



*Advanced Public Transportation Projects*

This section presents the regional transit projects. These projects were developed in consultation with the ITS Working Group. It has been identified that Transfort, COLT, and The Bus are all interested in deploying technologies such as fixed-route AVL, fixed-route CAD, online trip planning, and electronic fare payment. Recognizing that the individual agencies may be starting at different points in the planning process, it is still strongly recommended that these agencies work together to undertake these deployments regionally when possible in order to provide improved service to their customers on a regional scale. The locations of transit operations centers and the approximate service areas for Transfort, COLT, and The Bus are shown on Figure 21.

The regional transit projects are:

- T1 – Transit Vehicle Tracking
- T2 – Regional Service Coordination
- T3 – Regional Transit Trip Planning
- T4 – Transit Traveler Information
- T5 – Fixed Route CAD
- T6 – Regional Fare Coordination
- T7 – Transit Security
- T8 – Transit Signal Priority

<b>T1 – Transit Vehicle Tracking</b>
<b>Time Frame for Deployment:</b> Near term.
<b>Description:</b> This project would install Automatic Vehicle Location (AVL) systems on fixed-route buses for the three major transit agencies: Transfort, COLT, and The Bus.
<b>Geographic Scope:</b> Region-wide.
<b>Key Stakeholders:</b> <ul style="list-style-type: none"> <li>• Transfort, COLT (Primary)</li> <li>• The Bus</li> </ul>
<b>Problems Addressed:</b> <ul style="list-style-type: none"> <li>• Real-time transit vehicle location information.</li> </ul>
<b>Market Packages Included:</b> <ul style="list-style-type: none"> <li>• Transit Vehicle Tracking</li> </ul>
<b>Potential Deployment Barriers and Coordination Requirements:</b> <ul style="list-style-type: none"> <li>• In order to potentially streamline the deployment of regional fixed-route AVL, it is recommended that Transfort, COLT, and The Bus consider partnering on at least the initial planning and requirements stage of this project, to ensure that the final systems can be integrated and data easily shared between the agencies.</li> <li>• Project would also provide real-time bus location data to the Regional Service Coordination and Transit Traveler Information projects.</li> </ul>



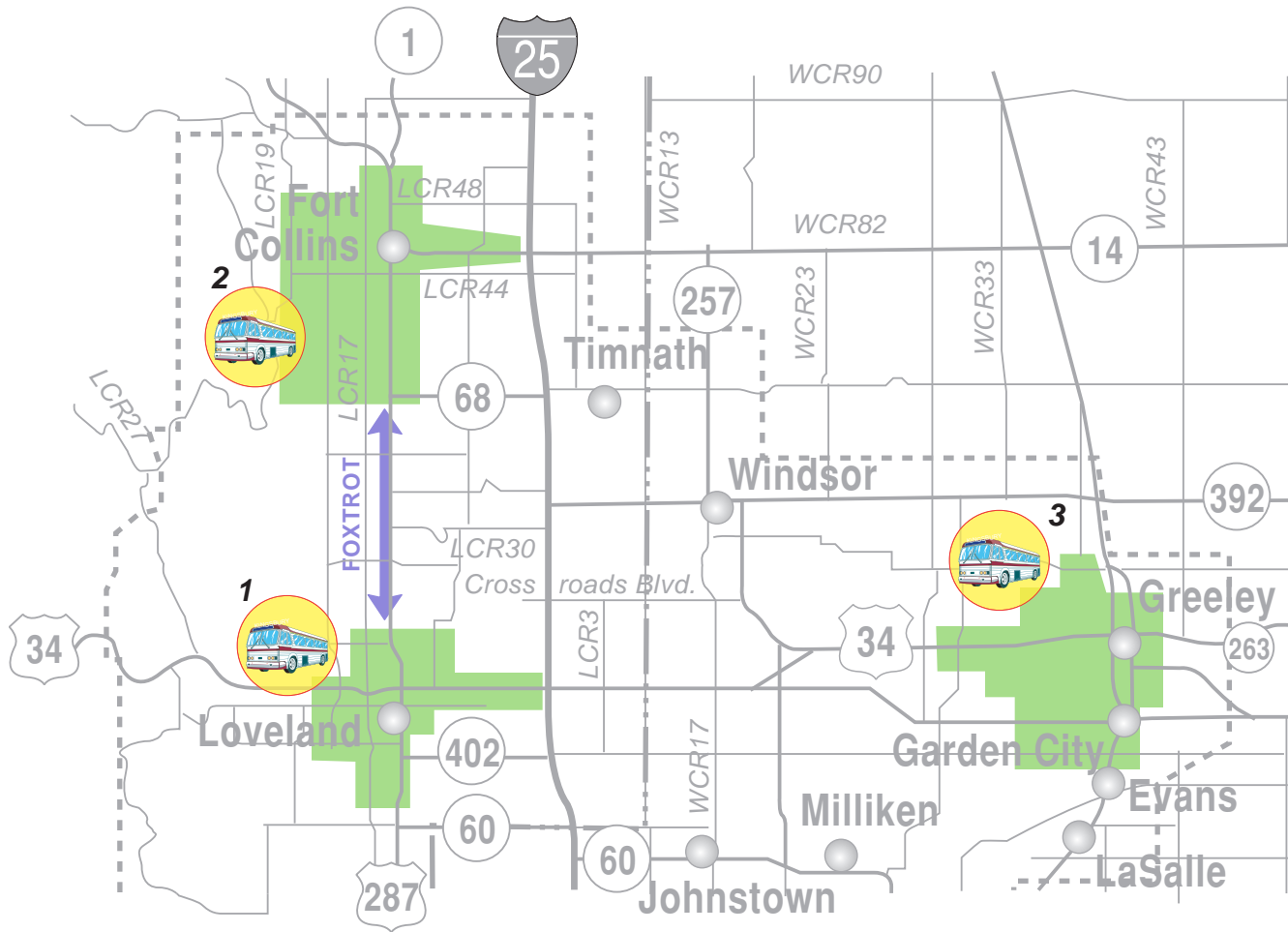
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**T1 – Transit Vehicle Tracking**

**Estimated Costs:**

Total Capital Cost	\$792,000
Total Design Cost (15%)	\$119,000
Total	\$911,000
Yearly O&M	\$80,000

# Transit Centers and Service Areas



**LEGEND**

Transit Operations Center  
 1. 318 N. Garfield, Loveland  
 2. 6570 Portner Rd., Fort Collins  
 3. 1200 "A" St., Greeley

Service Area Boundary



Figure 22



<b>T2 – Regional Service Coordination</b>	
<b>Time Frame for Deployment:</b> Near term.	
<b>Description:</b> This project would facilitate the implementation of transit service coordination planning to include new intercity bus routes and also enable future real-time coordination between the transit agencies.	
<b>Geographic Scope:</b> Region-wide.	
<b>Key Stakeholders:</b>	
<ul style="list-style-type: none"> <li>• Transfort</li> <li>• COLT</li> <li>• The Bus</li> <li>• North Front Range MPO</li> </ul>	
<b>Problems Addressed:</b>	
<ul style="list-style-type: none"> <li>• Multi-modal coordination between transit agencies</li> </ul>	
<b>Market Packages Included:</b>	
<ul style="list-style-type: none"> <li>• Transit Fixed Route Operations</li> <li>• Multi-Modal Coordination</li> </ul>	
<b>Potential Deployment Barriers and Coordination Requirements:</b>	
<ul style="list-style-type: none"> <li>• In order to enable real-time service coordination, Transit Vehicle Tracking would need to be deployed.</li> <li>• Center-to-Center coordination required between transit agencies.</li> <li>• Prepare institutional agreements and service planning.</li> <li>• Project would also coordinate with Regional Transit Trip Planning and Transit Traveler Information projects.</li> </ul>	
<b>Estimated Costs:</b>	
Total Capital Cost	\$330,000
Total Design Cost (15%)	\$ 50,000
Total	\$380,000
Yearly O&M	\$ 33,000



<b>T3 – Regional Transit Trip Planning</b>	
<b>Time Frame for Deployment:</b> Near term.	
<b>Description:</b> This project would enable online trip planning via agency web sites. The project could begin by enabling trip planning for a trip with a single service provider and then be expanded to include intercity trips that involve multiple service providers. It is expected that a larger service provider may champion this effort by developing a system that may easily be integrated with scheduling information from other providers.	
<b>Geographic Scope:</b> Region-wide.	
<b>Key Stakeholders:</b>	
<ul style="list-style-type: none"> <li>• Transfort (Primary)</li> <li>• COLT</li> <li>• The Bus</li> </ul>	
<b>Problems Addressed:</b>	
<ul style="list-style-type: none"> <li>• Provide online trip planning services.</li> </ul>	
<b>Market Packages Included:</b>	
<ul style="list-style-type: none"> <li>• Transit Traveler Information</li> <li>• Multi-Modal Coordination</li> </ul>	
<b>Potential Deployment Barriers and Coordination Requirements:</b>	
<ul style="list-style-type: none"> <li>• In order to enable real-time trip planning, Transit Vehicle Tracking would need to be deployed.</li> <li>• Project would also coordinate with Regional Service Coordination and Transit Traveler Information projects.</li> </ul>	
<b>Estimated Costs:</b>	
Total Capital Cost	\$300,000
Total Design Cost (15%)	\$ 45,000
Total	\$345,000
Yearly O&M	\$ 30,000



<b>T4 – Transit Traveler Information</b>
<b>Time Frame for Deployment:</b> Phased, beginning in the mid term.
<p><b>Description:</b> This project would build upon Transit Vehicle Tracking to provide real-time “next bus” information for transit riders at bus stops, via telephone, and online.</p> <p>The project may be a phased deployment as follows:</p> <p><b>Phase 1:</b></p> <ul style="list-style-type: none"> <li>• Procure, install and configure central system</li> </ul> <p><b>Phase 2:</b></p> <ul style="list-style-type: none"> <li>• Deploy “next bus” information displays at selected stops</li> </ul> <p><b>Phase 3:</b></p> <ul style="list-style-type: none"> <li>• Expand system to all stops</li> <li>• Develop web site and telephone interface.</li> </ul>
<b>Geographic Scope:</b> Region-wide.
<p><b>Key Stakeholders:</b></p> <ul style="list-style-type: none"> <li>• Transfort</li> <li>• COLT</li> <li>• The Bus</li> <li>• Town of Estes Park</li> </ul>
<p><b>Problems Addressed:</b></p> <ul style="list-style-type: none"> <li>• Provide transit traveler information.</li> </ul>
<p><b>Market Packages Included:</b></p> <ul style="list-style-type: none"> <li>• Transit Traveler Information</li> </ul>
<p><b>Potential Deployment Barriers and Coordination Requirements:</b></p> <ul style="list-style-type: none"> <li>• Project is dependent on availability of AVL data and schedule data, and communications to the field, and requires displays to be installed at bus stops and terminals.</li> </ul>



**T4 – Transit Traveler Information**

**Estimated Costs:**

Phase 1

Total Capital Cost	\$442,000
Total Design Cost (15%)	\$ 67,000
Total	\$509,000

Yearly O&M	\$ 45,000
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Phase 2

Total Capital Cost	\$165,000
Total Design Cost (15%)	\$ 25,000
Total	\$190,000

Yearly O&M	\$ 12,000
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<b>T5 – Fixed-Route Computer Aided Dispatch</b>	
<b>Time Frame for Deployment:</b> Mid term.	
<b>Description:</b> This project would upgrade or replace existing scheduling software to provide Computer Aided Dispatch (CAD) capability for fixed-route buses. Transfort, COLT and The Bus each have already deployed CAD for paratransit.	
<b>Geographic Scope:</b> Region-wide.	
<b>Key Stakeholders:</b>	
<ul style="list-style-type: none"> <li>• Transfort</li> <li>• COLT</li> <li>• The Bus</li> </ul>	
<b>Problems Addressed:</b>	
<ul style="list-style-type: none"> <li>• Provide CAD capability for fixed-route buses.</li> </ul>	
<b>Market Packages Included:</b>	
<ul style="list-style-type: none"> <li>• Transit Fixed-Route Operations</li> </ul>	
<b>Potential Deployment Barriers and Coordination Requirements:</b>	
<ul style="list-style-type: none"> <li>• Project will require AVL data to be most functional.</li> </ul>	
<b>Estimated Costs:</b>	
Total Capital Cost	\$520,000
Total Design Cost (15%)	\$ 78,000
Total	\$598,000
Yearly O&M	\$ 52,000



<b>T6 – Regional Fare Coordination</b>	
<b>Time Frame for Deployment:</b> Mid term.	
<b>Description:</b> This project would provide a fare media that would be valid for inter-city trips. A Smart Card-type system is already being investigated by some agencies. Possible coordination with electronic payment systems at parking facilities may also be considered.	
<b>Geographic Scope:</b> Region-wide.	
<b>Key Stakeholders:</b>	
<ul style="list-style-type: none"> <li>• Transfort</li> <li>• COLT</li> <li>• The Bus</li> </ul>	
<b>Problems Addressed:</b>	
<ul style="list-style-type: none"> <li>• Electronic fare coordination between agencies</li> <li>• Fee collection management at parking facilities</li> </ul>	
<b>Market Packages Included:</b>	
<ul style="list-style-type: none"> <li>• Transit Passenger and Fare Management</li> </ul>	
<b>Potential Deployment Barriers and Coordination Requirements:</b>	
<ul style="list-style-type: none"> <li>• Transit agencies may wish to coordinate or partner with RTD to provide an even greater geographical range for fare coordination.</li> </ul>	
<b>Estimated Costs:</b>	
Total Capital Cost	\$736,000
Total Design Cost (15%)	\$111,000
Total	\$847,000
Yearly O&M	\$ 74,000



<b>T7 – Transit Security</b>	
<b>Time Frame for Deployment:</b> Long term.	
<b>Description:</b> This project would expand on existing transit security systems to provide on-board cameras and push-button alarms for transit vehicles. The project could initially deploy a system that is contained on the vehicle, with an expansion to using wireless communications for real-time monitoring.	
<b>Geographic Scope:</b> Region-wide.	
<b>Key Stakeholders:</b>	
<ul style="list-style-type: none"> <li>• Transfort</li> <li>• COLT</li> <li>• The Bus</li> </ul>	
<b>Problems Addressed:</b>	
<ul style="list-style-type: none"> <li>• Ensure safety of public and staff while on board transit.</li> </ul>	
<b>Market Packages Included:</b>	
<ul style="list-style-type: none"> <li>• Transit Security</li> </ul>	
<b>Potential Deployment Barriers and Coordination Requirements:</b>	
<ul style="list-style-type: none"> <li>• N/A</li> </ul>	
<b>Estimated Costs:</b>	
Total Capital Cost	\$294,000
Total Design Cost (15%)	\$ 45,000
Total	\$339,000
Yearly O&M	\$ 30,000



<b>T8 – Transit Signal Priority<sup>4</sup></b>	
<b>Time Frame for Deployment:</b> Deployment time frame will vary depending on the corridors where Transit Signal Priority is installed.	
<b>Description:</b> This project would install Transit Signal Priority (TSP) emitters and receivers on transit vehicles and at select signals along regional corridors, allowing buses running behind schedule to have priority at those intersections.	
<b>Geographic Scope:</b> Region-wide.	
<b>Key Stakeholders:</b>	
<ul style="list-style-type: none"> <li>• Partnership of corridor stakeholders and transit agencies.</li> </ul>	
<b>Problems Addressed:</b>	
<ul style="list-style-type: none"> <li>• Improved transit schedule adherence.</li> </ul>	
<b>Market Packages Included:</b>	
<ul style="list-style-type: none"> <li>• Multi-Modal Coordination</li> </ul>	
<b>Potential Deployment Barriers and Coordination Requirements:</b>	
<ul style="list-style-type: none"> <li>• N/A</li> </ul>	
<b>Estimated Costs:</b>	
Total Capital Cost	\$1,118,000
Total Design Cost (15%)	\$ 168,000
Total	\$1,286,000
Yearly O&M	\$ 112,000

<sup>4</sup> This project is has not been assigned a specific priority, as it will likely be deployed as part of a corridor improvement program.

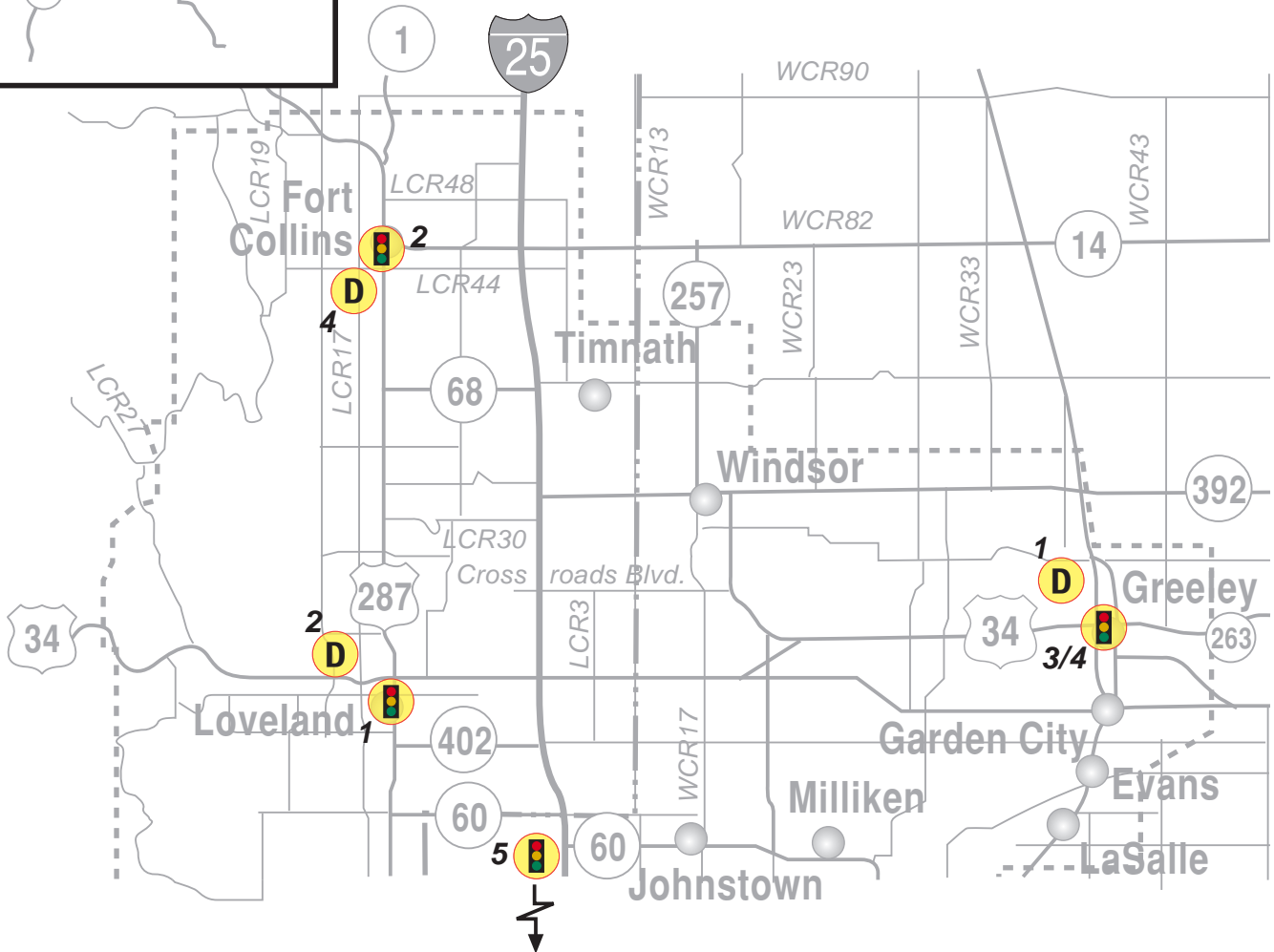
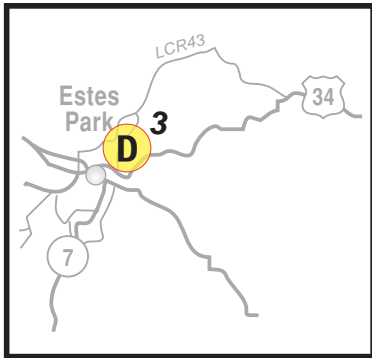


## *Regional Projects*

This section presents the regional ITS projects. These projects were developed in consultation with the ITS Working Group. The locations of communication centers are shown on Figure 23. The regional ITS projects are:

- R1 – Center-to-Center Coordination
- R2 – Regional Communications Plan
- R3 – Regional Incident Management and Routing Plan
- R4 – Regional Data Warehouse
- R5 – Greeley and Loveland Traffic Operation Centers
- R6 – Emergency Vehicle Tracking
- R7 – Integration with 511
- R8 – Regional Public TV Traveler Information
- R9 – Estes Park/RMNP Traveler Information Web Site
- R10 – Fixed Audible Signals at Railroad Crossings
- R11 – Estes Park Area Parking Management
- R12 – Automated Hazard Detection and Road Closure
- R13 – Maintenance and Construction Vehicle Tracking
- R14 – Transportation Infrastructure Protection
- R15 – Train Tracking Alerts
- R16 – Maintenance and Construction Vehicle Maintenance

# Communication Centers



**LEGEND**

Traffic Operations Center

- 105 W. 5th St., Loveland
- 626 Linden St., Fort Collins
- 1420 2nd St., Greeley (CDOT)
- 1300 "A" St., Greeley (City)
- 700 Kipling St., Lakewood (CTMC)

Dispatch Centers

- Weld County, 1950 "O" St., Greeley
- Loveland, Police / Fire - 810 E. 10th St.  
Emergency Operations - 410 E. 5th St.
- Estes Park, 170 McGregor Avenue
- Larimer County, 2501 Midpoint Drive (Fort Collins)



Figure 23



**R1 – Center-to-Center Coordination**

**Time Frame for Deployment:** Phased, beginning in the near term.

**Description:** The purpose of this project is to develop agreements and solutions to provide and improve coordination and information sharing between agencies within the study area.

This project is best approached with a phased implementation with the following activities completed in order:

1. Define coordination plan between agencies. This will determine the roles and responsibilities of the partner agencies. It will also define what information will be shared and the means by which it will be shared.
2. Design and implement center-to-center connections with the intention of sharing data only.
3. Expand the center-to-center connections to include the capability to view and control real-time video.
4. Expand the center-to-center connections to include the capability to share control of specific devices by agreement (i.e. DMS)

This project will take place within the context of the ATMS integration effort.

**Phase 1:**

- An initial center-to-center connection between Fort Collins and CDOT ITS Branch may serve as suitable demonstration project.

**Phase 2:**

- Based on the experience of the demonstration project, the center-to-center connections will be expanded to include Loveland, Greeley, CDOT Region 4, Weld County Emergency Services, Larimer County Emergency Services and the Colorado State Patrol.

**Geographic Scope:** Region-wide



**R1 – Center-to-Center Coordination**

**Key Stakeholders:**

- CDOT ITS Branch
- CDOT Region 4
- Fort Collins
- Greeley
- Loveland
- Weld County Emergency Services
- Larimer County Emergency Services
- Colorado State Patrol
- Transfort
- COLT
- The Bus

**Problems Addressed:**

- Improved data sharing between agencies

**Market Packages Included:**

- Network Surveillance
- Surface Street Control
- Freeway Control
- Traffic Information Dissemination
- Transit Traveler Information
- Wide Area Alert
- Weather Information Processing and Distribution

**Potential Deployment Barriers and Coordination Requirements:**

- Interagency agreements must be prepared to determine the roles and responsibilities of the partner agencies. These agreements must include what information will be shared and how it will be shared.
- This project depends directly upon the development and deployment of the “Regional Communications Plan”.

**Estimated Costs:**

Total Capital Cost	\$505,000
Total Design Cost (15%)	\$ 76,000
Total	\$581,000
Yearly O&M	\$ 80,000





<b>R2 – Regional Communications Plan</b>	
<b>Time Frame for Deployment:</b> Phased, beginning in the near term.	
<p><b>Description:</b> This project involves a study and design of a Regional Communications Plan. The communications plan involves two main components: center-to-field communications and center-to-center communications. The main purpose of the plan is to ensure that cost-effective and reliable communications is provided as a backbone for the ITS deployments through the region, which includes developing a design that can grow with the expansion of ITS deployments.</p> <p>Center-to-field communications focus solely on the communications to existing and planned ITS equipment in the field from the owner agency. The communications will provide each owner agency the capability to monitor and control their own ITS devices. The plan will consider as the base the existing communications and plan for growth and/or migration to another medium in the most cost-effective means possible.</p> <p>Center-to-center communications focus on the means by which high-bandwidth communications can be provided between the centers in direct support for the “Center-to-Center Coordination Project”. CDOT ITS Branch is pursuing plans to provide fiber communications along I-25, which could serve as a significant resource to both the center-to-center and the center-to-field communications planning.</p>	
<b>Geographic Scope:</b> Region-wide	
<p><b>Key Stakeholders:</b></p> <ul style="list-style-type: none"> <li>• CDOT ITS Branch</li> <li>• Owner agencies</li> </ul>	
<p><b>Problems Addressed:</b></p> <ul style="list-style-type: none"> <li>• Improved data sharing between agencies</li> <li>• Communications infrastructure planning to accommodate ITS systems</li> </ul>	
<p><b>Market Packages Included:</b></p> <ul style="list-style-type: none"> <li>• Network Surveillance</li> <li>• Surface Street Control</li> <li>• Freeway Control</li> <li>• Traffic Information Dissemination</li> <li>• Transit Traveler Information</li> <li>• Wide Area Alert</li> <li>• Weather Information Processing and Distribution</li> </ul>	



**R2 – Regional Communications Plan**

**Potential Deployment Barriers and Coordination Requirements:**

- Interagency agreements must be prepared to describe the terms upon which communications infrastructure will be shared. This includes capital and maintenance cost responsibilities as well as terms of use.
- ITS deployments often demand high bandwidth communications that have a correspondingly high capital cost. Obtaining funding for the construction of communications infrastructure alone is challenging.
- There are existing resources in the study area owned by outside parties that will require special agreements and funding in order to be utilized for regional communications.

**Estimated Costs:**

Total Capital Cost	\$200,000
Total Design Cost (15%)	\$ 30,000
Total	\$230,000
Yearly O&M	\$ 20,000



<b>R3 – Regional Incident Management and Routing Plan</b>	
<b>Time Frame for Deployment:</b> Near term.	
<b>Description:</b> This project will support the existing I-25 Incident Management Plan and other future corridor plans in the region. This project will facilitate the implementation of device states to support the incident management plans. This includes both response plans for both planned (construction, events) and unplanned (accidents, weather, emergencies) incidents. Alternate routes, and means of alerting drivers via ITS devices (such as dynamic message sign alerts, posted in advance of the incident) would be addressed.	
<b>Geographic Scope:</b> Region-wide, beginning with highest priority corridors.	
<b>Key Stakeholders:</b>	
<ul style="list-style-type: none"> <li>• All regional transportation agencies</li> <li>• City/County emergency services</li> <li>• Colorado State Patrol</li> </ul>	
<b>Problems Addressed:</b>	
<ul style="list-style-type: none"> <li>• Regional incident management planning and routing</li> <li>• Improved management of road closures</li> </ul>	
<b>Market Packages Included:</b>	
<ul style="list-style-type: none"> <li>• Incident Management</li> <li>• Emergency Response</li> <li>• Disaster Response and Recovery</li> <li>• Evacuation and Reentry Management</li> <li>• Wide-Area Alert</li> </ul>	
<b>Potential Deployment Barriers and Coordination Requirements:</b>	
<ul style="list-style-type: none"> <li>• ITS devices (such as dynamic message signs) will need to be in place or planned along key corridors and alternate routes, in order to be included in the incident management plan.</li> </ul>	
<b>Estimated Costs:</b>	
Total Capital Cost	\$250,000
Total Design Cost (15%)	\$ 38,000
Total	\$288,000
Yearly O&M	\$ 25,000



<b>R4 – Regional Data Warehouse</b>									
<b>Time Frame for Deployment:</b> Mid term.									
<p><b>Description:</b> This project would plan and implement a central data repository that would allow regional agencies the ability to seamlessly access and share transportation data such as:</p> <ul style="list-style-type: none"> <li>• Traffic data</li> <li>• Weather data</li> <li>• Incident information</li> <li>• Transit operations data</li> <li>• GIS data</li> </ul> <p>This project would require multi-agency participation and coordination, but could be championed and maintained by the North Front Range MPO. Although many configurations are possible for a data warehouse, depending on the requirements of the agencies involved, the most simple would be for access to be enabled via a web-based interface that would allow authorized users to log in and browse the data from their office.</p>									
<b>Geographic Scope:</b> Region-wide.									
<p><b>Key Stakeholders:</b></p> <ul style="list-style-type: none"> <li>• North Front Range MPO (Primary)</li> <li>• All regional transportation and safety agencies</li> </ul>									
<p><b>Problems Addressed:</b></p> <ul style="list-style-type: none"> <li>• Improved ease of access to interagency transportation data.</li> </ul>									
<p><b>Market Packages Included:</b></p> <ul style="list-style-type: none"> <li>• ITS Data Mart</li> <li>• ITS Data Warehouse</li> <li>• ITS Virtual Data Warehouse</li> </ul>									
<p><b>Potential Deployment Barriers and Coordination Requirements:</b></p> <ul style="list-style-type: none"> <li>• Project will require agreements between agencies regarding data will be shared and how it may be used.</li> </ul>									
<p><b>Estimated Costs:</b></p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding-left: 20px;">Total Capital Cost</td> <td style="text-align: right;">\$170,000</td> </tr> <tr> <td style="padding-left: 20px;">Total Design Cost (15%)</td> <td style="text-align: right;">\$ 26,000</td> </tr> <tr> <td style="padding-left: 20px;">Total</td> <td style="text-align: right;">\$196,000</td> </tr> <tr> <td style="padding-left: 40px;">Yearly O&amp;M</td> <td style="text-align: right;">\$ 17,000</td> </tr> </table>		Total Capital Cost	\$170,000	Total Design Cost (15%)	\$ 26,000	Total	\$196,000	Yearly O&M	\$ 17,000
Total Capital Cost	\$170,000								
Total Design Cost (15%)	\$ 26,000								
Total	\$196,000								
Yearly O&M	\$ 17,000								



<b>R5 – Greeley &amp; Loveland Traffic Operation Centers</b>	
<b>Time Frame for Deployment:</b> Mid term.	
<p><b>Description:</b> This project would design/build traffic operations centers in the City of Loveland and the City of Greeley, as identified in the North Front Range 2025 Plan. The centers would operate and control existing and planned ITS systems, including:</p> <ul style="list-style-type: none"> <li>• Traffic signal system</li> <li>• CCTV cameras</li> <li>• DMS</li> <li>• Weather stations</li> </ul> <p>The centers could also potentially have dispatch capability for maintenance vehicles, and connections to other transportation and emergency centers in the region, enabling a wealth of data sharing opportunities.</p>	
<b>Geographic Scope:</b> Greeley and Loveland.	
<p><b>Key Stakeholders:</b></p> <ul style="list-style-type: none"> <li>• City of Greeley (Primary)</li> <li>• City of Loveland (Primary)</li> <li>• CDOT ITS</li> <li>• CDOT Region 4</li> </ul>	
<b>Problems Addressed:</b>	
<ul style="list-style-type: none"> <li>• Traffic operations centers in urban areas.</li> </ul>	
<b>Market Packages Included:</b>	
<ul style="list-style-type: none"> <li>• Surface Street Control</li> <li>• Network Surveillance</li> <li>• Traffic Information Dissemination</li> <li>• Maintenance and Construction Vehicle and Equipment Tracking</li> </ul>	
<b>Potential Deployment Barriers and Coordination Requirements:</b>	
<ul style="list-style-type: none"> <li>• As more devices come online, the need for a center increases. This project should be considered carefully as part of the phased deployment of cameras and other devices along key corridors such as US 34 and US 85.</li> </ul>	
<b>Estimated Costs:</b>	
Total Capital Cost	\$1,000,000
Total Design Cost (15%)	\$ 150,000
Total	\$1,150,000
Yearly O&M	\$ 100,000



<b>R6 – Emergency Vehicle Tracking</b>	
<b>Time Frame for Deployment:</b> Mid term.	
<b>Description:</b> This project would deploy Automatic Vehicle Location systems on police and emergency vehicles, with a link back to county emergency dispatch centers, in order to provide more effective routing and dispatch of emergency vehicles.	
<b>Geographic Scope:</b> Regional.	
<b>Key Stakeholders:</b>	
<ul style="list-style-type: none"> <li>• Weld County and Larimer County Emergency Dispatch</li> </ul>	
<b>Problems Addressed:</b>	
<ul style="list-style-type: none"> <li>• Effective routing for emergency vehicles during congestion, incidents, and around train blockages.</li> </ul>	
<b>Market Packages Included:</b>	
<ul style="list-style-type: none"> <li>• Emergency Routing</li> </ul>	
<b>Potential Deployment Barriers and Coordination Requirements:</b>	
<ul style="list-style-type: none"> <li>• May coordinate with the Train Tracking Alert system, so that dispatchers can have information on approaching trains and route vehicles accordingly.</li> </ul>	
<b>Estimated Costs:</b>	
Phase 1	
Total Capital Cost	\$1,000,000
Total Design Cost (15%)	\$ 150,000
Total	\$1,150,000
Yearly O&M	\$ 100,000
Phase 2	
Total Capital Cost	\$3,250,000
Total Design Cost (15%)	\$ 488,000
Total	\$3,738,000
Yearly O&M	\$ 325,000



<b>R7 – Integration with 511</b>	
<b>Time Frame for Deployment:</b> Mid term.	
<b>Description:</b> This project represents a local effort to provide the links and integration planning necessary to consolidate access to traveler information on one phone number. Regional and local data would be made available to travelers by phone. Existing traveler information services by phone would be consolidated to form the core system set for expansion to new sources of traveler information. Eventually, the statewide effort to deploy a 511 system will require that this system merge with the statewide system.	
<b>Geographic Scope:</b> Regional.	
<b>Key Stakeholders:</b>	
<ul style="list-style-type: none"> <li>• Regional transportation and transit agencies.</li> <li>• CDOT ITS</li> <li>• CDOT Region 4</li> </ul>	
<b>Problems Addressed:</b>	
<ul style="list-style-type: none"> <li>• Disseminate congestion information, incident information, construction and roadway closures information to the public.</li> </ul>	
<b>Market Packages Included:</b>	
<ul style="list-style-type: none"> <li>• Interactive Traveler Information</li> </ul>	
<b>Potential Deployment Barriers and Coordination Requirements:</b>	
<ul style="list-style-type: none"> <li>• CDOT has not established a formal 511 migration project, however, as regional projects move forward, project champions should be mindful of the potential to link their information to the 511 system.</li> </ul>	
<b>Estimated Costs:</b>	
Total Capital Cost	\$265,000
Total Design Cost (15%)	\$ 40,000
Total	\$305,000
Yearly O&M	\$ 27,000



<b>R8 – Regional Public TV Travel Information</b>									
<b>Time Frame for Deployment:</b> Mid term.									
<p><b>Description:</b> This project would provide traveler information broadcasts via available city public access channels. The public access channel could be used to broadcast the following:</p> <ul style="list-style-type: none"> <li>• Still traffic camera images</li> <li>• Traffic camera feeds</li> <li>• Scrolling traffic conditions information</li> <li>• Incident information</li> <li>• Alternate route information</li> <li>• Weather forecasts and roadway/pavement conditions.</li> </ul> <p>This project would require a phased approach, beginning with a simple text display and adding more information as additional ITS devices (such as cameras) come online.</p>									
<b>Geographic Scope:</b> Regional.									
<p><b>Key Stakeholders:</b></p> <ul style="list-style-type: none"> <li>• CDOT ITS (Primary)</li> <li>• Public broadcasting agencies</li> <li>• Any agencies owning devices that may be brought online</li> </ul>									
<p><b>Problems Addressed:</b></p> <ul style="list-style-type: none"> <li>• Disseminate congestion information, incident information, construction and roadway closures information to the public.</li> </ul>									
<p><b>Market Packages Included:</b></p> <ul style="list-style-type: none"> <li>• Broadcast Traveler Information</li> </ul>									
<p><b>Potential Deployment Barriers and Coordination Requirements:</b></p> <ul style="list-style-type: none"> <li>• As corridor projects are deployed, additional weather, incident, and traffic camera images will become available.</li> </ul>									
<p><b>Estimated Costs:</b></p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 60%;">Total Capital Cost</td> <td style="text-align: right;">\$126,000</td> </tr> <tr> <td>Total Design Cost (15%)</td> <td style="text-align: right;">\$ 19,000</td> </tr> <tr> <td><b>Total</b></td> <td style="text-align: right;"><b>\$145,000</b></td> </tr> <tr> <td> Yearly O&amp;M</td> <td style="text-align: right;"> \$ 19,000</td> </tr> </table>		Total Capital Cost	\$126,000	Total Design Cost (15%)	\$ 19,000	<b>Total</b>	<b>\$145,000</b>	 Yearly O&M	 \$ 19,000
Total Capital Cost	\$126,000								
Total Design Cost (15%)	\$ 19,000								
<b>Total</b>	<b>\$145,000</b>								
 Yearly O&M	 \$ 19,000								



<b>R9 – Estes Park/Rocky Mountain National Park Travel Information Web Site</b>											
<b>Time Frame for Deployment:</b> Mid term.											
<p><b>Description:</b> This project would seek to expand/consolidate existing online traveler information web sites for the Estes Park/Rocky Mountain National Park area by providing local information such as:</p> <ul style="list-style-type: none"> <li>• Road conditions</li> <li>• Construction</li> <li>• Parking and transit</li> <li>• Weather</li> </ul> <p style="text-align: center;">In addition to access via personal computing devices, kiosks may be deployed at transit centers, rest areas, and/or the Chamber of Commerce office.</p>											
<b>Geographic Scope:</b> Estes Park area.											
<p><b>Key Stakeholders:</b></p> <ul style="list-style-type: none"> <li>• City of Estes Park (Primary)</li> <li>• RMNP</li> </ul>											
<p><b>Problems Addressed:</b></p> <ul style="list-style-type: none"> <li>• Disseminate congestion information, incident information, construction and roadway closures information to the public.</li> </ul>											
<p><b>Market Packages Included:</b></p> <ul style="list-style-type: none"> <li>• Interactive Traveler Information</li> </ul>											
<p><b>Potential Deployment Barriers and Coordination Requirements:</b></p> <ul style="list-style-type: none"> <li>• As corridor projects are deployed, additional weather, incident, and traffic camera images will become available.</li> <li>• Project may coordinate with the Estes Park Area Parking Management project to provide real-time parking information online.</li> </ul>											
<p><b>Estimated Costs:</b></p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding-left: 20px;">Total Capital Cost</td> <td style="text-align: right;">\$230,000</td> </tr> <tr> <td style="padding-left: 20px;">Total Design Cost (15%)</td> <td style="text-align: right;">\$ 35,000</td> </tr> <tr> <td style="padding-left: 20px;">Total</td> <td style="text-align: right;">\$265,000</td> </tr> <tr> <td colspan="2"> </td> </tr> <tr> <td style="padding-left: 20px;">Yearly O&amp;M</td> <td style="text-align: right;">\$ 23,000</td> </tr> </table>		Total Capital Cost	\$230,000	Total Design Cost (15%)	\$ 35,000	Total	\$265,000			Yearly O&M	\$ 23,000
Total Capital Cost	\$230,000										
Total Design Cost (15%)	\$ 35,000										
Total	\$265,000										
Yearly O&M	\$ 23,000										



<b>R10 – Fixed Audible Signals at Railroad Crossings</b>	
<b>Time Frame for Deployment:</b> Long term.	
<b>Description:</b> This project would provide at-grade automated train horns at highway-rail crossings in order to address safety/noise pollution concerns. These horns can be operated based upon activation of detectors on or near the tracks, and can be heard over a greatly reduced area, as compared to traditional train horns.	
<b>Geographic Scope:</b> Regional, at railroad crossings where noise pollution and/or safety is an issue.	
<b>Key Stakeholders:</b>	
<ul style="list-style-type: none"> <li>• Rail companies</li> <li>• Agency that has jurisdiction over the road crossing.</li> </ul>	
<b>Problems Addressed:</b>	
<ul style="list-style-type: none"> <li>• Improved highway-rail intersection safety.</li> </ul>	
<b>Market Packages Included:</b>	
<ul style="list-style-type: none"> <li>• Standard Railroad Grade Crossing</li> </ul>	
<b>Potential Deployment Barriers and Coordination Requirements:</b>	
<ul style="list-style-type: none"> <li>• Requires cooperation from rail companies.</li> <li>• Technology not yet available on a wide scale.</li> <li>• Project must be designated a demonstration project.</li> </ul>	
<b>Estimated Costs:</b>	
Total Capital Cost	\$56,000
Total Design Cost (15%)	\$ 9,000
Total	\$65,000
Yearly O&M	\$ 6,000



<b>R11 – Estes Park Area Parking Management</b>	
<b>Time Frame for Deployment:</b> Long term.	
<b>Description:</b> This project would use vehicle detection and data processing to monitor parking lot capacities in downtown Estes Park, and then disseminate information on parking availability to the public via HAR, DMS and the Internet.	
<b>Geographic Scope:</b> Downtown Estes Park, with potential expansion to RMNP.	
<b>Key Stakeholders:</b>	
<ul style="list-style-type: none"> <li>• Town of Estes Park</li> </ul>	
<b>Problems Addressed:</b>	
<ul style="list-style-type: none"> <li>• Means of monitoring parking availability in Estes Park, and providing this information to both residents and visitors.</li> </ul>	
<b>Market Packages Included:</b>	
<ul style="list-style-type: none"> <li>• Parking Facility Management</li> <li>• Regional Parking Management</li> </ul>	
<b>Potential Deployment Barriers and Coordination Requirements:</b>	
<ul style="list-style-type: none"> <li>• Coordinate with US 34 and US 36 corridor projects to provide parking information via HAR and DMS at entrances to city.</li> <li>• Information may also be provided in real time via a local web site.</li> </ul>	
<b>Estimated Costs:</b>	
Total Capital Cost	\$585,000
Total Design Cost (15%)	\$ 88,000
Total	\$673,000
Yearly O&M	\$ 59,000



<b>R12 – Automated Hazard Detection and Road Closure</b>	
<b>Time Frame for Deployment:</b> Long term.	
<b>Description:</b> This project would enable remote operation of road closure gates in the event that a flood or other emergency is detected, and the road becomes impassable. The gate would integrate with existing pavement or stream monitoring systems to determine emergency conditions. A surveillance camera could confirm conditions and operation of the gate, and traveler information systems used to inform the public of the road closure.	
<b>Geographic Scope:</b> At problem locations, as needed.	
<b>Key Stakeholders:</b>	
<ul style="list-style-type: none"> <li>• City agencies.</li> </ul>	
<b>Problems Addressed:</b>	
<ul style="list-style-type: none"> <li>• Improved management of road closures</li> </ul>	
<b>Market Packages Included:</b>	
<ul style="list-style-type: none"> <li>• Roadway Closure Management</li> </ul>	
<b>Potential Deployment Barriers and Coordination Requirements:</b>	
<ul style="list-style-type: none"> <li>• Integration required with pavement and stream monitors, and/or a camera installed in order to enable remote verification of conditions.</li> </ul>	
<b>Estimated Costs:</b>	
Total Capital Cost	\$207,000
Total Design Cost (15%)	\$ 32,000
Total	\$239,000
Yearly O&M	\$ 22,000



<b>R13 – Maintenance and Construction Vehicle Tracking</b>	
<b>Time Frame for Deployment:</b> Long term.	
<b>Description:</b> This project would provide Automatic Vehicle Location equipment on maintenance vehicles, including snowplows, striping trucks, and street sweepers.	
<b>Geographic Scope:</b> Regional.	
<b>Key Stakeholders:</b>	
<ul style="list-style-type: none"> <li>• Weld County</li> <li>• City of Loveland</li> <li>• City of Greeley</li> <li>• City of Fort Collins</li> </ul>	
<b>Problems Addressed:</b>	
<ul style="list-style-type: none"> <li>• Improved tracking and data collection from maintenance and emergency vehicles</li> </ul>	
<b>Market Packages Included:</b>	
<ul style="list-style-type: none"> <li>• Maintenance and Construction Vehicle and Equipment Tracking</li> </ul>	
<b>Potential Deployment Barriers and Coordination Requirements:</b>	
<ul style="list-style-type: none"> <li>• None identified</li> </ul>	
<b>Estimated Costs:</b>	
Phase 1	
Total Capital Cost	\$ 670,000
Total Design Cost (15%)	\$ 101,000
Total	\$ 771,000
Yearly O&M	\$ 67,000
Phase 2	
Total Capital Cost	\$1,280,000
Total Design Cost (15%)	\$ 192,000
Total	\$1,472,000
Yearly O&M	\$ 128,000



<b>R14 – Transportation Infrastructure Protection</b>	
<b>Time Frame for Deployment:</b> Long term.	
<b>Description:</b> This project would provide the ability to remotely monitor key infrastructure, such as the US 34 bike tunnels near Loveland, and alert authorities if the presence of a potentially harmful situation was detected.	
<b>Geographic Scope:</b> Regional.	
<b>Key Stakeholders:</b>	
<ul style="list-style-type: none"> <li>• CDOT Region 4</li> <li>• Emergency Response Agencies</li> </ul>	
<b>Problems Addressed:</b>	
<ul style="list-style-type: none"> <li>• Protective measures for critical infrastructure</li> </ul>	
<b>Market Packages Included:</b>	
<ul style="list-style-type: none"> <li>• Transportation Infrastructure Protection</li> </ul>	
<b>Potential Deployment Barriers and Coordination Requirements:</b>	
<ul style="list-style-type: none"> <li>• None identified</li> </ul>	
<b>Estimated Costs:</b>	
Total Capital Cost	\$164,000
Total Design Cost (15%)	\$ 25,000
Total	\$189,000
Yearly O&M	\$ 40,000



<b>R15 – Train Tracking Alerts</b>	
<b>Time Frame for Deployment:</b> Long term.	
<b>Description:</b> This project would detect trains approaching key intersections and send an alert to emergency dispatchers so that emergency vehicles may be rerouted to avoid blocked intersections.	
<b>Geographic Scope:</b> Regional.	
<b>Key Stakeholders:</b>	
<ul style="list-style-type: none"> <li>• CDOT Region 4</li> <li>• Emergency Dispatch Agencies</li> </ul>	
<b>Problems Addressed:</b>	
<ul style="list-style-type: none"> <li>• Routing for emergency vehicles during congestion, incidents, and around train blockages.</li> </ul>	
<b>Market Packages Included:</b>	
<ul style="list-style-type: none"> <li>• Standard Railroad Grade Crossing</li> </ul>	
<b>Potential Deployment Barriers and Coordination Requirements:</b>	
<ul style="list-style-type: none"> <li>• Coordination with Emergency Vehicle Tracking.</li> </ul>	
<b>Estimated Costs:</b>	
Total Capital Cost	\$290,000
Total Design Cost (15%)	\$ 44,000
Total	\$334,000
Yearly O&M	\$ 30,000



<b>R16 – Maintenance and Construction Vehicle Maintenance</b>	
<b>Time Frame for Deployment:</b> Long term.	
<b>Description:</b> This project would provide on-board maintenance diagnostics system for city or county maintenance vehicles.	
<b>Geographic Scope:</b> Regional, as needed.	
<b>Key Stakeholders:</b>	
<ul style="list-style-type: none"> <li>• City and county maintenance departments</li> </ul>	
<b>Problems Addressed:</b>	
<ul style="list-style-type: none"> <li>• Improved tracking and data collection from maintenance and emergency vehicles</li> </ul>	
<b>Market Packages Included:</b>	
<ul style="list-style-type: none"> <li>• Maintenance and Construction Vehicle Maintenance</li> </ul>	
<b>Potential Deployment Barriers and Coordination Requirements:</b>	
<ul style="list-style-type: none"> <li>• None identified</li> </ul>	
<b>Estimated Costs:</b>	
Total Capital Cost	\$ 900,000
Total Design Cost (15%)	\$ 135,000
Total	\$1,035,000
Yearly O&M	\$ 90,000



**C. Financial Summary**

This section summarizes the estimated budget requirements for the projects described in the previous section. Note that all of the estimates are subject to review and revision by the ITS Working Group as the scope and quantities need to be confirmed.

Table 12 provides a summary of the estimates(in 2003 dollars) provided for the projects described in this section. The design and capital cost estimate and the average annual costs are listed for each project organized by the timeframe in which it is deployed. The total for the annual cost is calculated as a straight-line sum consider three years in the Near Term, three years in the Mid Term and four years in the Long Term.

**Table 12. Financial Summary**

	Corridor Projects	Deployment							
		Near Term		Mid Term		Long Term		Project Total	
		Design & Capital	Average Annual Costs	Design & Capital	Average Annual Costs	Design & Capital	Average Annual Costs	Design & Capital	Cumulative Annual Costs
C1	I-25	\$1,647,000	\$73,500	\$1,647,000	\$147,000		\$147,000	\$3,294,000	\$1,249,500
C2	US 85	\$1,318,500	\$107,500	\$1,318,500	\$215,000		\$215,000	\$2,637,000	\$1,827,500
C3	US 287	\$772,000	\$53,500	\$772,000	\$107,000		\$107,000	\$1,544,000	\$909,500
C4	US 34 East	\$850,000	\$55,000	\$850,000	\$110,000		\$110,000	\$1,700,000	\$935,000
C5	US 34 West	\$918,500	\$85,000	\$918,500	\$170,000		\$170,000	\$1,837,000	\$1,445,000
C6	SH 392			\$339,000	\$18,000		\$18,000	\$339,000	\$126,000
C7	SH 52			\$1,198,000	\$97,000		\$97,000	\$1,198,000	\$679,000
C8	US 36			\$773,000	\$85,000		\$85,000	\$773,000	\$595,000
C9	SH 14					\$534,000	\$41,000	\$534,000	\$164,000
C10	SH 257					\$152,000	\$6,000	\$152,000	\$24,000
C11	SH 66					\$1,049,000	\$76,000	\$1,049,000	\$304,000
C12	SH 402					\$272,000	\$8,000	\$272,000	\$32,000
	Subtotal	\$5,506,000	\$374,500	\$7,816,000	\$949,000	\$2,007,000	\$1,080,000	\$15,057,000	\$8,290,500
<b>Advanced Public Transportation Projects</b>									
T1	Transit Vehicle Tracking	\$911,000	\$80,000		\$80,000		\$80,000	\$911,000	\$800,000
T2	Regional Service Coordination	\$380,000	\$33,000		\$33,000		\$33,000	\$380,000	\$330,000
T3	Regional Transit Trip Planning	\$345,000	\$30,000		\$30,000		\$30,000	\$345,000	\$300,000
T4	Transit Traveler Information			\$509,000	\$45,000	\$190,000	\$57,000	\$699,000	\$363,000
T5	Fixed-Route Computer Aided Dispatch			\$598,000	\$52,000		\$52,000	\$598,000	\$364,000
T6	Regional Fare Coordination			\$847,000	\$74,000		\$74,000	\$847,000	\$518,000
T7	Transit Security					\$339,000	\$30,000	\$339,000	\$120,000
T8	Transit Signal Priority	\$428,667	\$37,333	\$428,667	\$74,667	\$428,667	\$112,000	\$1,286,000	\$784,000
	Subtotal	\$2,064,667	\$180,333	\$2,382,667	\$388,667	\$957,667	\$468,000	\$5,405,000	\$3,579,000

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February 16, 2004



	Corridor Projects	Deployment							
		Near Term		Mid Term		Long Term		Project Total	
		Design & Capital	Average Annual Costs	Design & Capital	Average Annual Costs	Design & Capital	Average Annual Costs	Design & Capital	Cumulative Annual Costs
<b>Regional Projects</b>									
R1	Center-to-Center Communication	\$581,000	\$80,000		\$80,000		\$80,000	\$581,000	\$800,000
R2	Regional Communications Plan	\$230,000	\$20,000		\$20,000		\$20,000	\$230,000	\$200,000
R3	Regional Incident Management and Routing Plan	\$288,000	\$25,000		\$25,000		\$25,000	\$288,000	\$250,000
R4	Regional Data Warehouse			\$196,000	\$17,000		\$17,000	\$196,000	\$119,000
R5	Greeley & Loveland Traffic Operations Centers			\$1,150,000	\$100,000		\$100,000	\$1,150,000	\$700,000
R6	Emergency Vehicle Tracking			\$1,150,000	\$100,000	\$3,738,000	\$425,000	\$4,888,000	\$2,000,000
R7	Integration with 511			\$305,000	\$27,000		\$27,000	\$305,000	\$189,000
R8	Regional Public TV Travel Information			\$145,000	\$19,000		\$19,000	\$145,000	\$133,000
R9	Estes Park/RMNP Travel Information Web Site			\$265,000	\$23,000		\$23,000	\$265,000	\$161,000
R10	Fixed Audible Signals at Railroad Crossings					\$65,000	\$6,000	\$65,000	\$24,000
R11	Estes Park Area Parking Management					\$673,000	\$59,000	\$673,000	\$236,000
R12	Automated Hazard Detection and Road Closure					\$239,000	\$22,000	\$239,000	\$88,000
R13	Maintenance and Construction Vehicle Tracking					\$2,243,000	\$195,000	\$2,243,000	\$780,000
R14	Transportation Infrastructure Protection					\$189,000	\$40,000	\$189,000	\$160,000
R15	Train Tracking Alerts					\$334,000	\$30,000	\$334,000	\$120,000
R16	Maintenance and Construction Vehicle Maintenance					\$1,035,000	\$90,000	\$1,035,000	\$360,000
	Subtotal	\$1,099,000	\$125,000	\$3,211,000	\$411,000	\$8,516,000	\$1,178,000	\$12,826,000	\$6,320,000
	Grand Totals	\$8,669,667		\$13,409,667		\$11,480,667		\$33,288,000	\$18,189,500
* Projects require clarification in scope by ITS Working Group.									



## VIII. NEXT STEPS

The ITS Strategic Plan is intended to guide the deployment of ITS elements within the study area. It is intended that this document be maintained as an input to the formal planning process in the study area.

1. In order to satisfy federal requirements, a Regional ITS Architecture, consistent with the ITS Strategic Plan, will be completed by the ITS Working Group.
2. Since an update for the North Front Range RTP is imminent, projects identified in this ITS Strategic Plan may be submitted by sponsoring agencies for inclusion in that document.
3. The North Front Range MPO will form an ITS Committee as a regional forum for discussion of regional ITS issues and deployment progress.

The ITS Committee will meet at least every six months. At the meeting held roughly one year prior to scheduled RTP update (every three years), the ITS Committee will discuss specifically and determine whether updates to the ITS Strategic Plan are necessary. If an update is required, the ITS Strategic Plan will be updated prior to RTP update.

4. The next scheduled update for the RTP in the Upper Front Range TPR is in approximately three years; therefore, projects in this report are not considered in that plan. In order to include ITS projects in this RTP, sponsoring agencies will have to consider its relative priority with existing projects and determine whether it should be advanced forward in an interim update or submitted in the next scheduled update.
5. The ITS Committee and the agencies participating in the development of this ITS Strategic Plan will begin to consider the following issues and needs identified by the members of the ITS Working Group:
  - Definition of a separate funding pool and project category for ITS projects within the RTP.
  - Definition of an interim amendment process in order to maintain the plan outside of the regular schedule.
  - Development of agreements to coordinate regional ITS planning between the neighboring TPRs (North Front Range, Upper Front Range and DRCOG) and CDOT.

In order to prepare ITS projects for inclusion in the TIP, the project sponsors will need to work with the ITS Committee in order to demonstrate that a systems engineering analysis has been applied to the projects, per the Federal requirements.

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# **APPENDIX A**

## **Market Packages**

### **Spreadsheet**

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## APPENDIX A MARKET PACKAGES SPREADSHEET

This spreadsheet was distributed following the Regional ITS Architecture Workshop. The spreadsheet contains brief descriptions of each market package, its applicability to the region, and its deployment status (Existing, Planned, Future, Not Planned).

Market Package Name	Quick Description	Region 4 Applicability	Status			
			Existing	Planned	Future	Needed
<b>Advanced Traffic Management Systems</b>						
ATMS01 Network Surveillance	Collects information from field devices (detectors, CCTV, etc.) for monitoring of roadway conditions.	Two cameras planned in Greeley, existing video detection. Need for detectors and video along I-25, US 34, US 36, SH 14, and US 85. Existing video detection and cameras in Loveland. Existing cameras in Fort Collins, plans for automatic retrieval of ATR data. CDOT R4 would like access to CDOT ITS and Fort Collins video images.	✓	✓	✓	
ATMS02 Probe Surveillance	Use toll transponder equipped vehicles, volunteers, buses, anonymous cellular phone tracking or other technology to monitor traffic conditions	Potential for using probe data for origin-destination studies in Loveland, tracking volunteers on 34 and in downtown. There are no regional transit routes, but could possibly use VanGo commercial vanpool vehicles as probes.			✓	

	Market Package Name	Quick Description	Region 4 Applicability	Status				
				Existing	Planned	Future	Needed	Not Applicable
ATMS03	Surface Street Control	Provide traffic signal control.	Need for synchronized and interconnected signal system in Estes Park and Windsor on state highways. Routes include SH 52, US 34, US 85, US 287. Existing centralized systems in Greeley, Loveland, and Fort Collins. CDOT R4 has a signal system server in Greeley and controls Estes Park and other signals. Coordination between agencies planned.	✓	✓		✓	
ATMS04	Freeway Control	Control of devices installed along freeways, including control of cameras and dynamic message signs.	Existing dynamic message signs on I-25, cameras needed.	✓		✓	✓	
ATMS05	HOV Lane Management	Manages HOV lanes by coordinating freeway ramp meters and connector signals with HOV lane usage signals	Future HOV on I-25 at south end of study area.			✓		

	Market Package Name	Quick Description	Region 4 Applicability					Status			
			Existing	Planned	Future	Needed	Not Applicable				
ATMS06	Traffic Information Dissemination	Supports Dynamic Message Signs and Highway Advisory Radio	City of Loveland Highway Advisory Radio. Fixed dynamic message signs and HAR on I-25, agency owned portable DMS. Need for devices on US 85 due to growth and snow closures on Hwy 66. Need for HAR and DMS along entrances to Estes Park. Need for DMS in Fort Collins. Existing HAR at CSU. Need DMS on 287, north and south of Loveland, also west of Loveland on 34. May also need DMS at Colorado Blvd. and Highway 52 intersection in Frederick.	✓			✓				
ATMS07	Regional Traffic Control	Provides for the sharing of traffic information and control among traffic management centers to support a regional control strategy.					Sharing of video images needed. CDOT R4 and Fort Collins are not interested in sharing signal control.		✓		
ATMS08	Incident Management System	Detects incidents and provides links between transportation and emergency management centers to exchange information					Need for incident management and event planning at Larimer County Event Center and for the Greeley Stampede. Congestion and routing an issue for special events in Fort Collins. Existing I-25 incident management plan.		✓		

	Market Package Name	Quick Description	Region 4 Applicability	Status				
				Existing	Planned	Future	Needed	Not Applicable
ATMS09	Traffic Forecast and Demand Management	Use of historical traffic data to predict future demand.	Planned in Fort Collins. Counts and video detection information will be used for demand management. Future HOT lanes.	✓				
ATMS10	Electronic Toll Collection	Use of electronic "tags" to collect tolls and process violations without requiring motorists to stop.			✓			
ATMS11	Emissions Monitoring and Management	Monitors individual vehicle emissions and provides general air quality monitoring using distributed sensors to collect the data	Weld County may be an "area of influence" for ozone in Denver. Greeley and Fort Collins are in "maintenance" status for CO2 emissions. Existing emissions check stations.	✓		✓		
ATMS12	Virtual TMC and Smart Probe data	For rural areas, uses vehicle probes to collect traffic data. No central TMC; rather, each locality can access the data from their own office.	Not applicable.					✓
ATMS13	Standard Railroad Grade Crossing	Manages highway traffic at highway-rail intersections where rail operational speeds are less than 80 miles per hour	Existing rail signal pre-emption in Fort Collins. Need timing plans to "flush" system after pre-emption. Greeley is considering automated train horns, would like to be a demo project.	✓			✓	
ATMS14	Advanced Railroad Grade Crossing	Same as Standard, but for intersections with trains traveling in excess of 80 miles per hour.	Not applicable.					✓

	Market Package Name	Quick Description	Region 4 Applicability	Status				
				Existing	Planned	Future	Needed	Not Applicable
ATMS15	Railroad Operations Coordination	Provides an information link between rail operations and traffic management centers and emergency dispatch.	Would like advance notification of trains to alert emergency vehicles - either via roadside detection or from rail companies.			✓		
ATMS16	Parking Facility Management	Provides monitoring and management of parking facilities	Smart Cards for transit parking facilities in Fort Collins? Need for parking lot monitoring in downtown Estes Park and at Rocky Mountain State Park.			✓		
ATMS17	Regional Parking Management	Supports coordination between parking facilities to enable regional parking management strategies	Possible future coordination in Estes Park (very long term)		✓			
ATMS18	Reversible Lane Management	Provides for the control of reversible lane facilities.	Not applicable.					✓
ATMS19	Speed Monitoring	Monitors speeds of vehicles on roadways. DMS can then be used to post a safe speed reminder.	Speed warning system needed on Windsor Hill, possibly on US 34 curves. Potential for speed monitoring in some locations in Fort Collins.		✓	✓		
ATMS20	Drawbridge Management	Drawbridge control systems – gates, warning lights, DMS, etc.	Not applicable.					✓
ATMS21	Roadway Closure Management	Support for remotely controlled gates or barriers that close off roads in unsafe conditions, plus camera surveillance and traveler information.	Rossum Drive in Loveland has an existing gate, remote control is needed. Possible need for traveler information system on US 34 in Big Thompson Canyon.				✓	

Market Package Name	Quick Description	Region 4 Applicability	Status				
			Existing	Planned	Future	Needed	Not Applicable
<b>Advanced Traveler Information Systems</b>							
ATIS1 Broadcast Traveler Information	Dissemination of information over a wide area through existing infrastructures and low cost user equipment.	Existing radio station (KEZ 1410) broadcasts weather and travel information in Estes Park. Existing CDOT faxes of road condition information. Interest in disseminating regional transportation data via public TV. Existing Loveland HAR on 1610 AM, posts traffic information online and sends out weekly emails. Loveland has a city TV channel that could be used for traffic images. Existing Welcome Center kiosks scroll through various traffic information.	✓		✓		
ATIS2 Interactive Traveler Information	Provides tailored information in response to a traveler request. Includes dynamic web pages and 511 telephone information.	CDOT Co-Trip web site and telephone information system existing. Estes Park city traveler information web site and kiosks needed. Plans for 511 and statewide web site enhancements. Plans for Fort Collins web site.	✓	✓		✓	

	Market Package Name	Quick Description	Region 4 Applicability	Status				
				Existing	Planned	Future	Needed	Not Applicable
ATIS3	Autonomous Route Guidance	In-vehicle or handheld electronic devices used to provide trip planning information and directions. This service is generally not provided by public sector agencies.	Not applicable.					✓
ATIS4	Dynamic Route Guidance	Builds on Autonomous Route Guidance to factor in real-time conditions information. Again, this market package is generally more of a private-sector initiative.	Not applicable.					✓
ATIS5	ISP (Information Service Provider) Based Route Guidance	Trip planning and directions information that is provided by a service, and does not require a specific user device – "Mapquest" web site would be an example.	Not applicable.					✓
ATIS6	Integrated Transportation Management/ Route Guidance	Ties in with route guidance systems to optimize traffic control strategies along anticipated vehicle routes.	Not applicable.					✓
ATIS7	Yellow Pages and Reservation	Provides "Yellow pages" business listings and the capacity to make reservations. Not a service generally provided by public sector agencies.	Not applicable.					✓
ATIS8	Dynamic Ridesharing	Provides dynamic ridesharing/ride matching capability in real time. Some large companies provide this service.	NFRMPO handles existing carpool match system with a 24-hour turnaround. Heading towards a real-time system.		✓			
ATIS9	In Vehicle Signing	Supports distribution of information, such as travel advisories, to drivers through in-vehicle devices	Not applicable.					✓

	Market Package Name	Quick Description	Region 4 Applicability		Status			
			Existing	Planned	Future	Needed	Not Applicable	
<b>Advanced Public Transit Systems</b>								
APTS1	Transit Vehicle Tracking	Provide automatic vehicle location (AVL) to track transit vehicles.	✓		✓			
APTS2	Transit Fixed-Route Operations	Performs automatic driver assignment and monitoring, as well as vehicle routing and scheduling for fixed-route services						
APTS3	Demand Response Transit Operations	Performs automatic driver assignment and monitoring as well as vehicle routing and scheduling for demand response transit services	✓		✓			
APTS4	Transit Passenger and Fare Management	Allows for the management of passenger loading and fare payments on-board vehicles using electronic means			✓			
APTS5	Transit Security	Provides for the physical security of transit passengers	✓		✓			
APTS6	Transit Maintenance	Supports automatic maintenance scheduling and monitoring.			✓			

	Market Package Name	Quick Description	Region 4 Applicability	Status				
				Existing	Planned	Future	Needed	Not Applicable
APTS7	Multi-modal Coordination	Establishes two-way communications between multiple transit and traffic agencies and transit signal priority.	Interest in trip planning services. Interest in fare coordination between agencies. Plans for transit signal priority on some corridors. Existing real-time coordination between COLT and Transfort. Planning for bus between Loveland and Greeley.	✓	✓		✓	
APTS8	Transit Traveler Information	Provides customized or real-time transit information.	Transfort planning on-board stop announcements, real-time bus arrival displays, and online trip planning. Need for real-time transit information in Estes Park. Greeley planning for "Next Bus" information at stops.		✓		✓	

Market Package Name	Quick Description	Region 4 Applicability	Status			
			Existing	Planned	Future	Needed Not Applicable
<b>Emergency Management</b>						
EM1	Emergency Response Provides computer-aided dispatch systems	Weld County emergency services dispatch and 911. Larimer County Sheriff dispatch. Fort Collins emergency department. Loveland emergency response.	✓			
EM2	Emergency Routing Automatic Vehicle Location and dynamic routing for emergency vehicles.	Existing CAD for emergency vehicles in Estes Park. Trains block emergency vehicle access in La Salle. Existing signal pre-emption in Greeley, Loveland, and Fort Collins. Plans for AVL on some Weld County emergency vehicles and Greeley police cars.	✓	✓	✓	
EM3	Mayday Support Supports response to requests for help from in-vehicle or call-box type systems.	Existing in-vehicle systems. No plans for call boxes.	✓			
EM4	Roadway Service Patrols Service trucks that respond to reports of disabled vehicles and help to clear them, in order to reduce the impact on the traffic flow.	Possibility for future major construction on I-25.		✓		
EM5	Transportation Infrastructure Protection Uses surveillance cameras and sensors to monitor critical infrastructure such as bridges, tunnels, etc.	Potential future locations include bike underpasses on US 34, by National Guard airport in Greeley, and at railroad switch boxes.		✓		

	Market Package Name	Quick Description	Region 4 Applicability	Status				
				Existing	Planned	Future	Needed	Not Applicable
EM6	Wide-Area Alert	Facilitates the use of ITS driver information devices (such as DMS and HAR) to spread emergency alert messages – example would be Amber Alerts.	CDOT ITS currently places DMS messages on request of R4, State Patrol, and HQ. This includes Amber Alerts.	✓				
EM7	Early Warning System	Uses various types of sensors and monitors to facilitate early detection and warning of emergencies, including weather emergencies and terrorist attacks.	Stream level monitoring in Loveland, Fort Collins, and Estes Park. Some linked to emergency operations centers. Estes Park has a SCADA system with alarm capabilities. Existing stream monitoring on US 85, but not linked to any centers.	✓				
EM8	Disaster Response and Recovery	Supports the overall coordinated response to emergencies by transportation, emergency response, and maintenance personnel.	Existing emergency management plans.	✓				
EM9	Evacuation and Reentry Management	Supports coordination of evacuation plans by transportation and safety agencies as well as the subsequent return to the evacuation area.	Existing emergency management plans.	✓				
EM10	Disaster Traveler Information	Augments existing traveler information systems to provide emergency traveler information, such as evacuation routes, etc., in the event of a disaster.	Existing emergency management plans.	✓				

	Market Package Name	Quick Description	Region 4 Applicability	Status				
				Existing	Planned	Future	Needed	Not Applicable
<b>Maintenance and Construction</b>								
MC1	Maintenance and Construction Vehicle and Equipment Tracking	Tracks the location of maintenance and construction vehicles and other equipment.	Data communications and GPS systems on CDOT snow plows may be considered. Future GPS tracking of Weld County maintenance vehicles. Existing electronic control and tracking of Fort Collins street sweepers. Installing asset management system with GIS capability; want GPS on striping trucks. Planned AVL on Greeley and Loveland street sweepers.	✓	✓	✓		
MC02	Maintenance and Construction Vehicle Maintenance	On-board diagnostics that provide maintenance and repair information for snowplows, trucks, etc.	Needed in Greeley.			✓		
MC03	Road Weather Data Collection	Collection of weather and road conditions data using sensors installed near the roadway.	Weather stations in Fort Collins, Windsor, Loveland, Greeley, and CDOT R4 (on I-25). R4, Greeley and Loveland are interconnected. Fort Collins has their own server. Need more sensors on US 85 and US 34, more pavement sensors in Loveland.					✓

	Market Package Name	Quick Description	Region 4 Applicability	Status				
				Existing	Planned	Future	Needed	Not Applicable
MC04	Weather Information Processing and Distribution	Processing and dissemination of road/weather conditions information to travelers, maintenance workers, etc.	Plans for statewide data collection and processing of CDOT weather stations. Existing CDOT Road Weather Alert pager/email system. Existing internal web site with conditions info for maintenance. Additional weather information may be available from the Forest Service and airports.	✓	✓			
MC05	Roadway Automated Treatment	Automated anti-icing systems for bridges and roadways.	City of Fort Collins Timberline Bridge de-icing system. Potential for anti-icing system along SH 14. Needed for US 34 bridge crossing US 85 and at Crossroads and I-25.	✓			✓	
MC06	Winter Maintenance	Supports winter road maintenance including snowplow operations, roadway treatments (i.e., salt spraying, etc.)	Existing winter maintenance operations.	✓				
MC07	Roadway Maintenance and Construction	Supports scheduled and unscheduled maintenance and construction of ITS and non-ITS equipment.	Existing maintenance and construction operations. Existing CDOT ITS maintenance database.	✓				
MC08	Work Zone Management	Enables construction delay and routing information to be provided en-route to drivers, and also facilitates providing this information to other agencies.	Need traveler information and alternate route information entering Estes Park.				✓	

		Status					
Market Package Name	Quick Description	Region 4 Applicability	Existing	Planned	Future	Needed	Not Applicable
MC09	Work Zone Safety Monitoring	"Intrusion Alarms" and other devices that warn if a vehicle is approaching a work zone at a high rate of speed or has entered the work zone. May also monitor movements of workers.	CDOT will be requiring contractors to have a work zone incident management plan.		✓		
MC10	Maintenance and Construction Activity Coordination	Coordination of maintenance and construction activities between various agencies for improved operations.	Most agencies post scheduled road closures to web sites.	✓			

Market Package Name	Quick Description	Region 4 Applicability	Status			
			Existing	Planned	Future	Needed
<b>Commercial Vehicle Operations</b>						
CVO01	Fleet Administration Electronic routing of commercial vehicle fleets.	Not applicable.				✓
CVO02	Freight Administration Electronic tracking of cargo movements from source to destination, including whether the shipment has been tampered with.	Not applicable.				✓
CVO03	Electronic Clearance Provides for pre-registered commercial vehicles to pass through check stations without pulling over	PrePass and Automatic Vehicle Identification equipment installed on I-25. No plans to automate POE near Platteville.	✓			
CVO04	CV Administrative Processes Provides for electronic information sharing and automation of a number of commercial vehicle administration tasks, such as fee collection, credentialing, and tax filing.	Not applicable.				✓
CVO05	International Border Electronic Clearance Expands the Electronic Clearance market package to include border crossings.	Not applicable.				✓
CVO06	Weigh-In-Motion Includes systems that allow commercial vehicles to be weighed by equipment installed on the roadside, allowing the vehicle to bypass traditional weigh stations.	WIM installed on I-25 south of SH 14.	✓			
CVO07	Roadside CVO Safety Provides for automated roadside safety monitoring and reporting	Not applicable.				✓
CVO08	On-board CVO Safety Provides for on-board commercial vehicle safety monitoring and reporting	Generally a private sector initiative.				✓

	Market Package Name	Quick Description	Region 4 Applicability	Status				
				Existing	Planned	Future	Needed	Not Applicable
CVO09	CVO Fleet Maintenance	On-board monitoring and maintenance system.	Generally a private sector initiative.					✓
CVO10	HAZMAT Management	Integrates incident management capabilities with commercial vehicle tracking to assure effective treatment of HAZMAT material and incidents	Not applicable.					✓
CVO11	Roadside HAZMAT Security Detection and Mitigation	Uses roadside equipment to detect HAZMAT cargo, then checks the vehicle's credentials to ensure that the cargo and driver are properly authorized.	Not applicable.					✓
CVO12	CV Driver Security Authentication	Uses onboard security to detect unauthorized CV drivers, and if detected, disables the vehicle.	Generally a private sector initiative.					✓
CVO13	Freight Assignment Tracking	Registration and tracking of the vehicle, cargo shipment, and driver.	Not applicable.					✓

Market Package Name		Quick Description	Region 4 Applicability		Status				
			Existing	Planned	Future	Needed	Not	Applicable	
<b>Archived Data</b>									
AD1	ITS Data Mart	Collect data for future analysis for one agency only.	Existing CDOT ITS DMS and weather station archive logs. Existing city and county speed monitoring data. Need for traffic volume and crash data.	✓		✓			
AD2	ITS Data Warehouse	Store data for multiple agencies.	Could be used for weather data, incident data, traffic counts.			✓			
AD3	ITS Virtual Data Warehouse	Supports networked access to data archives for multiple agencies.	Could be used to access GIS repository on NFRMPO server.			✓			

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# **APPENDIX B**

## **Project Cost**

### **Spreadsheets**

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## APPENDIX B PROJECT COST SPREADSHEETS

The following spreadsheets were prepared in order to develop the planning-level cost data for the ITS projects. The spreadsheets provide additional itemized cost data that was not broken out in the project descriptions, and is provided here as a reference. All estimates are subject to review and revision by the ITS Working Group.

**C1 - I-25 Corridor (WCR 8 to North Front Range Boundary)****MPO: North Front Range**

Item	Quantity	Unit Price	Total Capital Cost	Yearly O&M (Unit)	Yearly O&M (Total)
CCTV Camera	9	\$ 5,000	\$ 45,000	\$ 500	\$ 4,500
CCTV Pole	9	\$ 7,000	\$ 63,000	\$ 700	\$ 6,300
Dynamic Message Sign	1	\$ 100,000	\$ 100,000	\$ 10,000	\$ 10,000
DMS Structure	1	\$ 75,000	\$ 75,000	\$ 7,500	\$ 7,500
Weather Station (Basic)	3	\$ 30,000	\$ 90,000	\$ 3,000	\$ 9,000
Automatic Anti-Icing	2	\$ 150,000	\$ 300,000	\$ 15,000	\$ 30,000
Vehicle Detection	9	\$ 15,000	\$ 135,000	\$ 1,500	\$ 13,500
Communications Infrastructure	1	\$ 1,050,000	\$ 1,050,000	\$ 21,000	\$ 21,000

Total Capital Cost \$ 1,858,000  
Total Design Cost (15%) \$ 279,000  
Total \$ 2,137,000

Yearly O&M \$ 102,000

**MPO: Upper Front Range**

Item	Quantity	Unit Price	Total Capital Cost	Yearly O&M (Unit)	Yearly O&M (Total)
CCTV Camera	3	\$ 5,000	\$ 15,000	\$ 500	\$ 1,500
CCTV Pole	3	\$ 7,000	\$ 21,000	\$ 700	\$ 2,100
Dynamic Message Sign	1	\$ 100,000	\$ 100,000	\$ 10,000	\$ 10,000
DMS Structure	1	\$ 75,000	\$ 75,000	\$ 7,500	\$ 7,500
Weather Station (Enhanced)	1	\$ 50,000	\$ 50,000	\$ 5,000	\$ 5,000
Vehicle Detection	3	\$ 15,000	\$ 45,000	\$ 1,500	\$ 4,500
Communications Infrastructure	1	\$ 700,000	\$ 700,000	\$ 14,000	\$ 14,000

Total Capital Cost \$ 1,006,000  
Total Design Cost (15%) \$ 151,000  
Total \$ 1,157,000

Yearly O&M \$ 45,000

**C2 - US 85 Corridor (SH52 to SH392)**

**MPO: North Front Range**

Item	Quantity	Unit Price	Total Capital Cost	Yearly O&M (Unit)	Yearly O&M (Total)
CCTV Camera	2	\$ 5,000	\$ 10,000	\$ 500	\$ 1,000
CCTV Pole	2	\$ 7,000	\$ 14,000	\$ 700	\$ 1,400
Dynamic Message Sign	2	\$ 100,000	\$ 200,000	\$ 10,000	\$ 20,000
DMS Structure	2	\$ 75,000	\$ 150,000	\$ 7,500	\$ 15,000
Weather Station (Basic)	1	\$ 30,000	\$ 30,000	\$ 3,000	\$ 3,000
Vehicle Detection	3	\$ 15,000	\$ 45,000	\$ 1,500	\$ 4,500
Dilemma Zone Detection	3	\$ 3,000	\$ 9,000	\$ 300	\$ 900
Signal Coordination (Infrastructure)	10	\$ 20,000	\$ 200,000	\$ 2,000	\$ 20,000
Communications Infrastructure	1	\$ 190,000	\$ 190,000	\$ 4,000	\$ 4,000

Total Capital Cost \$ 848,000  
 Total Design Cost (15%) \$ 128,000  
 Total \$ 976,000  
 Yearly O&M \$ 70,000

**MPO: Upper Front Range**

Item	Quantity	Unit Price	Total Capital Cost	Yearly O&M (Unit)	Yearly O&M (Total)
CCTV Camera	4	\$ 5,000	\$ 20,000	\$ 500	\$ 2,000
CCTV Pole	4	\$ 7,000	\$ 28,000	\$ 700	\$ 2,800
Dynamic Message Sign	4	\$ 100,000	\$ 400,000	\$ 10,000	\$ 40,000
DMS Structure	4	\$ 75,000	\$ 300,000	\$ 7,500	\$ 30,000
Weather Station (Basic)	2	\$ 30,000	\$ 60,000	\$ 3,000	\$ 6,000
Vehicle Detection	2	\$ 15,000	\$ 30,000	\$ 1,500	\$ 3,000
Dilemma Zone Detection	2	\$ 3,000	\$ 6,000	\$ 300	\$ 600
Signal Coordination (Timing)	10	\$ 5,000	\$ 50,000	\$ 500	\$ 5,000
WIM/Prepass	1	\$ 350,000	\$ 350,000	\$ 35,000	\$ 35,000
Communications Infrastructure	1	\$ 200,000	\$ 200,000	\$ 20,100	\$ 20,100

Total Capital Cost \$ 1,444,000  
 Total Design Cost (15%) \$ 217,000  
 Total \$ 1,661,000  
 Yearly O&M \$ 145,000

**C3 - US 287 Corridor (Fort Collins to Boulder County Line)**

**MPO: North Front Range**

Item	Quantity	Unit Price	Total Capital Cost	Yearly O&M (Unit)	Yearly O&M (Total)
CCTV Camera	1	\$ 5,000	\$ 5,000	\$ 500	\$ 500
CCTV Pole	1	\$ 7,000	\$ 7,000	\$ 700	\$ 700
Dynamic Message Sign	5	\$ 100,000	\$ 500,000	\$ 10,000	\$ 50,000
DMS Structure	5	\$ 75,000	\$ 375,000	\$ 7,500	\$ 37,500
Weather Station (Basic)	1	\$ 30,000	\$ 30,000	\$ 3,000	\$ 3,000
Dilemma Zone Detection	5	\$ 3,000	\$ 15,000	\$ 300	\$ 1,500
Signal Coordination (Timing)	10	\$ 5,000	\$ 50,000	\$ 500	\$ 5,000
Pavement Detector	1	\$ 10,000	\$ 10,000	\$ 1,000	\$ 1,000
Communications Infrastructure	1	\$ 350,000	\$ 350,000	\$ 7,000	\$ 7,000

Total Capital Cost \$ 1,342,000  
 Total Design Cost (15%) \$ 202,000  
 Total \$ 1,544,000  
 Yearly O&M \$ 107,000

**C4 - US 34 Corridor (east) (I-25 to US85)**

**MPO: North Front Range**

Item	Quantity	Unit Price	Total Capital Cost	Yearly O&M (Unit)	Yearly O&M (Total)
CCTV Camera	2	\$ 5,000	\$ 10,000	\$ 500	\$ 1,000
CCTV Pole	2	\$ 7,000	\$ 14,000	\$ 700	\$ 1,400
Dynamic Message Sign	3	\$ 100,000	\$ 300,000	\$ 10,000	\$ 30,000
DMS Structure	3	\$ 75,000	\$ 225,000	\$ 7,500	\$ 22,500
Weather Station (Basic)	2	\$ 30,000	\$ 60,000	\$ 3,000	\$ 6,000
Vehicle Detection	10	\$ 15,000	\$ 150,000	\$ 1,500	\$ 15,000
Signal Coordination (Timing)	10	\$ 5,000	\$ 50,000	\$ 500	\$ 5,000
Automatic Anti-Icing System	1	\$ 150,000	\$ 150,000	\$ 15,000	\$ 15,000
Advance Warning System (rail)	1	\$ 30,000	\$ 30,000	\$ 3,000	\$ 3,000
Communications Infrastructure	1	\$ 489,000	\$ 489,000	\$ 10,600	\$ 10,600

Total Capital Cost \$ 1,478,000  
 Total Design Cost (15%) \$ 222,000  
 Total \$ 1,700,000  
  
 Yearly O&M \$ 110,000

**C5 - US 34 Corridor (west) (I-25 towards Rocky Mountain National Park MPO: North Front Range)**

Item	Quantity	Unit Price	Total Capital Cost	Yearly O&M (Unit)	Yearly O&M (Total)
CCTV Camera	1	\$ 5,000	\$ 5,000	\$ 500	\$ 500
CCTV Pole	1	\$ 7,000	\$ 7,000	\$ 700	\$ 700
Dynamic Message Sign	2	\$ 80,000	\$ 160,000	\$ 8,000	\$ 16,000
DMS Structure	2	\$ 75,000	\$ 150,000	\$ 7,500	\$ 15,000
Weather Station (Basic)	3	\$ 30,000	\$ 90,000	\$ 3,000	\$ 9,000
Automatic Anti-Icing System	1	\$ 50,000	\$ 50,000	\$ 5,000	\$ 5,000
Communications Infrastructure	1	\$ 150,000	\$ 150,000	\$ 3,000	\$ 3,000

Total Capital Cost \$ 612,000  
 Total Design Cost (15%) \$ 92,000  
 Total \$ 704,000  
  
 Yearly O&M \$ 50,000

**MPO: Upper Front Range**

Item	Quantity	Unit Price	Total Capital Cost	Yearly O&M (Unit)	Yearly O&M (Total)
CCTV Camera	4	\$ 5,000	\$ 20,000	\$ 500	\$ 2,000
CCTV Pole	4	\$ 7,000	\$ 28,000	\$ 700	\$ 2,800
Dynamic Message Sign	4	\$ 100,000	\$ 400,000	\$ 10,000	\$ 40,000
DMS Structure	4	\$ 75,000	\$ 300,000	\$ 7,500	\$ 30,000
Weather Station (Basic)	2	\$ 30,000	\$ 60,000	\$ 3,000	\$ 6,000
Vehicle Detection	2	\$ 15,000	\$ 30,000	\$ 1,500	\$ 3,000
Signal Coordination (Infrastructure)	2	\$ 20,000	\$ 40,000	\$ 2,000	\$ 4,000
Speed Warning System	6	\$ 5,000	\$ 30,000	\$ 500	\$ 3,000
Automatic Traffic Recorder	1	\$ 5,000	\$ 5,000	\$ 500	\$ 500
Highway Advisory Radio	1	\$ 24,000	\$ 24,000	\$ 2,400	\$ 2,400
Communications Infrastructure	1	\$ 48,000	\$ 48,000	\$ 25,400	\$ 25,400

Total Capital Cost \$ 985,000  
 Total Design Cost (15%) \$ 148,000  
 Total \$ 1,133,000  
  
 Yearly O&M \$ 120,000

**C6 - SH 392 Corridor (I-25 towards Rocky Mountain National Park) MPO: North Front Range**

Item	Quantity	Unit Price	Total Capital Cost	Yearly O&M (Unit)	Yearly O&M (Total)
CCTV Camera	1	\$ 5,000	\$ 5,000	\$ 500	\$ 500
CCTV Pole	1	\$ 7,000	\$ 7,000	\$ 700	\$ 700
Speed Monitoring System	1	\$ 5,000	\$ 5,000	\$ 500	\$ 500
Vehicle Detection	5	\$ 15,000	\$ 75,000	\$ 1,500	\$ 7,500
Signal Coordination (Timing)	5	\$ 5,000	\$ 25,000	\$ 500	\$ 2,500
Weather Station (Basic)	1	\$ 30,000	\$ 30,000	\$ 3,000	\$ 3,000
Communications Infrastructure	1	\$ 147,000	\$ 147,000	\$ 3,300	\$ 3,300

Total Capital Cost \$ 294,000  
 Total Design Cost (15%) \$ 45,000  
 Total \$ 339,000  
  
 Yearly O&M \$ 18,000

**C7 - SH 52 Corridor (I-25 to US85) MPO: North Front Range**

Item	Quantity	Unit Price	Total Capital Cost	Yearly O&M (Unit)	Yearly O&M (Total)
CCTV Camera	1	\$ 5,000	\$ 5,000	\$ 500	\$ 500
CCTV Pole	1	\$ 7,000	\$ 7,000	\$ 700	\$ 700
Dynamic Message Sign	5	\$ 100,000	\$ 500,000	\$ 10,000	\$ 50,000
DMS Structure	5	\$ 75,000	\$ 375,000	\$ 7,500	\$ 37,500
Signal Coordination (Timing)	10	\$ 5,000	\$ 50,000	\$ 500	\$ 5,000
Communications Infrastructure	1	\$ 104,000	\$ 104,000	\$ 2,600	\$ 2,600

Total Capital Cost \$ 1,041,000  
 Total Design Cost (15%) \$ 157,000  
 Total \$ 1,198,000  
  
 Yearly O&M \$ 97,000

**C8 - US 36 Corridor (Study Area Boundary to RMNP Entrance) MPO: Upper Front Range**

Item	Quantity	Unit Price	Total Capital Cost	Yearly O&M (Unit)	Yearly O&M (Total)
CCTV Camera	3	\$ 5,000	\$ 15,000	\$ 500	\$ 1,500
CCTV Pole	3	\$ 7,000	\$ 21,000	\$ 700	\$ 2,100
Dynamic Message Sign	3	\$ 100,000	\$ 300,000	\$ 10,000	\$ 30,000
DMS Structure	3	\$ 75,000	\$ 225,000	\$ 7,500	\$ 22,500
Weather Station	1	\$ 30,000	\$ 30,000	\$ 3,000	\$ 3,000
Vehicle Detection	5	\$ 15,000	\$ 75,000	\$ 1,500	\$ 7,500
Communications Infrastructure	1	\$ 6,000	\$ 6,000	\$ 18,000	\$ 18,000

Total Capital Cost \$ 672,000  
 Total Design Cost (15%) \$ 101,000  
 Total \$ 773,000  
  
 Yearly O&M \$ 85,000

**C9 - SH 14 Corridor (US287 to I-25) MPO: North Front Range**

Item	Quantity	Unit Price	Total Capital Cost	Yearly O&M (Unit)	Yearly O&M (Total)
CCTV Camera	1	\$ 5,000	\$ 5,000	\$ 500	\$ 500
CCTV Pole	1	\$ 7,000	\$ 7,000	\$ 700	\$ 700
Dynamic Message Sign	1	\$ 100,000	\$ 100,000	\$ 10,000	\$ 10,000
DMS Structure	1	\$ 75,000	\$ 75,000	\$ 7,500	\$ 7,500
Pavement Ice Sensors	5	\$ 10,000	\$ 50,000	\$ 1,000	\$ 5,000
Automatic Anti-Icing	1	\$ 150,000	\$ 150,000	\$ 15,000	\$ 15,000
Communications Infrastructure	1	\$ 77,000	\$ 77,000	\$ 1,800	\$ 1,800

Total Capital Cost \$ 464,000  
 Total Design Cost (15%) \$ 70,000  
 Total \$ 534,000  
  
 Yearly O&M \$ 41,000

**C10 - SH 257 Corridor (SH60 to SH14)**

**MPO: North Front Range**

Item	Quantity	Unit Price	Total Capital Cost	Yearly O&M (Unit)	Yearly O&M (Total)
Weather Station	1	\$ 30,000	\$ 30,000	\$ 3,000	\$ 3,000
Communications Infrastructure	1	\$ 102,000	\$ 102,000	\$ 2,300	\$ 2,300

Total Capital Cost \$ 132,000  
 Total Design Cost (15%) \$ 20,000  
 Total \$ 152,000  
 Yearly O&M \$ 6,000

**C11 - SH 66 Corridor**

**MPO: Upper Front Range**

Item	Quantity	Unit Price	Total Capital Cost	Yearly O&M (Unit)	Yearly O&M (Total)
CCTV Camera	1	\$ 5,000	\$ 5,000	\$ 500	\$ 500
CCTV Pole	1	\$ 7,000	\$ 7,000	\$ 700	\$ 700
Dynamic Message Sign	4	\$ 100,000	\$ 400,000	\$ 10,000	\$ 40,000
DMS Structure	4	\$ 75,000	\$ 300,000	\$ 7,500	\$ 30,000
Communications Infrastructure	1	\$ 200,000	\$ 200,000	\$ 4,000	\$ 4,000

Total Capital Cost \$ 912,000  
 Total Design Cost (15%) \$ 137,000  
 Total \$ 1,049,000  
 Yearly O&M \$ 76,000

**C12 - SH 402 Corridor**

**MPO: North Front Range**

Item	Quantity	Unit Price	Total Capital Cost	Yearly O&M (Unit)	Yearly O&M (Total)
CCTV Camera	3	\$ 5,000	\$ 15,000	\$ 500	\$ 1,500
CCTV Pole	3	\$ 7,000	\$ 21,000	\$ 700	\$ 2,100
Communications Infrastructure	1	\$ 200,000	\$ 200,000	\$ 4,000	\$ 4,000

Total Capital Cost \$ 236,000  
 Total Design Cost (15%) \$ 36,000  
 Total \$ 272,000  
 Yearly O&M \$ 8,000

**T1 - Transit Vehicle Tracking**

Item	Quantity	Unit Price	Total Capital Cost	Yearly O&M (Unit)	Yearly O&M (Total)
AVL Central System	1	\$ 350,000	\$ 350,000	\$ 35,000	\$ 35,000
On-Board AVL Equipment (Transfort)	24	\$ 12,000	\$ 288,000	\$ 1,200	\$ 28,800
Installation and Testing (Transfort)	24	\$ 1,000	\$ 24,000	\$ 100	\$ 2,400
On-Board AVL Equipment (Greeley)	10	\$ 12,000	\$ 120,000	\$ 1,200	\$ 12,000
Installation and Testing (Greeley)	10	\$ 1,000	\$ 10,000	\$ 100	\$ 1,000
Total Capital Cost			\$ 792,000		
Total Design Cost (15%)			\$ 119,000		
Total			\$ 911,000		
Yearly O&M			\$ 80,000		

**T2 - Regional Service Coordination**

Item	Unit	Unit Price	Total Capital Cost	Yearly O&M (Unit)	Yearly O&M (Total)
Computer Hardware	3	\$ 10,000	\$ 30,000	\$ 1,000	\$ 3,000
System Software	1	\$ 300,000	\$ 300,000	\$ 30,000	\$ 30,000
Total Capital Cost			\$ 330,000		
Total Design Cost (15%)			\$ 50,000		
Total			\$ 380,000		
Yearly O&M			\$ 33,000		

**T3 - Regional Transit Trip Planner**

Item	Quantity	Unit Price	Total Capital Cost	Yearly O&M (Unit)	Yearly O&M (Total)
Trip Planning Software	1	\$ 300,000	\$ 300,000	\$ 30,000	\$ 30,000
Total Capital Cost			\$ 300,000		
Total Design Cost (15%)			\$ 45,000		
Total			\$ 345,000		
Yearly O&M			\$ 30,000		

**T4 - Transit Traveler Information**

**Phase 1 Major Transfer Sites**

Item	Quantity	Unit Price	Total Capital Cost	Yearly O&M (Unit)	Yearly O&M (Total)
Software Application	1	\$ 350,000	\$ 350,000	\$ 35,000	\$ 35,000
LED Reader Boards (Transfort)	3	\$ 7,500	\$ 22,500	\$ 750	\$ 2,250
Communications to STOP (Transfort)	3	\$ 3,000	\$ 9,000	\$ 300	\$ 900
Installation and Testing (Transfort)	3	\$ 1,000	\$ 3,000	\$ 100	\$ 300
LED Reader Boards (Greeley)	5	\$ 7,500	\$ 37,500	\$ 750	\$ 3,750
Communications to STOP (Greeley)	5	\$ 3,000	\$ 15,000	\$ 300	\$ 1,500
Installation and Testing (Greeley)	5	\$ 1,000	\$ 5,000	\$ 100	\$ 500
Total Capital Cost			\$ 442,000		
Total Design Cost (15%)			\$ 67,000		
Total			\$ 509,000		
Yearly O&M			\$ 45,000		

**Phase 2 Expanded Sites**

Item	Quantity	Unit Price	Total Capital Cost	Yearly O&M (Unit)	Yearly O&M (Total)
Planning	1	\$ 50,000	\$ 50,000	\$ -	\$ -
LED Reader Boards	10	\$ 7,500	\$ 75,000	\$ 750	\$ 7,500
Communications to STOP	10	\$ 3,000	\$ 30,000	\$ 300	\$ 3,000
Installation and Testing	10	\$ 1,000	\$ 10,000	\$ 100	\$ 1,000
Total Capital Cost			\$ 165,000		
Total Design Cost (15%)			\$ 25,000		
Total			\$ 190,000		
Yearly O&M			\$ 12,000		

**T5 - Fixed Route Computer Aided Dispatch**

Item	Quantity	Unit Price	Total Capital Cost	Yearly O&M (Unit)	Yearly O&M (Total)
Central CAD System	1	\$ 350,000	\$ 350,000	\$ 35,000	\$ 35,000
On-Board Equipment (Greeley)	10	\$ 5,000	\$ 50,000	\$ 500	\$ 5,000
On-Board Equipment (Transfort)	24	\$ 5,000	\$ 120,000	\$ 500	\$ 12,000
Total Capital Cost			\$ 520,000		
Total Design Cost (15%)			\$ 78,000		
Total			\$ 598,000		
Yearly O&M			\$ 52,000		

**T6 - Regional Fare Coordination**

Item	Quantity	Unit Price	Total Capital Cost	Yearly O&M (Unit)	Yearly O&M (Total)
On-Board Equipment (Transfort)	24	\$ 4,000	\$ 96,000	\$ 400	\$ 9,600
On-Board Equipment (Greeley)	10	\$ 4,000	\$ 40,000	\$ 400	\$ 4,000
Computer Hardware	1	\$ 100,000	\$ 100,000	\$ 10,000	\$ 10,000
System Software	1	\$ 500,000	\$ 500,000	\$ 50,000	\$ 50,000
Total Capital Cost			\$ 736,000		
Total Design Cost (15%)			\$ 111,000		
Total			\$ 847,000		
Yearly O&M			\$ 74,000		

**T7 - Transit Security**

Item	Unit	Unit Price	Total Capital Cost	Yearly O&M (Unit)	Yearly O&M (Total)
Central Hardware	1	\$ 75,000	\$ 75,000	\$ 7,500	\$ 7,500
Video Monitors	3	\$ 5,000	\$ 15,000	\$ 500	\$ 1,500
On-board Cameras/Push Button Alarms (Transfort)	24	\$ 5,000	\$ 120,000	\$ 500	\$ 12,000
Wireless Communications (Transfort)	24	\$ 1,000	\$ 24,000	\$ 100	\$ 2,400
On-board Cameras/Push Button Alarms (Greeley)	10	\$ 5,000	\$ 50,000	\$ 500	\$ 5,000
Wireless Communications (Greeley)	10	\$ 1,000	\$ 10,000	\$ 100	\$ 1,000
Total Capital Cost			\$ 294,000		
Total Design Cost (15%)			\$ 45,000		
Total			\$ 339,000		
Yearly O&M			\$ 30,000		

**T8 - Transit Signal Priority**

Item	Quantity	Unit Price	Total Capital Cost	Yearly O&M (Unit)	Yearly O&M (Total)
Central System	1	\$ 75,000	\$ 75,000	\$ 7,500	\$ 7,500
Field Antenna and Controller (Transfort)	9	\$ 35,000	\$ 315,000	\$ 3,500	\$ 31,500
Programming Signals (Transfort)	9	\$ 5,000	\$ 45,000	\$ 500	\$ 4,500
On-Board Vehicle Tags (Transfort)	19	\$ 100	\$ 1,900	\$ 10	\$ 190
Field Antenna and Controller (Greeley)	17	\$ 35,000	\$ 595,000	\$ 3,500	\$ 59,500
Programming Signals (Greeley)	17	\$ 5,000	\$ 85,000	\$ 500	\$ 8,500
On-Board Vehicle Tags (Greeley)	10	\$ 100	\$ 1,000	\$ 10	\$ 100
Total Capital Cost			\$ 1,118,000		
Total Design Cost (15%)			\$ 168,000		
Total			\$ 1,286,000		
Yearly O&M			\$ 112,000		

**R1 - Center-to-Center Coordination**

Item	Quantity	Unit Price	Total Capital Cost	Yearly O&M (Unit)	Yearly O&M (Total)
Hardware and Software	1	\$ 500,000	\$ 500,000	\$ 50,000	\$ 50,000
Communications	1	\$ 5,000	\$ 5,000	\$ 30,000	\$ 30,000

Total Capital Cost	\$ 505,000
Total Design Cost (15%)	\$ 76,000
Total	\$ 581,000
Yearly O&M	\$ 80,000

**R2 - Regional Communications Plan**

Item	Quantity	Unit Price	Total Capital Cost	Yearly O&M (Unit)	Yearly O&M (Total)
Plan Development	1	\$ 200,000	\$ 200,000	\$ 20,000	\$ 20,000

Total Capital Cost	\$ 200,000
Total Design Cost (15%)	\$ 30,000
Total	\$ 230,000
Yearly O&M	\$ 20,000

**R3 - Regional Incident Management and Routing Plan**

Item	Quantity	Unit Price	Total Capital Cost	Yearly O&M (Unit)	Yearly O&M (Total)
Regional Response Plan Development and Implementation	1	\$ 250,000	\$ 250,000	\$ 25,000	\$ 25,000

Total Capital Cost	\$ 250,000
Total Design Cost (15%)	\$ 38,000
Total	\$ 288,000
Yearly O&M	\$ 25,000

**R4 - Regional Data Warehouse**

Item	Quantity	Unit Price	Total Capital Cost	Yearly O&M (Unit)	Yearly O&M (Total)
Data Server	1	\$ 20,000	\$ 20,000	\$ 2,000	\$ 2,000
Software	1	\$ 150,000	\$ 150,000	\$ 15,000	\$ 15,000

Total Capital Cost	\$ 170,000
Total Design Cost (15%)	\$ 26,000
Total	\$ 196,000
Yearly O&M	\$ 17,000

**R5 - Greeley and Loveland Traffic Operations Centers**

Item	Quantity	Unit Price	Total Capital Cost	Yearly O&M (Unit)	Yearly O&M (Total)
TOC Hardware	2	\$ 500,000	\$ 1,000,000	\$ 50,000	\$ 100,000

Total Capital Cost	\$ 1,000,000
Total Design Cost (15%)	\$ 150,000
Total	\$ 1,150,000
Yearly O&M	\$ 100,000

**R6 - Emergency Vehicle Tracking****Phase 1 Demonstration Project**

Item	Quantity	Unit Price	Total Capital Cost	Yearly O&M (Unit)	Yearly O&M (Total)
AVL Central Software	1	\$ 350,000	\$ 350,000	\$ 35,000	\$ 35,000
On-Board AVL Equipment	50	\$ 12,000	\$ 600,000	\$ 1,200	\$ 60,000
Installation and Testing	50	\$ 1,000	\$ 50,000	\$ 100	\$ 5,000

Total Capital Cost \$ 1,000,000  
Total Design Cost (15%) \$ 150,000  
Total \$ 1,150,000  
  
Yearly O&M \$ 100,000

**Phase 2 Expanded Installations**

Item	Quantity	Unit Price	Total Capital Cost	Yearly O&M (Unit)	Yearly O&M (Total)
On-Board AVL Equipment	250	\$ 12,000	\$ 3,000,000	\$ 1,200	\$ 300,000
Installation and Testing	250	\$ 1,000	\$ 250,000	\$ 100	\$ 25,000

Total Capital Cost \$ 3,250,000  
Total Design Cost (15%) \$ 488,000  
Total \$ 3,738,000  
  
Yearly O&M \$ 325,000

**R7 - Integration with 511**

Item	Quantity	Unit Price	Total Cost	Yearly O&M (Unit)	Yearly O&M (Total)
System Design and Management	1	\$ 80,000	\$ 80,000	\$ 8,000	\$ 8,000
Regional Exchange Reprogramming	1	\$ 50,000	\$ 50,000	\$ 5,000	\$ 5,000
New Automated Message System	1	\$ 135,000	\$ 135,000	\$ 13,500	\$ 13,500

Total Capital Cost \$ 265,000  
Total Design Cost (15%) \$ 40,000  
Total \$ 305,000  
  
Yearly O&M \$ 27,000

**R8 - Regional Public TV Travel Information**

Item	Quantity	Unit Price	Total Capital Cost	Yearly O&M (Unit)	Yearly O&M (Total)
TV Channel Hardware	1	\$ 50,000	\$ 50,000	\$ 5,000	\$ 5,000
Presentation Design	1	\$ 75,000	\$ 75,000	\$ 7,500	\$ 7,500
Communications	1	\$ 1,000	\$ 1,000	\$ 6,000	\$ 6,000

Total Capital Cost \$ 126,000  
Total Design Cost (15%) \$ 19,000  
Total \$ 145,000  
  
Yearly O&M \$ 19,000

**R9 - Estes Park/Rocky Mountain National Park Travel Information Web Site**

Item	Quantity	Unit Price	Total Capital Cost	Yearly O&M (Unit)	Yearly O&M (Total)
Traffic Dissemination Software	1	\$ 20,000	\$ 20,000	\$ 2,000	\$ 2,000
Website Development	1	\$ 150,000	\$ 150,000	\$ 15,000	\$ 15,000
Kiosk	3	\$ 20,000	\$ 60,000	\$ 2,000	\$ 6,000

Total Capital Cost \$ 230,000  
Total Design Cost (15%) \$ 35,000  
Total \$ 265,000  
  
Yearly O&M \$ 23,000

**R10 - Fixed Audible Signals at Railroad Crossings**

Item	Unit	Unit Price	Total Capital Cost	Yearly O&M (Unit)	Yearly O&M (Total)
Train Detectors	2	\$ 18,000	\$ 36,000	\$ 1,800	\$ 3,600
Audible Alarms	2	\$ 10,000	\$ 20,000	\$ 1,000	\$ 2,000

Total Capital Cost \$ 56,000  
 Total Design Cost (15%) \$ 9,000  
 Total \$ 65,000  
  
 Yearly O&M \$ 6,000

**R11 - Estes Park Area Parking Management**

Item	Unit	Unit Price	Total Capital Cost	Yearly O&M (Unit)	Yearly O&M (Total)
Central Software System	1	\$ 150,000	\$ 150,000	\$ 15,000	\$ 15,000
Vehicle Detection	6	\$ 15,000	\$ 90,000	\$ 1,500	\$ 9,000
Web Interface	1	\$ 25,000	\$ 25,000	\$ 2,500	\$ 2,500
DMS	6	\$ 50,000	\$ 300,000	\$ 5,000	\$ 30,000
HAR	1	\$ 20,000	\$ 20,000	\$ 2,000	\$ 2,000

Total Capital Cost \$ 585,000  
 Total Design Cost (15%) \$ 88,000  
 Total \$ 673,000  
  
 Yearly O&M \$ 59,000

**R12 - Automated Hazard Detection and Road Closure**

Item	Quantity	Unit Price	Total Capital Cost	Yearly O&M (Unit)	Yearly O&M (Total)
Lane Control Gates	1	\$ 125,000	\$ 125,000	\$ 12,500	\$ 12,500
CCTV Camera	1	\$ 12,000	\$ 12,000	\$ 2,400	\$ 2,400
Traveler Info Software	1	\$ 20,000	\$ 20,000	\$ 2,000	\$ 2,000
Integration	1	\$ 50,000	\$ 50,000	\$ 5,000	\$ 5,000

Total Capital Cost \$ 207,000  
 Total Design Cost (15%) \$ 32,000  
 Total \$ 239,000  
  
 Yearly O&M \$ 22,000

**R13 - Maintenance and Construction Vehicle Tracking**

**Phase 1 Demonstration Project**

Item	Quantity	Unit Price	Total Capital Costs	Yearly O&M (Unit)	Yearly O&M (Total)
AVL Central Software	1	\$ 350,000	\$ 350,000	\$ 35,000	\$ 35,000
On-Board AVL Equipment	20	\$ 12,000	\$ 240,000	\$ 1,200	\$ 24,000
Installation and Testing	20	\$ 1,000	\$ 20,000	\$ 100	\$ 2,000
Push Button Alarm	20	\$ 3,000	\$ 60,000	\$ 300	\$ 6,000

Total Capital Cost \$ 670,000  
 Total Design Cost (15%) \$ 101,000  
 Total \$ 771,000  
  
 Yearly O&M \$ 67,000

**Phase 2 Expanded System**

Item	Quantity	Unit Price	Total Capital Costs	Yearly O&M (Unit)	Yearly O&M (Total)
On-Board AVL Equipment	80	\$ 12,000	\$ 960,000	\$ 1,200	\$ 96,000
Installation and Testing	80	\$ 1,000	\$ 80,000	\$ 100	\$ 8,000
Push Button Alarm	80	\$ 3,000	\$ 240,000	\$ 300	\$ 24,000

Total Capital Cost \$ 1,280,000  
 Total Design Cost (15%) \$ 192,000  
 Total \$ 1,472,000  
  
 Yearly O&M \$ 128,000

**R14 - Transportation Infrastructure Protection**

Item	Quantity	Unit Price	Total Capital Cost	Yearly O&M (Unit)	Yearly O&M (Total)
Surveillance Hardware/Software	1	\$ 100,000	\$ 100,000	\$ 10,000	\$ 10,000
Video Monitoring (camera)	4	\$ 15,000	\$ 60,000	\$ 1,500	\$ 6,000
Communications	1	\$ 4,000	\$ 4,000	\$ 24,000	\$ 24,000
Total Capital Cost			\$ 164,000		
Total Design Cost (15%)			\$ 25,000		
Total			\$ 189,000		
Yearly O&M			\$ 40,000		

**R15 - Train Tracking Alerts**

Item	Quantity	Unit Price	Total Capital Cost	Yearly O&M (Unit)	Yearly O&M (Total)
Train Detection (field)	6	\$ 18,000	\$ 108,000	\$ 1,800	\$ 10,800
Central Hardware	2	\$ 30,000	\$ 60,000	\$ 3,000	\$ 6,000
Central Software	1	\$ 110,000	\$ 110,000	\$ 11,000	\$ 11,000
Communications	1	12,000.00	12,000.00	1,800.00	1,800.00
Total Capital Cost			\$ 290,000		
Total Design Cost (15%)			\$ 44,000		
Total			\$ 334,000		
Yearly O&M			\$ 30,000		

**R16 - Maintenance and Construction Vehicle Maintenance**

Item	Quantity	Unit Price	Total Capital Cost	Yearly O&M (Unit)	Yearly O&M (Test)
Maintenance Management System	1	\$ 900,000	\$ 900,000	\$ 90,000	\$ 90,000
Total Capital Cost			\$ 900,000		
Total Design Cost (15%)			\$ 135,000		
Total			\$ 1,035,000		
Yearly O&M			\$ 90,000		

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# **APPENDIX C**

## **Additional Potential Equipment Locations**

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## APPENDIX C      ADDITIONAL POTENTIAL EQUIPMENT LOCATIONS

**Out of Study Area Items:** The following items were identified by the ITS Working Group as needed, however these locations were outside of the Region 4 study area boundaries. These items are listed here for future reference.

- Weather Station at I-76 and SH 52
- Automatic Traffic Recorder needed on SH 7 four miles to the south of US 34
- Dynamic Message Signs on US 36 in both directions near Lyons for road closures.
- Weather Station on US 36 near Lyons



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