration of completing the action.
- Any dependencies the action has on any other actions.

Strategy 1: Establish active traffic management in priority corridors.

Action 1.1	Establish policies requiring the implementation of ITS devices to achieve traffic management in priority corridors.		
Category	Investment	Policy and Process	Technical Assistance
Priority	High	Medium	Low
Description	CDOT ITS has developed guidelines for institutionalizing ITS activities as part of corridor optimization activities. CDOT DTD, Regional planners, and TPR staff are in the process of identifying priority corridors, earmarked for traffic management activities. This action is to establish policies and guidelines for determining how ITS systems and devices should be deployed on priority corridors, to meet CDOT mobility and safety goals.		
Major Steps	<ol style="list-style-type: none"> 1. Identify and review planning policies and guidelines covering infrastructure requirements and evaluation of expansion to meet future traffic needs. 2. Draft new or amended policies or guidelines to emphasize implementation of ITS solutions for managing traffic on priority corridors. 3. Complete review and approval process for amended policies and standards. 4. Incorporate amendments and/or new policies into DTD planning guidelines. 		
Outcomes and Benefits	<ul style="list-style-type: none"> • Policies and standards for identifying ITS devices as key parts of overall road construction projects • Provides a means of institutionalizing ITS into project delivery. 		
Resources and Responsibilities	CDOT ITS Planning and Special Projects staff develops policies and guidelines, with assistance and review from CDOT DTD and CDOT Regional planning staff. Implementation of policies and guidelines will be the responsibility of regional staff.		
Status and Timeline	Identification of some priority corridors is completed, future corridors will be identified, and placed within a tiered structure (1, 2, or 3). Policies and guidelines may be developed from Corridor Optimization Guideline document.		
Duration	3 to 6 months.		
Dependencies	Dependent upon agreed identification of priority corridors by CDOT and regional planners.		

Strategy 2: Continue statewide deployment of ITS devices used for collecting pre-trip and enroute travel planning information.

Action 2.1	Manage and coordinate deployment of systems and devices (such as CCTV, ATRs, weather information systems, probe vehicles) for collecting road condition information.
Category	Investment Policy and Process Technical Assistance
Priority	High Medium Low
Description	CDOT ITS has deployed several systems and devices for monitoring traffic conditions. This action is to ensure CDOT continues planning and deployment of equipment (cameras, automatic traffic recorders, probe vehicles, DMSs, and other ITS devices), as needed to extend the overall coverage of priority corridors, to collect road and traffic condition information.
Major Steps	<ol style="list-style-type: none"> 1. Review corridor designs for appropriate ITS device locations. 2. Review local and regional incident management plans; identify requests for ITS devices used for detection and response to incidents. 3. Identify gaps between currently deployed devices and those identified or planned in accordance with documented plans and designs. 4. Recommend and identify locations for installing fixed data collection devices. 5. Recommend type/model of equipment for deployment, based on project scoping details, and applicable equipment specifications and standards. 6. Develop deployment schedule, based on project implementation plan. 7. Maintain and update inventory of CDOT-owned ITS devices installed throughout the state.
Outcomes and Benefits	Extends coverage of data collection and dissemination equipment (the more devices CDOT deploys and integrates directly correlates to the increased coverage of the state).
Resources and Responsibilities	CDOT ITS Planning and Special Projects staff and ITS Project Managers oversee and manage deployment of equipment, and coordinate deployment with Regional planning and engineering staff.
Status and Timeline	Through the CTMS project, CDOT is currently deploying and integrating additional CCTVs and ATRs.
Duration	Deployment of systems and devices will follow current and future regional/corridor-level plans and designs. Collecting road condition information will continue indefinitely.
Dependencies	<ul style="list-style-type: none"> • Installation of ITS enabling infrastructure. • Corridor plans and incident management plans. • Implementation of ITS device specification and standards.

Strategy 3: Develop the Advanced Traveler Information System and use the System to disseminate statewide traveler information.

Action 3.1	Modify and enhance communication plans for providing traveler information to the public.		
Category	Investment	Policy and Process	Technical Assistance
Priority	High	Medium	Low
Description	Develop a formal communications plan and set of procedures for passing information between Colorado state agencies and CDOT ITS TMC regarding road, weather, work zone, construction, and planned maintenance conditions.		
Major Steps	<ol style="list-style-type: none"> 1. Review current procedures between CDOT ITS, other CDOT branches, and other state agencies (i.e., CDOT Maintenance and Operations Branch, Colorado State Patrol) for communicating travel related information to and from TMCs. 2. Identify and document shortfalls in current procedures. 3. Reengineer procedures to increase reliability and timeliness of data. 4. Develop agreements to share and disseminate traveler information. 5. Develop and document communications plans and procedures for disseminating traveler information (using phone, fax, email, etc. to communicate with media partners). 6. Distribute communication plans to stakeholders. 7. Implement formalized procedures for collecting and sharing travel condition information. 8. Review communication plans and procedures effectiveness on a scheduled basis. 		
Outcomes and Benefits	<ul style="list-style-type: none"> • Encourages data sharing and accurate dissemination to the traveling public. • Informed public regarding travel conditions. 		
Resources and Responsibilities	CDOT ITS Traffic Operations Manager, CDOT Regional Maintenance manager, and Colorado State Patrol representatives formalize improved procedures for communicating information between agencies.		
Status and Timeline	CDOT branches have a procedure for communicating information, however, timeliness and reliability has lagged behind publicly expected levels. A relationship between CDOT and CSP also exists.		
Duration	3 to 6 months.		
Dependencies	Installation of enabling infrastructure and development of Colorado ITS Architecture.		

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Action 3.2	Operate and further develop the role of the CDOT Web site in disseminating traveler information.
Category	Investment Policy and Process Technical Assistance
Priority	High Medium Low
Description	Continue to enhance and maintain Internet-based traveler information service.
Major Steps	<ol style="list-style-type: none"> 1. Develop and implement a communications plan/marketing strategy to encourage public use of the website for travel planning. 2. Review current documented procedures for monitoring quality and accuracy of website information. 3. Document procedures, roles, and responsibilities for overseeing and managing website. 4. Develop, establish, and maintain CDOT hardware and software architecture standards for web applications. 5. Design, build, and install additional web applications to support TMC operations, as needed, to provide information on road, weather, work zone, construction, and planned maintenance conditions, as well as links to multi-modal transportation agencies.
Outcomes and Benefits	<ul style="list-style-type: none"> • Improved decision-making by travelers regarding mode and route selection. • Provides real time information to the traveling public. • Large number of “hits” on website, high public appraisal of website’s utility and helpfulness in aiding travel decision-making.
Resources and Responsibilities	CDOT ITS TMC network administrator manages website activities; overall CDOT public communications policies are set by CDOT Public Relations Office; CDOT Information Systems staff owns and manages website server platforms.
Status and Timeline	The CDOT ITS website, www.cotrip.org , operates from CDOT Information Systems equipment. TMC staff have constant access to update or change information presented. Currently expanding the information available as well as developing marketing strategy in conjunction with CDOT Office of Public Relations.
Duration	Activities will continue indefinitely to support new data and information technology platforms.
Dependencies	None.

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Action 3.3	Collect and disseminate travel information.		
Category	Investment	Policy and Process	Technical Assistance
Priority	High	Medium	Low
Description	This action will ensure that Gather traffic, road, and weather conditions from CDOT and CDOT partner sources, as well as media. Provide information to broadcast channels and through the Advanced Traveler Information System.		
Major Steps	<ol style="list-style-type: none"> 1. Collect and verify traffic, road, and weather condition information. 2. Sort and prioritize information for immediacy and applicability to local, regional, and statewide needs. 3. Disseminate traveler information, using ITS devices (i.e., update ATIS information database, toll-free information line, etc.) 		
Outcomes and Benefits	<ul style="list-style-type: none"> • Improved decision-making by travelers regarding mode and route selection. • Increases the effectiveness of mobility to the traveling public. 		
Resources and Responsibilities	CDOT TMC Manager oversees TMC staff in obtaining, verifying, and disseminating accurate and timely information.		
Status and Timeline	This task is being conducted. As additional data collection and dissemination devices are installed, the level of activity will increase.		
Duration	This activity will continue indefinitely.		
Dependencies	<ul style="list-style-type: none"> • Implementation of ITS enabling infrastructure to collect and disseminate traveler information. • Development and implementation of the Advanced Traffic Management System and the Advanced Traveler Information System. 		

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Action 3.4	Coordinate and maintain partnerships with media outlets (radio, TV, Cable TV, etc.) to disseminate traveler information.		
Category	Investment	Policy and Process	Technical Assistance
Priority	High	Medium	Low
Description	CDOT has instituted partnerships with several media outlets, and has maintained these partnerships for a number of years. CDOT has monitored the media outlets with regard to timeliness and accuracy of information transmitted. This action will create new and maintain existing partnerships between CDOT and regional/statewide media outlets to provide status reports of road, weather, construction, work zone, and planned maintenance condition information.		
Major Steps	<ol style="list-style-type: none"> 1. Identify other media outlets with significant coverage or provide specific types of information (travel and weather channels) to the traveling public. 2. Meet with media outlet management to discuss ability or desire to disseminate traveler information. 3. Develop formal memoranda of understanding with media groups to share and disseminate traveler information. 4. Meet with all partnered media outlets on a occasional basis to review operating procedures, changes in business processes, etc. 		
Outcomes and Benefits	<ul style="list-style-type: none"> • Increased coverage and dissemination of transportation related information • Encourages sharing and dissemination of information to the traveling public 		
Resources and Responsibilities	CDOT ITS Traffic Operations Manager coordinates and maintains agreements with media outlets. CDOT Office of Public Relations is kept apprised of status of partnering agreements and relationships.		
Status and Timeline	CDOT ITS Branch has maintained relations with some media outlets for the past several years.		
Duration	This activity will continue indefinitely.		
Dependencies	None.		

Strategy 4: Use real-time road condition information to deploy and assist with incident response.

Action 4.1	Participate with other agencies in development and review of incident management plans.		
Category	Investment	Policy and Process	Technical Assistance
Priority	High	Medium	Low
Description	This action is to ensure CDOT ITS participates in and facilitates development and upkeep of regional and corridor-level incident management plans.		
Major Steps	<ol style="list-style-type: none"> 1. Participate in regional incident management committees. 2. Define ITS Branch roles and responsibilities in incident management plans (i.e., define who communicates with incident managers, how and when communications are achieved, and what information is communicated). 3. Review existing incident management plans; identify any gaps or weaknesses due to changing conditions along corridor, such as corridor design, etc. 4. Discuss recommended changes with stakeholders. 5. Implement approved changes to communications plans. 6. Develop guidelines for plan development and modifications. 7. Facilitate maintenance and update of corridor incident management plans. 		
Outcomes and Benefits	<ul style="list-style-type: none"> • Incident management plans and communications plan for priority corridors. • Seamless communications between incident response agencies and coordinators. • Reduced response time to incidents. 		
Resources and Responsibilities	<ul style="list-style-type: none"> • CDOT ITS TMC Manager participates and encourages development and maintenance of corridor management plans created by regional committees, made up of CDOT M&O staff, regional and local incident response personnel. • Communications plan(s) are developed in conjunction with regional/corridor level stakeholders (CSP, Regional Traffic Engineers, Safety Engineers, incident response managers). 		
Status and Timeline	<p>CDOT ITS is participating with regional incident management committees to develop corridor-level incident management plans. Regional incident management committees have been organized and have developed or are developing corridor-level incident management plans. In all, 3 plans have been completed and 4 more are in progress. These activities have been underway for 1 year, and will continue for 1 year, with periodic review and updating of plans continuing indefinitely.</p>		

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Action 4.1	Participate with other agencies in development and review of incident management plans.
Duration	6 months to 1 year.
Dependencies	<ul style="list-style-type: none">• Assignment and management support for regional incident management committees.• Continued support for committees after plan has been adopted.

Action 4.2	Establish procedures governing CDOT ITS activities in support of incident management plans, deployment of incident dispatch, and emergency management services.		
Category	Investment	Policy and Process	Technical Assistance
Priority	High	Medium	Low
Description	As a follow-up to facilitating development of incident management plans, this action will document the policies and procedures for utilizing TMCs and ITS devices (CCTVs, etc.) in aiding incident detection and response.		
Major Steps	<ol style="list-style-type: none"> 1. Document roles of ITS devices in detecting, identifying, and responding to incident management. 2. Incorporate TMC responsibilities in assisting with incident management. 3. Develop procedures for TMC staff regarding incident response management. 4. Complete approval and incorporate into TMC operational procedures manual. 		
Outcomes and Benefits	<ul style="list-style-type: none"> • Reduced duration of responding to incidents and cleaning up incident sites. • Consistency in implementing incident management plans statewide. 		
Resources and Responsibilities	CDOT ITS TMC Manager identifies roles and responsibilities of TMC staff.		
Status and Timeline	Roles and responsibilities are developed. Further documentation needed to clarify staff roles.		
Duration	An annual review may be required to ensure plans are up to date. Expected duration should not last more than 2 months.		
Dependencies	Documented incident response and management plans for priority corridors		

Strategy 5: Use active traffic management capabilities to reduce congestion arising from recurring/non-recurring incidents and provide traveler information about incidents.

Action 5.1	Refine, and provide training in procedures for providing pre-trip and enroute information to travelers (alternate routes, different traffic patterns, cautions, etc.) regarding planned and unplanned incidents.
Category	Investment Policy and Process Technical Assistance
Priority	High Medium Low
Description	Develop processes supporting dissemination of pre-trip and enroute information (road closures or alternative routes, advisories, etc.) through the CDOT web site, cellular and toll free info information line, dynamic message signs, and highway advisory radio systems.
Major Steps	<ol style="list-style-type: none"> 1. Identify local, regional, and statewide stakeholders of travel information data, such as event planners; local, regional, or statewide road transportation and maintenance managers; local/regional transportation authorities. 2. Develop plans for exchanging travel information between stakeholders, such as sporting events, schedule maintenance activities by CDOT and local transportation departments, weather information, and unplanned incidents. 3. Establish standard turnover times for updating information provided on website and toll-free information service. Review current procedures for updating and maintaining database of traffic information broadcast to travelers. 4. Develop schedules for collecting relevant data from stakeholders (advanced time to provide data in order for incorporating to website, toll-free number, and other dissemination equipment. 5. Measure effectiveness of procedures, and make refinements as needed. 6. Identify performance gaps or procedures with lower than expected effectiveness in providing information. 7. Develop new processes and procedures to close shortfall in performance. Document functional processes for managing information dissemination through ITS devices. 8. Develop training material for new staff in information dissemination procedures. 9. For planned and unplanned incidents, develop substitute traffic flow plans containing (pre-determined) alternative travel routes.

DISCUSSION DRAFT

Action 5.1	Refine, and provide training in procedures for providing pre-trip and enroute information to travelers (alternate routes, different traffic patterns, cautions, etc.) regarding planned and unplanned incidents.
Outcomes and Benefits	<ul style="list-style-type: none"> • Staff trained in managing TMC equipment and disseminating road condition information to the traveling public in a timely manner. • Reduce traffic congestion due to incidents.
Resources and Responsibilities	CDOT ITS TMC Manager provides guidance and training to TMC staff. Contingency plans are developed in conjunction with corridor incident management plans, by regional incident management committee members.
Status and Timeline	CDOT TMC staff are trained in managing information dissemination equipment, including updating information presented on website and through toll-free number.
Duration	This action will continue indefinitely.
Dependencies	None.

Action 5.2	Define policies, procedures, roles, and responsibilities for Traffic Management Centers.		
Category	Investment	Policy and Process	Technical Assistance
Priority	High	Medium	Low
Description	This action will define roles and responsibilities of CDOT staff and other stakeholders involved with managing and operating TMCs. In addition, this action will ensure TMCs are staffed with and appropriate level of skilled personnel.		
Major Steps	<ol style="list-style-type: none"> 1. Review current business functions and processes performed by TMC staff. 2. Review incident management plans, identify TMC roles and responsibilities. 3. Define/document roles and responsibilities for staff assigned to TMCs. 4. Document policies and procedures for conducting normal and emergency operation functions of TMC. 5. Develop policies, procedures, or guidelines for TMC business functions. 6. Develop any needed training material for TMC staff to perform activities. 7. Conduct annual or as needed training to ensure staff can effectively perform roles as TMC operators. 		
Outcomes and Benefits	<ul style="list-style-type: none"> • Policies and procedures for operating TMCs. • Organizational structure for managing and operating TMCs • Annual training requirements for effective operation of TMCs, including communications plans, contingency plans, etc. • Established inter-operational communications between TMCs. 		
Resources and Responsibilities	CDOT ITS TMC Project Manager establishes, implements, administers, and maintains policies, procedures, and guidelines.		
Status and Timeline	<ul style="list-style-type: none"> • Some policies and procedures developed for TMC. • Organizational structure is in place through FTEs and temporary employees. • Currently no annual training in place, all training available is done in-house. 		
Duration	6 months to 1 year		
Dependencies	Completion of incident management plans.		

Strategy 6: Establish a statewide ITS maintenance planning, replacement, and budgeting process.

Action 6.1	Develop processes for overseeing the management of maintenance activities supporting current and planned ITS equipment and device deployment.
Category	Investment Policy and Process Technical Assistance
Priority	High Medium Low
Description	This action develops roles and responsibilities, and guidelines for managing maintenance activities in support of ITS systems and devices.
Major Steps	<ol style="list-style-type: none"> 1. Review current management activities supporting ITS device maintenance across all CDOT Regions. 2. From other DOTs, gather and review best practices for managing ITS device maintenance. 3. Identify gaps between current, potentially disparate activities, and best practices. 4. Develop ITS system/device maintenance management information system with functional connectivity to CDOT MMS. Include general equipment data (vendor, location, serial number, as well as operational, maintenance, and cost performance data, developed from Action 6.2). 5. Identify roles and responsibilities for managing maintenance activities of ITS equipment and systems. 6. Quantify equipment maintenance requirements, based on vendor-furnished information and best practices, identifying staff levels, skills, and funding needs. 7. Incorporate roles, responsibilities, and guidelines into Maintenance operations manual.
Outcomes and Benefits	<ul style="list-style-type: none"> • Statewide standards for level of service. • Statewide procedures for managing ITS device maintenance.
Resources and Responsibilities	CDOT ITS Maintenance Manager and CDOT M&O Regional Superintendents identify roles/responsibilities, evaluate best practices, and formulate consistent procedures for maintaining equipment.
Status and Timeline	QAR Committee has completed a review of ITS maintenance activities, including current procedures, staffing, and the ability to complete procedures. Work will begin in the next 3 to 6 months to evaluate and update maintenance management activities.
Duration	<ul style="list-style-type: none"> • 6 months for reviewing best practices. • 6 months for establishing guidelines.
Dependencies	None.

DISCUSSION DRAFT

Action 6.2	Develop and maintain lifecycle maintenance and service life cost information on CDOT ITS devices.		
Category	Investment	Policy and Process	Technical Assistance
Priority	High	Medium	Low
Description	This action collects ITS device operating and maintenance performance data to determine future maintenance needs and equipment selection. This action also sets service life standards, and level of service standards of ITS equipment.		
Major Steps	<ol style="list-style-type: none"> 1. Continue collecting device operating and maintenance data (labor and material costs, down time, mean time between failure, etc.). 2. Incorporate data into ITS maintenance management system, developed in Action 6.1 3. Develop service life and level of service guidelines/standards for ITS equipment. 4. Develop standards for expected service life for equipment, and operational level of service standards for devices, based on vendor-furnished information and operational statistics. 5. Analyze device performance against service life and level of service standards, as well as vendor-furnished information. 6. Identify and document gaps between expected and actual device performance. 7. Use performance data in reviewing and amending level of service standards. 8. Develop or modify criteria for maintaining and replacing equipment. 9. Periodically document and report equipment lifecycle costs. 		
Outcomes and Benefits	<ul style="list-style-type: none"> • Documentation of lifecycle performance data of individual devices • Performance characteristics of alternative or competitive vendor equipment 		
Resources and Responsibilities	CDOT ITS Maintenance Manager oversees efforts by regional staff, vendors, and consultants, assisted by QAR Team.		
Status and Timeline	CDOT ITS is working with the Regions to collect performance data.		
Duration	<ul style="list-style-type: none"> • 6 months for developing performance measures. • Collection and analysis of performance continued indefinitely. 		
Dependencies	<ul style="list-style-type: none"> • Dependent on development and incorporation of performance statistics and maintenance data into ITS maintenance management system. • Dependent on Action 12.2 		

DISCUSSION DRAFT

Action 6.3	Review current in-house and contracted ITS maintenance practices, and develop cost effective approaches for meeting ITS device level of service standards.		
Category	Investment	Policy and Process	Technical Assistance
Priority	High	Medium	Low
Description	This action will review current ITS maintenance contracting activities, including maintenance costs, and staffing levels and enhance or develop processes that meet CDOT requirements.		
Major Steps	<ol style="list-style-type: none"> 1. Review and document current procedures for maintaining CDOT ITS equipment, including staff levels, skill requirements, and funding. 2. Identify and compare maintenance requirements and procedures, through CDOT experience with equipment and vendor-furnished information. 3. Gather best maintenance practices information from DOTs and other agencies maintaining similar equipment. 4. Identify gaps between CDOT procedures, vendor-specified procedures, and best practices. 5. Develop maintenance processes that meet best practices, reduce costs, meet CDOT goals and objectives, etc. 6. Complete review of new or enhanced procedures and standards. 7. Complete approval process for standard maintenance processes. 8. Document processes in CDOT Maintenance and Operations Manual. 		
Outcomes and Benefits	<ul style="list-style-type: none"> • Establishment of best practices for meeting ITS device service standards • Standard review process • Standard language in contracts with vendors and service providers 		
Resources and Responsibilities	CDOT ITS Maintenance Manager and CDOT Regional Maintenance Superintendents identify roles/responsibilities, evaluate best practices, and formulate consistent procedures for maintaining equipment.		
Status and Timeline	QAR Committee has completed a review of ITS maintenance activities, including current procedures, staffing, and the ability to complete procedures. Work will begin in the next 3 to 6 months to evaluate and update maintenance management activities.		
Duration	6 months.		
Dependencies	None.		

DISCUSSION DRAFT

Action 6.4	Develop and implement training programs for CDOT and contractor personnel to maintain ITS devices.		
Category	Investment	Policy and Process	Technical Assistance
Priority	High	Medium	Low
Description	This action is to provide a mechanism ensuring ITS devices are maintained by skilled technicians.		
Major Steps	<ol style="list-style-type: none"> 1. Review CDOT ITS Maintenance staff and contractors' skill levels, familiarity with, and ability to maintain ITS systems. 2. Identify training needs for ITS maintenance staff and contractors, based on skills review and vendor-furnished information. 3. In conjunction with vendors, develop training and implement training materials for maintaining equipment. 		
Outcomes and Benefits	<ul style="list-style-type: none"> • Provide training to CDOT and/or contracted personnel on how to maintain ITS systems and devices 		
Resources and Responsibilities	CDOT ITS Maintenance Manager and Maintenance Team complete review, utilizing data from vendors. Vendors and contractors may provide short training programs for maintaining systems and devices		
Status and Timeline	This activity is in progress.		
Duration	Maintenance training activities will be reviewed on an annual/as needed basis, and will continue indefinitely.		
Dependencies	None.		

DISCUSSION DRAFT

Action 6.5	Establish a recommended list of products and parts for maintenance and replacement of ITS components and devices.		
Category	Investment	Policy and Process	Technical Assistance
Priority	High	Medium	Low
Description	This action will develop and maintain a list of recommended ITS equipment and support parts for use on CDOT sponsored transportation projects. Selection of ITS devices for procurement, during the design and construction phases of project, will be from this list. The action will also develop purchasing guidelines and authority for staff to quickly acquire parts when needed.		
Major Steps	<ol style="list-style-type: none"> 1. Evaluate device characteristics (i.e., functional performance and capabilities, costs, ease of maintenance, connectivity, compatibility with established ITS architecture, etc.) 2. Develop performance criteria. 3. Select recommended devices, based on performance criteria. 4. Review current purchasing guidelines and standards for CDOT owned equipment. 5. Develop and implement changes to guidelines as necessary. 6. Develop list of recommended parts. 		
Outcomes and Benefits	<ul style="list-style-type: none"> • List of ITS products and devices for purchase by CDOT and CDOT regions. • Provides a standardized set of devices and parts for applications in Colorado. • Drives purchasing contracts (five year vendor support contracts, etc.) • Potentially, this list may be used by non-CDOT agencies in the state for device procurement, with possibility for cost savings from multi-device/system purchasing contracts (economies of scale). 		
Resources and Responsibilities	CDOT ITS Special Projects Manager, ITS maintenance team, and CDOT regional procurement staff.		
Status and Timeline	Inventory of CDOT-owned equipment is in progress.		
Duration	This action will continue indefinitely.		
Dependencies	Equipment inventory is part of Action 2.1.		

Strategy 7: Conduct statewide ITS deployment planning and provide leadership for implementing the statewide ITS enabling infrastructure.

Action 7.1	Maintain and update the statewide ITS enabling infrastructure plan.		
Category	Investment	Policy and Process	Technical Assistance
Priority	High	Medium	Low
Description	This action maintains and updates CDOT’s ITS enabling infrastructure plan (developed by vendors), which describes the fiber-optic communications network, traffic management centers, ITS architecture, and lateral connectivity. The action ensures the plan is updated to reflect changes in fiscal conditions.		
Major Steps	<ol style="list-style-type: none"> 1. Ensure fiber-optic network installation is completed in accordance with CDOT specifications and standards. 2. Review pertinent FHWA and CDOT planning requirements. 3. Maintain and update Traffic Management Center implementation plans. 4. Review current and planned budget levels for enabling infrastructure deployment and maintenance. 5. Update plan in accordance with in accordance with CDOT strategic focus and funding priorities. 6. Maintain and update private/public partnerships with enabling infrastructure providers. 7. Propose changes to partnerships, as needed, to reflect conditions of infrastructure providers. 		
Outcomes and Benefits	<ul style="list-style-type: none"> • Up-to-date statewide ITS infrastructure plan • Standard/compatible equipment and parts used throughout the state. 		
Resources and Responsibilities	CDOT ITS Special Projects and Planning Manager oversees relationship with private partners, and monitors funding requirements for enabling infrastructure. Updates plan in accordance with ability to meet planned capital and operating budgets.		
Status and Timeline	This activity is in progress.		
Duration	6 months, and ongoing during operations and maintenance phase of ITS Program.		
Dependencies	None.		

DISCUSSION DRAFT

Action 7.2	Develop and refine the statewide and regional ITS architectures.		
Category	Investment	Policy and Process	Technical Assistance
Priority	High	Medium	Low
Description	<p>This action facilitates the maintenance and upkeep of the Colorado statewide ITS Architecture. The ITS Architecture will outline characteristics and standards for design and implementation of ITS equipment within, as well as independent of, other traditional road transportation projects.</p> <p>This action also provides a means for the CDOT ITS Branch to lobby and influence decision-making on current and future investment priorities for ITS projects, while meeting departments strategic directions.</p>		
Major Steps	<ol style="list-style-type: none"> 1. Identify stakeholders for formulating statewide ITS architecture. 2. Form committee of stakeholders and develop ITS architecture. 3. Review National ITS Architecture. 4. Identify what portions of National Architecture is applicable to Colorado needs. 5. Review statewide ITS needs and priorities, from perspective of meeting goals and objectives, and core services of CDOT. 6. Develop statewide ITS architecture. 7. Review regional ITS needs and priorities. 8. Develop regional ITS architecture. 		
Outcomes and Benefits	<ul style="list-style-type: none"> • Development and documentation of Colorado ITS Architecture • Prioritized list of strategic investments to meet system needs and CDOT goals and objectives. • Automated database for network design collection 		
Resources and Responsibilities	CDOT ITS Network Group, Regional Traffic Staff, participating in the documentation, provide documentation guidelines in the development of an automated solution.		
Status and Timeline	Network design drawing database being developed by IBI Group in support of the blueprint of statewide ITS systems architecture.		
Duration	3 to 6 months, plus some time on annual basis to update.		
Dependencies	None.		

Strategy 8: Use performance measures to evaluate ITS' contributions to CDOT investment categories.

Action 8.1	Implement ITS performance measures.		
Category	Investment	Policy and Process	Technical Assistance
Priority	High	Medium	Low
Description	This action is to quantifiably determine the contribution made by ITS activities on CDOT core services. This action will initiate collection and analysis of ITS device performance data, and calculate device performance measures, in order to measure the effectiveness of ITS systems and devices in meeting CDOT goals and objectives.		
Major Steps	<ol style="list-style-type: none"> 1. Collect inventory of CDOT-owned or shared ITS systems and devices. 2. Identify and detail best practice and performance measures of ITS systems/devices; data requirements for measuring performance. 3. Develop Performance Measures Implementation Plan. 4. Collect and maintain database of system and device performance characteristics, from data requirements identified above. 5. Measure, evaluate, and report performance of systems and devices on an on-going basis (implement performance measures). 		
Outcomes and Benefits	<ul style="list-style-type: none"> • Performance measures of ITS systems and devices. • Quantifiable contribution of CDOT ITS on core services and investment categories. 		
Resources and Responsibilities	CDOT ITS Special Projects and Planning Manager or designee oversees collection and analysis of ITS system/device performance.		
Status and Timeline	Inventory of devices underway. Performance measures identified. Implementation plan to be developed.		
Duration	3 to 6 months for deployment of measures. Collection of performance data continues indefinitely.		
Dependencies	None.		

DISCUSSION DRAFT

Action 8.2	Use ITS performance measures for business planning and budgeting.
Category	Investment Policy and Process Technical Assistance
Priority	High Medium Low
Description	This action is to use the performance measures developed in Action 8.1 to assist in planning and budgeting activities, ranging from simple equipment selection analyses to considering strategic statewide investment of ITS systems. This action should be a driver of investment decision-making in the next 3 to 5 years, after sufficient performance data has been collected and analyzed.
Major Steps	<ol style="list-style-type: none"> 1. Document ITS system and device performance, from data and statistics gathered in Action 8.1. 2. Review device performance against device characteristics and trends (i.e., lifecycle cost, geographical location, overall utility). 3. Identify and document device performance trends effecting future planning and budgetary decisions.
Outcomes and Benefits	<ul style="list-style-type: none"> • Business planning and budgeting of ITS systems and devices, based on individual system and device performance.
Resources and Responsibilities	CDOT ITS Special Projects and Planning Manager or designee maintains database of ITS system and device performance measures.
Status and Timeline	CDOT ITS is in the process of developing performance measures. Determination of initial performance measures will continue for the next 3 to 6 months.
Duration	Review of device performance and use in business planning activities will continue indefinitely.
Dependencies	Determination of performance measures and gathering of performance data.

Strategy 9: Institutionalize ITS into the statewide and regional planning processes.

Action 9.1	Incorporate evaluation of ITS components into CDOT’s corridor and statewide planning processes.
Category	Investment Policy and Process Technical Assistance
Priority	High Medium Low
Description	This action is to develop procedures and guidelines for considering ITS systems and devices when completing statewide and regional planning activities for transportation projects.
Major Steps	<ol style="list-style-type: none"> 1. Identify statewide and corridor-level transportation needs and requirements. 2. Review current planning guidelines and procedures used during project planning. 3. Develop guidance language for evaluating when it is appropriate to include ITS components in projects, involving such parameters as cost and benefits, performance criteria, device technical capability, etc. 4. Identify where evaluation and consideration of ITS components should be included in procedure or guideline documentation. 5. Draft new or amended text for inclusion in guidelines or procedures. 6. Complete review and approval process for guidelines and procedures. 7. Develop training material for implementing guidelines and procedures. 8. Provide coaching and technical assistance to enable statewide and corridor-level planning staff to evaluate ITS projects and programs.
Outcomes and Benefits	Guarantee consideration of ITS devices and components in project planning.
Resources and Responsibilities	CDOT ITS Special Projects and Planning Manager, with assistance from CDOT DTD. Guidelines will be implemented by DTD.
Status and Timeline	Guidelines are under development. Six months to 1 year for completion.
Duration	Update and refinement of guidelines will be should be reviewed on an as needed basis.
Dependencies	None.

DISCUSSION DRAFT

Action 9.2	Establish guidelines for evaluating ITS components as part of regional transportation planning processes.
Category	Investment Policy and Process Technical Assistance
Priority	High Medium Low
Description	This action will develop policies and procedures for evaluating ITS project needs and priorities, to be used during regional transportation planning activities.
Major Steps	<ol style="list-style-type: none"> 1. Identify regional transportation needs and requirements. 2. Review current regional planning guidelines and procedures used during project planning. 3. Develop guidance language for evaluating when it is appropriate to include ITS components in projects, involving such parameters as cost and benefits, performance criteria, device technical capability, etc. 4. Identify where evaluation and consideration of ITS components should be included in regional procedure or guideline documents. 5. Draft new or amended text for inclusion in guidelines or procedures. 6. Complete review and approval process for guidelines and procedures. 7. Develop training material for implementing guidelines and procedures. 8. Provide coaching and technical assistance to enable regional planning staff to evaluate ITS projects and programs.
Outcomes and Benefits	Role of ITS understood and applied by regional project planners.
Resources and Responsibilities	CDOT ITS Special Projects and Planning Manager, CDOT DTD statewide and regional planners, CDOT Region planning staff develop guidelines.
Status and Timeline	Identification of regional needs is underway.
Duration	6 months for formulation and promulgation of guidelines.
Dependencies	None.

DISCUSSION DRAFT

Action 9.3	Institute ITS components into the Project Priority Programming Process (4P).		
Category	Investment	Policy and Process	Technical Assistance
Priority	High	Medium	Low
Description	Develop list of ITS projects from the fiscally constrained 2020 Statewide Transportation Plan for discussion in the Project Priority Programming Process when the STIP is being updated.		
Major Steps	<ol style="list-style-type: none"> 1. Document ITS projects identified in the fiscally constrained 2020 Statewide Transportation Plan. 2. Discuss priority of the ITS projects with local and regional officials during the Project Priority Programming Process for the STIP update. 3. Discuss potential regional plan and statewide plan amendments which may be necessary to include an unfunded ITS project in the fiscally constrained element. 		
Outcomes and Benefits	Prioritized list of ITS projects documented in STIP.		
Resources and Responsibilities	CDOT ITS Special Projects and Planning Manager, CDOT DTD Planning Manager.		
Status and Timeline	This activity is in progress.		
Duration	6 months.		
Dependencies	None.		

DISCUSSION DRAFT

Action 9.4	Develop and maintain Corridor Master Plans incorporating ITS systems and components.		
Category	Investment	Policy and Process	Technical Assistance
Priority	High	Medium	Low
Description	This action will facilitate organization of multi-agency and multi-jurisdictional committees, and evaluate and modify current corridor master plans to incorporate ITS systems and devices as needed for future traffic volumes. Additional corridor plans will be developed as new corridors are identified.		
Major Steps	<ol style="list-style-type: none"> 1. Identify members of committees. 2. Facilitate formation of multi-agency/multi-jurisdictional planning committees. 3. Review current corridor plans (MISs, corridor plans, EISs, etc.) for incorporating anticipated or planned ITS deployment initiatives. 4. Document corridor priority needs. 5. Develop or amend corridor master plans to meet future requirements. 6. Identify new priority corridors as needed. 7. Develop corridor master plans for new priority corridors. 8. Complete bi-annual reviews to update plans in accordance with conditional changes (technology, demographic, etc.). 		
Outcomes and Benefits	Ability to measure benefits of individual systems and devices		
Resources and Responsibilities	CDOT ITS Special Projects and Planning Manager works with DTD planners, CDOT regional planners, Regional traffic engineers, rural TPR staff and STAC members to develop corridor master plans.		
Status and Timeline	CDOT is currently developing corridor master plans. Inclusion of ITS activities will be completed over next 6 to 12 months.		
Duration	Corridor master plans completed in 6 to 12 months. Annual or bi-annual reviews.		
Dependencies	<ul style="list-style-type: none"> • Identification of priority corridors. • Plan for installation and operation of enabling infrastructure. • Plan for installation of ITS systems and devices. 		

DISCUSSION DRAFT

Action 9.5	Provide technical support and advocacy for consideration of ITS in CDOT and multi-jurisdictional planning.		
Category	Investment	Policy and Process	Technical Assistance
Priority	High	Medium	Low
Description	Provide proactive support in multi-jurisdictional planning activities and venues		
Major Steps	<ol style="list-style-type: none"> 1. Define role for CDOT ITS planning in state and regional planning activities. 2. Develop knowledge base of technical and functional capabilities of ITS devices and equipment. 3. Strengthen the ITS section of the regional planning guidebook. 4. Provide technical performance, functional capabilities, and benefits of ITS systems and devices to statewide and regional transportation planning activities. 5. Support and assist training efforts within local transportation assistance programs and to DTD statewide and regional planning staff and CDOT Region planning staff. 		
Outcomes and Benefits	Inclusion of ITS systems and devices in corridor and regional transportation planning		
Resources and Responsibilities	CDOT ITS Special Planning and Projects Manager and CDOT DTD statewide and regional planning staff, CDOT Region planning staff.		
Status and Timeline	Work on this activity began in late 2000.		
Duration	This activity will continue indefinitely.		
Dependencies	None.		

Strategy 10: Institutionalize ITS into CDOT's project scoping processes.

Action 10.1	Establish standard guidelines and procedures for determining ITS needs during project scoping.		
Category	Investment	Policy and Process	Technical Assistance
Priority	High	Medium	Low
Description	This action is to develop guidelines and procedures for evaluating ITS system needs during project scoping activities.		
Major Steps	<ol style="list-style-type: none"> 1. Establish working group of stakeholders involved with project scoping. 2. Review current guidelines and procedures for scoping transportation projects. 3. Review current guidelines and procedures for scoping and evaluating ITS devices and alternatives. 4. Identify portions of scoping procedures and guidelines requiring modification or amendments. 5. Develop new guidelines or procedures, or amend current procedures, identifying criteria, benefits and costs, or applicability of alternative devices. 6. Complete approval process for guidelines or procedures. 7. Distribute guidelines and provide instruction on following. 		
Outcomes and Benefits	<ul style="list-style-type: none"> • Guidelines for scoping ITS projects as part of, and independent of, larger transportation projects. 		
Roles and Responsibilities	CDOT ITS Special Planning and Project Manager works in conjunction with CDOT DTD project staff.		
Status and Timeline	This activity has not started.		
Duration	6 months to 1 year.		
Dependencies	None.		

DISCUSSION DRAFT

Action 10.2	Evaluate and amend project scoping activities and documents to include ITS devices and systems.		
Category	Investment	Policy and Process	Technical Assistance
Priority	High	Medium	Low
Description	This action is to ensure ITS components are evaluated during the project scoping process.		
Major Steps	<ol style="list-style-type: none"> 1. Review current project scoping forms and procedures followed by CDOT project managers. 2. Amend or modify forms to include ITS devices or systems at key junctions of the process. 3. Ensure project scoping staff are following procedures and guidelines identifying criteria for selecting ITS components, such as benefits and costs, technical capability, etc. 		
Outcomes and Benefits	<ul style="list-style-type: none"> • Policy/guideline for determining where to place dynamic message signs along transportation corridors 		
Roles and Responsibilities	CDOT ITS Special Planning and Project Manager works in conjunction with CDOT DTD project staff.		
Status and Timeline	This activity has not started.		
Duration	Required time is less than 6 months.		
Dependencies	None.		

Strategy 11: Deploy ITS enabling infrastructure on a statewide basis.

Action 11.1	Implement communications backbone.		
Category	Investment	Policy and Process	Technical Assistance
Priority	High	Medium	Low
Description	This action will maintain current private/public partnerships, and develop new partnerships and agreements with private communications service providers and suppliers, to install hardware and communications network equipment, including fiber-optic cables, cellular towers, and other communication equipment.		
Major Steps	<ol style="list-style-type: none"> 1. Maintain and develop public/private partnerships with fiber-optic network providers, and wireline and wireless communications service providers. 2. Oversee installation, testing, and acceptance of Tier 1 fiber optic backbone network. 3. Oversee installation, testing, and acceptance of Tier 2 communications network. 4. Oversee installation, testing, and acceptance of Tier 3 communications network. 5. Ensure ITS devices and components meet communications protocols (lateral connectivity, etc.) 		
Outcomes and Benefits	<ul style="list-style-type: none"> • Partnerships with private industry provide opportunity for state to reduced expenditures needed to install communication infrastructure. • CDOT receives exclusive operating rights to a high-speed backbone for linking ITS devices. • Upgrade communications infrastructure along metropolitan and rural transportation corridors for public/private use. 		
Resources and Responsibilities	CDOT ITS TMC Program Manager and CDOT ITS Network Manager administer and manage contractors/vendors implementation of communications backbone.		
Status and Timeline	<ul style="list-style-type: none"> • Installing fiber-optic infrastructure on 1200 miles of CDOT freeway right-of-way. • Tier 1 SONET backbone in progress. • Tier 2 SONET multiplexer in progress by CDOT. • Tier 3 ITS device connection planned by CDOT. 		
Duration	Begun 11/8/99, ongoing.		
Dependencies	None.		

DISCUSSION DRAFT

Action 11.2	Implement Traffic Management Centers.		
Category	Investment	Policy and Process	Technical Assistance
Priority	High	Medium	Low
Description	This action is to complete the development and implementation of permanent traffic management centers, strategically located throughout Colorado. This action is to also link these TMCs to ITS devices, and implement communication protocols between TMCs		
Major Steps	<ol style="list-style-type: none"> 1. Find and encumber funding for construction of permanent TMC facilities. 2. Complete acquisition of real estate property and any necessary local permitting requirements. 3. Design TMCs facilities. 4. Complete development of ATIS/ATMS functional requirements, 5. Complete evaluation of competitive ATIS/ATMS software systems. 6. Complete necessary communication backbone installation. 7. Select and install ATIS/ATMS software suites. 8. Complete test and evaluation periods of TMC hardware and software. 9. Certify systems and place into service. 		
Outcomes and Benefits	<ul style="list-style-type: none"> • Traffic management centers providing services to Colorado. • TMCs acting as backups to other regional TMCs and Colorado TMC. 		
Resources and Responsibilities	CDOT Director, TMC Manager, consultants review, evaluate, and select competitive software products. CDOT TMC Project Manager facilitates design and construction of permanent TMCs, and integration/connectivity to ITS components located throughout the state.		
Status and Timeline	<ul style="list-style-type: none"> • Funding for TMCs identified and encumbered. • Interim CTMC in place and operational. • Permanent CTMC in planning stage. • Denver and Colorado Springs data link currently being connected. • Western Slope link will not be connected until fiber is available. • Same for Eisenhower and Hanging Lakes Tunnels, except video link is in place. • CTMC and Regional TOC communication protocols being integrated. 		
Duration	1.5 to 2 years.		
Dependencies	None.		

Strategy 12: Establish statewide ITS device procurement specifications and guidelines.

Action 12.1	Establish statewide specifications and performance standards for ITS devices.		
Category	Investment	Policy and Process	Technical Assistance
Priority	High	Medium	Low
Description	This action is to establish ITS device performance standards useful for evaluating the benefits and costs of competitive products when making procurement designs.		
Outcomes and Benefits	<ul style="list-style-type: none"> • Statewide acquisition of compatible ITS equipment • Use of statewide specifications for procuring equipment. 		
Major Steps	<ol style="list-style-type: none"> 1. Establish a cross-functional working group, including ITS Branch, CDOT Regional and local traffic engineers, CDOT maintenance superintendents, among others. 2. Review current CDOT equipment procurement specifications. 3. Review current ITS equipment design and performance specifications. 4. Identify segments of specifications requiring amendments or modifications. 5. Define new rules if necessary. 6. Draft amendments and new rules. 7. Complete review and approval process for standards and procurement specifications. 8. Collect and maintain ITS device performance statistics. 9. Identify acceptable levels of performance, based on field results and best practice information from other ITS managers. 		
Resources and Responsibilities	CDOT ITS Project Manager, staff from Center for Procurement Services		
Status and Timeline	This activity has not started.		
Duration	1 year		
Dependencies	None.		

DISCUSSION DRAFT

Action 12.2	Establish statewide procurement practices and mechanisms based on lifecycle management activities of ITS components.		
Category	Investment	Policy and Process	Technical Assistance
Priority	High	Medium	Low
Description	This action will establish procurement procedures that utilize lifecycle cost data to select ITS systems and components. Activities will include reviewing purchase and maintenance service agreements/warranties, and any special conditions for operations that should be included in specifications.		
Major Steps	<ol style="list-style-type: none"> 1. Review current procurement practices used by different transportation agencies. 2. Identify portions of guidelines or procedures that require update, modification, or amendments to include life-cycle cost decisions in equipment procurement. 3. Identify other best practices for procurement of ITS devices used by the regions and other states, especially those considering life-cycle cost approaches. 4. Gather and analyze cost data for procuring, operating, maintaining, and disposing of ITS components. 5. Write new or amended procurement guidelines and specifications for selecting equipment, based on functionality and costs 6. Complete review process for new or amended guidelines. 		
Outcomes and Benefits	<ul style="list-style-type: none"> • Acquisition of ITS equipment at best value; incorporation of lifecycle cost considerations in selection and acquisition of ITS equipment. 		
Resources and Responsibilities	CDOT ITS Special Planning and Projects Manager, procurement staff from Center for Procurement Services review and develop amended or new procurement specifications.		
Status and Timeline	This activity has not started.		
Duration	6 months to 1 year.		
Dependencies	None.		

Strategy 13: Establish policies, procedures, and provide guidelines for inspection and acceptance of ITS components.

Action 13.1	Establish a working group to develop ITS standard procedures for test and acceptance of ITS devices.
Category	Investment Policy and Process Technical Assistance
Priority	High Medium Low
Description	This action will ensure procurement specifications include detailed specifications outlining how test and acceptance trials will be completed before components are certified for full operation.
Major Steps	<ol style="list-style-type: none"> 1. Identify and assemble state and regional stakeholders for reviewing CDOT specifications. 2. Review specifications. 3. Review vendor-provided procedures for test and acceptance of ITS devices. 4. Review project-specific special provisions, identify applicable sections for revision to include test and acceptance procedures. 5. Identify portions of specifications requiring modifications or amendments to incorporate test and acceptance procedures. 6. Write new procedures or guidelines, or develop amended procedures for test and evaluation of ITS components. 7. Complete review process for new or amended specifications or standards. 8. Promulgate specifications, standards, or guidelines. 9. Incorporate procedures and guidelines into an ITS test and evaluation manual. 10. Provide results of testing to stakeholders (i.e., Colorado Revenue for test and evaluation performance of devices located in Ports of Entry).
Outcomes and Benefits	<ul style="list-style-type: none"> • Updated procurement specifications, including test and evaluation procedures, in procurement specification. • ITS device test and evaluation manual.
Resources and Responsibilities	CDOT ITS Special Projects and Planning Manager, CDOT region design staff, project development and construction staff.
Status and Timeline	This activity might occur during specification development.
Duration	6 months to 1 year
Dependencies	None.

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Action 13.2	Provide training for construction inspections and acceptance procedures for ITS systems and devices.		
Category	Investment	Policy and Process	Technical Assistance
Priority	High	Medium	Low
Description	This action will train CDOT inspection staff, and other appropriate staff (e.g., port of entry officials, city and county engineers) how to examine ITS-related equipment for acceptance		
Major Steps	<ol style="list-style-type: none"> 1. Identify staff requiring training of amended or new procedures for inspection and acceptance of ITS device installation, as part of construction projects. 2. Develop curriculum to provide training. 3. Arrange training schedule. 4. Conduct training as needed. 5. Update training curricula as needed. 		
Outcomes and Benefits	<ul style="list-style-type: none"> • Incorporation of procedures for inspecting ITS devices as part of scheduled infrastructure inspection activities 		
Resources and Responsibilities	CDOT ITS Special Projects and Planning Manager, with assistance from equipment vendors, contractors, and consultants.		
Status and Timeline	In progress.		
Duration	This action will continue indefinitely.		
Dependencies	Dependent on developing test and evaluation procedures for accepting ITS components prior to certifying as fully operational.		

Strategy 14: Develop and establish statewide design standards for ITS systems and devices.

Action 14.1	Determine and incorporate ITS design considerations, within the framework of the ITS National and Colorado Architecture specifications, into CDOT’s design policies and manuals.		
Category	Investment	Policy and Process	Technical Assistance
Priority	High	Medium	Low
Description	Participation in a cross-functional working group, providing input to the CDOT Standards Committee regarding development of ITS design standards		
Major Steps	<ol style="list-style-type: none"> 1. Establish cross-functional working group from CDOT Project Development Branch, ITS Branch, and CDOT regions 2. Review CDOT design standards. 3. Review ITS National and Colorado Architecture. 4. Identify current ITS design standards used throughout the state. 5. Develop consistent ITS design standards. 		
Outcomes and Benefits	<ul style="list-style-type: none"> • Incorporation of ITS design standards in CDOT design manual 		
Resources and Responsibilities	CDOT ITS project manager, Regional project design and development staff		
Status and Timeline	This activity has not started. The activity should continue indefinitely as the National and Colorado ITS Architecture is amended.		
Duration	6 months to 1 year for initial development, then periodic updates.		
Dependencies	None.		

Attachment B: Glossary of Terms



4P	Project Priority Programming Process
ATIS	Advanced Traveler Information System
ATMS	Advanced Traveler Management System
CCTV	Closed-circuit television camera
CDOT	Colorado Department of Transportation
CTMC	Colorado Traffic Management Center
CSP	Colorado State Patrol
DMS	Dynamic Message Sign (see also VMS)
DTD	CDOT Division of Transportation Development
FHWA	Federal Highway Administration
HAR	Highway Advisory Radio
ITS	Intelligent Transportation Systems
M&O	CDOT Maintenance and Operations Branch
RWIS	Road/Weather Information System
STIP	Statewide Transportation Improvement Plan
TIP	Transportation Improvement Plan
TOC	Traffic Operations Center, now referred to as Traffic Management Centers
TMC	Traffic Management Center (see TOC)
TPR	Transportation Planning Region
VMS	Variable Message Sign
WIMS	Weigh-in-Motion System

Attachment C: Matrix of Responsibilities



DISCUSSION DRAFT

Strategy	Action	Description	Roles and Responsibilities
Establish active traffic management in priority corridors	1.1	CDOT ITS has developed guidelines for institutionalizing ITS activities as part of corridor optimization activities. CDOT DTD, Regional planners, and TPR staff are in the process of identifying priority corridors, earmarked for traffic management activities. This action is to establish policies and guidelines for determining how ITS systems and devices should be deployed on priority corridors, to meet CDOT mobility and safety goals.	CDOT ITS Planning and Special Projects staff develops policies and guidelines, with assistance and review from CDOT DTD and CDOT Regional planning staff. Implementation of policies and guidelines will be the responsibility of regional staff.
Continue statewide deployment of ITS devices used for collecting pre-trip and enroute travel planning information	2.1	CDOT ITS has deployed several systems and devices for monitoring traffic conditions. This action is to ensure CDOT continues planning and deployment of equipment (cameras, automatic traffic recorders, probe vehicles, DMSs, and other ITS devices), as needed to extend the overall coverage of priority corridors, to collect road and traffic condition information.	CDOT ITS Planning and Special Projects staff and ITS Project Managers oversee and manage deployment of equipment, and coordinate deployment with Regional planning and engineering staff.
Develop the Advanced Traveler Information System and use the System to disseminate statewide traveler information	3.1	Develop a formal communications plan and set of procedures for passing information between Colorado state agencies and CDOT ITS TMC regarding road, weather, work zone, construction, and planned maintenance conditions.	CDOT ITS Traffic Operations Manager, CDOT Regional Maintenance manager, and Colorado State Patrol representatives formalize improved procedures for communicating information between agencies.
	3.2	Continue to enhance and maintain Internet-based traveler information service.	CDOT ITS TMC network administrator manages website activities; overall CDOT public communications policies are set by CDOT Public Relations Office; CDOT Information Systems staff owns and manages website server platforms.
	3.3	This action will ensure that Gather traffic, road, and weather conditions from CDOT and CDOT partner sources, as well as media. Provide information to broadcast channels and through the Advanced Traveler Information System.	CDOT TMC Manager oversees TMC staff in obtaining, verifying, and disseminating accurate and timely information.
	3.4	CDOT has instituted partnerships with several media outlets, and has maintained these partnerships for a number of years. CDOT has monitored the media outlets with regard to timeliness and accuracy of information transmitted. This action will create new and maintain existing partnerships between CDOT and regional/statewide media outlets to provide status reports of road, weather, construction, work zone, and planned maintenance condition information.	CDOT ITS Traffic Operations Manager coordinates and maintains agreements with media outlets. CDOT Office of Public Relations is kept apprised of status of partnering agreements and relationships.

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Strategy	Action	Description	Roles and Responsibilities
Use real time road condition information to deploy and assist with incident response	4.1	This action is to ensure CDOT ITS participates in and facilitates development and upkeep of regional and corridor-level incident management plans.	<ul style="list-style-type: none"> • CDOT ITS TMC Manager participates and encourages development and maintenance of corridor management plans created by regional committees, made up of CDOT M&O staff, regional and local incident response personnel. • Communications plan(s) are developed in conjunction with regional/corridor level stakeholders (CSP, Regional Traffic Engineers, Safety Engineers, incident response managers).
	4.2	As a follow-up to facilitating development of incident management plans, this action will document the policies and procedures for utilizing TMCs and ITS devices (CCTVs, etc.) in aiding incident detection and response.	CDOT ITS TMC Manager identifies roles and responsibilities of TMC staff.
Refine, and provide training in procedures for providing pre-trip and enroute information to travelers (alternate routes, different traffic patterns, cautions, etc.) regarding planned and unplanned incidents.	5.1	Develop processes supporting dissemination of pre-trip and enroute information (road closures or alternative routes, advisories, etc.) through the CDOT web site, cellular and toll free info information line, dynamic message signs, and highway advisory radio systems.	CDOT ITS TMC Manager provides guidance and training to TMC staff. Contingency plans are developed in conjunction with corridor incident management plans, by regional incident management committee members.
	5.2	This action will define roles and responsibilities of CDOT staff and other stakeholders involved with managing and operating TMCs. In addition, this action will ensure TMCs are staffed with and appropriate level of skilled personnel.	CDOT ITS TMC Project Manager establishes, implements, administers, and maintains policies, procedures, and guidelines.
Establish a statewide ITS maintenance planning, replacement, and budgeting process	6.1	This action develops roles and responsibilities, and guidelines for managing maintenance activities in support of ITS systems and devices.	CDOT ITS Maintenance Manager and CDOT M&O Regional Superintendents identify roles/responsibilities, evaluate best practices, and formulate consistent procedures for maintaining equipment.
	6.2	This action collects ITS device operating and maintenance performance data to determine future maintenance needs and equipment selection. This action also sets service life standards, and level of service standards of ITS equipment.	CDOT ITS Maintenance Manager oversees efforts by regional staff, vendors, and consultants, assisted by QAR Team.
	6.3	This action will review current ITS maintenance contracting activities, including maintenance costs, and staffing levels and enhance or develop processes that meet CDOT requirements.	CDOT ITS Maintenance Manager and CDOT Regional Maintenance Superintendents identify roles/responsibilities, evaluate best practices, and formulate consistent procedures for maintaining equipment.

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Strategy	Action	Description	Roles and Responsibilities
	6.4	This action is to provide a mechanism ensuring ITS devices are maintained by skilled technicians.	CDOT ITS Maintenance Manager and Maintenance Team complete review, utilizing data from vendors. Vendors and contractors may provide short training programs for maintaining systems and devices
	6.5	This action will develop and maintain a list of recommended ITS equipment and support parts for use on CDOT sponsored transportation projects. Selection of ITS devices for procurement, during the design and construction phases of project, will be from this list. The action will also develop purchasing guidelines and authority for staff to quickly acquire parts when needed.	CDOT ITS Special Projects Manager, ITS maintenance team, and CDOT regional procurement staff.
Conduct statewide ITS deployment planning and provide leadership for implementing the statewide ITS enabling infrastructures	7.1	This action maintains and updates CDOT's ITS enabling infrastructure plan (developed by vendors), which describes the fiber-optic communications network, traffic management centers, ITS architecture, and lateral connectivity. The action ensures the plan is updated to reflect changes in fiscal conditions.	CDOT ITS Special Projects and Planning Manager oversees relationship with private partners, and monitors funding requirements for enabling infrastructure. Updates plan in accordance with ability to meet planned capital and operating budgets.
	7.2	This action facilitates the maintenance and upkeep of the Colorado statewide ITS Architecture. The ITS Architecture will outline characteristics and standards for design and implementation of ITS equipment within, as well as independent of, other traditional road transportation projects. This action also provides a means for the CDOT ITS Branch to lobby and influence decision-making on current and future investment priorities for ITS projects, while meeting departments strategic directions.	CDOT ITS Network Group, Regional Traffic Staff, participating in the documentation, provide documentation guidelines in the development of an automated solution.
Use performance measures to evaluate ITS' contribution to cost investment categories.	8.1	This action is to quantifiably determine the contribution made by ITS activities on CDOT core services. This action will initiate collection and analysis of ITS device performance data, and calculate device performance measures, in order to measure the effectiveness of ITS systems and devices in meeting CDOT goals and objectives.	CDOT ITS Special Projects and Planning Manager or designee oversees collection and analysis of ITS system/device performance.
	8.2	This action is to use the performance measures developed in Action 8.1 to assist in planning and budgeting activities, ranging from simple equipment selection analyses to considering strategic statewide investment of ITS systems.	CDOT ITS Special Projects and Planning Manager or designee maintains database of ITS system and device performance measures.

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Strategy	Action	Description	Roles and Responsibilities
		This action should be a driver of investment decision-making in the next 3 to 5 years, after sufficient performance data has been collected and analyzed.	
Institutionalize ITS into the statewide and regional planning processes.	9.1	This action is to develop procedures and guidelines for considering ITS systems and devices when completing statewide and regional planning activities for transportation projects.	CDOT ITS Special Projects and Planning Manager, with assistance from CDOT DTD. Guidelines will be implemented by DTD.
	9.2	This action will develop policies and procedures for evaluating ITS project needs and priorities, to be used during regional transportation planning activities.	CDOT ITS Special Projects and Planning Manager, CDOT DTD statewide and regional planners, CDOT Region planning staff develop guidelines.
	9.3	Develop list of ITS projects from the fiscally constrained 2020 Statewide Transportation Plan for discussion in the Project Priority Programming Process when the STIP is being updated.	CDOT ITS Special Projects and Planning Manager, CDOT DTD Planning Manager.
	9.4	This action will facilitate organization of multi-agency and multi-jurisdictional committees, and evaluate and modify current corridor master plans to incorporate ITS systems and devices, as needed for future traffic volumes. Additional corridor plans will be developed as new corridors are identified.	CDOT ITS Special Projects and Planning Manager works with DTD planners, CDOT regional planners, Regional traffic engineers, rural TPR staff and STAC members to develop corridor master plans.
	9.5	Provide proactive support in multi-jurisdictional planning activities and venues	CDOT ITS Special Planning and Projects Manager and CDOT DTD statewide and regional planning staff, CDOT Region planning staff.
Institutionalize ITS into CDOT's project scoping processes	10.1	This action is to develop guidelines and procedures for evaluating ITS system needs during project scoping activities.	CDOT ITS Special Planning and Project Manager works in conjunction with CDOT DTD project staff.
	10.2	This action is to ensure ITS components are evaluated during the project scoping process.	CDOT ITS Special Planning and Project Manager works in conjunction with CDOT DTD project staff.
Deploy ITS enabling infrastructure on a statewide basis	11.1	This action will maintain current private/public partnerships, and develop new partnerships and agreements with private communications service providers and suppliers, to install hardware and communications network equipment, including fiber-optic cables, cellular towers, and other communication equipment.	CDOT ITS TMC Program Manager and CDOT ITS Network Manager administer and manage contractors/vendors implementation of communications backbone.
	11.2	This action is to complete the development and implementation of permanent traffic management centers,	CDOT Director, TMC Manager, consultants review, evaluate, and select competitive software products. CDOT TMC Project

DISCUSSION DRAFT

Strategy	Action	Description	Roles and Responsibilities
		strategically located throughout Colorado. This action is to also link these TMCs to ITS devices, and implement communication protocols between TMCs	Manager facilitates design and construction of permanent TMCs, and integration/connectivity to ITS components located throughout the state.
Establish statewide ITS device procurement specifications and guidelines	12.1	This action is to establish ITS device performance standards useful for evaluating the benefits and costs of competitive products when making procurement designs.	CDOT ITS Project Manager, staff from Center for Procurement Services
	12.2	This action will establish procurement procedures that utilize lifecycle cost data to select ITS systems and components. Activities will include reviewing purchase and maintenance service agreements/warranties, and any special conditions for operations that should be included in specifications.	CDOT ITS Special Planning and Projects Manager, procurement staff from Center for Procurement Services review and develop amended or new procurement specifications.
Establish policies, procedures, and provide guidelines for inspection and acceptance of ITS components	13.1	This action will ensure procurement specifications include detailed specifications outlining how test and acceptance trials will be completed before components are certified for full operation.	CDOT ITS Special Projects and Planning Manager, CDOT region design staff, project development and construction staff.
	13.2	This action will train CDOT inspection staff, and other appropriate staff (e.g., port of entry officials, city and county engineers) how to examine ITS-related equipment for acceptance	CDOT ITS Special Projects and Planning Manager, with assistance from equipment vendors, contractors, and consultants.
Develop and establish statewide design standards for ITS systems and devices	14.1	Participation in a cross-functional working group, providing input to the CDOT Standards Committee regarding development of ITS design standards	CDOT ITS project manager, Regional project design and development staff