**Washington State Department of Transportation**


# EASTERN WASHINGTON ITS IMPLEMENTATION PLAN
# FINAL REPORT

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# 1. INTRODUCTION

The Washington State Department of Transportation (WSDOT) has undertaken an effort to develop an Intelligent Transportation Systems (ITS) Implementation Plan for three of their regional operations divisions: the North Central, South Central and Eastern Regions. These three regions comprise WSDOT's operations in the eastern half of Washington State, and are primarily rural in nature. Although ITS were initially developed for urban applications, they are increasingly finding a place in rural operations, particularly for the management of hazardous conditions due to weather. WSDOT has deployed successful ITS applications for traveler information, roadway monitoring, and weather conditions management in Eastern Washington, and is now developing this plan to guide the implementation of future projects.

The development of the Eastern Washington ITS Implementation Plan involved several steps. First, the "baseline" for the regions was documented through meetings with stakeholders, including documentation of the region's current operations and maintenance activities, as well as transportation, safety, and operational needs. The needs and problem locations were then analyzed to develop new ITS projects intended to address these issues. Detailed project descriptions were then developed, providing a plan for implementation. In a parallel effort, an Eastern Washington Center-to-Center plan was developed that identifies options for implementing information and control sharing connections between the three regions. The Center-to-Center plan can be found in Appendix A.

The *Eastern Washington ITS Implementation Plan: Final Report* has been submitted to WSDOT Headquarters and is a compilation of the work completed for the Eastern, North Central and South Central Regions. This report has been developed specifically for the Eastern Region and provides a "stand alone" compilation of the work completed for that region.

## 1.1 Project Approach

The following tasks were undertaken in an effort to complete this project:

- **Review Current Traffic Operations and Maintenance Activities:** Several meetings were held with representatives of each WSDOT region to collect information pertaining to the existing operations and maintenance activities and responsibilities. Existing reports and plans were reviewed to gain an understanding of transportation issues and planned projects within the region.

- **Regional Implementation Plan:** This task focused on the development of three separate ITS Implementation Plans for the Eastern, South Central and North Central Regions of WSDOT. During this task, workshops were held with each region to identify and review regional ITS Projects developed based on the region's preliminary needs. The project descriptions were refined using comments from the group.

- **Spokane Area ITS Implementation Plan Update:** During the development of the WSDOT Eastern Region ITS Implementation Plan, a concurrent project to update the Spokane Area ITS Implementation plan was underway. As a member of the Spokane Region Transportation Council many ITS projects identified for the Spokane area has an impact on WSDOT. Therefore, the ITS projects identified in the update to the Spokane Area ITS Implementation Plan have been included in this report as Appendix B.

- **Center To Center (C2C) Plan:** The purpose of this task was to define a C2C plan for connecting the Eastern, North Central and South Central WSDOT Traffic Management Centers (TMC) to each other and to the WSDOT Headquarters TMC in Olympia, Washington. Meetings were held with each region to establish the needs and future functionality of the C2C links. The Center to Center Plan has been included in this report as Appendix C.

- **Final Report:** The Final Report for this project is a compilation of the work completed for of each of the three WSDOT Regions. This includes the previous *Current Operations* and *ITS Project Descriptions* technical memorandums developed for each region. This report has been specifically developed for the Eastern Region and only includes information relevant for that region. To review the work completed for all three regions, as submitted to WSDOT Headquarters, see the *Eastern Washington ITS Implementation Plan: Final Report*.

# 2. EXISTING CONDITIONS

This section summarizes efforts conducted during task 1 of the project. Workshops were conducted at each Region, with representation from WSDOT Regional staff and representatives of transportation departments of local jurisdictions within each region. Information gathered at the workshops included current operations and maintenance activities. Additionally, these meetings highlighted some preliminary transportation needs that are summarized in this section. Systems owned and operated by both WSDOT and local jurisdictions are also described.

## 2.1 Statewide Systems

WSDOT has implemented and is in the process of implementing a number of systems to help manage traffic statewide. These systems are described in more detail below.

### 2.1.1 CONDITION ACQUISITION AND REPORTING SYSTEM (CARS)

WSDOT's Condition Acquisition and Reporting System (CARS) is an Internet-based system that allows state, local and regional agencies to collect and share information regarding road incidents, weather conditions, traffic delays and other situations. CARS is based on ITS standards and exchanges data using Extensible Markup Language (XML). CARS data is used to help coordinate roadway response and supplies a portion of the traveler information content in WSDOT's 511 travel information system and Internet pages (see descriptions below).

### 2.1.2 WASHINGTON STATE 511 SYSTEM

On July 21, 2000 the FCC designated 511 as the national traveler information number. The FCC ruling left nearly all implementation issues and schedules to state and local agencies and telecommunications carriers. WSDOT was one of the front-runners in implementation, with the Washington State 511 system. "WSDOT's system builds upon the highly successful Washington State Highway hotline previously accessed through 1-800 toll free numbers. Updated every few minutes, 511 allows callers to get a variety of information including"[1]:

- Puget Sound traffic conditions
- Statewide construction impacts

[1] http://www.wsdot.wa.gov/traffic/511/

- Incident information
- Mountain pass conditions
- State's ferry system information
- 800 numbers for passenger rail and airlines
- Weather
- In July 2005, the 511 system received 43,766 calls.

### 2.1.3 TRAVELER INFORMATION WEB SITE

Traveler information makes up about 90% of WSDOT web use statewide. WSDOT has one of the most comprehensive traveler information web sites in the country. By logging onto www.wsdot.wa.gov travelers can access information through camera images (all WSDOT and WSF cameras, and city/county cameras in the Seattle Area, Tacoma, Gig Harbor, Olympia, Vancouver (BC), Mount Vernon, Bellingham, Canadian Border, Spokane, Wenatchee), flow maps and travel times, construction updates, road conditions, travel alerts and weather conditions.

In 2004, the WSDOT web site had a record-breaking 12 million page views in one day. Web use averages over three million page views per day. Customer feedback provided the basis for designing the site to meet the needs of travelers. The WSDOT traveler information site provides a comprehensive report of roadway travel and weather conditions. Accidents and other incidents, warnings, weather-related problems, and construction impacts, can all be found in one place, in real-time at all times of the day.

The most heavily-used mountain passes now have their own home pages that offer camera images, roadway restrictions, weather information, and Highway Advisory Radio messages all in one place furthering the customer-friendly one-stop shopping approach.

WSDOT research shows more people are finding WSDOT traveler information every day. Each quarter, web usage rises 15% over the same quarter the previous year.

### 2.1.4 ROAD WEATHER INFORMATION SYSTEM (RWIS)

WSDOT's rWeather program has significantly integrated and expanded the capabilities of Road Weather Information Systems (RWIS) in the state, enabling proactive winter maintenance practices and better-informed winter travel decisions. An RWIS is a combination of technologies that collects, transmits, models, and disseminates weather and road condition information. There are over 400 weather stations in Washington State.

In Washington, deployed RWIS components include roadside sensor stations, a statewide communication network, data access tools for maintenance personnel, tailored weather forecasting services, advanced weather modeling, pavement temperature modeling and prediction, and an Internet web site for maintenance decision making and traveler information. Implementation of these RWIS components serves primarily to help WSDOT maintenance personnel make timely and efficient winter maintenance decisions. It enables the use of cost-effective, proactive snow and ice control practices that improve safety and the level of service provided to users of the state highway system. This same road condition and weather information is disseminated to the public as a way of helping travelers make informed decisions for safe and efficient travel.

WSDOT's rWeather program, includes not only the sensor stations owned by WSDOT but also almost 400 other stations owned by nine other federal, state, and local agencies.

Practices that are enabled by RWIS include:

- Anti-icing – the practice of applying chemicals to the road surface before a weather event to prevent bonding of snow and ice to the road rather than having to work harder to break the bond after it has already formed.
- Reduced use of routine patrols – a result of having sensor stations and cameras reporting conditions from remote locations.
- Cost-effective allocation of resources – putting the right amount of people, equipment and materials where they are needed, when they are needed, including eliminating routine night and weekend shift work.
- Provide travelers with better information – travelers with better information about weather conditions can be better prepared for, or avoid altogether, poor driving conditions.
- Cost-effective summer maintenance scheduling – pavement temperature forecasts can be used to schedule paving operations when conditions will be conducive.
- Share weather data – RWIS sensor stations can provide weather observations at key locations for weather forecast modeling.

### 2.1.5 COMMERCIAL VEHICLE INFORMATION SYSTEMS AND NETWORKS (CVISN)

Washington was one of the eight original pilot states selected in 1996 for demonstration and evaluation of Commercial Vehicle Information Systems and Networks (CVISN) model systems for electronic credentialing.

The original goal of the initiative was simply to deploy weigh-in-motion. Weigh-in-motion (WIM) sites check truck weights and credentials without requiring trucks to stop. However, the CVISN program grew to include Electronic Credentialing; Electronic Permitting for Over-Dimensioned Loads; and improved Commercial Vehicle Safety.

The following agencies are involved in the deployment of CVISN in Washington:

- Department of Licensing – prepare the Electronic Credentialing component of CVISN.
- Washington State Patrol (WSP) – provide the roadside enforcement component of CVISN. WSP officers, at the scale facilities, operate the CVISN roadside screening system, inspect commercial motor vehicles, and upload vehicle inspection data. WSP also installs the WIM systems that tie into the Automated Vehicle Identification (AVI) and CVISN software.
- Department of Transportation – develop, install and maintain the CVISN software, develop the interfaces with the national CVISN databases, and provide program management.
- The Washington Trucking Associations is a public/private partner. Their role has been one of oversight and to act as a promoter of this program to the motor carrier industry.

A total of nine electronic credentialing and WIM sites are currently deployed along I-5, I-90 and I-82. Four more are in development or planned.

The weight, size, carrier registration, and safety record of transponder-equipped trucks are captured by Automatic Vehicle Identification (AVI) devices and weigh-in-motion scales imbedded in the roadway approximately one half-mile before weigh stations, and transmitted to the weigh station computer. The information is reviewed by the computer, and then a signal is sent back to the

transponder to let the driver know whether the truck is free to pass, or must stop at the weigh station for further inspection. Approximately 5% of registered trucks are selected at random and required to stop.


## 2.2 Eastern Region


The Eastern Region encompasses the counties of Adams, Ferry, Lincoln, Pend Oreille, Spokane, Stevens, Whitman and portions of Franklin County. This part of the state is mostly rural. The Region reaches north to the Canadian border and south to the Pullman area. The Region borders North Central Region to the east and South Central Region to the south. The more densely populated areas are focused primarily around the cities of Spokane and Pullman.

The WSDOT Eastern Region manages traffic on the state and interstate freeways throughout this region. The urban areas experience typical traffic problems including congestion, accidents and construction delays. The more rural areas have weather issues (drifting snow, ice, dust storms, floods, etc.). The rural areas also have limited communications to devices and issues with wildlife (deer, wild turkeys, etc.).

### 2.2.1 TRAFFIC MANAGEMENT CENTER (TMC)

WSDOT staff operates the Spokane Regional Traffic Management Center (SRTMC). The TMC is overseen by a committee with participants from WSDOT, Spokane Regional Transportation Council (SRTC), the City of Spokane, City of Spokane Valley, Spokane County and the Spokane Transit Authority (STA). The SRTMC is staffed 24/7, and WSDOT has eight staff members employed there. It is located at the Intermodal Center (hub for Amtrak and local transit).

WSDOT houses some ITS infrastructure/servers at the WSDOT Eastern Region Office at 2714 N Mayfair Street, in Spokane, Washington.

## 2.3 ER Infrastructure

Devices controlled from the SRTMC include Closed Circuit Television (CCTV) Cameras, Highway Advisory Radio (HAR), and Dynamic Message Signs (DMS). The SRTMC is also the central hub for the collection of traffic data/counts from the Remote Traffic Microwave Sensor (RTMS) units. The cameras, RTMS and one DMS are controlled with the Region's i2TMS System. This equipment is described in more detail in the following sections.

### 2.3.1 COMMUNICATION AND COORDINATION

WSDOT uses a system called Insight to interface with the City of Spokane's ACTRA™ signal system. Insight allows the SRTMC operator to select from a set of signal timing response plans and implement the plans using the City's signals.

Once incident information has been entered in WSDOT's CARS systems, the incident details are sent via the statewide Ethernet to the 511 system, the regional web site, and other local agencies (via the CARS system). Traveler notifications are also sent via email and cell phone text messages to local media and key WSDOT staff.

### 2.3.2 CLOSED CIRCUIT TELEVISION (CCTV) CAMERAS

WSDOT Eastern Region owns and operates 31 Pan-Tilt-Zoom (PTZ) CCTV cameras and 2 web cameras.

The SRTMC is used as the primary distributor for all video signals in the region. All video signals are brought back to the SRTMC. Snapshots from the web cameras are provided to the general public on the WSDOT web page. Additionally there are cameras located at each RWIS site. Snapshots from the RWIS cameras are accessible through the web using the ScanWeb SSI software.

### 2.3.3 DYNAMIC MESSAGE SIGNS (DMS)

WSDOT Eastern Region operates six Dynamic Message Signs. One of these is controlled through the i2TMS software, the other five use dial-up or radio communications and are controlled using the 3M software.

### 2.3.4 HIGHWAY ADVISORY RADIO (HAR)

WSDOT Eastern Region operates five Highway Advisory Radios (HARs). The permanent HARs are accessed through microwave or dial-up connections. The two portable HARs use cellular communications.

The portable HARs are typically used for traveler information at Sherman Pass in the winter and for roadway construction in the summer.


### 2.3.5 TRAFFIC COUNTERS

The Region has 23 RTMS vehicle detection sites along I-90 that are controlled through the i2TMS system. The RTMS provide speed, flow/volume and occupancy data to i2TMS. At this time the

information is only used internally, though the intention is to make it publicly available online. Counts from these sites are also sent by dial-up to the Statewide Data Office.

### 2.3.6 TRAFFIC SIGNALS

WSDOT Eastern Region operates 51 traffic signals, 7 of which are connected to the i2TMS system. Signals are controlled through a dial-up system. The signals are currently on 170 controllers with plans to replace these with 2070 controllers in the future.

### 2.3.7 ITS INFRASTRUCTURE SUMMARY

The following table summarizes the existing ITS infrastructure in the WSDOT Eastern Region.

| ITS Infrastructure Type | Location |
|---|---|
| Closed Circuit Television (CCTV) Cameras | **I-90**<br>• US 2<br>• US 195<br>• Jefferson Street<br>• Walnut Street<br>• 2 Cameras at Division Street<br>• Arthur Street<br>• Hamilton Street<br>• Freya Street<br>• Havana Street<br>• Fancher Road<br>• Sprague Avenue<br>• Broadway Avenue<br>• Park Road<br>• Argonne Road<br>• University<br>• N. Pines Road<br>• Evergreen<br>• Sullivan<br>• Medical Lake Interchange<br>• Milepost 274.15<br>• Geiger Road Interchange<br>• US 2 (dual camera site)<br>• Milepost 278.8<br>**Other Locations**<br>Farwell and Shady Slope |
| Dynamic Message Signs (DMS) (Existing) | • Eastbound (EB) I-90 and W. Geiger<br>• Eastbound (EB) I-90 and Cowley<br>• Eastbound (EB) I-90 and Custer<br>• SR 2 and Spotted Road<br>• Westbound (WB) I-90 and Altamont<br>• Westbound (WB) I-90 and Pines |
| Highway Advisory Radio (HAR) (Existing) | • I-90 and SR 2 Interchange (microwave)<br>• I-90 and Broadway Interchange (dial-up)<br>• I-90 and Liberty Lake (dial-up)<br>• Pullman<br>• Rosalia |

### 2.3.8 COMMUNICATIONS

- There is a fiber connection between the SRTMC and the WSDOT Eastern Region Office at 2714 N Mayfair Street, in Spokane, Washington.
- There is a fiber link between the SRTMC and the regional 911 Center. The police at this center have the ability to select and view full-motion video (up to sixteen feeds).
- There is a radio link between the SRTMC and Washington State Patrol (WSP). This provides the ability for the State Patrol to select and view one camera signal at any time. There is also the capability to select a feature that scrolls through the video feeds.
- There is a fiber communications link to Spokane City Hall and to Spokane County.
- There is also a link between the SRTMC and the City of Spokane Cable 5 Television station and the South Arena.

## 2.4 Local Agencies

The following subsections provide a summary of the infrastructure owned and operated by the local jurisdictions within Eastern Region.

### 2.4.1 CITY OF SPOKANE

The major traffic generators within the City of Spokane include River Parks Square, Northtown Mall, Performing Arts Center, Joe Albi Stadium, Convention Center, Opera House, 1st Night Out, Bloomsday, Hoopfest, the Lilac Parade, 4th of July Parade, St. Patty's Day Parade and Gonzaga University. In addition to these major event traffic generators, the city experiences traffic congestion during peak commuting hours along the cities major arterials and corridors.

The city typically requires ITS infrastructure to be installed as part of any major roadway construction, and as such, the city has a sizeable conduit network in place. Additionally, some projects such at the Viaduct resurfacing (to be conducted in 2006) will include the installation of CCTV cameras.

The City of Spokane owns and operates signals at 251 intersections, of these 220 signals are controlled from a central location using the ACTRA signal control system. The remaining signals operate on a time-based cycle, and the downtown Spokane signal network uses Eagle NEMA controllers. Approximately 45 traffic signals use video detection. The city can also view cameras through their i2TMS workstation, which also allows them to view WSDOT DMS and CCTV. The city's three RWIS sites are tied in to the WSDOT Eastern Region RWIS system. The city's traffic signals use mid-segment detectors in some areas of the city. This data could be used for a future regional flow map.

A list of the City of Spokane's existing ITS Infrastructure can be found in the table below:

**Table 1: City of Spokane's Existing ITS Infrastructure**

| ITS Infrastructure | Type Location |
|---|---|
| Closed Circuit Television (CCTV) Cameras (Existing) | o 2nd / Browne intersection<br>o 2nd / Monroe intersection<br>o 3rd / Maple<br>o 3rd / Washington intersection<br>o Trent / Hamilton intersection |

### 2.4.2 CITY OF SPOKANE VALLEY

The City of Spokane Valley has 85 signalized intersections. Of these, ten are maintained by WSDOT. Spokane County maintains the remaining signals which use Peek 3000E, LMD8811, or Eagle M52 controllers. Five of the city's traffic signals are connected to the SRTMC i2TMS and are tied to the TMC. Eventually the city would like to connect the arterial traffic signals to the TMC, either through radio or fiber. The City of Spokane Valley's traffic signals are all equipped with Opticon receivers and allow for fire and law enforcement signal preemption. Spokane Valley also employs video detection at eleven intersections. One intersection uses Autoscope technology, while the remaining ten locations use Traficon technology. The City of Spokane Valley also has an i2TMS workstation from which they can access the SRTMC equipment.

The City of Spokane Valley currently has no means of detecting congestion or incidents automatically. Cameras or detectors are desired to provide travel time information along key routes in the city. The city also plans to develop a traffic web page for construction events and road closures, but will link to the SRTMC web site for access to real-time information such as CCTV camera images and traffic advisories. Spokane Valley has existing conduit in place in several locations for future fiber communications. And it is expected that any future roadwork (widening, reconstruction) will include the installation of conduit.

### 2.4.3 SPOKANE COUNTY

The county has access to an i2TMS workstation to access all SRTMC camera images. Through this workstation they are also able to access WSDOT DMS and HAR. During special events, the County loans out two trailer mounted DMS to the City of Spokane Valley to use for traffic management. The DMS are controllable via a dial-up modem. Spokane County performs maintenance for signals in Spokane Valley (incorporated), City of Millwood and City of

Liberty Lake. Spokane County provides signal preemption to the fire vehicles. The county Sheriff also has a portable speed notification sign.

### 2.4.4 NORTH EAST REGIONAL TRANSPORTATION PLANNING ORGANIZATION (NEWRTPO)

Within the area covered by the NEWRTPO there are:

- Twelve traffic signals (including five in Colville which are operated by WSDOT).
- RWIS sites in Sherman's Pass and Tiger Pass.
- Two CCTV cameras near Colville (full motion) and a camera at Loon Lake. The cameras in Colville are available via an unadvertised internet address.
- The NEWRTPO also has a portable speed notification sign.

NEWRTPO transportation issues include congestion related to hunting season, traffic congestion on the two-lane corridor into Colville, traffic congestion on SR 395 corridor, forest fires and animal/vehicle collisions including whitetail and mule deer, and moose.

### 2.4.5 IDAHO TRANSPORTATION DEPARTMENT

- Idaho Transportation Department District 1 owns one 3M DMS on eastbound I-90 just west of the Washington/Idaho border. They also own two portable DMS, which are used for event management purposes. The 3M sign is controlled through a dial-up connection from Coeur d'Alene.
- There is a communication link between the small Traffic Management Center (TMC) in Coeur d'Alene and the ITD TMC in Ada County.
- ITD also owns an RWIS station at the I-90 and Pleasantview interchange.
- ITD plans to launch their 511 system in December 2005.
- Major traffic generators in the region include the Dog Track, Hot Rod, Equestrian Center and the Convention/Sporting Center.
- The Pullman-Moscow corridor has a high accident rate. This is also a commercial corridor that could become congested in the future.

## 2.5 Preliminary Needs

The following is a summary of preliminary needs that have been identified for the Eastern Region.

### 2.5.1 COMMERCIAL VEHICLE SYSTEMS

- There is a need for more border information (i.e., wait times, traffic conditions, weather etc.) for truckers and the general public.
- In the spring, when much of the snow thaws, weigh restrictions for commercial vehicles are often put in place in the northeast part of the Region. There is a need for a method to inform the trucking community of these restrictions before the vehicles are en-route.

### 2.5.2 INCIDENT MANAGEMENT

- The Region has identified the need for a response management tool. The vision is that pre-determined event response plans would be developed for a set of incidents/ scenarios. The Region would like to be able to respond to traffic events in a timely and efficient manner. The response could utilize equipment such as DMS, HARs and traffic signals. A key need is for the development of signal timing plans for incident response. A new WSDOT SRTMC staff member has been hired specifically for this need.

- WSDOT has identified the need to coordinate with ITD for event management, traffic flow monitoring, and planned events. WSDOT and ITD would like a continuous communications link between the TMCs. While there is interest in expanding the fiber network along the I-90 from Sullivan Road to the Idaho border there is currently no funding available. Additionally, a coordinated 511 system between the two states would be desirable.

- WSDOT is working with Spokane County to investigate the opportunity to use the County-City hot zone to provide information to DOT response vehicles equipped with antennas. The hot zone is also being expanded geographically to the medical district to the south, and to Gonzaga University. WSDOT would also like to equip their response vehicles with Global Positioning Systems (GPS). Another desire is to provide the ability for the DOT response vehicles to upload their reports automatically and remotely (currently drivers prepare their reports on a laptop in the vehicle).

- The new Federal rules on work zone management may result in the need for additional ITS equipment such as portable DMS, radios and cameras.

### 2.5.3 TRAVELER INFORMATION

- Stakeholders identified the need to disseminate more traveler information over the Internet. Desirable information includes an Eastern Region Flow Map, additional traffic camera images (JPG images or snapshots are adequate), status of DMS messages on I-90, and dissemination of local construction information. The SRTMC Operating Board developed a Regional traffic information web page (www.srtmc.org) to provide traveler information from the cities and counties in the Spokane region, however, at this time only traveler information for WSDOT is provided.

- More traveler information at rest areas, to provide critical pass information, and major shopping centers, to provide transit, parking and local traffic information. This could be provided by kiosks and/or wireless Internet access for those with laptops and handheld devices with Internet access.

### 2.5.4 ITS EQUIPMENT

The following ITS equipment needs have been identified for the Eastern Region.

| ITS Infrastructure Needed | Location |
|---|---|
| Closed Circuit Television (CCTV) Camera | • Truck routes from Canadian border<br>• Spokane Valley<br>Argonne corridor, between I-90 and Trent<br>Sprague/Pines |

| ITS Infrastructure Needed | Location |
|---|---|
| Dynamic Message Signs (DMS) | • US 2 approaching Steven's County, MP 281.26, MP 278, MP 295.5<br>• Replace existing DMS on I-90 at Geiger, Hamilton, Custer, Pines, and at MP 297<br>• US 195 at MP 95.5<br>• Eastbound I-90 west of SR 27 (to be used to inform traffic about traffic accidents within Spokane Valley)<br>• Westbound I-90 east of Appleway interchange (to be used to inform traffic about traffic accidents within Spokane Valley)<br>• Sprague Avenue (Spokane Valley) between Park and Thiesman |
| Traffic Detection | **I-90**<br>• Flora Road<br>• Barker Road Interchange<br>• Appleway Interchange<br>• Liberty Lake Interchange<br>• MP 297<br>• MP 298<br>• MP 299<br>**US 195**<br>• MP 91.5<br>• MP 93<br>• MP 94.3<br>• MP 95.5<br>• MP 175.6<br>**US 2**<br>• MP 277<br>• MP 278<br>• MP 279.27<br>• MP 280.7<br>• MP 282<br>• Nevada Interchange (MP 294)<br>• MP 295.1<br>• Farwell Interchange (MP 295.7) |
| Road Weather Information Systems (RWIS) | • WSDOT's Statewide RWIS Plan identifies top RWIS locations<br>• Additional locations include:<br>Sherman Pass<br>South Hill (south of I-90) (ice)<br>West of Spokane City (fog)<br>Hwy 31 at Metaline<br>SR 395 close to the Canadian border |

### 2.5.5 SIGNAL PRE-EMPTION

The City of Spokane would like to have signal pre-emption for emergency vehicles outside the downtown area.

### 2.5.6 GENERAL

Key transportation corridors that would benefit from additional ITS infrastructure include:

- Sherman Pass to I-90
- Hwy 195 to Pullman, especially during football games. Colfax is impacted by the thru traffic.
- US 2 from I-90 to Fairchild Air Force base vicinity
- US 195 near Pullman
- SR 27 through Spokane Valley

### 2.5.7 COMMUNICATIONS AND COORDINATION

- There is a need for an Eastern Region Communications Plan. The plan would identify all communications requirements to support current and future ITS installations as well as any Center-to-Center communications required to meet the interagency data and control sharing needs. The plan would review different communications technologies and make a recommendation for the best communications design for the region.

- The Emergency Response/Emergency Service organizations would like to have access to live camera images (i.e., first responders would like to see the accident conditions before they arrive on-site).

# 3. PROJECT IDENTIFICATION AND PRIORITIZATION

Based upon the needs assessment conducted for the region in the previous task, the following provides the list of ITS projects that have been identified as potentially beneficial for meeting the needs of Eastern Region. The Eastern Region's current conditions and needs can be found in the February 2006 technical memorandum, *Eastern Washington ITS Implementation Plan: Current Operations*. In addition to the ITS Projects listed below, the WSDOT Eastern Region has been identified as a key stakeholder in several ITS projects described in the Spokane ITS Implementation Plan Update, as such several WSDOT ITS Projects appear in both the Spokane ITS Implementation Plan Update and the Eastern Washington ITS Plan. Projects listed in both plans are identified by "*". Descriptions of the Spokane ITS Implementation Plan ITS projects can be found in Appendix B of this document.

The list of ITS Projects identified for the Eastern Region includes:

- **WSDOT-A*: I-90 East Communications Backbone and ITS Deployment:** Technology deployments and communications improvements along the I-90 corridor.

- **WSDOT-B*: US 195 Congestion and Incident Management ITS**: Traffic sensors, cameras, Dynamic Message Signs (DMS), and communications infrastructure along the US 195 corridor.

- **WSDOT-C*: US 2 Congestion and Incident Management ITS:** Traffic sensors, cameras, DMS and communications infrastructure along US-2.

- **WSDOT-D*: US 2/North Spokane ITS Devices:** Traffic sensors, DMS and cameras on US 2 north of Spokane.

- **WSDOT-E*: Replace DMS on I-90 to SRTMC:** Replaces 5 3M DMS Signs in the Spokane Metro Area with i2TMS compatible signs.

- **WSDOT-F: RWIS Deployment:** Deployment of additional Road Weather Information System (RWIS) sensor stations.

- **WSDOT-G: Existing HAR Station Upgrade:** Upgrade of Highway Advisory Radio (HAR) sites for integration with the statewide HAR network upgrade.

- **WSDOT-H: Integration of Eastern Washington Traffic Management Centers (TMC):** Interconnection of Eastern Washington TMCs as described in the C2C Plan technical memorandum.

- **WSDOT-I: US 2 to US 395 Communications Connection:** Provide communications along US 2 to connect various ITS devices and several local agency centers.

- **WSDOT-J: Eastern Region Permanent HAR Deployment:** Installation of several permanent HAR sites throughout WSDOT Eastern Region.

## 3.1 Project Prioritization

While developing the Eastern Washington ITS Implementation Plan (a concurrent project), a separate project to update the Spokane Metro ITS Implementation Plan was initiated. Therefore the Eastern Region's project prioritization was handled differently than the North and South Regions to correlate to the Spokane Metro ITS Implementation Plan. This separate effort was initiated both to allow for better consistency with the Spokane ITS Implementation Plan effort, as well as to develop a more "quantitative" and expandable prioritization process; i.e. one that allows for the DOT to add future projects into the list and to prioritize them accordingly. The prioritization of the identified projects was determined based on the expected benefits and levels of impact of each project, based on different prioritization criteria. The benefits were separated into six categories (or evaluation criteria):

- **Safety –** Improves safety of roadway/corridor by decreasing occurrence of crashes, reducing the risk crashes occurring and improves emergency/incident response.

- **Mobility –** Improves mobility by reducing travel time delay/congestion and variability and improves transit service and reliability.

- **Productivity & Efficiency –** Provides cost savings by a reduction in operating and maintaining costs. And improves the optimization of existing facilities to reduce the development of new facilities and/or expanding right-of-way.

- **Regional & Multi-Modal Coordination –** Improves communications between regional traffic and transit agencies to improve service and regional connectivity.

- **Energy & Environment –** Reduces fuel consumptions and emissions.

- **Customer Satisfaction –** A perceived benefit to the customer, or customer experiences improved satisfaction.

The six benefit/evaluation criteria were determined based on the unique needs of the Spokane metro area and the reported benefits compiled in the Federal Highway Administration (FHWA) ITS Benefits database (www.itsbenefits.its.dot.gov). For each benefit/evaluation category, a level of impact (significant, moderate and limited) was determined.

- **Significant Impact (2 points):** The project demonstrates a measurable improvement on known transportation needs when considered against this particular category. The

degree of improvements must lead to a noticeable change from the base condition and be documented. The project may also be included if it is part of the core infrastructure or system operation.

- **Moderate Impact (1 point):** The project is perceived as likely to have a measurable improvement on known transportation needs, when considered against this particular category. This impact may be secondary to other positive impacts that the project might have. For example, a traveler information web site with trip times might result in an increased transit ridership, although the primary goal of the project would be to reduce traffic congestion by providing pre-trip information. Thus, such a project might be given this ranking against a transit-related benefit.

- **Limited Impact/Not Applicable (no points):** The project is perceived as unlikely to have a measurable improvement on known regional transportation needs, when considered against this particular category.

Each level of impact correlates to a specific number (0-2 points), as indicated above. Thus, each project has the potential to receive between 0 and 12 points. Projects ranging between 8-12 points are considered high priority projects, 5-7 points are medium priority projects, and 0-4 points are low priority projects. The table below summarizes the priorities of the identified ITS projects, and are organized by *High*, *Medium* and *Low* priority.

| Project Name | Safety | Mobility | Productivity & Efficiency | Regional Connectivity & Multi-Modal Coordination | Energy & Environment | Customer Satisfaction | Total Score | Project Dependent on: | Rank |
|---|---|---|---|---|---|---|---|---|---|
| WSDOT-A: I-90 East Communications Backbone and ITS Deployment | 1 | 2 | 1 | 2 | 1 | 1 | 8 | SR-09 | High |
| WSDOT-B: US 195 Congestion and Incident Management ITS | 1 | 2 | 2 | 1 | 1 | 1 | 8 | SR-09 | High |
| WSDOT-C: US 2 Congestion and Incident Management ITS | 1 | 2 | 2 | 1 | 1 | 1 | 8 | SR-09 | High |
| WSDOT-D: US 2/North Spokane ITS Devices | 1 | 1 | 1 | 2 | 1 | 1 | 7 | | Medium |
| WSDOT-E: Replace DMS on I-90 to SRTMC | 1 | 2 | 1 | 1 | 1 | 2 | 8 | | High |
| WSDOT-F: RWIS Deployment | 1 | 0 | 1 | 1 | 0 | 0 | 3 | | Low |
| WSDOT-G: Existing HAR Station Upgrade | 1 | 0 | 2 | 1 | 0 | 1 | 5 | | Medium |
| WSDOT-H: Integration of Eastern Washington Traffic Management Centers (TMC) | 1 | 0 | 2 | 1 | 0 | 1 | 5 | | Medium |
| WSDOT-I: US 2 to US 395 Communications Connection | 1 | 1 | 1 | 1 | 0 | 0 | 4 | | Low |
| WSDOT-J: Eastern Region Permanent HAR Deployment | 1 | 0 | 1 | 1 | 0 | 0 | 3 | WSDOT-F | Low |

# 4. EASTERN REGION PROJECT DESCRIPTIONS

The following projects were identified through a preliminary needs assessment completed earlier in the project. From these needs, WSDOT developed the Eastern Region ITS Priority List. The cost estimates shown for each project were developed by the Eastern Region as un-inflated 2006 estimates, and may need to be adjusted as projects move forward and scopes of work are further defined.

An ITS inventory map displaying the locations of existing and future ITS equipment deployments for the Eastern Region can be found in Appendix A.

## WSDOT-A*: I-90 EAST COMMUNICATIONS BACKBONE AND ITS DEPLOYMENT

**Priority:** High (8) | **Estimated Costs:** $3.6M

**Location:** I-90 MP 292.7 – 299.82

**Infrastructure/Project Dependencies:** It is strongly recommended that the Spokane Area Communications Plan is completed prior to/in conjunction with the deployment of this project.

! SR-09[2]

**Project Description:** Although the western stretch of I-90 has good ITS coverage, ITS deployments in the eastern half have been hampered by a lack of communications. Extending the I-90 communications backbone will allow for the deployment of additional ITS devices such as vehicle detection stations, DMS and traffic cameras. This project will extend the communications backbone on I-90 from the Sullivan Road interchange to the Idaho State line, and install 7 vehicle detection stations, 7 closed caption (CCTV) traffic cameras and 1 dynamic message signs (DMS). The list below outlines the ITS deployments and specific locations:

Camera and Traffic Data Accumulator (TDA) Systems to be deployed at the following locations:

- Flora Road
- Barker Road Interchange
- Appleway Interchange
- Liberty Lake Interchange
- MP 297
- MP 298
- MP 299

DMS:

- MP 297 Westbound

The specific tasks within this task include the following:

1. Prepare a communications system design to accommodate ITS field device needs. Optional: Communications Alternatives Analysis
2. Develop Communications Design (consider device requirements, communications redundancy, reliability, performance requirements, future expansion and scalability)
3. Develop P, S&E detailed design to include the following
    i. Device location
    ii. DMS:
        1. Sign sizing including number of characters, character height and number of lines
        2. DMS structure type and detail (sign bridge, cantilever, or side mounting, footing detail, detail of structure/sign connection)
    iii. CCTV:
        1. Camera,
        2. Camera mounting,
        3. PTZ assembly
    iv. Traffic Sensors
        1. Technology requirements (inductance loop, video, microwave etc)
4. Prepare Bid Package
5. Bid and select Contractor
6. Installation (hardware, fiber, wireless, ancillary device [multiplexers, modems, repeaters etc]))
7. Testing and Commissioning

| Benefits/Evaluation Criteria | *Levels of Impact* |
|---|---|
| Safety:<br>▪ CCTV cameras, flow reporting and DMS reduces traffic congestion reducing the likelihood of collisions Improves response time to hazardous road surface conditions | Moderate<br>(1) |
| Mobility:<br>▪ Deployment of additional ITS devices and communications improves traveler information available to that stretch of the road, reducing delay caused by incidents, construction, congestion and inclement weather. | Significant<br>(2) |
| Productivity & Efficiency:<br>▪ TMC operators and maintenance staff can survey traffic and roadway conditions using CCTV cameras<br>▪ Traffic sensors allows for traffic counts and other important data<br>▪ Traffic detection data can be used for management, planning and public information | Moderate<br>(1) |

[2] For information on SR-12, see the *Spokane ITS Implementation Plan Update, December 2006*

| | |
|---|---|
| Regional Connectivity & Multi-modal coordination:<br>▪ Additional CCTV cameras provide regional coverage<br>▪ Traffic detection provides managers a look at what is happening along the roadway<br>▪ Facilitate a future connection to the Port of Entry, weigh in motion equipment, and the planned connection to the Idaho Department of Transportation. | Significant<br>(2) |
| Energy & Environment:<br>▪ Reduction in emissions is a secondary reaction to the overall reduction in congestion and delay on a recognized congested corridor | Moderate<br>(1) |
| Customer Satisfaction:<br>▪ DMS deployed along I-90 will be connected to the SRTMC allowing travelers to view posted messages | Moderate<br>(1) |

## WSDOT-B* US 195 CONGESTION AND INCIDENT MANAGEMENT ITS

**Priority:** Medium (7) | **Estimated Costs:** $2.83M

**Location:** US 195 MP 91 – 96

**Infrastructure/Project Dependencies:** It is strongly recommended that the Spokane Area Communications Plan is completed prior to/in conjunction with the deployment of this project.

! SR-09

**Infrastructure/Project Dependencies:** None at this time

**Project Description:** This project will expand the network communications infrastructure on US 195 from mile point 91 to mile point 96. This corridor is a rapidly developing corridor that has several high-speed, at grade intersections. The project will also install 4 vehicle detection stations and traffic cameras on US 195 from Hatch Road to I-90. A DMS sign will also be installed as part of this project.

The following ITS device locations have been identified:

Camera and Traffic Data Accumulator (TDA) Systems:

- MP 91.5
- MP 93
- MP 94.3
- MP 95.5

DMS:

- MP 95.5 Northbound

The specific tasks within this task include the following:

1. Prepare a communications system design to accommodate ITS field device needs
2. Optional: Communications Alternatives Analysis
3. Develop Communications Design (consider device requirements, communications redundancy, reliability, performance requirements, future expansion and scalability)
4. Develop P, S&E detailed design to include the following
    i. Device location
    ii. DMS:
        1. Sign sizing including number of characters, character height and number of lines
        2. DMS structure type and detail (sign bridge, cantilever, or side mounting, footing detail, detail of structure/sign connection)
    iii. CCTV:
        3. Camera,
        4. Camera mounting,
        5. PTZ assembly
    iv. Traffic Sensors
        6. Technology requirements (inductance loop, video, microwave etc)
5. Prepare Bid Package
6. Bid and select Contractor
7. Installation (hardware, fiber, wireless, ancillary device [multiplexers, modems, repeaters etc]))
8. Testing and Commissioning

| Benefits/Evaluation Criteria | *Levels of Impact* |
|---|---|
| Safety:<br>▪ Rapid response to travel conditions can reduce the occurrence of secondary incidents.<br>▪ DMS can alert travelers of roadway conditions to help them to drive with caution | Moderate<br>(1) |
| Mobility:<br>▪ Deployment of additional ITS devices and communications improves traveler information available to that stretch of the road, reducing delay caused by incidents, construction, congestion and inclement weather. | Significant<br>(2) |
| Productivity & Efficiency:<br>▪ Deployment of communications and the ITS devices will allow for improved traffic management.<br>▪ Allows staff to survey traffic and roadway conditions | Significant<br>(2) |
| Regional Connectivity & Multi-modal coordination:<br>▪ Additional communications for ITS equipment linking to the SRTMC fills in “gaps” in the region | Moderate<br>(1) |

| | |
|---|---|
| Energy & Environment:<br>▪ Reduction in emissions is a secondary reaction to the overall reduction in congestion and delay on a recognized congested corridor | Moderate<br>(1) |
| Customer Satisfaction:<br>▪ Additional ITS devices available to travelers through traveler information such as Traffic Cameras and Traffic Flow Maps improve overall perception of Traveler Information. | Moderate<br>(1) |

## WSDOT-C*: US 2 CONGESTION AND INCIDENT MANAGEMENT ITS

**Priority:** High (8) | **Estimated Costs:** $3.7M

**Location:** US 2 I-90 to Fairchild Air Force Base

**Infrastructure/Project Dependencies:** It is strongly recommended that the Spokane Area Communications Plan is completed prior to/in conjunction with the deployment of this project.

! SR-09

**Infrastructure/Project Dependencies:** None at this time

**Project Description**: This project will expand network communications infrastructure along the US 2 corridor from I-90 to Fairchild Air Force Base vicinity, and will also install 6 vehicle detection stations and traffic cameras. The route will provide ITS deployment to the vicinity of Spokane International Airport, City of Airway Heights and Fairchild Air Force Base. A DMS sign will also be installed as part of this project, see below for locations of ITS devices:

Camera and Traffic Data Accumulator (TDA) Systems to be deployed at the following locations:

- MP 275.6
- MP 277
- MP 278
- MP 279.27
- MP 280.7
- MP 282

DMS:

- MP 278 eastbound

The specific tasks within this task include the following:

1. Prepare a communications system design to accommodate ITS field device needs
2. Optional: Communications Alternatives Analysis
3. Develop Communications Design (consider device requirements, communications redundancy, reliability, performance requirements, future expansion and scalability)
4. Develop P, S&E detailed design to include the following
    i. Device location
    ii. DMS:
        1. Sign sizing including number of characters, character height and number of lines
        2. DMS structure type and detail (sign bridge, cantilever, or side mounting, footing detail, detail of structure/sign connection)
    iii. CCTV:
        3. Camera,
        4. Camera mounting,
        5. PTZ assembly
    iv. Traffic Sensors
        6. Technology requirements (inductance loop, video, microwave etc)
5. Prepare Bid Package
6. Bid and select Contractor
7. Installation (hardware, fiber, wireless, ancillary device [multiplexers, modems, repeaters etc]))
8. Testing and Commissioning

| Benefits/Evaluation Criteria | *Levels of Impact* |
|---|---|
| Safety:<br>▪ Expedited incident detection and response, and improved traffic management | Moderate<br>(1) |
| Mobility:<br>▪ Deployment of additional ITS devices and communications improves traveler information available to that stretch of the road, reducing delay caused by incidents, construction and congestion<br>▪ Eastern congested corridor, as identified in the Washington State Transportation Plan | Significant<br>(2) |
| Productivity & Efficiency:<br>▪ Deployment of communications and the ITS devices will allow for improved traffic management<br>▪ Allows staff to survey traffic and roadway conditions | Significant<br>(2) |
| Regional Connectivity & Multi-modal coordination:<br>▪ Additional communications for ITS equipment linking to the SRTMC fills in “gaps” in the region | Moderate<br>(1) |

| | |
|---|---|
| Energy & Environment:<br>▪ Reduction in emissions is a secondary reaction to the overall reduction in congestion and delay on a recognized congested corridor | Moderate<br>(1) |
| Customer Satisfaction:<br>▪ Additional ITS devices available to travelers through traveler information such as traffic cameras and traffic flow maps, improves overall perception of Traveler Information | Moderate<br>(1) |

## WSDOT-D*: US 2/NORTH SPOKANE ITS DEVICES

**Priority:** Medium (7) | **Estimated Costs:** $710K

**Location:** US 2 between Spokane City Limits (Hawthorne) and Farwell Road

**Infrastructure/Project Dependencies:** None at this time

**Project Description:** This project will install 3 cameras and traffic data collection equipment, and a DMS on US 2 between Spokane city limits (Hawthorne) and Farwell Road. The list below identifies the infrastructure deployment and locations:

Camera and Traffic Data Accumulator (TDA) Systems to be deployed at the following locations:

- MP 294 (Nevada St)
- MP 295.1
- MP 295.7 (Farwell)

DMS:

- MP 295.5 northbound

The following is a general scope for the ITS Infrastructure implementation:

1. Determine installation phasing
2. Determine exact locations for device installation
3. Determine general and site specific functional requirements
4. Determine general equipment and installation requirements including:
    i. Operational requirements
    ii. Physical requirements
    iii. Environmental requirements
    iv. Power/Electrical Requirements
    v. Communications/Integration Requirements
5. Develop P, S&E detailed design for each site to include the following
    i. Device location
    ii. DMS:
        1. Sign sizing including number of characters, character height and number of lines
        2. DMS structure type and detail (sign bridge, cantilever, or side mounting, footing detail, detail of structure/sign connection)
    iii. CCTV:
        1. Camera,
        2. Camera mounting,
        3. PTZ assembly
    iv. Traffic Sensors
        1. Technology requirements (inductance loop, video, microwave etc)
    v. Cabinet type and mounting detail (pedestal, base)
    vi. Communications and Power routing
6. Procure equipment
7. Install equipment, power and communications
8. Test equipment

| Benefits/Evaluation Criteria | *Levels of Impact* |
|---|---|
| Safety:<br>▪ Expedited incident detection and response, and improved traffic management | Moderate<br>(1) |
| Mobility:<br>▪ Deployment of additional ITS devices and communications improves traveler information available to that stretch of the road, reducing delay caused by incidents, construction and congestion | Moderate<br>(1) |
| Productivity & Efficiency:<br>▪ Deployment of communications and the ITS devices will allow for improved traffic management | Moderate<br>(1) |
| Regional Connectivity & Multi-modal coordination:<br>▪ Additional communications for ITS equipment linking to the SRTMC fills in "gaps" in the region<br>▪ Connected to the existing fiber backbone for communications back to the SRTMC | Significant<br>(2) |

| | |
|---|---|
| Energy & Environment:<br>▪ Reduction in emissions is a secondary reaction to the overall reduction in congestion and delay on a recognized congested corridor | Moderate<br>(1) |
| Customer Satisfaction:<br>▪ Additional ITS devices available to travelers through traveler information such as traffic cameras and traffic flow maps, improves overall perception of Traveler Information | Moderate<br>(1) |

## WSDOT-E*: REPLACE DMS ON I-90 TO SRTMC

**Priority:** High (8)

**Estimated Costs:** $1.25M

**Location:** Various

**Infrastructure/Project Dependencies:** None at this time

**Project Description:** **Project Description:** WSDOT operates six DMS in the Spokane Region. One of these is controlled through the i2TMS software, the other five use dial-up or radio communications and are controlled using the 3M software. The purpose of this project is to replace the five 3M DMS so that they can be controlled by the i2 system and that the current status and messages can be displayed on the SRTMC website.


The locations include:

| US 2 | I-90 |
|---|---|
| ▪ MP 281.26 EB | ▪ Geiger (MP 275.03 EB)<br>▪ Division (MP 281.48 EB)<br>▪ Altamont (MP 283.08 EB)<br>▪ University (MP 288.83 WB) |

A general scope for the implementation of the ITS Infrastructure is found below:

1. Determine installation phasing
2. Determine exact locations for device installation
3. Determine general and site specific functional requirements
4. Determine general equipment and installation requirements including:
   a. Operational requirements
   b. Physical requirements
   c. Environmental requirements
   d. Power/Electrical Requirements
   e. Communications/Integration Requirements
   f. Develop P, S&E detailed design for each site to Message Signs (DMS structure type and detail, sign size, etc.) communications and power routing
5. Procure equipment
6. Install equipment, power and communications
7. Testing

| Benefits/Evaluation Criteria | *Levels of Impact* |
|---|---|
| Safety:<br>▪ Advanced notice of incidents or congestion reduces secondary collisions. | Moderate<br>(1) |
| Mobility:<br>▪ Travelers are able to make informed decisions based on messages posted which result in reduce congestion/delay | Significant<br>(2) |
| Productivity & Efficiency:<br>▪ Resulting operational efficiencies improves utilization of the existing lanes deferring system expansion. | Moderate<br>(1) |
| Regional Connectivity & Multi-modal coordination:<br>▪ Local Transportation agencies can remotely view DMS messages through i2TMS and on the web<br>▪ Operators do not need to contact individual local transportation offices to relay information posted on DMS signs<br>▪ Reduces overall demand on SRTMC Operators | Moderate<br>(1) |
| Energy & Environment:<br>▪ Reduced congestion and delay results in higher operating speeds which results in reduced CO and Particulate emissions. | Moderate<br>(1) |
| Customer Satisfaction:<br>▪ Travelers will be able to view real-time messages posted on DMS signs on the web (www.srtmc.org)<br>▪ Improves information sharing reducing customer frustration. | Significant<br>(2) |

## WSDOT-F: ROAD WEATHER INFORMATION SYSTEM (RWIS) DEPLOYMENT

**Priority:** Low (3) | **Estimated Costs:** $970K

**Location:** Various

**Infrastructure/Project Dependencies:** None at this time

**Project Description: Project Description:** This project will Install the nine (9) RWIS sites identified in the 03-05 State RWIS plan for the WSDOT Eastern Region. This project correlates with the regional RWIS deployment project SR-12(b): Weather Sensor Deployment. WSDOT locations include:

| I-90 | US 2 | SR 20 | SR 21 | SR 25 | SR 27 |
|---|---|---|---|---|---|
| MP 237 | MP 264 | MP 379.28 | MP 106.7 | MP 100.82 | MP 68 |
| | MP 319 | | MP 191.04 | MP 66.27 | |

The following is a general scope for the RWIS implementation:

1. Determine key coverage areas requiring RWIS
2. Review and Confirm implementation priority phasing
3. Determine exact sensor locations
4. Determine general and site specific requirements
5. Determine general equipment and installation requirements including:
    a. Operational requirements
    b. Physical Requirements
    c. Environmental requirements
    d. Power/Electrical Requirements
    e. Communications/Integration Requirements
6. Develop P, S&E design to include the following (RWIS sensors, communications and power to sensors, transmitter))
7. Procure sensors and processing units
8. Install all equipment
9. Test equipment

| Benefits/Evaluation Criteria | *Levels of Impact* |
|---|---|
| Safety:<br>▪ Improves response time to hazardous road surface conditions | Moderate<br>(1) |
| Mobility:<br>▪ Criteria does not apply | NA<br>(0) |
| Productivity & Efficiency:<br>▪ Weather sensors alert maintenance to inclement conditions automatically | Moderate<br>(1) |
| Regional Connectivity & Multi-modal coordination:<br>▪ Enhances region RWIS infrastructure | Moderate<br>(1) |
| Energy & Environment:<br>▪ Criteria does not apply | NA<br>(0) |
| Customer Satisfaction:<br>▪ Criteria does not apply | NA<br>(0) |

## WSDOT-G: EXISTING HAR STATION UPGRADE

| Priority: Medium (5) | Estimated Costs: $170K |
|---|---|

Location: Various-See project description

Infrastructure/Project Dependencies: None at this time

Project Description: WSDOT's Highway Advisory Radios are short-range AM stations that can be programmed to repeatedly broadcast a short traveler advisory message. Flashing beacons at the roadside alert travelers to "tune in" when a radio alert is available for that area. Currently, manual posting and updating of HAR messages to multiple locations is very time-consuming, as each recorded message must be individually programmed for broadcast at each site. In addition, each flashing beacon must be powered on or off individually, and there is no way to confirm that it is functioning properly. Thus, WSDOT is in the process of networking their HARs so that changes may be made to multiple sites at one time, as well as other enhancements such as confirming the beacon's function. This project will upgrade the region's existing HAR sites for inclusion in the statewide HAR initiative.

I-90 Eastern Region locations include:

- I-90/US 2 Interchange
- Broadway Interchange
- Liberty Lake Interchange

In addition to the 3 locations above, Sherman Pass currently has two trailer mounted HAR stations which the region would like to replace with permanent HAR. This project can be found in WSDOT-10: Sherman Pass HAR Replacement

The following is a general scope for the HAR implementation:

1. Determine device requirements and equipment installation locations
2. Determine general and site specific requirements
3. Determine general equipment and installation requirements including:
    a. Operational requirements
    b. Physical Requirements
    c. Environmental requirements
    d. Power/Electrical Requirements
    e. Communications/Integration Requirements
    f. Develop P, S&E design to include the following (camera, camera mounting, cabinet, communications, power, HAR hardware and software)
4. Procure camera, PTZ assembly, mounting equipment, HAR components etc
5. Install CCTV and HAR equipment, power and communications
6. Test equipment

| Benefits/Evaluation Criteria | *Levels of Impact* |
|---|---|
| Safety:<br>▪ Alerts travelers to tune to radio frequency for critical roadway information | Moderate<br>(1) |
| Mobility:<br>▪ Criteria does not apply | NA<br>(0) |
| Productivity & Efficiency:<br>▪ Upgrading HAR stations will improve the response time for initiating and updating traffic messages | Significant<br>(2) |
| Regional Connectivity & Multi-modal coordination:<br>▪ Allows regions to "share" HAR messages with bordering regions/states and local agencies | Moderate<br>(1) |
| Energy & Environment:<br>▪ Criteria does not apply | NA<br>(0) |
| Customer Satisfaction:<br>▪ Travelers can make more informed decisions while on the road<br>▪ Improves public perception of HAR program | Moderate<br>(1) |

| WSDOT-H: INTEGRATION OF EASTERN WASHINGTON TRAFFIC MANAGEMENT CENTERS (TMC) | |
|---|---|
| **Priority:** Medium (5) | **Estimated Costs:** $1.7M |
| **Location:** NA | |
| **Infrastructure/Project Dependencies:** None at this time<br>Software and communication enhancements may be required to support the integration. The project should also account for the expansion of communications to the Idaho Transportation Department (ITD) TMC. | |
| **Project Description:** This project will install Integrated traffic management software at the Union Gap and Wenatchee TMCs. The software will enable device control, data and video images to be shared between the NCR, SCR and SRTMC and allow the Centers to provide stand-in operations support for each other in the event of a disaster. As a future expansion project, the SRTMC would also like to partner with the Idaho Department of Transportation to interconnect with their TMC.<br>The Eastern Washington Center-to-Center(C2C) Plan has developed requirements and recommendations for the interconnection of the WSDOT Eastern TMCs, as a pilot for the eventual networking of all WSDOT TMCs across the state. The objectives of the plan was assess the C2C needs reported by the Eastern Washington regions and WSDOT headquarters and provide a Concept of Operations for how C2C could be implemented.<br>This plan was developed as part of Task 2 of this project and the resulting document can be found in the technical memorandum, *Eastern Washington Center-To-Center Plan: Concept of Operations*. The memorandum documents the baseline needs as reported by the regions, identifies the key functionality that a new C2C approach would need to provide, analyzes configuration alternatives for a new C2C approach, and identifies potential challenges. The document also illustrates how day-to-day operations at the TMCs could benefit from the implementation of a one-stop incident response system that would enable the regions to manage events, rather than devices. | |
| **Benefits/Evaluation Criteria** | ***Levels of Impact*** |
| **Safety:**<br>▪ Rapid response for incidents and inclement weather occurring along corridors that cross regional boundaries | Moderate<br>(1) |
| **Mobility:**<br>▪ Criteria does not apply | NA<br>(0) |
| **Productivity & Efficiency:**<br>▪ Interconnecting the TMCs enables each TMC to operate as a backup for the others and will help to provide 24X7 coverage for TMCs that would not otherwise be able to provide that level of staffing.<br>▪ Interconnecting the TMCs will also help to streamline incident response for incidents that occur along corridors that cross regional boundaries. | Significant<br>(2) |
| **Regional Connectivity & Multi-modal coordination:**<br>▪ Interconnecting the TMCs enables each TMC to "see" what is happening in bordering regions | Moderate<br>(1) |
| **Energy & Environment:**<br>▪ Criteria does not apply | NA<br>(0) |
| **Customer Satisfaction:**<br>▪ Secondary benefit of linking TMCs includes the availability of more complete and comprehensive traveler information | Moderate<br>(1) |

| WSDOT-I: US 2 TO US 395 COMMUNICATIONS CONNECTION | |
|---|---|
| **Priority:** Medium (4) | **Estimated Costs:** $500K |
| **Location:** NA | |
| **Infrastructure/Project Dependencies:** None at this time | |
| **Project Description:** This project will deploy ITS communications between US 2 and US 395. This project will also provide connections between the WSDOT, WSP and STA facilities and provide traffic monitoring at the WSDOT Eastern Region Area 1 Maintenance Facility. Currently, WSP received traffic images via a radio communication link. This project will allow WSP dispatchers to view camera images via fiber optic communications, and allow for better incident management and coordination. The project will also provide a fiber optic communications link to the STA Facility to provide transit dispatchers with camera images and better interagency coordination.<br>A camera and traffic monitoring system will also be deployed as part of this project. Additionally, this project will install signal interconnection at US 395 and Hastings.<br>The specific tasks within this task include the following:<br>1. Prepare a communications system design to accommodate ITS field device needs<br>2. Optional: Communications Alternatives Analysis<br>3. Develop Communications Design (consider device requirements, communications redundancy, reliability, performance requirements, future expansion and scalability)<br>4. Prepare Bid Package<br>5. Bid and select Contractor<br>6. Installation (hardware, fiber, wireless, ancillary device [multiplexers, modems, repeaters etc]))<br>7. Testing and Commissioning | |
| **Benefits/Evaluation Criteria** | *Levels of Impact* |
| **Safety:**<br>▪ Improves incident management and coordination between SRTMC and WSP | Moderate<br>(1) |
| **Mobility:**<br>▪ Improved coordination between WSP and SRTMC reduces overall delay caused by incidents | Moderate<br>(1) |
| **Productivity & Efficiency:**<br>▪ Improves incident management and coordination between SRTMC and WSP | Moderate<br>(1) |
| **Regional Connectivity & Multi-modal coordination:**<br>▪ Provides connectivity to ITS devices and interconnect transportation facilities. | Moderate<br>(1) |
| **Energy & Environment:**<br>▪ Reduction in emissions is a secondary reaction to the overall reduction in congestion and delay | Limited<br>(0) |
| **Customer Satisfaction:**<br>▪ Improves public perception of Traveler Information | Limited<br>(0) |

| WSDOT-J: EASTERN REGION PERMANENT HAR DEPLOYMENT | |
|---|---|
| Priority: Low (3) | Estimated Costs: $240K |
| Location: NA | |
| Infrastructure/Project Dependencies: New HAR site will need to be networked with the Statewide HAR initiative as described in the WSDOT-F project. | |
| Project Description: This project will replace the Sherman Pass HAR site from two trailer mounted HARs to permanent HAR sites and install new HARs at the US 395/SR 26 Junction and on US 20 at MPs 303 and 342. The deployment of permanent HAR stations will provide critical traveler information to motorists at key locations along the corridor.<br>The following is a general scope for the HAR implementation:<br>1. Determine device requirements and equipment installation locations<br>2. Determine general and site specific requirements<br>3. Determine general equipment and installation requirements including:<br>a. Operational requirements<br>b. Physical Requirements<br>c. Environmental requirements<br>d. Power/Electrical Requirements<br>e. Communications/Integration Requirements<br>f. Develop P, S&E design to include the following (camera, camera mounting, cabinet, communications, power, HAR hardware and software)<br>4. Procure camera, PTZ assembly, mounting equipment, HAR components etc<br>5. Install CCTV and HAR equipment, power and communications<br>6. Test equipment | |
| Benefits/Evaluation Criteria | *Levels of Impact* |
| Safety:<br>▪ The new HAR stations will be able to provide travelers with key information at a key decision point along the corridor. | Moderate (1) |
| Mobility:<br>▪ Criteria does not apply | NA (0) |
| Productivity & Efficiency:<br>▪ Improves response time for initiating and updating traffic messages | Moderate (1) |
| Regional Connectivity & Multi-modal coordination:<br>▪ Both South Central and Eastern Region will benefit by deploying permanent HAR site | Moderate (1) |
| Energy & Environment:<br>▪ Criteria does not apply | NA (0) |
| Customer Satisfaction:<br>▪ Improves public perception of HAR program | Limited (0) |

# 5. COST SUMMARY

The following cost summary table lists the different projects, their corresponding project ranking, and associated cost estimate. The estimated costs have been provided for each project by the Eastern Region as un-inflated 2006 estimates and may need to be adjusted as projects move forward and become further defined.

**Table 2: Cost Summary Table**

| Project # | Project Ranking | Project Name | Total Cost |
|---|---|---|---|
| WSDOT-A | High | I-90 East Communications Backbone and ITS Deployment | $3.54M |
| WSDOT-B | High | US 195 Congestion and Incident Management ITS | $2.83M |

| | | | |
|---|---|---|---|
| WSDOT-C | High | US 2 Congestion and Incident Management ITS | $3.70M |
| WSDOT-D | Medium | US 2/North Spokane ITS Devices | $710K |
| WSDOT-E | Low | RWIS Deployment | $970K |
| WSDOT-F | Medium | Existing HAR Station Upgrade | $170K |
| WSDOT-G | Medium | Integration of Eastern Washington Traffic Management Centers (TMC) | $1.66M |
| WSDOT-H | Low | US 2 to US 395 Communications Connection | $500K |
| WSDOT-I | Low | Sherman Pass HAR Site Upgrade and New HAR at US 395 | $240K |

# 6. NEXT STEPS

The ITS Implementation Plan is intended to guide the deployment of the WSDOT Eastern Region ITS program. It is recommended that this document be maintained as an input to the regional planning process.

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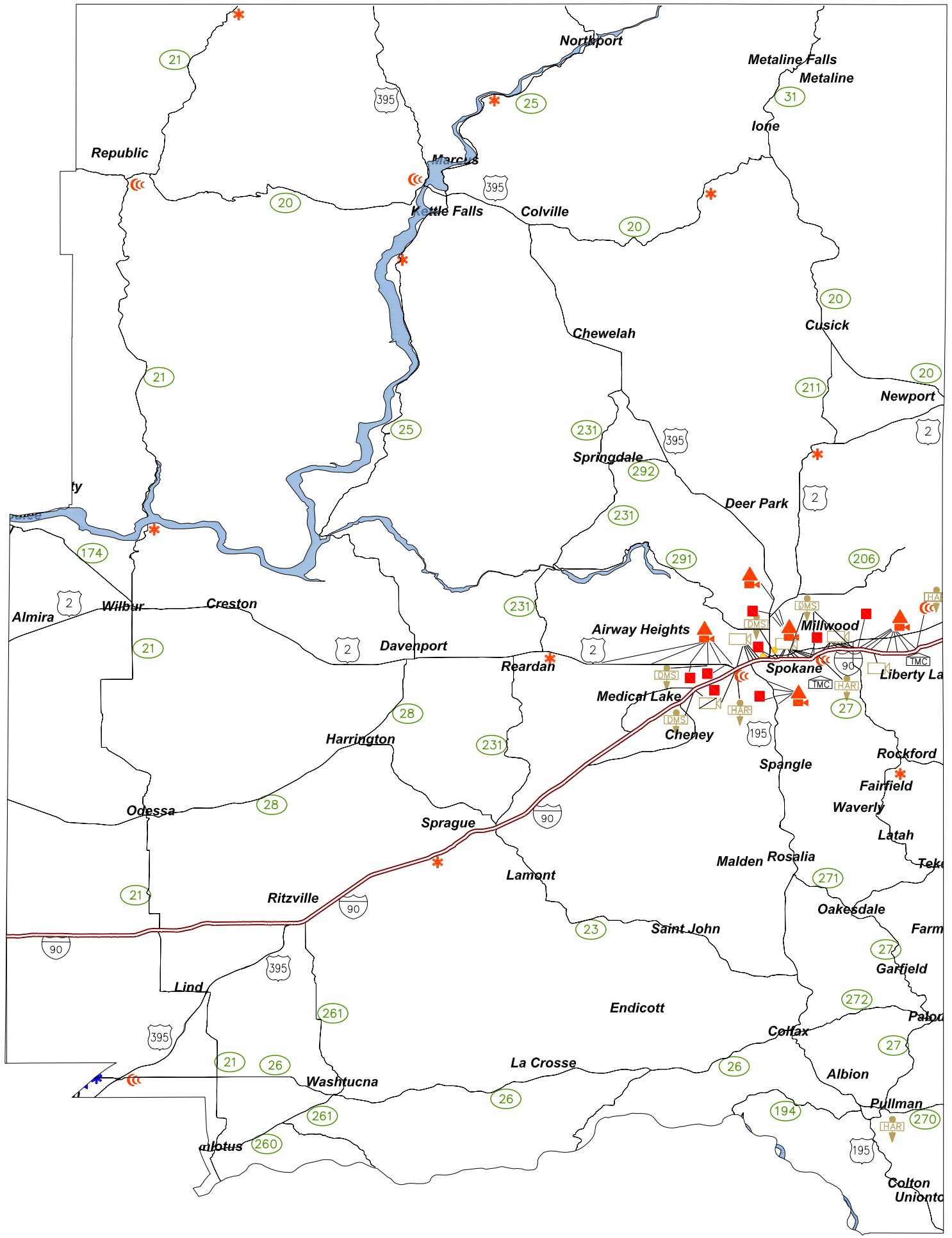
# APPENDIX A

## ER ITS INFRASTRUCTURE MAP




# LEGEND

| EQUIPMENT | PLANNED | EQUIPMENT | EXISTING |
|---|---|---|---|
| TRAFFIC DETECTION | ▲ | Road Weather Information System | ✳ |
| CCTV | ■ | Traffic Flow Camera | ▭ |
| DMS | ■ | Variable Message Sign | VMS |
| RWIS | ✱ | Dynamic Message Sign | DMS |
| HAR | ((( | Highway Advisory Radio | HAR |
| | | Automatic Anti-icer System | ⬡ |
| | | Warning System Beacon | ⊂ |
| | | Traffic Management Center | TMC |

# ITS INFRASTRUCTURE EXISTING / PLANNED

**EASTERN REGION**

**WSDOT**

***Rev. NOV 13, 2006***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IBI GROUP

# APPENDIX B

## SPOKANE METRO ITS IMPLEMENTATION PLAN ITS PROJECT DESCRIPTIONS

# PROJECT IDENTIFICATION AND PRIORITIZATION

Since the development of the 2000 ITS Implementation Plan, the Spokane area has continued to grow in size and density. Eastern Washington is one of the fastest growing areas in the Northwest. With increased congestion and limited space, the region has invested heavily in the area of ITS. Due to this fact, several other opportunities to enhance and further develop their growing ITS infrastructure have been identified in this section. These projects were developed based on needs assessments conducted over the past several months with the Spokane area stakeholders. The following report provides a list of Intelligent Transportation System (ITS) projects that have been identified as advantageous for the Spokane Regional area. Additionally, some projects not completed in the 2004 update to the Spokane Implementation Plan have also been carried over into this portion of the document.

Projects are organized within the following main categories:

**Regional ITS Projects:** Regional projects are defined as project that impact and/or benefit multiple transportation agency stakeholders in the Spokane area. These projects include traveler information, traffic management, incident and emergency management and ITS Infrastructure deployment projects that may involve regional cost sharing.

- **SR-01: TMC Expansion and Security Enhancements –** Upgrades TMC with Universal power source and implements physical security for video and network gear.

- **SR-02: Traveler Information Expansion –** Adds major local arterials to the existing Spokane Metro website.

- **SR-03: Traveler information Kiosks (Pilot Project) –** Provides travelers with important information at key decision points.

- **SR-04: TMC Access to Local Police and Fire Dispatch –** Provides SRTMC Operators with local Dispatch information, such as incidents, on major arterial roadways.

- **SR-05: Real-Time Traffic Information to City and County Maintenance –** Provides county and city maintenance facilities with streaming video from traffic cameras.

- **SR-06: Interoperable DMS Operations and Equipment Standards –** Develops operating guidelines for the use of dynamic message signs.

- **SR-07: ITS Architecture Flow Diagrams and Change Management Plan –** Provides detailed data flow diagrams and develops a program to provide consistency during system and sub system changes.

- **SR-08: Traffic Sensor Deployment Study –** Conducts a study to identify regional corridors that could benefit from traffic sensor deployments.

- **SR-09: Eastern Region Communications Plan –** Provides guidelines for individual agencies to expand their communications infrastructure for the benefit of the region.

**Major Stakeholder ITS projects:** Major Stakeholder ITS Projects are defined as projects impacting and/or benefiting a single transportation agency stakeholder in the Spokane area. These projects are likely to be funded by a single agency.

- Washington Department of Transportation Projects

- **WSDOT-A[1]: I-90 East Communications Backbone and ITS Deployment –** Extend the communications backbone on I-90 from the Sullivan Road interchange to the Idaho State line, and install 7 vehicle detection stations, 7 CCTV cameras and 1 DMS.

- **WSDOT-B: US 195 Congestion and Incident Management ITS –** Expands the network communications infrastructure on US 195 from mile point 91 to mile point 96. The project will also install 4 vehicle detection stations, DMS and traffic cameras on US 195 from Hatch Road to I-90.

- **WSDOT-C: US 2 Congestion and Incident Management ITS –** Expands network communications infrastructure along the US 2 corridor from I-90 to Fairchild Air Force Base vicinity. This project will also install 6 vehicle detection stations and traffic cameras.

- **WSDOT-D: US 2/North Spokane ITS Devices –** Installs cameras, traffic data collection equipment and DMS on US 2 between Spokane city limits (Hawthorne) and Farwell Road.

- **WSDOT-E: Replace DMS on I-90 to SRTMC –** Replaces 5 3M DMS Signs in the Spokane Metro Area with i2TMS compatible signs.

- Spokane Transit Authority (STA) Projects:

  - **STA-01: Real Time Transit Information –** Provides real time transit information to customers.

  - **STA-02: WiFi for Transit Customers Study –** Examines possibility of contracting out WiFi connectivity at STA Park & Ride locations and on specific commuter and student routes.

  - **STA-03: Transit Priority Feasibility Study –** Examines routes to identify intersections that frequently experience severe congestions.

  - **STA-04: Expand MDT Roll Out on all Transit Vehicles –** Expands MDT rollout on Flex and Fixed route transit vehicles.

  - **STA-05: Alternative Fare Study –** Identifies alternative methods of fare payment such as vicinity smart card readers, multi-use smart cards, magnetic strip cards, etc.

  - **STA-06: Expanded AVL Deployment –** Expands limited AVL deployment to remaining transit vehicles.

  - **STA-07: APC Deployment –** Deploys automatic passenger counters on transit vehicles.

  - **STA-08: Voice Annunciation and Overhead Displays –** Deploys voice annunciation and overhead displays on transit vehicles.

- Spokane County Projects:

  - **SC-01: Spokane County Traffic Controller Upgrade –** Upgrades Peak traffic controllers to be compatible with i2TMS severs.

- City of Spokane Valley Projects:

  - **SV-01: City of Spokane Valley Traffic Controller Replacement –** Upgrades existing signal controllers to be compatible with i2TMS severs, and installs fiber and conduit for some intersections to connect to the SRTMC.

[1] WSDOT projects have also been included in the *Eastern Washington ITS Implementation Plan: Eastern Region* document. The projects may have slightly different ratings based on the projects identified in each report document.

- **SV-02: Sprague – Appleway Corridor –** Replaces existing traffic controllers along this corridor and includes the installation of DMS, fiber, detection and PTZ cameras.

- **SV-03: SR 27 Corridor –** Replaces existing traffic signal controllers on SR 27 from Sprague to SR 290. Conduit with fiber will be installed from Mission to Sprague and from Mansfield to SR-290.

➢ City of Spokane Projects:

- **SP-01: Emergency Vehicle Pre-Emption Outside of Downtown Area –** Enables emergency vehicle pre-emption outside of downtown area.

- **SP-02: Spokane DMS Deployment –** Deploys along specific corridors.

- **SP-03: 29th Ave ITS Devices and Communications Infrastructure** – Deploys CCTV cameras, traffic count stations and conduit along the 29th Avenue corridor.

- **SP-04: Division Street DMS Deployment** – Completes the deployment of ITS devices along this corridor by installing 4-6 DMS.

- **SP-05: Francis Ave – Division St to East City Limits ITS Devices and Communications Infrastructure** – Installs conduit along this corridor and ITS devices (CCTV, traffic count stations, possible RWIS) at select intersections.

- **SP-06: Francis Ave – Division St to West City Limits ITS Devices and Communications** – Installs communications and ITS devices along this corridor.

### 1.1.1 PROJECT PRIORITIZATION

The prioritization of the identified projects was determined based on the expected benefits and levels of impact of each project. The benefits were separated into six benefit/evaluation categories:

- **Safety –** Improves safety of roadway/corridor by decreasing occurrence of crashes, reducing the risk crashes occurring and improves emergency/incident response.

- **Mobility –** Improves mobility by reducing travel time delay/congestion and variability and improves transit service and reliability.

- **Productivity & Efficiency –** Provides cost savings by a reduction in operating and maintaining costs. And improves the optimization of existing facilities to reduce the development of new facilities and/or expanding right-of-way.

- **Regional & Multi-Modal Coordination –** Improves communications between regional traffic and transit agencies to improve service and regional connectivity.

- **Energy & Environment –** Reduces fuel consumptions and emissions.

- **Customer Satisfaction –** A perceived benefit to the customer, or customer experiences improved satisfaction.

The six benefit/evaluation criteria were determined based on the unique needs of the Spokane metro area and the reported benefits compiled in the Federal Highway Administration (FHWA) ITS Benefits database (www.itsbenefits.its.dot.gov). For each benefit/evaluation category, a level of impact (significant, moderate and limited) was determined.

- **Significant Impact (2 points):** The project demonstrates a measurable improvement on known transportation needs when considered against this particular category. The degree of improvements must lead to a noticeable change from the base condition and be documented. The project may also be included if it is part of the core infrastructure or system operation.

- **Moderate Impact (1 point):** The project is perceived as likely to have a measurable improvement on known transportation needs, when considered against this particular category. This impact may be secondary to other positive impacts that the project might have. For example, a traveler information web site with trip times might result in an increased transit ridership, although the primary goal of the project would be to reduce traffic congestion by providing pre-trip information. Thus, such a project might be given this ranking against a transit-related benefit.

- **Limited Impact/Not Applicable (no points):** The project is perceived as unlikely to have a measurable improvement on known regional transportation needs, when considered against this particular category.

Each level of impact correlates to a specific number (0-2 points), as indicated above. Thus, each project has the potential to receive between 0 and 12 points. Projects ranging between 8-12 points are considered high priority projects, 5-7 points are medium priority projects, and 0-4 points are low priority projects. Table 1: Project Prioritization Summary, summarizes the priorities of the identified ITS projects, and are organized by *High*, *Medium* and *Low* priority.

**Table 1: Project Prioritization Summary**

| Project Name | Safety | Mobility | Productivity & Efficiency | Regional Connectivity & Multi-Modal Coordination | Energy & Environment | Customer Satisfaction | Total Score | Rank | Project Dependant on: |
|---|---|---|---|---|---|---|---|---|---|
| SR-09: Spokane Area Communications Plan | 0 | 0 | 2 | 2 | 0 | 0 | 4 | High[2] | |
| SR-01: TMC Expansion and Security Enhancements | 1 | 2 | 2 | 2 | 0 | 1 | 8 | High | |
| WSDOT-E: Replace DMS on I-90 to SRTMC | 1 | 2 | 1 | 1 | 1 | 2 | 8 | High | |
| WSDOT-A: I-90 East Communications Backbone and ITS Deployment | 1 | 2 | 1 | 2 | 1 | 1 | 8 | High | SR-09 |
| WSDOT-B: US 195 Congestion and Incident Management ITS | 1 | 2 | 2 | 1 | 1 | 1 | 8 | High | SR-09 |
| WSDOT-C: US 2 Congestion and Incident Management ITS | 1 | 2 | 2 | 1 | 1 | 1 | 8 | High | SR-09 |
| SV-01: City of Spokane Valley Traffic Controller Upgrade | 1 | 1 | 2 | 2 | 1 | 1 | 8 | High | SR-09 |
| SV-02: Sprague - Appleway Corridor | 1 | 2 | 2 | 2 | 1 | 0 | 8 | High | SR-09 |
| SR-06: Interoperable DMS Operations and Equipment Standards | 1 | 1 | 1 | 1 | 0 | 0 | 4 | Medium[3] | |
| SR-02: Traveler Information Expansion | 1 | 1 | 0 | 2 | 1 | 2 | 7 | Medium | SR-09 |

[2] The completion of this project was identified as a pre-requisite of a high priority project (see project description for SR-09).
[3] The completion of this project was identified as a pre-requisite of a medium priority project (see project description for SR-06).

| Project Name | Safety | Mobility | Productivity & Efficiency | Regional Connectivity & Multi-Modal Coordination | Energy & Environment | Customer Satisfaction | Total Score | Rank | Project Dependant on: |
|---|---|---|---|---|---|---|---|---|---|
| SR-04: TMC Access to Local Police and Fire Dispatch | 1 | 1 | 1 | 1 | 1 | 2 | 7 | Medium | |
| SR-08: Traffic Sensor Deployment Study | 0 | 2 | 1 | 1 | 1 | 2 | 7 | Medium | |
| WSDOT-D: US 2 / North Spokane ITS Devices | 1 | 1 | 1 | 2 | 1 | 1 | 7 | Medium | |
| STA-06: Expand AVL Deployment | 1 | 1 | 2 | 1 | 1 | 1 | 7 | Medium | |
| SV-03: SR-27 Corridor | 1 | 2 | 2 | 1 | 1 | 0 | 7 | Medium | SR-09 |
| STA-03: Transit Priority Feasibility Study | 1 | 2 | 2 | 0 | 0 | 1 | 6 | Medium | |
| SP-02: Spokane DMS Deployment | 1 | 1 | 1 | 2 | 0 | 1 | 6 | Medium | SR-06<br>SR-09 |
| SP-03: 29th Ave ITS Devices and Communications Infrastructure | 1 | 1 | 1 | 2 | 0 | 1 | 6 | Medium | SR-09 |
| SP-04: Division Street DMS Deployment | 2 | 1 | 1 | 1 | 0 | 1 | 6 | Medium | SR-06 |
| SP-05: Francis Ave - Division St To East City Limits ITS Devices and Communications Infrastructure | 1 | 1 | 1 | 2 | 0 | 1 | 6 | Medium | SR-09 |
| SP-05: Francis Ave - Division St To West City Limits ITS Devices and Communications Infrastructure | 1 | 1 | 1 | 2 | 0 | 1 | 6 | Medium | SR-09 |
| STA-01: Real-Time Transit Information | 0 | 1 | 1 | 1 | 1 | 2 | 6 | Medium | STA-06 |
| STA-04: Expand MDT Roll Out on all Transit Vehicles | 1 | 1 | 2 | 1 | 0 | 0 | 5 | Medium | STA-06 |
| SR-03: Traveler Information Kiosks (Pilot Project) | 1 | 1 | 0 | 1 | 0 | 1 | 4 | Low | SR-09 |
| SR-05: Real-Time Traffic Information to City & County Maintenance | 1 | 1 | 1 | 1 | 0 | 0 | 4 | Low | SR-09 |
| STA-08: Voice Annunciation and Overhead Displays | 0 | 0 | 2 | 0 | 0 | 2 | 4 | Low | STA-06 |
| SC-01: Spokane County Traffic Controller Upgrade | 0 | 0 | 2 | 2 | 0 | 0 | 4 | Low | SR-09 |
| SR-07: ITS Architecture Flow Diagrams and Change Management Plan | 0 | 0 | 1 | 2 | 0 | 0 | 3 | Low | |
| STA-02: WiFi Study for Transit Customers | 0 | 1 | 0 | 1 | 0 | 1 | 3 | Low | |
| STA-05: Alternative Fare Study | 0 | 0 | 1 | 1 | 0 | 1 | 3 | Low | |
| STA-07: APC Deployment | 0 | 1 | 2 | 0 | 0 | 0 | 3 | Low | STA-06 |
| SP-01: Emergency Pre-emption Outside of Downtown Area | 1 | 2 | 0 | 0 | 0 | 0 | 3 | Low | |

# SPOKANE METRO AREA PROJECT DESCRIPTIONS

The following projects were identified through a preliminary needs assessment completed earlier in the project. The projects were then compiled in a brief memo and reviewed by stakeholders in early May 2006. The project descriptions are divided into two sections:

- Regional ITS Projects
- Major Stakeholder Projects

An inventory map of ITS equipment deployments can be found in Appendix A.

## 1.2 Regional ITS Projects

| SR-01: TMC EXPANSION AND SECURITY ENHANCEMENTS | |
|---|---|
| **Priority:** High (8) | **Estimated Costs:** $400K |
| **Lead Agency/Organization:** SRTMC | **Key Stakeholders:** Cities of Spokane and Spokane Valley, Spokane Transit Authority (STA), Spokane County, WSDOT Eastern Region |
| **Infrastructure/Project Dependencies:** None at this time | |
| **Project Description:** This project will upgrade the current SRTMC with a universal power source to service existing equipment, implement physical security for the TMC and provide better protection for video and network gear located at the TMC. This project will also include the purchase of generators to be used during power outages.<br>The following is a general scope for the TMC Upgrades:<br>• Define special equipment requirements (video wall, HVAC upgrades, security features etc)<br>• Order, procurement and installation of new equipment<br>• Construction and/or installation<br>• Testing | |
| *Benefits/Evaluation Categories* | *Levels of Impact* |
| Safety:<br>▪ Power source will provide usability to external ITS devices (beyond signals) if SRTMC is not up and running. With current conditions, should SRTMC go down, devices are unusable | Moderate (1) |
| Mobility:<br>▪ Improves operator performance in responding to incidents and events in the Spokane area | Significant (2) |
| Productivity & Efficiency:<br>▪ Reduced cost of operations by providing remote monitoring<br>▪ Deployment of ITS improves overall efficiency of the roadway network | Significant (2) |
| Regional Connectivity & Multi-modal coordination:<br>▪ Upgrades provide better regional connectivity between devices<br>▪ Improved communications between local agencies such as STA, City of Spokane, City of Spokane Valley, Spokane County and TMC Operators | Significant (2) |
| Energy & Environment:<br>▪ Does not apply | NA (0) |
| Customer Satisfaction:<br>▪ Improves customer satisfaction by creating the ability to post information to web, DMS, Incident Response (etc.) if SRTMC is down. Current conditions does not allow for this functionality | Moderate (1) |

## SR-02: TRAVELER INFORMATION EXPANSION

| | |
|---|---|
| **Priority:** Medium (7) | **Estimated Costs:** $300K |
| **Lead Agency/Organization:** SRTC | **Key Stakeholders:** Cities of Spokane and Spokane Valley, STA, Spokane County, WSDOT Eastern Region, ITD |

**Infrastructure/Project Dependencies:** It is strongly recommended that the Spokane Area Communications Plan is completed prior to/in conjunction with the deployment of this project.

! SR-09

**Project Description:** Currently the Spokane Metro Area Traffic Information Website (www.srtmc.org) is limited to WSDOT roadway information. In order to provide a complete regional "view" of traffic related information, major local arterials need to be included on the regional website. In order to incorporate the stakeholders into the CARS database, some software development is required. The main tasks associated with this project are listed below:


Vancouver metro area traveler information website including Portland area info

- Expand regional map to include Spokane County
- Include local arterials on the flow diagrams.
- Provide streaming video for state and local cameras to the website
- Explore the possibility to add local arterials to the CARS database to disseminate local construction and incident events to the traveling public.
- Link DMS messages to the regional website for travelers to view messages posted on the DMS (see section for DMS to SRTMC linkage requirements).
- Provide regional displays for operators to enable them to get the "big" picture of what is happening region wide.

Additionally, the region will want to expand local traveler information onto the WSDOT 511 system, and include bi-state (Idaho) traveler information.

| *Benefits/Evaluation Categories* | *Levels of Impact* |
|---|---|
| Safety:<br>▪ Traveler information reduces congestion and thereby decreases overall occurrence and risk of incidents<br>▪ Local construction information dissemination improves work zone safety | Moderate<br>(1) |
| Mobility:<br>▪ Pre-trip traveler information improves on-time reliability.<br>▪ Regional information allows travelers to make better decisions to alter driving patterns to avoid incidents, congestion, etc. | Moderate<br>(1) |
| Productivity & Efficiency:<br>▪ TMC Operators are able to view local transportation conditions for multiple agencies without having to call, email, fax, etc. | Limited<br>(0) |
| Regional Connectivity & Multi-modal coordination:<br>▪ Provides regional "snap shot" of current conditions on regions highways and local major arterials.<br>▪ Single destination for state and local construction information<br>▪ Allows for future Web/511 expansion to include transit information/links<br>▪ Improved roadway network | Significant<br>(2) |
| Energy & Environment:<br>▪ Reduction in emissions caused by delay/congestion | Moderate<br>(1) |
| Customer Satisfaction:<br>▪ Better public perception of traveler information<br>▪ Enhances available traveler information by providing additional functionality (traffic flow map, regional construction events, etc.) | Significant<br>(2) |

## SR-03: TRAVELER INFORMATION KIOSKS (PILOT PROJECT)

| | |
|---|---|
| **Priority:** Low (4) | **Estimated Costs:** $20K / Kiosk installation not including communications costs |
| **Lead Agency/Organization:** STA | **Key Stakeholders:** Cities of Spokane and Spokane Valley, STA, Spokane County, WSDOT Eastern Region, ITD |

**Infrastructure/Project Dependencies:** It is strongly recommended that the Spokane Area Communications Plan is completed prior to/in conjunction with the deployment of this project

! SR-09

**Project Description:** This project would provide travelers with critical traffic information relating to roadway conditions such as a closed road, heavy ice, long construction delays, major incidents, washed out roads, mud slides and other such important information. An initial study should be conducted to determine the appropriate method of information dissemination specifically looking at Kiosks, wireless internet availability, and/or a coordinated effort with the Idaho Transportation Department (ITD). Connection to the kiosks could be by a dial-up system (similar to HAR and DMS) to relay semi-static information or a direct communication link providing real-time traveler information. The wireless internet availability may tie into the statewide WiFi project. Example areas include the Rest Area near Pullman, the Spokane International Airport, malls and other such critical locations. Additionally, Kiosks placed in urban areas such as the airport and malls should consider the eventual expansion to include transit information (see STA-01) and Idaho Transportation Department information.


A high level scope for this project is provided below:

1. Determine installation location(s)
2. Determine general and site specific requirements
3. Determine functional and physical requirements for the kiosks
4. Determine communications requirements
5. Procure kiosks
6. Develop and install software
7. Install kiosks
8. Test equipment

| Benefits/Evaluation Categories | *Levels of Impact* |
|---|---|
| Safety:<br>▪ Provides en-route real-time traveler info at critical decision points reducing "stranded" motorists, and improving safety | Moderate<br>(1) |
| Mobility:<br>▪ By reducing the number of stranded motorists, traffic maintenance personnel are able to more quickly remedy the situation to return to normal flow | Moderate<br>(1) |
| Productivity & Efficiency:<br>▪ Does not apply | NA<br>(0) |
| Regional Connectivity & Multi-modal coordination:<br>▪ Provides regional traveler information | Moderate<br>(1) |
| Energy & Environment:<br>▪ Does not apply | NA<br>(0) |
| Customer Satisfaction:<br>▪ Better public perception of traveler information | Moderate<br>(1) |

| SR-04: TMC ACCESS TO LOCAL POLICE AND FIRE DISPATCH | |
|---|---|
| **Priority:** Medium (7) | **Estimated Costs:** Up to $50K |
| **Lead Agency/Organization:** SRTMC | **Key Stakeholders:** City of Spokane Police and Fire Dispatch Centers, Spokane County 911, Cities of Spokane and Spokane Valley, Spokane County, WSDOT Eastern Region. |
| **Infrastructure/Project Dependencies:** None at this time | |
| **Project Description:** Often when motorists have collisions or run across debris, disabled vehicles and other such roadway obstructions they call 911, not the TMC. During incidents Police and Fire often have the most accurate information on what the status of events are. This information can be extremely useful to TMC operators. Operators need to know when collisions occur, and what the status is, to relay that information to the traveling public. Developing an interface to local city and county police CAD system, as well as the Spokane CAD system, will allow Operators to have improved communications between agencies and to disseminate the best possible information to motorists. The project will investigate the possibility of expanding the CARS/CAD utility to extend to local agencies. This project should be coordinated with local Incident Management plans.<br>This project will consist of the following steps:<br>• Determine functional requirements<br>• Develop software to link CAD data to CARS<br>• Testing | |

| Benefits/Evaluation Categories | *Levels of Impact* |
|---|---|
| Safety:<br>▪ Reduces risk of secondary collisions associated with disabled vehicles and arterial incidents | Moderate (1) |
| Mobility:<br>▪ Reduces delays caused by collisions and disabled vehicles | Moderate (1) |
| Productivity & Efficiency:<br>▪ Potential reduction in costs associated with nonrecurring delay, secondary crashes and vehicle operating costs | Moderate (1) |
| Regional Connectivity & Multi-modal coordination:<br>▪ Develops a regional plan for incident response on local arterials | Moderate (1) |
| Energy & Environment:<br>▪ Reduces emissions/fuel consumption caused by delays associated with collisions and disabled vehicles | Moderate (1) |
| Customer Satisfaction:<br>▪ Studies and surveys of existing incident response programs around the country have shown significant customer satisfaction with the programs. | Significant (2) |

| SR-05: REAL-TIME TRAFFIC INFORMATION TO CITY & COUNTY MAINTENANCE | |
|---|---|
| **Priority:** Low (4) | **Estimated Costs:** $50K per agency for equipment and installation/configuration |
| **Lead Agency/Organization:** Cities of Spokane and Spokane Valley, Spokane County, WSDOT Eastern Region | **Key Stakeholders:** Cities of Spokane and Spokane Valley, Spokane County, WSDOT Eastern Region, City of Spokane Street Department Radio Operator |
| **Infrastructure/Project Dependencies:** It is strongly recommended that the Spokane Area Communications Plan is completed prior to/in conjunction with the deployment of this project<br>! SR-09 | |
| **Project Description:** This project would provide a real-time data link from the SRTMC to the County Public Works Building, Spokane Valley, and City of Spokane 24-hour Radio Operator to provide ITS device status' such as messages posted on DMS and HAR, and streaming video from city and state traffic cameras located through out the region. There is existing infrastructure for the data links to the City of Spokane Valley. Two fibers are available, however this project should consider a future (3rd fiber) communications link for additional ITS devices. This project will also include access for the possible i2 Workstation from the Idaho Transportation Department (ITD) to the SRTMC. | |

| Benefits/Evaluation Categories | *Levels of Impact* |
|---|---|
| Safety:<br>▪ Allows agency maintenance personnel to more quickly troubleshoot roadway and/or signal failures through early detection and observation | Moderate<br>(1) |
| Mobility:<br>▪ Maintenance personnel are able to quickly restore the flow of traffic | Moderate<br>(1) |
| Productivity & Efficiency:<br>▪ Improves response time during severe weather conditions | Moderate<br>(1) |
| Regional Connectivity & Multi-modal coordination:<br>▪ Local agency maintenance and operations personnel are able to view regional traffic conditions | Moderate<br>(1) |
| Energy & Environment:<br>▪ Does not apply | NA<br>(0) |
| Customer Satisfaction:<br>▪ Does not apply | NA<br>(0) |

| SR-06: INTEROPERABLE DMS OPERATIONS AND EQUIPMENT STANDARDS | |
|---|---|
| **Priority:** Medium (4)<br>*The development of this document was identified as a requirement for the following medium priority projects: SP-03, SP-05* | **Estimated Costs:** $50K |
| **Lead Agency/Organization:** Cities of Spokane and Spokane Valley, Spokane County, WSDOT Eastern Region | **Key Stakeholders:** Cities of Spokane and Spokane Valley, Spokane County, WSDOT Eastern Region |
| **Infrastructure/Project Dependencies:** None at this time | |
| **Project Description:** This project would develop interoperable operation and equipment standards for the use and deployment of Dynamic Message Signs. Where applicable, specific deployment criteria will be defined. The deployment criteria should define both when to use a sign as part of a traffic management strategy, and which sign(s) to use. The guidelines should also provide a decision-tree to assist operators in determining the appropriate message to set under various event situations.<br>This project would also develop guidelines for future DMS installations. The guidelines would address when the installation of a DMS is appropriate, the uses for that particular sign, and the type/size of sign that would best meet the needs at a specific location. Additionally, the DMS Standard Requirements could identify prioritization criteria to assist planners and designers in determining which new sign locations have the highest priority, should funding become available. The design guidelines would address issues such as required technical standards and protocols (e.g. NTCIP compliant). | |

| Benefits/Evaluation Categories | *Levels of Impact* |
|---|---|
| **Safety:**<br>▪ Standardizing messages will reduce the chance of incidents occurring out of motorist uncertainty/confusion | Moderate<br>(1) |
| **Mobility:**<br>Improves predictability of drive patterns in response to DMS messages | Moderate<br>(1) |
| **Productivity & Efficiency:**<br>▪ Standardization will reduce additional cost of installing incompatible DMS<br>▪ Identifying high priority locations for new sign locations enhances the regional roadway network | Moderate<br>(1) |
| **Regional Connectivity & Multi-modal coordination:**<br>Consistent design guidelines will ensure that the most critical "new signs" locations are addressed first. | Moderate<br>(1) |
| **Energy & Environment:**<br>▪ Does not apply | NA<br>(0) |
| **Customer Satisfaction:**<br>▪ Does not apply | NA<br>(0) |

| SR-07: ITS ARCHITECTURE FLOW DIAGRAMS AND CHANGE MANAGEMENT PROGRAM | |
|---|---|
| **Priority:** Low (3) | **Estimated Costs:** $200K |
| **Lead Agency/Organization:** WSDOT Eastern Region, Cities of Spokane and Spokane Valley, STA, Spokane County, SRTC | **Key Stakeholders:** Cities of Spokane and Spokane Valley, STA, Spokane County, WSDOT Eastern Region, ITD |
| **Infrastructure/Project Dependencies:** None at this time | |
| **Project Description:** This project will enhance the Spokane Regional ITS Architecture high level market package diagrams to provide detailed diagrams depicting data flows from devices to the user or system. For example, the diagrams will identify the location of the device and specify how the data is transmitted to the system or user, the format of the data and the location of the stored data if used for other processes. Updating the Spokane ITS Architecture should be included as part of this project. Much of the information needed to develop the detailed flow diagrams can also be used to update the regional ITS Architecture.<br>Additionally, this project would create a program to provide consistency during system and sub-system changes. The Change Management Program will provide an evaluation of proposed changes. Proposed changes are evaluated on the expected impact on the entire system. The program will include requirements, design, test and acceptance documentation are accurate and consistent with the actual physical design of the item. | |

| Benefits/Evaluation Categories | *Levels of Impact* |
|---|---|
| Safety:<br>▪ Does not apply | NA<br>(0) |
| Mobility:<br>▪ Does not apply | NA<br>(0) |
| Productivity & Efficiency:<br>▪ Provides the region with a detailed inventory of ITS devices, information, and communications | Moderate<br>(1) |
| Regional Connectivity & Multi-modal coordination:<br>▪ Details existing ITS devices, the data flows and communications to better assist the region in expanding their ITS infrastructure<br>▪ Identifies "gaps" in the regional network | Significant<br>(2) |
| Energy & Environment:<br>▪ Does not apply | NA<br>(0) |
| Customer Satisfaction:<br>▪ Does not apply | NA<br>(0) |

| SR-08: TRAFFIC SENSOR DEPLOYMENT STUDY | |
|---|---|
| **Priority:** Medium (7) | **Estimated Costs:** $75K |
| **Lead Agency/Organization:** SRTC | **Key Stakeholders:** Cities of Spokane and Spokane Valley, Spokane County, WSDOT Eastern Region |
| **Infrastructure/Project Dependencies:** None at this time | |
| **Project Description:** The project will conduct a study to determine the regional corridors to deploy traffic sensing equipment. The study will also outline the timelines for deployment by identifying long, medium and short term deployments for the corridors. Identify existing detector locations/types, coordinate with regional Modeler User Group and other agencies. Consider Analysis of equipment being used, determine desired new/future equipment. | |

| Benefits/Evaluation Categories | *Levels of Impact* |
|---|---|
| Safety:<br>▪ Does not apply | NA<br>(0) |
| Mobility:<br>▪ Proper detector types/locations can populate a regional flow map that can be posted on a public web page and allow drivers to plan routes before taking trips. | Significant<br>(2) |
| Productivity & Efficiency:<br>▪ The study will identify key corridors to implement traffic sensor equipment and the types of equipment to install | Moderate<br>(1) |
| Regional Connectivity & Multi-modal coordination:<br>▪ Allows stakeholders to have a broad outlook on future deployments region wide | Moderate<br>(1) |
| Energy & Environment:<br>▪ Proper detector deployment will encourage trip planning, reducing congestion and air pollution. | Moderate<br>(1) |
| Customer Satisfaction:<br>▪ Properly placed detectors will give drivers and staff a higher resolution picture of traffic conditions in real-time. | Significant<br>(2) |

| SR-09: SPOKANE AREA COMMUNICATIONS PLAN | |
|---|---|
| **Priority:** High (4)<br>*The completion of this project was identified as a requirement to complete several projects: (High) WSDOT-A, WSDOT-B, WSDOT-C, SV-01, SV-02, (Medium) SR-02, SR-05, SV-03, SP-02, SP-06, SP-04, (Low) SR-06, SR-03, SC-01* | **Estimated Costs:** $100K |
| **Lead Agency/Organization:** SRTMC | **Key Stakeholders:** Cities of Spokane and Spokane Valley, Spokane Transit Authority (STA), Spokane County, WSDOT Eastern Region |
| **Infrastructure/Project Dependencies:** None at this time | |
| **Project Description:** With the deployment of additional ITS infrastructure and the rapid expansion of ITS in the area, The need for a regional Communications Plan has been identified as a high priority. During the course of this project, to update the Spokane ITS Implementation Plan, a brief communications assessment was conducted to identify the existing conditions of the area. This project will further expand that assessment to develop an Eastern Region Communications Plan that will identify not only the existing communications infrastructure, but also current and future regional needs. Furthermore, this plan will also provide guidance for individual agencies to expand their communications infrastructure for the benefit of the entire region. The plan should also map the existing fiber communications corridor infrastructure and provide guidelines for fiber counts and sharing between agencies. | |

| Benefits/Evaluation Categories | *Levels of Impact* |
|---|---|
| Safety:<br>▪ Does not apply | NA<br>(0) |
| Mobility:<br>▪ Does not apply | NA<br>(0) |
| Productivity & Efficiency:<br>▪ Improved communications network utilizing interoperability and identifies sharing possibilities | Significant<br>(2) |
| Regional Connectivity & Multi-modal coordination:<br>▪ Identifies current and future communications needs to better assist the Spokane Metropolitan area in expanding their communications infrastructure | Significant<br>(2) |
| Energy & Environment:<br>▪ Does not apply | NA<br>(0) |
| Customer Satisfaction:<br>▪ Does not apply | NA<br>(0) |

## 1.3 Major Stakeholder ITS Projects

### 1.3.1 WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

Projects A-E included in the Eastern Washington ITS Implementation Plan: Eastern Region Final Report were included in the SRTMC ITS Implementation Plan Update.

### 1.3.2 SPOKANE TRANSIT AUTHORITY (STA)

| STA-01: REAL-TIME TRANSIT INFORMATION | |
|---|---|
| **Priority:** Medium (6) | **Estimated Costs:** $750K |
| **Lead Agency/Organization:** Spokane Transit Authority | **Key Stakeholders:** Spokane Transit Authority, WSDOT Eastern Region, Cities of Spokane and Spokane Valley, Spokane County |
| **Infrastructure/Project Dependencies:** The deployment of AVL and a fleet management system is required to provide transit information. Additionally, communications to the kiosks is required to provide real-time transit information.<br>! STA-06 | |
| **Project Description:** The Spokane Transit Agency would like to provide real-time transit information to their customers. Providing real-time transit information to transit customers provides many advantages to the transit user, allowing them to make route selection and departure time decisions, often leading to a higher level of customer satisfaction. Real-time transit information includes providing inter-active transit route planning, next bus arrival information, and other valuable transit information such as cost and estimated arrival time, and transit trip time. Methods of dissemination should look at the internet and automated phone system. Information dissemination to cellular phones and personal digital assistants (PDAs) should also be considered. Static transit information can be displayed using strategically placed kiosks at malls, transit centers, and park and ride locations. The kiosks should be designed with the option to provide real-time traveler information in the future. | |

| Benefits/Evaluation Categories | *Levels of Impact* |
|---|---|
| Safety:<br>▪ Does not apply | NA<br>(0) |
| Mobility:<br>▪ Additional transit tools such as real time next bus arrival improves transit reliability<br>▪ Use of inter-active transit route planning encourages transit use, that may reduce congestion throughout the region | Moderate<br>(1) |
| Productivity & Efficiency:<br>▪ Transit planning and real-time information optimizes current transit services | Moderate<br>(1) |
| Regional Connectivity & Multi-modal coordination:<br>▪ Additional transit information may be linked to regional traveler information | Moderate<br>(1) |
| Energy & Environment:<br>▪ Increased transit usage contributes to a reduction in emissions | Moderate<br>(1) |
| Customer Satisfaction:<br>▪ Improves public perception of Transit<br>▪ Provides valuable transit planning tools | Significant<br>(2) |

| STA-02: WIFI FOR TRANSIT CUSTOMERS STUDY | |
|---|---|
| **Priority:** Low (3) | **Estimated Costs:** $75K |
| **Lead Agency/Organization:** Spokane Transit Authority | **Lead Agency/Organization:** Spokane Transit Authority |
| **Infrastructure/Project Dependencies:** None at this time | |
| **Project Description:** There has been some desire for deploying WiFi connectivity for STA commuters and student transit customers. This project will look into providing or contracting out WiFi on commuter and student routes and at park and ride locations. This project may tie into the region wide WiFi project. | |
| **Benefits/Evaluation Categories** | *Levels of Impact* |
| **Safety:**<br>▪ Does not apply | NA<br>(0) |
| **Mobility:**<br>▪ Improved transit services, such as WiFi availability may encourage more customers to regularly use transit reducing congestion | Moderate<br>(1) |
| **Productivity & Efficiency:**<br>▪ Does not apply | NA<br>(0) |
| **Regional Connectivity & Multi-modal coordination:**<br>▪ Possibility for transit vehicles to use WiFi to communicate with Dispatch | Moderate<br>(1) |
| **Energy & Environment:**<br>▪ Does not apply | NA<br>(0) |
| **Customer Satisfaction:**<br>▪ Transit users will have access to WiFi at Park& Rides and along commuter routes | Moderate<br>(1) |

| STA-03: TRANSIT PRIORITY FEASIBILITY STUDY | |
|---|---|
| **Priority:** Medium (6) | **Estimated Costs:** $100K (Costs will vary based on number of routes and intersections.) |
| **Lead Agency/Organization:** Spokane Transit Authority | **Key Stakeholders:** Spokane Transit Authority, WSDOT Eastern Region, Cities of Spokane and Spokane Valley, Spokane County |
| **Infrastructure/Project Dependencies:** None at this time | |

**Project Description:** The objective of this project is to improve service quality, reduce overall trip time, and increase schedule adherence by installing signal priority, preemption and/or queue jump systems for transit vehicles at intersections which frequently experience severe congestion. This project will investigate the feasibility of signal prioritization systems and possibly installing queue bypass lanes along transit corridors and routes which commonly experience severe traffic congestion. Areas where buses are prone to run late due to congestion are prime examples of installing this infrastructure to allow buses to jump ahead of traffic or to clear a queue ahead of the vehicle. A queue jumper is where a special transit-only provision is designed into an intersection approach and an inductive loop (or similar) is placed in the lane to detect the presence of a transit vehicle. More sophisticated approaches of queue jumpers may allow for some continuous emitter or transponder on the transit vehicle to differentiate between transit and normal traffic or to make distinctions between priority and normal bus service.

The Transit Priority Study will include the following:

- Route Selection – Identify routes with schedule adherence issues, delays, etc.
- On-Street analysis – Gather traffic information on problem intersections, observe the intersections, estimate the required length of the queue jump lane, and required systems modifications.
- Controller/Hardware Analysis – Gather information on signal controller types and capabilities, emergency preemption equipment and any other hardware that would be necessary to implement transit signal priority. Evaluate the capabilities of the existing system for various signal priority strategies (early green, green extension, queue jumps, etc.), and develop recommendations for hardware/software changes.
- Preliminary Queue Jump Design – Looks at the existing alignment to determine conflicts with property, utilities, etc to prepare a preliminary design and cost estimate. At this time, additional attention should also be given to the signal system to determine if additional detection, on-vehicle equipment, transit only displays are required, etc.
- Evaluation of Transit Signal Priority strategies – Develop alternatives for improving travel time on select corridors and model to compare impacts on transit vehicles and general purpose traffic.
- Model intersection and traffic flow impacts based on proposed systems and infrastructure changes.

| Benefits/Evaluation Categories | *Levels of Impact* |
|---|---|
| Safety:<br>▪ Reduces occurrence of incidents involving transit vehicles merging into the flow of traffic | Moderate<br>(1) |
| Mobility:<br>▪ Allows transit vehicles to bypass areas of traffic congestion at approaches to signalized intersections<br>▪ Gives transit vehicles a "head start" when stopped at congested intersections through the ability to jump ahead of traffic<br>▪ Improves schedule adherence for routes during peak travel times | Significant<br>(2) |
| Productivity & Efficiency:<br>▪ Can allow for transit signal priority without specialized equipment on the transit vehicle and with limited modification to the signal system<br>▪ Can use existing "right turn only lanes" | Significant<br>(2) |
| Regional Connectivity & Multi-modal coordination:<br>▪ Does not apply | NA<br>(0) |
| Energy & Environment:<br>▪ Reduces emissions caused by transit vehicles idling in congestion | Limited<br>(0) |
| Customer Satisfaction:<br>▪ Improves customer perception of transit by improving schedule adherence | Moderate<br>(1) |

| STA-04: EXPAND MDT ROLL OUT ON ALL TRANSIT VEHICLES | |
|---|---|
| **Priority:** Medium (5) | **Estimated Costs:** $10-15K per vehicle |
| **Lead Agency/Organization:** Spokane Transit Authority | **Key Stakeholders:** Spokane Transit Authority |
| **Infrastructure/Project Dependencies:** Prior to the deployment of MDTs, vehicles need to be equipped with AVL technology. The completion of this project may be dependent on the completion of the expanded AVL deployment project.<br>! STA-06 | |
| **Project Description:** MDT units have many functions, one of which is the ability to help dispatch and improve communications between dispatch and the field operators. STA is in the process of upgrading their current Paratransit MDTs with Mentor MDCs with enhanced features. MDCs will be able to be interfaced with overhead displays and stop annunciation, and will provide communications with dispatch, driver sign-in capabilities among other features. | |

| Benefits/Evaluation Categories | *Levels of Impact* |
|---|---|
| **Safety:**<br>▪ Many MDT's include silent alarm functionality in the event of an emergency occurring on a transit vehicle | Moderate (1) |
| **Mobility:**<br>▪ Improves transit reliability | Moderate (1) |
| **Productivity & Efficiency:**<br>▪ The combined use of AVL/CAD and MDTs reduces voice communication traffic, potentially reducing the number of communications channels required, increases efficiency of dispatch operations, and depending on system configuration, can share voice and data communications on the same channel(s) | Significant (2) |
| **Regional Connectivity & Multi-modal coordination:**<br>▪ Helps dispatch and manage paratransit and fixed route vehicles by improving communications between the bus operator and dispatch | Moderate (1) |
| **Energy & Environment:**<br>▪ Does not apply | NA (0) |
| **Customer Satisfaction:**<br>▪ Does not apply | NA (0) |

| STA-05: ALTERNATIVE FARE STUDY | |
|---|---|
| **Priority:** Low (3) | **Estimated Costs:** $150K |
| **Lead Agency/Organization:** Spokane Transit Authority | **Key Stakeholders:** Spokane Transit Authority |
| **Infrastructure/Project Dependencies:** None at this time | |
| **Project Description:** STA has procured new fare boxes with both smart card and magnetic stripe card capabilities and would like investigate alternative fare payment methods. The new fare boxes are still able to accept cash and have the ability to print two hour transfer passes for passengers. The study will also provide a comprehensive evaluation of Spokane Transit's current fare structure. This will include a review of peer agencies and provide recommendations for future modifications to the fare policy. Also, the study will detail the development of a fare (ridership/revenue forecasting) model. | |

| Benefits/Evaluation Categories | *Levels of Impact* |
|---|---|
| Safety:<br>▪ Does not apply | NA<br>(0) |
| Mobility:<br>▪ Does not apply | Moderate<br>(0) |
| Productivity & Efficiency:<br>▪ Multi-use fare cards and other forms of fare payment can improve efficiency | Moderate<br>(1) |
| Regional Connectivity & Multi-modal coordination:<br>▪ This study will provide the agency with options for alternative methods for fare payment. | Moderate<br>(1) |
| Energy & Environment:<br>▪ Does not apply | NA<br>(0) |
| Customer Satisfaction:<br>▪ Improves public perception of transit | Moderate<br>(1) |

## STA-06: EXPANDED AVL DEPLOYMENT

| | |
|---|---|
| **Rating:** Medium (7) | **Estimated Costs:** $12K/vehicles for on-board AVL equipment (assumes central AVL system is installed in initial deployment) |
| **Lead Agency/Organization:** Spokane Transit Authority (STA) | **Key Stakeholders:** STA |
| **Infrastructure/Project Dependencies:** None at this time | |

http://www.spokanetransit.com/aboutSTA/staffleet.asp

**Project Description:** The original July 2000 Spokane ITS Implementation Plan called for the deployment of an Automated Vehicle Location (AVL) system that would address operational efficiencies and customer information needs. AVL is required for many other transit ITS applications that depend on knowing vehicle location. It provides the location data needed for operations software, silent alarms, automatic passenger counters, real-time passenger information, in-vehicle signs and annunciators. AVL is also necessary to provide real-time transit information via web, on-board, or through PDA/cellular devices. The primary functions of the system would include:

- On-board GPS units, data radios and network connections providing automatic location of transit vehicle,
- Route monitoring and real time information
- Enhanced coordination between paratransit and fixed route services by increasing transfer capabilities, and
- Interface to the customer information system to provide timely route and service information

An initial deployment of AVL is funded for the 2008 / 2009 years as noted in the STA exiting conditions. This project will expand the limited AVL deployment to encompass the remaining fixed route vehicles. More specifically, this project assumes an AVL central system has been purchased and this project will install AVL equipment (GPS receiver, on-board processor, and RF communications) on the remaining fixed route vehicles in the fleet.

| Benefits/Evaluation Categories | *Levels of Impact* |
|---|---|
| Safety:<br>▪ Enhance security measures | Moderate (1) |
| Mobility:<br>▪ Improves on-time bus performance | Moderate (1) |
| Productivity & Efficiency:<br>▪ Reduces data collection and analysis time and improve data accuracy.<br>▪ Other functions could track and enhance routine maintenance needs, fluid use and revenue reporting | Significant (2) |
| Regional Connectivity & Multi-modal coordination:<br>▪ Provides real time data for system wide management and passenger information.<br>▪ Improve model connections | Moderate (1) |
| Energy & Environment:<br>▪ Encourages ridership and improves transit time thereby reducing emissions | Moderate (1) |
| Customer Satisfaction:<br>▪ Project leads to the provision of more timely and accurate information for customers | Moderate (1) |

| STA-07: APC DEPLOYMENT | |
|---|---|
| **Priority:** Low (3) | **Estimated Costs:** $1,500/vehicle |
| **Lead Agency/Organization:** Spokane Transit Authority (STA) | **Key Stakeholders:** STA |
| **Infrastructure/Project Dependencies:** In order to reap the benefits of the data, APCs depend on AVL to record stop specific boarding's and alightings. This project depended on the expanded deployment of AVL<br>! STA-06 | |
| **Project Description:** Automated Passenger Counters (APC) count passengers automatically as they board and alight buses along the route. This data can be used to provide a wealth of information for passengers boarding and alighting by stop and time of day when combined with AVL data. APC equipment generally use one of two counting methods: treadle mats which are triggered when stepped on, or infrared beams that are triggered when the beam is broken (note: infrared beam technology is more commonly implemented currently). Two mats or beams are used to determine whether passengers are boarding or alighting. New technologies including body heat sensors are also in development. This project will install APCs on a percentage or all of STA's fleet. | |
| **Benefits/Evaluation Categories** | ***Levels of Impact*** |
| Safety:<br>▪ Does not apply | NA<br>(0) |
| Mobility:<br>▪ APC data can be used to adjust transit schedules to better improve travel times and on time performance | Moderate<br>(1) |
| Productivity & Efficiency:<br>▪ APC data will provide a greater volume and variety of ridership data, which can be used to improve schedule adherence and route efficiencies.<br>▪ APC also provides more accurate data while at the same time reducing the data collection and analysis time of manual counting. | Significant<br>(2) |
| Regional Connectivity & Multi-modal coordination:<br>▪ Does not apply | NA<br>(0) |
| Energy & Environment:<br>▪ Does not apply | NA<br>(0) |
| Customer Satisfaction:<br>▪ Does not apply | NA<br>(0) |

| STA-08: VOICE ANNUNCIATION AND OVERHEAD DISPLAYS | |
|---|---|
| **Priority:** Medium (4) | **Estimated Costs:** $2,000/vehicle |
| **Lead Agency/Organization:** Spokane Transit Authority (STA) | **Key Stakeholders:** STA |
| **Infrastructure/Project Dependencies:** ASA systems require real-time data from AVL. This project depended on the expanded deployment of AVL<br>! STA-06 | |
| **Project Description:** This project will deploy automated stop annunciation (ASA) systems on STA vehicles. ASA use electronic reader boards and public address speakers to "call out" or announce (visually and audibly) the next stop along a bus route. Through the use of AVL, the bus knows its location, route and direction of travel. A computer processor on the bus calculates all of this information to determine which stop is coming up next, and announces the stop using pre-recorded or electronically generated voice messages on the public address system, as well as text on a reader board. The system can also announce major landmarks, intersections, transfer points, or other locations of interest.<br>The bus can make external as well as on-board announcements. Using speakers on the outside of the vehicle, the bus will automatically "announce itself" to passengers waiting at a stop as it arrives and opens its doors. This is important for visually impaired passengers who may not be able to read the destination sign on the front of the bus, or for anyone who misses seeing the destination sign when the bus pulls up. The system can also automatically change the destination sign with route or direction changes, thus ensuring that the audio announcement and sign message match. | |

| Benefits/Evaluation Categories | *Levels of Impact* |
|---|---|
| Safety:<br>▪ Does not apply | NA<br>(0) |
| Mobility:<br>▪ Does not apply | NA<br>(0) |
| Productivity & Efficiency:<br>▪ Voice annunciation and overhead displays will improve on-board real-time transit information and passenger access to route information. This is especially important for visually impaired transit users | Significant<br>(2) |
| Regional Connectivity & Multi-modal coordination:<br>▪ Does not apply | NA<br>(0) |
| Energy & Environment:<br>▪ Does not apply | NA<br>(0) |
| Customer Satisfaction:<br>▪ Automated stop annunciation (ASA) systems use electronic reader boards and public address speakers to "call out" or announce (visually and audibly) the next stop along a bus route<br>▪ The system can also announce major landmarks, intersections, transfer points, or other locations of interest.<br>▪ The bus can make external as well as on-board announcements. Using speakers on the outside of the vehicle, the bus will automatically "announce itself" to passengers waiting at a stop as it arrives and opens its doors. | Significant<br>(2) |

### 1.3.3 SPOKANE COUNTY

| SC-01: SPOKANE COUNTY TRAFFIC CONTROLLER UPGRADE | |
|---|---|
| **Priority:** Low (4) | **Estimated Costs:** $15K/intersection |
| **Lead Agency/Organization:** Spokane County | **Key Stakeholders:** Spokane County |
| **Infrastructure/Project Dependencies:** It is strongly recommended that the Spokane Area Communications Plan is completed prior to/ in conjunction with this project<br>! SR-09 | |
| **Project Description:** This project will perform a system wide replacement of Peek traffic controllers to be compatible with the SRTMC i2 servers. Traffic signals need to be NTCIP compatible. Traffic controllers that will be replaced are located outside of the urban area and will need to have the communications infrastructure to communicate back to the SRTMC. | |
| **Benefits/Evaluation Categories** | *Levels of Impact* |
| **Safety:**<br>▪ Does not apply | NA<br>(0) |
| **Mobility:**<br>▪ Does not apply | NA<br>(0) |
| **Productivity & Efficiency:**<br>▪ Connection to the SRTMC will allow remote observation and improve maintenance and operational practices<br>▪ Level of influence of this project limited due to remoteness of intersections. | Moderate<br>(2) |
| **Regional Connectivity & Multi-modal coordination:**<br>▪ Allows better regional traffic management from the SRTMC | Significant<br>(2) |
| **Energy & Environment:**<br>▪ Does not apply | NA<br>(0) |
| **Customer Satisfaction:**<br>▪ Does not apply | NA<br>(0) |

### 1.3.4 CITY OF SPOKANE VALLEY

| SV-01: CITY OF SPOKANE VALLEY TRAFFIC CONTROLLER UPGRADE | |
|---|---|
| **Priority:** High (8) | **Estimated Costs:** $15K/intersection |
| **Lead Agency/Organization:** Spokane Valley | **Key Stakeholders:** City of Spokane Valley |
| **Infrastructure/Project Dependencies:** It is strongly recommended that the Spokane Area Communications Plan is completed prior to/ in conjunction with this project<br>! SR-09 | |
| **Project Description:** This project will perform a system wide replacement of Peek traffic controllers to be compatible with the SRTMC i2 servers. Traffic signals need to be NTCIP compatible. Though this project mirrors the Spokane County traffic controller project (SC-01), the City of Spokane Valley controllers to be replaced affect traffic controllers in a more urban areas that will be able to communicate with the SRTMC in a shorter time frame than the Spokane County traffic controllers. | |
| **Benefits/Evaluation Categories** | *Levels of Impact* |
| **Safety:**<br>▪ Operation of incident response plans will reduce secondary collisions. | Moderate (1) |
| **Mobility:**<br>▪ Upgrading controllers will allow observation and control for incident response plans. | Moderate (1) |
| **Productivity & Efficiency:**<br>▪ Connection to the SRTMC will allow remote observation and improve maintenance and operational practices | Significant (2) |
| **Regional Connectivity & Multi-modal coordination:**<br>▪ Allows better regional traffic management from the SRTMC | Significant (2) |
| **Energy & Environment:**<br>▪ Operation of incident response plans will reduce congestion delay and fuel consumption and improve air quality. | NA (1) |
| **Customer Satisfaction:**<br>▪ Reduced congestion and delay will improve customer satisfaction. | NA (1) |

## SV-02: SPRAGUE-APPLEWAY CORRIDOR

| | |
|---|---|
| **Priority:** High (8) | **Estimated Costs:** $15K/intersection for controller replacement, $40K to $60K per DMS installation, and $25K per PZT camera Costs do not reflect communications cost to devices. |
| **Lead Agency/Organization:** City of Spokane Valley | **Key Stakeholders:** City of Spokane Valley, WSDOT Eastern Region, Spokane County |

**Infrastructure/Project Dependencies:** It is strongly recommended that the Spokane Area Communications Plan is completed prior to/ in conjunction with this project

! SR-09

**Project Description:** This project will perform a replacement of existing traffic signal controllers on Sprague and Appleway from Fancher to University. All signals have interconnect conduit, but only some have fiber in the conduit. This project will install fiber in the empty conduits allowing the new controllers to be connected into the traffic management center.

The project also includes the design and installation of a DMS for WB Sprague between Park and the WB I-90 on-ramp, and connection of the DMS to the TMC. Detection improvements in the form of advance loops using video detection are planned for the intersection of Sprague / I-90 ramps. PTZ cameras are also proposed for Sprague-Appleway on both the east and west side of the I-90 overpass.

Controller replacements will occur at the following intersections:

- Sprague / Fancher
- Sprague / I-90
- Sprague / Thierman
- Appleway / Thierman
- Sprague / Park
- Appleway / Park
- Sprague / Vista
- Appleway / Vista
- Sprague / Argonne
- Sprague / Mullan
- Appleway / Dishman-Mica
- Sprague / Farr
- Appleway / Farr
- Sprague / University
- Appleway / University

| Benefits/Evaluation Categories | *Levels of Impact* |
|---|---|
| **Safety:**<br>▪ Additional ITS devices will allow better incident detection and response, reducing likelihood of secondary collisions. | Moderate (1) |
| **Mobility:**<br>▪ The DMS will allow for commuters to be informed of WB freeway incidents and take an alternate route<br>▪ The advance detection will improve the efficiency of the Sprague/I-90 signal. | Significant (2) |
| **Productivity & Efficiency:**<br>▪ Ability to implement incident response timing plans<br>▪ Ability for Spokane Valley and Spokane County to monitor and access timing parameters remotely | Significant (2) |
| **Regional Connectivity & Multi-modal coordination:**<br>▪ Allows better regional traffic management from the SRTMC<br>▪ Traffic cameras on Sprague will help the TMC to monitor effectiveness of and need for incident management timing. | Significant (2) |
| **Energy & Environment:**<br>▪ Improved efficiency of the corridor will reduce congestion, delay and fuel consumption and improve air quality | Moderate (1) |
| **Customer Satisfaction:**<br>▪ Improved operations of traffic signals improve motorists perception of traffic controller upgrades | Limited (0) |

| SV-03: SR-27 CORRIDOR | |
|---|---|
| **Priority:** Medium (7) | **Estimated Costs:** $15K/intersection for controller replacement, total cost varies based on communications |
| **Lead Agency/Organization:** City of Spokane Valley | **Key Stakeholders:** City of Spokane Valley, WSDOT Eastern Region, Spokane County |

**Infrastructure/Project Dependencies:** It is strongly recommended that the Spokane Area Communications Plan is completed prior to/ in conjunction with this project

! SR-09

**Project Description:** This project will perform a replacement of existing traffic signal controllers on SR-27 from Sprague to SR-290. Conduit with fiber will be installed from Mission to Sprague and from Mansfield to SR-290.

Controller replacements will occur at the following intersections:

- Sprague / SR-27
- Broadway / SR-27
- Mission / SR-27
- SR-290 / SR-27

| Benefits/Evaluation Categories | *Levels of Impact* |
|---|---|
| **Safety:**<br>▪ Additional ITS devices will allow better incident detection and response, reducing likelihood of secondary collisions. | Moderate (1) |
| **Mobility:**<br>▪ The advance detection will improve the efficiency of the SR-27 corridor. | Significant (2) |
| **Productivity & Efficiency:**<br>▪ Ability to implement incident response timing plans<br>▪ Ability for Spokane Valley and Spokane County to monitor and access timing parameters remotely. | Significant (2) |
| **Regional Connectivity & Multi-modal coordination:**<br>▪ Allows better regional traffic management from the SRTMC | Moderate (1) |
| **Energy & Environment:**<br>▪ Improved efficiency of the corridor will reduce congestion, delay and fuel consumption and improve air quality | Moderate (1) |
| **Customer Satisfaction:**<br>▪ Improved operations of traffic signals improve motorists perception of traffic controller upgrades | Limited (0) |

### 1.3.5 CITY OF SPOKANE

| SP-01: EMERGENCY VEHICLE PRE-EMPTION OUTSIDE OF DOWNTOWN AREA | |
|---|---|
| **Priority:** Low (3) | **Estimated Costs:** $6,000/intersection plus vehicle emitters |
| **Lead Agency/Organization:** City of Spokane | **Key Stakeholders:** City of Spokane Valley, City of Spokane, WSDOT Eastern Region |
| **Infrastructure/Project Dependencies:** None at this time | |
| **Project Description:** Within the downtown area, emergency vehicle pre-emption does not work as efficiently due to the high density of traffic signals. Switches to control traffic signals near fire stations are more efficient and accurate during emergency situations and the Spokane Fire Departments would like to see increased use of these switches within the downtown area. Spokane Fire also sees value in installing emergency vehicle pre-emption software and devices outside the downtown area where traffic is less congested and the density of traffic signals is less. The City of Spokane Valley and Spokane County already have pre-emption systems in place. | |
| **Benefits/Evaluation Categories** | ***Levels of Impact*** |
| **Safety:**<br>▪ Provides emergency responders with the right of way to increase safety and reduce occurrences of collisions or delays. | Moderate<br>(1) |
| **Mobility:**<br>▪ Emergency responders are able to continue through the intersection without slowing or stopping, allowing them to reach their destination more quickly. | Significant<br>(2) |
| **Productivity & Efficiency:**<br>▪ Does not apply | NA<br>(0) |
| **Regional Connectivity & Multi-modal coordination:**<br>▪ Does not apply | NA<br>(0) |
| **Energy & Environment:**<br>▪ Does not apply | NA<br>(0) |
| **Customer Satisfaction:**<br>▪ Does not apply | NA<br>(0) |

## SP-02: SPOKANE DMS DEPLOYMENT

| | |
|---|---|
| **Priority:** Medium (6) | **Estimated Costs:** $30 to $100K per installation not including communications costs |
| **Lead Agency/Organization:** City of Spokane | **Key Stakeholders:** City of Spokane, City of Spokane Valley, WSDOT Eastern Region |

**Infrastructure/Project Dependencies:** It is highly recommended that the following projects be completed concurrently/prior to the completion of this project:

- ! SR-06
- ! SR-09

**Project Description:** This project will install dynamic message signs in various locations to improve corridor management and provide comprehensive traveler information in the City of Spokane. Because DMS locations have not yet been determined, these corridors have been highlighted on the ITS device infrastructure maps in Appendix A. The corridors identified as a priority are:

| Short Term Deployment | Medium Term Deployment | Long Term Deployment |
|---|---|---|
| o North Market | o East Sprague | o East Wellesley |
| | o South Regal | o Hatch Road urban Connector |

A general scope for the implementation of the ITS Infrastructure is found below:

1. Determine installation phasing
2. Determine exact locations for device installation
3. Determine general and site specific functional requirements
4. Determine general equipment and installation requirements including:
    a. Operational requirements
    b. Physical requirements
    c. Environmental requirements
    d. Power/Electrical Requirements
    e. Communications/Integration Requirements
    f. Develop P, S&E detailed design for each site to Message Signs (DMS structure type and detail, sign size, etc.) communications and power routing
5. Procure equipment
6. Install equipment, power and communications
7. Testing

| Benefits/Evaluation Categories | *Levels of Impact* |
|---|---|
| Safety:<br>▪ Motorists are able to obtain critical traveler information while on the road | Moderate (1) |
| Mobility:<br>▪ Travelers are able to make informed decisions based on messages posted on DMS | Moderate (1) |
| Productivity & Efficiency:<br>▪ Optimizes current corridor by providing real-time information | Moderate (1) |
| Regional Connectivity & Multi-modal coordination:<br>▪ Improves traffic management by allowing operators to quickly notify the traveling public of safety and roadway conditions.<br>▪ Local transportation agencies can view DMS messages through i2TMS and on the web at www.srtmc.org | Significant (2) |
| Energy & Environment:<br>▪ Does not apply | NA (0) |
| Customer Satisfaction:<br>▪ Travelers are able to view messages posted on DMS though web (www.srtmc.org) | Moderate (1) |

| SP-03: 29TH AVE ITS DEVICES AND COMMUNICATIONS INFRASTRUCTURE | |
|---|---|
| **Priority:** Medium (6) | **Estimated Costs:** $25K/camera, total cost varies depending on communications costs |
| **Lead Agency/Organization:** City of Spokane | **Key Stakeholders:** City of Spokane, SRTMC |

**Infrastructure/Project Dependencies:** It is highly recommended that the Spokane Area Communications Plan is completed prior to/ in conjunction with this project:

! SR-09

**Project Description:** Currently the City of Spokane has Street Bond Projects along 29th Ave between Grand Blvd and Freya Street. These projects will install 95% of ITS conduit. This project would complete the conduit network and install CCTV cameras at key intersections along the route and install Traffic Count Stations. This project will also create a communication loop by connecting the existing conduit on Ray St to the existing conduit and fiber on Grand Blvd.

Camera Locations:

- Grand
- Perry
- SE Blvd
- Ray

| Benefits/Evaluation Categories | *Levels of Impact* |
|---|---|
| Safety:<br>▪ CCTV cameras improve response time to hazardous road surface conditions | Moderate (1) |
| Mobility:<br>▪ Expedited incident detection and response reduces congestion/delay associated with road surface conditions | Moderate (1) |
| Productivity & Efficiency:<br>▪ TMC operators and maintenance staff can survey traffic and roadway conditions using CCTV cameras.<br>▪ Traffic sensors allow for the trafficcounts and congestion reporting reducing overall operating costs | Moderate (1) |
| Regional Connectivity & Multi-modal coordination:<br>▪ Enhances regional communications infrastructure.<br>▪ Additional CCTV cameras provide regional coverage.<br>▪ Traffic detection provides managers a look at what is happening along the roadway system. | Significant (2) |
| Energy & Environment:<br>▪ Allows commuter to make informed decisions regarding appropriate commute route saving time and natural resources | Limited (0) |
| Customer Satisfaction:<br>▪ Camera images and arterial flow maps will be connected to the SRTMC allowing travelers to view road conditions. | Moderate (1) |

| SP-04: DIVISION STREET DMS (DYNAMIC MESSAGE SIGN) DEPLOYMENT | |
|---|---|
| **Priority:** Medium (6) | **Estimated Costs:** $40K - $60K per DMS installation |
| **Lead Agency/Organization:** City of Spokane | **Key Stakeholders:** City of Spokane, SRTMC |
| **Infrastructure/Project Dependencies:** It is highly recommended that the following project be completed concurrently/prior to the completion of this project:<br>! SR-06 | |
| **Project Description:** This project is a follow up ITS project along Division St. Previous projects have installed the communication infrastructure along this route and there is a current ITS project in the Design Phase ('07 and '08 construction) to install CCTV cameras and traffic count stations along this corridor. This project will install 4 to 6 DMS signs along the corridor | |
| **Benefits/Evaluation Categories** | *Levels of Impact* |
| **Safety:**<br>▪ DMS can alert travelers of roadway conditions to help them to drive with caution | Significant (2) |
| **Mobility:**<br>▪ Relays traveler information to the driver, allowing them to alter travel route, reducing delay caused by incidents, construction, congestion, and inclement weather. | Moderate (1) |
| **Productivity & Efficiency:**<br>▪ Provides real time traffic information to the traveling public | Moderate (1) |
| **Regional Connectivity & Multi-modal coordination:**<br>▪ Additional communication between the SRTMC and the traveling public | Moderate (1) |
| **Energy & Environment:**<br>▪ Allows commuter to make informed decisions regarding appropriate commute route saving time and natural resources | Limited (0) |
| **Customer Satisfaction:**<br>▪ Real time traffic information allowing the commuter to make an informed decision regarding the best routes. | Moderate (1) |

| SP-05: FRANCIS AVE – DIVISION ST TO EAST CITY LIMITS ITS DEVICES AND COMMUNICATION INFRASTRUCTURE | |
|---|---|
| **Priority:** High (6) | **Estimated Costs:** $1.9M |
| **Lead Agency/Organization:** City of Spokane | **Key Stakeholders:** City of Spokane, SRTMC, WSDOT, Spokane County |
| **Infrastructure/Project Dependencies:** It is highly recommended that the Spokane Area Communications Plan is completed prior to/ in conjunction with this project:<br>! SR-06<br>! SR-09 | |
| **Project Description:** This project will install the communications infrastructure from Division Street to the east City Limits. It will connect to existing conduit/communication infrastructure at Crestline, Market and the North Spokane Corridor. It will also provide a future communication path for Spokane county on Bigelow Gulch Rd. ITS devices will be installed at key intersections along the route. These devices will include CCTV cameras, DMS, traffic count stations, and possibly a weather station. This project should help mitigate the additional traffic due to the NSC staged construction.<br>Possible camera locations:<br>• Addison St<br>• Nevada St<br>• Crestline St<br>• Market St<br>• Freya St | |

| Benefits/Evaluation Categories | *Levels of Impact* |
|---|---|
| **Safety:**<br>▪ CCTV cameras improve response time to hazardous road surface conditions | Moderate (1) |
| **Mobility:**<br>▪ Expedited incident detection and response reduces congestion/delay associated with road surface conditions | Moderate (1) |
| **Productivity & Efficiency:**<br>▪ TMC operators and maintenance staff can survey traffic and roadway conditions using CCTV cameras.<br>▪ Traffic sensors allow for the traffic counts and congestion reporting reducing overall operating costs | Moderate (1) |
| **Regional Connectivity & Multi-modal coordination:**<br>▪ Enhances regional communications infrastructure.<br>▪ Additional CCTV cameras provide regional coverage.<br>▪ Traffic detection provides managers a look at what is happening along the roadway system. | Significant (2) |
| **Energy & Environment:**<br>▪ Allows commuter to make informed decisions regarding appropriate commute route saving time and natural resources | Limited (0) |
| **Customer Satisfaction:**<br>▪ Camera images and arterial flow maps will be connected to the SRTMC allowing travelers to view road conditions. | Moderate (1) |

| SP-06: FRANCIS AVE – DIVISION ST TO WEST CITY LIMITS ITS DEVICES AND COMMUNICATION INFRASTRUCTURE | |
|---|---|
| **Priority:** Medium (6) | **Estimated Costs:** $2.5M |
| **Lead Agency/Organization:** City of Spokane | **Key Stakeholders:** City of Spokane, SRTMC, WSDOT, Spokane County |
| **Infrastructure/Project Dependencies:** It is highly recommended that the Spokane Area Communications Plan is completed prior to/ in conjunction with this project:<br>! SR-06<br>! SR-09 | |
| **Project Description:** This project will install the communications infrastructure from Division Street to the west City Limits. This route will provide the communication infrastructure for not only the northwest portion of the City but also WSDOT, Spokane County, and possibly southern Stevens County (Suncrest area). It will connect to existing conduit/communication infrastructure at Maple/Ash couplets and Indian Trail Rd. ITS devices will be installed at key intersections along the route. These devices will include CCTV cameras, DMS, traffic count stations, and possibly a weather station. This project will also provide the communications backbone for Spokane County's proposed west urban connector.<br>Possible camera locations:<br>• Wall/Monroe<br>• Maple/Ash<br>• Alberta<br>• Indian Trail<br>• Assembly | |
| **Benefits/Evaluation Categories** | *Levels of Impact* |
| **Safety:**<br>▪ CCTV cameras improve response time to hazardous road surface conditions | Moderate (1) |
| **Mobility:**<br>▪ Expedited incident detection and response reduces congestion/delay associated with road surface conditions | Moderate (1) |
| **Productivity & Efficiency:**<br>▪ TMC operators and maintenance staff can survey traffic and roadway conditions using CCTV cameras.<br>▪ Traffic sensors allow for the trafficcounts and congestion reporting reducing overall operating costs | Moderate (1) |
| **Regional Connectivity & Multi-modal coordination:**<br>▪ Enhances regional communications infrastructure.<br>▪ Additional CCTV cameras provide regional coverage.<br>▪ Traffic detection provides managers a look at what is happening along the roadway system. | Significant (2) |
| **Energy & Environment:**<br>▪ Allows commuter to make informed decisions regarding appropriate commute route saving time and natural resources | Limited (0) |
| **Customer Satisfaction:**<br>▪ Camera images and arterial flow maps will be connected to the SRTMC allowing travelers to view road conditions. | Moderate (1) |

# APPENDIX C

## EASTERN WASHINGTON CENTER-TO-CENTER (C2C) PLAN: CONCEPT OF OPERATIONS

Washington State Department of Transportation

# EASTERN WASHINGTON CENTER-TO-CENTER PLAN: CONCEPT OF OPERATIONS

FINAL REPORT

OCTOBER 2006

IBI GROUP

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# 1. INTRODUCTION

The Washington State Department of Transportation (WSDOT) has organized its statewide operations into six regions – Northwest, Olympic, Southwest, North Central, South Central, and Eastern. Each Region has its own Traffic Management Center (TMC) where Intelligent Transportation System (ITS) field devices may be centrally monitored and controlled.

As each TMC is the regional "hub" for WSDOT's statewide traveler information and incident reporting network, their availability is vital to providing timely, accurate information to the public. However, the scope of operations at each TMC varies widely with the needs of each Region, and the TMCs currently have varying hours of operation, technical capabilities, and staffing levels. In addition, the TMCs operate different control and reporting systems, based upon the ITS deployed in that Region. Currently, the regional TMCs send data and images to WSDOT Headquarters in Olympia for dissemination over the Department's website and 511system. This is primarily a one-way connection from the regions to Headquarters.

Although there is some limited device control sharing that occurs between the TMCs (particularly in the North Central and South Central region), there is not a two-way linking of the regional TMCs to each other or to WSDOT headquarters in Olympia. These types of connections are generally called "C2C" for center-to-center connections. WSDOT's vision for C2C in Eastern Washington is to implement a network of TMCs that are fully interoperable with each other, providing inter-jurisdictional control of ITS devices, and the ability to "cover" for another TMC during off-hours or as backup during periods of multiple or major events. It is expected that C2C would improve the efficiency of operations at all WSDOT TMCs and would reduce the need for 24/7 staffing.

The development of the Eastern Washington ITS Implementation Plan (covering the Eastern, North Central and South Central regions) identified the need for C2C between these three regions. The three Eastern Washington regions border each other, and are largely rural, as compared to the Western regions. The need for C2C in Eastern Washington parallels the larger need for C2C on a statewide basis. The purpose of this project is to identify alternatives and a path to C2C in Eastern Washington that complements the eventual implementation statewide.

Today, the three Eastern Washington TMCs have varying degrees of traffic management capabilities, both in terms of their operational resources and the systems available to support these operations. For example, the Spokane Regional Traffic Management Center (SRTMC) in Eastern Region has deployed i2TMS traffic management system software that allows them to integrate the management of some control features through one interface. The North Central TMC (NCR TMC) and South Central TMC (SCR TMC) do not yet have this capability, and operate all of their devices from a wide range of vendor-supplied software interfaces.

The amount of time required for the TMC operator to develop an individual response for each event, interface with numerous software applications, confirm that the devices have been correctly activated, and coordinate with partner agencies such as the Washington State Patrol (WSP), results in difficulty ensuring that all incidents are reported and responded to in a timely manner (or at all). As more ITS devices are deployed and as extensive construction projects along I-90 through Eastern Washington are planned, the need for a means of efficiently and effectively responding to incidents, including providing effective "regional" traffic management and accurate traveler information becomes increasingly important.

## 1.1 Objective of this Report

The objective of this report is to assess the C2C needs reported by the Eastern Washington regions and WSDOT headquarters and provide a Concept of Operations for how C2C could be implemented. This Concept of Operations documents the baseline needs as reported by the regions, identifies the key functionality that a new C2C approach would need to provide, analyzes configuration alternatives for a new C2C approach, and identifies potential challenges. A "Day in the Life" at a WSDOT TMC, before and after C2C, illustrates how day-to-day operations at the TMCs could benefit from the implementation of a one-stop incident response system that would enable the regions to manage events, rather than devices.

## 1.2 A Day in the Life at a WSDOT TMC

The following is an illustration of a hypothetical work shift in the SCR TMC. It is intended to illustrate the operational processes that a TMC operator may experience through the course of a typical day at work.

It's a Friday afternoon in the second week of April, and Bob arrives for his shift working as an operator in the control room in the South Central Region of WSDOT (at Union Gap).

It's soon time to gear-up for the afternoon rush, and so the activity level in the TMC increases. After scanning the CCTV displays available, Bob checks the Region's Road Weather Information System (RWIS) Scanweb monitoring software to determine if there are any road condition issues yet. He knows that a storm is forecasted. There is nothing from the RWIS yet, so when he's done, he uses the radio to check-in with the 'Smart Plow' operator to get his impressions of conditions. Having not found any problems, he may coordinate with WSP next door (via the TMC's microwave intercom), or review the current settings for the Highway Advisory Radio (HAR), and four Dynamic Message Sign (DMS) control platforms.

But he's soon interrupted by a call from Washington State Patrol (WSP) drawing his attention to the WSP Computer Aided Dispatch (CAD) display in the TMC. There has been a major collision on I-90 at Vantage that will impact travel in both directions. Bob makes note of the details and gets to work. He'll need to do the following:

- Work with WSP to get clearance vehicles dispatched.
- Determine the best detour for the rerouted traffic. There is likely a paper book used to store ideas on specific scenarios – this may or may not have suggestions for him, depending on the event.
- Identify what devices can be used to advise motorists of the incident.
- Plan appropriate responses to set on each of these devices that are appropriate for the devices location (relative to the incident) and its technical functionality (e.g., not all DMS can display the same length or type of message).
- Use each of the four DMS control software applications to set messages on the DMS.
- Set the appropriate HARs to advise of the incident and the detour route.
- Determine if an appropriate traffic control signal plan is available to deal with this type of road closure. By this time, the signal control technician has left for the day, and so Bob will identify and implement a preset plan if one is available.
- Update the Conditions Acquisition and Reporting System (CARS) system to ensure that a broader range of internal stakeholders is made aware of the incident.

But Bob knows that the standard CARS format does not always generate an appropriate message for deployment over 511. So, Bob scripts a message (appropriate for the incident) and uses an application developed by the SCR TMC to deliver a message directly to 511, bypassing the CARS system.

Later in his shift, when the incident is finally cleared and operations are trending toward normal, Bob will have to go back to each of the devices he set and clear the plan he implemented earlier.

Once he's done and things settle down a bit, Bob receives a fax notification of a planned construction event for early in the coming construction season. In addition to updating the CARS application for the planned event, Bob can tell at a glance that the project is of sufficient scale and duration that he'll need to identify appropriate response plans for the Region's traffic signals, HAR, as well as two or three of their four DMS systems. But now is not the time, because the snow is now coming down, and he needs to get to the storm management issues. When he gets time tomorrow, he will spend time analyzing the planned work, assessing what ITS infrastructure can be used to help manage the event, reviewing a paper log book identifying what is typically done for similar events, and then he will identify the appropriate responses taking into account the location of the equipment, the time and dates of the event, and who needs to be notified. He will then turn to each of the vendor-specific control systems (one for each of the HAR, traffic signal control system, email, and CARS, and four for the various DMS types) and program future responses – if the specific system features this capability. If not, Bob will have to make a note for himself (or whoever is on-shift) to implement his plans when the event 'goes live'.

Being early spring, heavy snow isn't out of the question, and it's now coming down heavily through Blewett Pass. The NCR TMC would normally take care of pass management, but their overnight operations just shut down for the season the previous week, so it is up to the SCR TMC to help out. Bob will have to go through most of the same processes he went through for the earlier incident. Each of his advisory systems will need to be set in a similar manner. However, given his current additional responsibilities for the NCR TMC, Bob will have to make incident management plans, and then proceed to use PCAnywhere to gain access to the NCR TMC's systems and set their devices as well. And as with the earlier incident, he'll need to return to each device's control software at the SCR and NCR TMCs to clear his plans once the event is finished.

Before he leaves his shift, Bob writes an email to NCR TMC providing details concerning the various actions he took through the night with the pass equipment.

# 2. C2C NEEDS ANALYSIS

The first task in developing the C2C Concept of Operations was meeting with stakeholders in the North Central, South Central and Eastern Regions to identify the needs that the Concept of Operations should address. In discussing day-to-day operations with TMC staff, it was noted that a number of steps must be followed for the TMC to respond to an incident. Upon notification of an event, the TMC must:

- Manually develop multiple responses (one for each type of field device) that are appropriate for the circumstances of an event.
- Control the various ITS infrastructure devices used to manage the event.
- Communicate with operational partners (e.g., WSP, EOC, other TMCs, etc.) in the management of an event.
- Disseminate traveler information to the public.

The concern with the current process is that each type of ITS device is under the control of a separate system, requiring the operator to enter commands via several different software control systems. A major incident requires the manual control of up to five control applications, and close coordination with WSP, the media, and other WSDOT personnel.

The time and effort required to develop and implement an incident response for all devices can take too long to be an effective means of managing minor events, resulting in the event being cleared in less time than a response can be implemented. This perceived limited benefit to implementing a response sometimes results in events that are not responded to or logged properly.

## 2.1 WSDOT Headquarters

### 2.1.1 SUMMARY OF CURRENT OPERATIONS

WSDOT Headquarters updates and maintains the Conditions Acquisition and Reporting System (CARS) application and Statewide ATIS. The Statewide ATIS consists of two primary components:

- **WSDOT Traveler Information Website**: WSDOT's statewide traveler information website is an excellent resource that provides CCTV camera images, construction notices, incidents, weather, ferry wait times, weather conditions, and a traffic flow map for all parts of the state. The weather information is provided via a central application that posts weather station data collected from RWIS sites across the state.

- **511 Traveler Information Telephone System**: 511 for traveler information is available statewide via cellular phones and land lines. Much of the real-time information that is available over the website is also available via 511, including ferry wait times, incidents and road closures.

Through these ATIS systems, congestion, construction, incidents, and other advisory information provided to travelers. Construction and incident information are entered at the regional level by TMC operators using the CARS web-based application. CARS interfaces with the ATIS to compile and post these conditions reports from the TMC to the website and 511.

The CARS application uses drop-down menus to "compose" each event message in a standardized format. Additionally, CARS supports free text event entry, which allows TMC Operators to create customized event messages.

In addition, WSDOT and WSP have implemented a data-sharing link that allows incident information entered into the WSP CAD database to be automatically submitted to CARS, where TMC and maintenance personnel can access it. The CAD data is "scrubbed" to remove any sensitive information before it is sent from WSP and posted to CARS. This data sharing agreement[1] has been implemented statewide.

WSDOT is currently implementing a statewide HAR network that will allow each regional TMC to have centralized regional access to their HAR stations. In some instances, upgrades to the HARs (i.e., the on-street devices) are required to make them compatible with the new system. Therefore, in some instances, regions are using two HAR control systems (old and new).

[1] A Joint Operations Policy Statement (JOPS) identifies data sharing between WSDOT and WSP (http://www.wsdot.wa.gov/incidentresponse/JOPS.pdf)

### 2.1.2 FUTURE C2C INITIATIVES

Although some systems are integrated statewide, (e.g., HARS, RWIS, CARS, 511) other key systems have not been integrated for information sharing, including CCTV, DMS and transportation data (such as traffic volumes and signal timing plans). The current focus is on moving towards a common platform for "data". WSDOT is seeking a statewide data system for the purposes of conditions tracking, planning and performance measures. The preference is for a web-based system, and Headquarters plans to start working with the regions to document requirements and prepare for migrating to a new system. There are several existing off-the-shelf and customized agency solutions that could provide the baseline design for a new application.

SIT STAT (Situation Status) will enable regions to enter items of “regional significance” into customizable forms that can interface with CARS, potentially eliminating the need for some dual entry.

### 2.1.3 CORRESPONDING NEEDS

WSDOT has identified the following needs for future statewide center-to-center operations:

- **Traveler Information**: The limited number of cross-mountain range connections (e.g., I-90, Hwy 2, Hwy 12) results in limited traffic capacity, and few detour alternatives – particularly when there are temporary blockages due to rockslides, snow-blocked passes, etc. This limited capacity affects not just Eastern Washington’s access to the west, but travel to and from Idaho and Canada. Providing information on closures and restriction to travelers pre-trip and en-route is critical. The Regional TMCs are the best and most relied-upon sources of this information. Improvements are needed in regards to timeliness, accuracy, and completeness, in order to ensure the integrity of the information that is provided to the public. In addition, although WSDOT provides frequently updated still camera images online from their traffic cameras deployed across the state, video streaming would provide travelers with a better idea of conditions.

- **Emergency Management**: Independent of the desire to have the TMCs be mutually supportive, WSDOT is seeking a means of providing over-arching emergency management capabilities. With the development of SIT STAT (described above), WSDOT has emphasized the need to determine agency-wide processes for handing emergencies. Some of the questions that need to be answered include:
  - Is there to be central command structure in statewide emergencies?
  - What sorts of circumstances will it cover?
  - What are the current resources available (including infrastructure, personnel, and support from other agencies)?
  - What are the specific responsibilities of each agency, region, and position?
  - How is command handed-off?
  - What are the system requirements of SIT STAT to support these functions?

- **Standard Operating Procedures**: WSDOT is in the process of developing standard operating procedures for the regional TMCs. These will provide the framework for how operators respond to events of regional significance (including notification of the incident and the type of response to be implemented). These procedures will also define the necessary level of impact before a regional response is required.

- **Performance Measures**: WSDOT is seeking to define performance measures for the TMCs - both in terms of center efficiency as well as on-street traffic impact of the center. These performance measures would indicate the outcome of operations, and provide an indication of the positive impact of the TMCs on traffic flow.

- **ITS Device Density**: All routes of regional significance should be equipped with ITS infrastructure, to the extent that the TMC can maintain a general understanding of the current conditions on each route. The number, type of equipment, and capability of field infrastructure should be adequate to meet the above-noted strategic needs of WSDOT statewide, as well as meet the individual TMC's traffic management needs.

The following sections describe region-specific existing operations, planned future C2C initiatives, and related needs, as identified during the stakeholder meetings.

## 2.2 Eastern Region

### 2.2.1 SUMMARY OF CURRENT OPERATIONS

The WSDOT Eastern Region operates the Spokane Regional Traffic Management Center (SRTMC). A regional committee that includes WSDOT, Spokane Regional Transportation Council (SRTC), the City of Spokane, City of Spokane Valley, Spokane County and the Spokane Transit Authority (STA) oversees the SRTMC. The SRTMC is staffed 24/7, and has nine staff members employed there.

The following types of devices are controlled at the SRTMC:

- Thirty-one CCTV cameras, WSDOT also has additional CCTV camera sites under construction and in the design phase.
- Six DMS. One of these is controlled through the i2TMS software, the other five use dial-up communications and are controlled using 3M software.
- Nine Remote Traffic Microwave Sensor (RTMS) vehicle detection sites along I-90 that are controlled through the i2TMS system, with five more under construction and eight more in the design phase.
- Five HARs, three fixed and two portable.
- RWIS stations with snapshot camera images available via the SSI Scanweb application.

WSDOT Signal Tech controls the signals, not SRTMC, although TMC staff can implement pre-determined event response plans when necessary.

### 2.2.2 FUTURE C2C INITIATIVES

In the future, the Eastern Region would like to establish a C2C link with the Idaho Transportation District (ITD) for event management, traffic flow monitoring, and planned events. Additionally, a coordinated 511 system between the two states would be desirable.

### 2.2.3 CORRESPONDING NEEDS

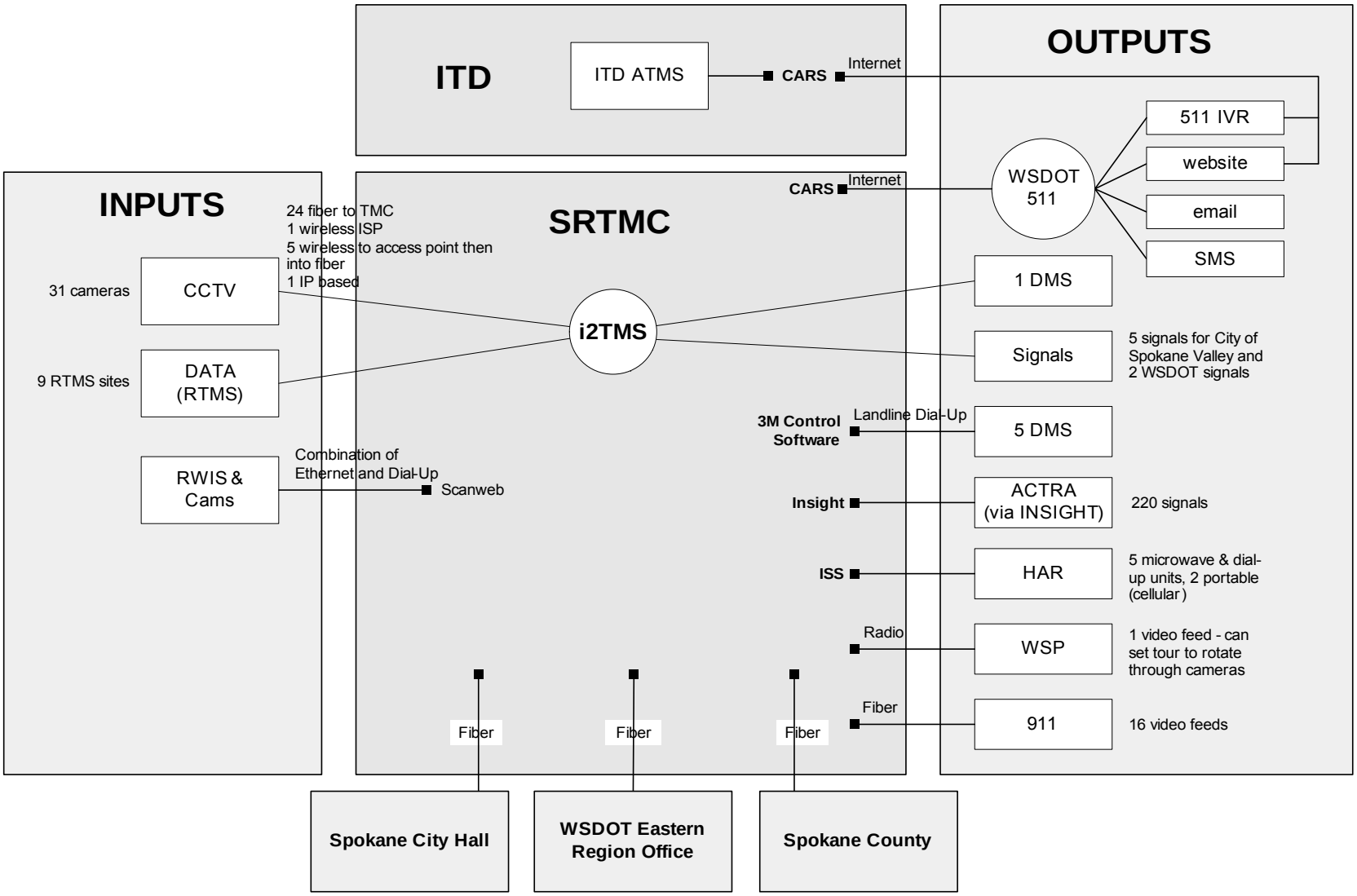
The Eastern Region has expressed a need for an incident response management tool that could implement pre-determined event response plans to help the TMC to respond to traffic events in a timely and efficient manner. The Region is planning to add a new staff member to develop specific

signal timing plans for incident response. The current CARS system cannot recommend or implement incident response plans, it can only serve as a reporting tool.

There is also a need to provide border traveler information, and weight restriction information to commercial vehicles.

A diagram of internal and third party system connectivity at the SRTMC is provided in Exhibit 2.1.

**Exhibit 2.1: Eastern Region (Spokane) TMC Current Systems Layout**



## 2.3 North Central Region

### 2.3.1 SUMMARY OF CURRENT OPERATIONS

The North Central Region TMC in Wenatchee controls the following ITS devices:

- Twenty-five RWIS sites, controlled via the Scanweb application. The RWIS require ongoing operator monitoring to assess conditions and determine when potentially hazardous conditions occur.
- Twenty-seven CCTV traffic cameras, of which, seven are pan-tilt-zoom (PTZ) with control software that allows for different user permissions and level of priority to be assigned to each camera.
- Eight VSLS, controlled via Daktronics' Vanguard control software.
- Ten Variable Message Signs (VMS), including five Daktronics and five American Electronics, both of which are controlled by separate software applications.
- Eight HAR sites, two controlled by HIS and six by ISS.

A WSDOT signal technician, not the TMC operator, controls the Region's traffic signals.

The NCR has a fiber link to the WSP office located across the street, but there is no information or control sharing in place at this time, besides the existing CAD/CARS interface. Communications with maintenance crews is via radio, and information from the local 911 dispatch is provided "secondhand" via the State Patrol.

### 2.3.2 FUTURE C2C INITIATIVES

Future C2C initiatives would include the activation of the fiber link with WSP for shared camera control, with access levels assigned for each camera. For example, cameras on the Vantage Bridge are intended for security issues primarily, so WSP would have priority control. The TMC is also interested in sharing camera control with Rivercom 911 dispatch.

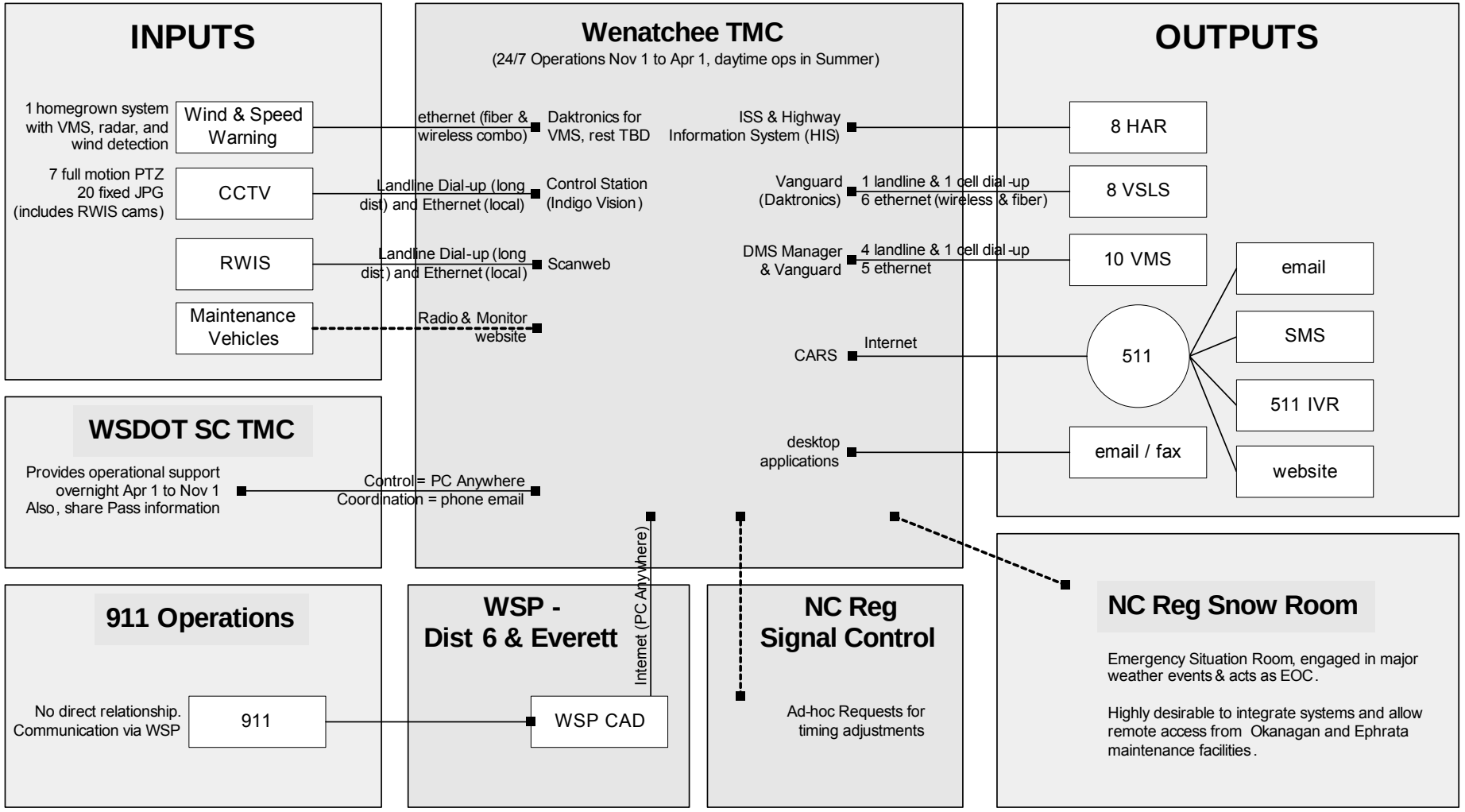
### 2.3.3 CORRESPONDING NEEDS

The NCR experiences difficulties inherent in operating multiple, proprietary control systems. Observation suggests that the manual process of monitoring the network, developing response plans, and entering data in multiple systems is time consuming. Further, the process of duplicate data entry, and potentially by different personnel, introduces a potential for inconsistency. Separate processes are used to establish messages to be delivered via HAR, DMS, and the information provided to other TMCs and WSP.

The North Central Region shares in the general consensus that the CARS user interface is inefficient for quickly and accurately entering incident information. One concern is that technical issues with the 511 interface results in grammatically awkward or incorrect messages. In addition, the application has several issues relating to performance and user-friendliness that result in its under-utilization.

A diagram of internal and third party system connectivity at the NCR TMC is provided in Exhibit 2.2.

**Exhibit 2.2: North Central Region TMC Current Systems Layout**



## 2.4 South Central Region

### 2.4.1 SUMMARY OF CURRENT OPERATIONS

The SCR TMC is located in Union Gap, and is co-located with the Washington State Patrol. The TMC operates the following ITS devices:

- A Portable workzone station will soon be available and will be used on an as-needed basis. The station will include a variable message sign, radar unit and CCTV camera, with separate software for each.
- DMS, with four different proprietary control software applications: SCMS, DMSman, Daktronics, and Motorola's Mosscad. The Variable Speed Limit Sign (VSLS) uses MIST. The DMS are primarily used for traffic information. Amber Alerts are posted to the DMS at the request of the WSP.
- HARs controlled through the Highway Information System (HIS) statewide system.
- Full motion video PTZ CCTV cameras and fixed cameras associated with RWIS stations. The RWIS cameras produce JPG snap shots every ten minutes. The JPG images are transferred automatically to WSDOT HQ over FTP.
- The RWIS are controlled by the Scanweb application, and the collected data provided to the statewide RWIS system, using combination of Environmental Sensors (ESS) (i.e., NTCIP) and non-ESS protocols. The Region is currently testing an alarm feature and decision-support logic.
- One Incident Response Truck (IRT) that is dispatched by the WSP. The IRT is equipped with both WSDOT and WSP radios.
- The SCR is interested in implementing centrally controlled freeway gates that could be used to control lane access or close off roadways in hazardous conditions.
- The South Central Region is considering the use of i2TMS, but it is not yet clear whether i2TMS can provide support for all the devices required (specifically, RWIS and HAR).

A WSDOT signal technician, not the TMC operator, controls the Region's traffic signals. The SCR is looking at allowing TMC staff to select preset timing plans when prescribed traffic or road closure conditions occur.

The SCR TMC also provides support for two other traffic management centers – located at the Hyak maintenance office (on I-90, near Snoqualmie Pass), and the North Central Region TMC. The ITS device control capabilities at Hyak are a duplication of those at Union Gap, but without the connection to the WSP CAD system. The two facilities have a close working relationship, and both may act as a backup for the other.

The SCR TMC also supports the NCR TMC operations during its non-operating hours (after hours and weekends, from April through the end of October). The SCR operates NCR devices by accessing the individual control applications through PCAnywhere. The SCR also has access and secondary control of the NCR cameras via the regional video server and the Internet. On-going operational coordination between these two TMCs is via telephone and radio. While the North Central and South Central TMCs coordinate on a regular basis, they have relatively little day-to-day operational contact with the Spokane Region TMC.

For local traveler information, the SCR operates three kiosks located at highway rest areas. Two of the kiosks use an automated application that collects data from multiple WSDOT sites (camera

images, weather, etc.) and posts the data to customized web pages. The third kiosk loops through a PowerPoint presentation of information. To update this kiosk, an operator must manually load a CD with a new file. The Region does not currently share traveler information or camera access with the local media.

### 2.4.2 FUTURE C2C INITIATIVES

In the future, the SCR is looking towards options for implementing C2C communications with emergency management agencies. The SCR TMC is interested in building an information sharing relationship with the Benton County Emergency Services (BCES), to include full-motion camera sharing and the installation of additional cameras near the Hanford nuclear site. The SCR is also interested in sharing information with 911 dispatch – currently, all coordination is via WSP.

Regarding the relationship with WSP, the SCR expects that video sharing will become a greater priority once full-motion video can be provided. Formalized agreements for command and control priorities, and use of the video taped images, will be required.

The SCR TMC is also interested in accessing weather condition data collected by “Smart” maintenance vehicles. These vehicles (two snowplows and two supervisor vehicles) are equipped with an Automatic Vehicle Location (AVL) system and road conditions sensors, which collect data such as roadway temperature, air temperature, friction, etc. Today, this information is relayed via radio, and the SCR TMC would like to have this information sent directly to the TMC in real time.

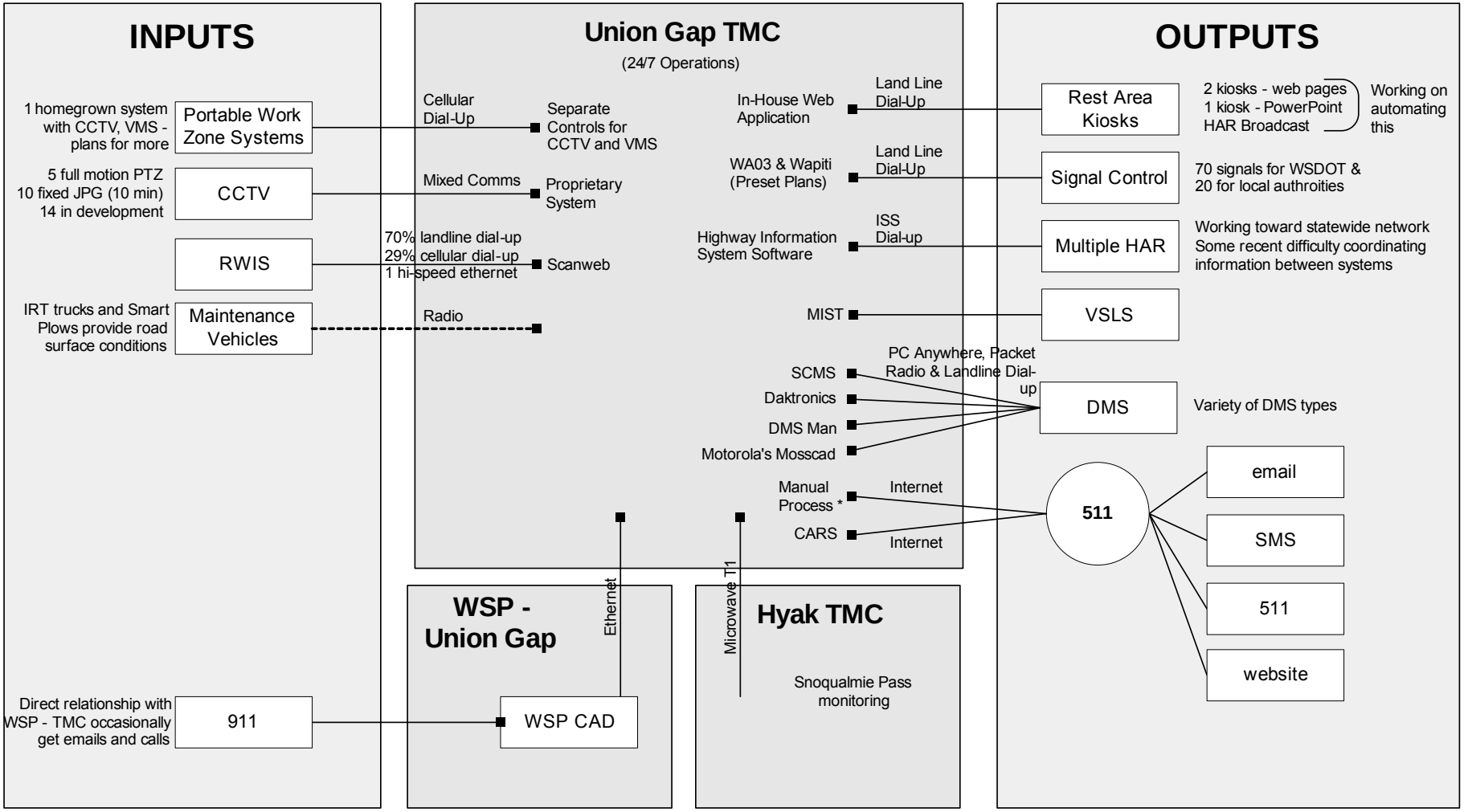
### 2.4.3 CORRESPONDING NEEDS

The SCR shares the concern of the other regions in regards to the difficulties inherent in operating multiple, proprietary control systems. Observation suggests that the manual process of monitoring the network, developing response plans, and entering data in multiple systems is very time consuming. Further, the process of duplicate data entry, and potentially by different personnel, introduces a potential for inconsistency. Separate processes are used to establish messages to be delivered via HAR, Kiosks, DMS, and the information provided to other TMCs and WSP. The inconsistencies that occur between the CARS interface to 511 have resulted in the SCR establishing a means of circumventing CARS and posting messages directly to 511.

The SCR TMC operators emphasized that should a new integrated central system be implemented, it is essential that the operator have a means of confirming that the response plan has been properly implemented, such that the active state of all affected devices can be readily confirmed.

A diagram of internal and third party system connectivity at the SCR TMC is provided in Exhibit 2.3.

**Exhibit 2.3: South-Central Region TMC Current Systems Layout**



## 2.5 Summary of Needs

The following table summarizes the information sharing needs identified by three Eastern Washington regions, in regards to the types of device control and real-time data that need to be exchanged between regions.

**Exhibit 2.4: Summary of Needs**

LEGEND: ○ – No Needs
▲ – Current Needs
● – Future Needs
Example: ○ / ● = Today / Future

| | NEEDS | | |
|---|---|---|---|
| **INFORMATION FROM** | **Eastern** | **North Central** | **South Central** |
| **Eastern** | | | |
| CCTV | --- | ▲ / ● | ▲ / ● |
| RWIS | --- | ▲ / ● | ▲ / ● |
| RTMS | --- | ○ / ● | ○ / ● |
| Signal Information | --- | ○ / ● | ○ / ● |
| **North Central** | | | |
| CCTV | ▲ / ● | --- | ▲ / ● |
| RWIS | ▲ / ● | --- | ▲ / ● |
| Maintenance Vehicle Info | ○ / ● | --- | ○ / ● |
| Wind & Speed Warning | ○ / ● | --- | ○ / ● |
| Signal Information | ○ / ● | --- | ○ / ● |
| **South Central** | | | |
| CCTV | ▲ / ● | ▲ / ● | --- |
| RWIS | ▲ / ● | ▲ / ● | --- |
| Maintenance Vehicle Info | ○ / ● | ○ / ● | --- |
| **South Central** | | | |
| Portable Work Zone | ○ / ● | ○ / ● | --- |

| | NEEDS | | |
|---|---|---|---|
| **INFORMATION FROM** | **Eastern** | **North Central** | **South Central** |
| Signal Information | ○ / ● | ○ / ● | --- |
| **CONTROL FROM** | **Eastern** | **North Central** | **South Central** |
| **Eastern** | | | |
| CCTV | --- | ○ / ● | ○ / ● |
| VMS | --- | ○ / ● | ○ / ● |
| HAR | --- | ○ / ● | ○ / ● |
| CARS | --- | ○ / ● | ○ / ● |
| Traffic Signals | --- | ○ / ● | ○ / ● |
| **North Central** | | | |
| CCTV | ○ / ● | --- | ▲ / ● |
| VMS | ○ / ● | --- | ▲ / ● |
| HAR | ○ / ● | --- | ▲ / ● |
| CARS | ○ / ● | --- | ▲ / ● |
| Traffic Signals | ○ / ● | --- | ▲ / ● |
| **South Central** | | | |
| CCTV | ○ / ● | ○ / ● | --- |
| VMS | ○ / ● | ○ / ● | --- |
| HAR | ○ / ● | ○ / ● | --- |
| CARS | ○ / ● | ○ / ● | --- |
| Traffic Signals | ○ / ● | ○ / ● | --- |

# 3. CONCEPT OF OPERATIONS

The proposed center-to-center operation will allow the various Regional TMCs and headquarters to exchange both status information and command and control information. Status information describes the current status of the various (or specific) ITS devices in the field, or within a Regional TMC. Command and control information refers to the sending of data to another TMC to remotely operate ITS devices in the field, or within the Regional TMC.

The following sections summarize the status and control information needs and functionalities identified in Section 2.

## 3.1 Proposed Functionality

### 3.1.1 OPERATIONS

The National ITS Architecture Market Packages provide functional requirements for ITS systems. A number of relevant Market Packages were identified that suit the stated operational requirements for the WSDOT C2C. The needs identified in Section 2 may be translated as functional requirements as follows:

**Operational Management**

- From any one TMC, provide emergency or planned/scheduled backup to another TMC.
- Provide full monitoring and control capabilities during backup operations.
- Inform internal WSDOT personnel concerning status of on-going events, proposed plans, etc.
- Contact specific personnel whose expertise or level of authority is required to manage specific situations.
- Provide system and operational resiliency to ensure business continuity.

**Traffic Management**

*Network Surveillance (Market Package ATMS01)*

- Use systems and operational partnerships to monitor road network for planned and unplanned events affecting travel.
- Track and monitor status of planned work.
- Use systems and operational partnerships to provide confirmation of events.
- Coordinate with field (typically road operations / maintenance) personnel to determine conditions.
- Monitor system conditions to ensure information delivery is timely and accurate.
- Regional users will be able to perform these activities within their own Region, and within the other Eastern Washington Regions.

*Surface Street Control (Market Package ATMS03)*

- Control traffic control signals to optimize flow on network.
- Use control software to facilitate detoured traffic flow.

*Freeway Control (Market Package ATMS04)*

- Monitor network conditions by viewing information from all ITS field devices (e.g., CCTV, RWIS, etc.).
- Develop response plans appropriate for the event.

- Control ITS field devices, including DMS, HAR, gate systems, VSLS, etc. to implement response plans.
- Coordinate with field personnel (typically WSP and other emergency personnel) to assist in incident clearance.

*Traffic Information Dissemination (Market Package ATMS06)*

Provide road network conditions to pre-trip and on-road travelers through various technologies associated with traveler information dissemination. These include interactive voice response (IRV), VMS, HAR, etc.

*Regional Traffic Management (Market Package ATMS07)*

- Share network status information and device control amongst Regional TMCs
- Each TMC should be able to remotely access other Regional TMCs for the purposes of providing emergency and time-of-day operational backup. This includes full operational capabilities (monitoring and control) over all devices employed within each of the control centers, per Section 2.
- Act as a resource to emergency management responders in the management of major incidents and emergencies.
- Coordinate with adjacent states or Provinces (i.e., Oregon, Idaho, and British Columbia), in the management of major incidents and emergencies.

*Traffic Incident Management System (Market Package ATMS08)*

- Collect, coordinate and analyze information from various field devices and operating partners to assess the impacts of planned (e.g., construction and maintenance) and unplanned events.
- Integration with operational partners systems to automate the delivery of this information.
- Work with a variety of operational stakeholders to implement response plans that mitigate the impacts of unplanned events.

*Virtual TMC and Smart Probe Data (Market Package ATMS12)*

- Distributed data entry to facilitate entry of surveillance data over a potentially broad geographic area involving multiple road operators/authorities.
- Use of in-vehicle systems to communicate road and weather conditions back to the TMC in support of monitoring rural road network conditions.

*Roadway Closure Management (Market Package ATMS21)*

- Coordinate road and lane closures related to construction, weather (particularly mountain passes), special events, major incidents, etc.
- Coordinate and support evacuation operations in the event of an area-wide event.

**Archived Data Management**

- Maintain a record of monitoring and response activities.

- The type of data stored, retention periods, level of aggregation are all user-configurable.
- Records can be stored locally or centrally.
- Records are available to each TMC for analysis, planning and reporting purposes.
- Some records may be made available to the public through automated means (including websites).

**Traveler Information**

*Broadcast Traveler Information (Market Package ATIS1)*

- Provide travel information concerning planned and unplanned events that allow travelers to make informed decisions concerning route, time of travel and mode of travel.
- Regional users will be able to disseminate travel information in other Regions, as well as statewide. This includes the ability to choose specific devices in other Regions to use for distribution.
- Regional TMCs support all WSDOT ATIS initiatives by ensuring the timeliness, accuracy, completeness, and precision of all traveler information.

*Interactive Traveler Information (Market Package ATIS2)*

Provide personalized traveler information services accessed via subscription-based user profiles.

**Commercial Vehicle Operations**

- Provide information concerning conditions affecting movement of goods – including oversized, overweight, HAZMAT, etc.
- Receive notifications affecting potential routes.
- Receive information regarding road restrictions.
- Facilitate commercial vehicle and other traveler needs at border crossing locations.

**Maintenance and Construction Vehicle Maintenance**

- Track location and status of maintenance and construction vehicles.
- Monitor status of material applications.
- Monitor condition of sensors related to road and weather conditions.
- Provide work-zone monitoring and safety management.

### 3.1.2 SYSTEMS

Based on the functional requirements noted above, and the stated needs of the Regional TMCs, there is a need to move away from the existing operating procedures that require manual monitoring of multiple data collection systems, and the manual control of multiple ITS device control systems. The existing process requires that TMC operators manipulate the control software for many devices for each event response (as described in Section 1.2). This takes a significant amount of time, and slows both the response time and the time required to deliver important traveler information.

The recommended approach to resolving these issues is to support operations within the TMC environment by implementing a fully functioning Advanced Traffic Management System (ATMS). Such a system would integrate the monitoring functions currently undertaken by the TMCs, and use logic algorithms to interpret this data and automatically generate spatially and temporally appropriate response plans for each of the potential ITS response devices. Conceptually, this will shift the focus from 'managing multiple ITS devices' to 'managing events'.

If operated as a 'Virtual TMC', such an ATMS deployment would fulfill the WSDOT's C2C requirements as well by providing full redundancy of monitoring and control functionality between WSDOT regional TMCs.

Exhibit 3.1 illustrates the many ways in which the implementation of an ATMS would address the stated needs amongst the Eastern Washington TMC operations and WSDOT headquarters.

**Exhibit 3.1 – Relationship of ATMS Features to WSDOT Functional Requirements**

| FUNCTIONAL REQUIREMENT AREA | EXISTING OPERATIONAL CONCERNS | HOW AN ATMS ADDRESSES THIS ISSUE |
|---|---|---|
| **Operational Management** | | |
| *Traveler Information* | WSDOT HQ relies on Regional TMCs use of CARS to populate the 511 system. There is evidence to suggest that the CARS system is not consistently populated with information due to difficulty of use and proliferation of response systems. | ATMS provide a simple GUI that promotes *ease of use* in data capture, and integration of systems so that data only needs to be entered *once*. This would ensure the simplification of data capture and management of all pertinent events. |
| | Lack of automated process relies on conditions, relationships, and experience of operator to ensure appropriate internal personnel and stakeholders are notified. | Systems can be configured to provide device-specific scripts as events are declared. |
| *Emergency Management* | WSDOT HQ wishes to establish "inter-operable and cross-jurisdictional control" amongst the TMCs in support of traffic management. | Operated as a virtual TMC, an ATMS would fulfill both these mandates. It would:<br>• Provide full operational (monitoring and control) capabilities from any desktop in the other TMCs and at WSDOT HQ, providing for full redundancy.<br>• Act as the primary input to 511, primary interface with state CAD, and provide statewide alerts and management capabilities unavailable in existing state systems. |
| | Use of PCAnywhere for control does not provide for emergency backup and business continuity. | Operated as a virtual TMC, an ATMS would provide full operational (monitoring and control) capabilities from any desktop in the other TMCs and at WSDOT HQ, providing for full redundancy. It would not be reliant upon the affected TMC control systems being operational. |

| FUNCTIONAL REQUIREMENT AREA | EXISTING OPERATIONAL CONCERNS | HOW AN ATMS ADDRESSES THIS ISSUE |
|---|---|---|
| *Standard Operating Procedures (SOP)* | Current systems and operating procedures require an SOP to manage the state road network in the event of emergencies and large events. | Operated as a virtual TMC, an ATMS would assist in standardizing the inputs, processing of data, and the response plans for a variety of circumstances. It would also provide flexibility to the SOP in terms of 'who does what'. |
| *Performance Measurement* | The current lack of integration and logging of performance amongst the various systems deployed makes performance management, and performance impact assessment, difficult to achieve. | ATMS use form-based data entry that promote input consistency between the TMC (and other) users despite varying degrees of training and experience with the system. This provides for consistent data collection. ATMS may typically be configured to generate statistical reports concerning various measures of effectiveness. |
| **Traffic Management** | | |
| *Network Surveillance* | Currently, need to manually monitor multiple systems to assess where conditions warrant action. | ATMS typically incorporate alarms that are tripped when ITS surveillance devices (e.g., Scanweb for RWIS, freeway AID, wind detection, cameras, etc.) reach user-defined thresholds. This frees the Operator's time for other duties. |
| | There is no provision for wide monitoring of systems (only regional at this time). | Allows any TMC to enter data related to any Region. Where desired, access to specific data entry points may be restricted to specific geographic areas, or personnel. The system will incorporate secure log-in access, and multiple levels of security access so that various data-entry users will have access only to the areas of their concern. In this way, despite being Internet-based, the system will be tamper-proof. |

| FUNCTIONAL REQUIREMENT AREA | EXISTING OPERATIONAL CONCERNS | HOW AN ATMS ADDRESSES THIS ISSUE |
|---|---|---|
| *Network Surveillance cont'd* | Current operations require the multiple entry of information into several control software applications. | ATMS operations focus on device control integration, and thus data only needs to be entered *once*. This would ensure the simultaneous (and thus timely) entry of data into each of control systems. This significantly reduces the response time. |
| *Surface Street Control* | Adaptive and responsive control is typically not available. Therefore, there is a need to be able to select pre-prepared traffic signal control plans and implement these plans in the event of an incident. | ATMS systems may be configured to provide an input stream to (potentially) multiple signal systems to trigger such a plan change. |
| *Freeway Control* | For each event, operators must generate response plans (appropriate for that event) for each of the ITS devices to be used for the response. This takes a tremendous amount of time, thereby delaying the response time and time to deliver traveler information. | ATMS allow Operators to select response devices appropriate for the event, and the system will generate responses (e.g., VMS messages, IVR voice messages, HAR, etc.) that are appropriate for the event, appropriate for the location of the device, and configured for the device type and capabilities. Because the response logic is built-in to the system, the operator does not need to develop (or look up) response plans. Nor do they need to enter the plans into each control software. This is *the central benefit* to ATMS systems. The benefits of this significant time savings include:<br>• Greatly improved time between incident detection and response.<br>• Allows the Operator to better manage the event, observe updates and coordinate with on-site and headquarters personnel.<br>• Removes the existing disincentive to enter events, and allow them to capture more events. |

| FUNCTIONAL REQUIREMENT AREA | EXISTING OPERATIONAL CONCERNS | HOW AN ATMS ADDRESSES THIS ISSUE |
|---|---|---|
| *Traffic Information Dissemination* | Some recent system automation experience led to lack of synchronization between devices. Bad experience and has created some distrust of automated procedures. The ability to have reliable information is paramount. | Notwithstanding the concerns experienced, the best means of achieving consistency in message delivery is the automation of the delivery process. Operated as a virtual TMC, an ATMS has the ability to disseminate a clear and consistent message statewide across multiple delivery devices. |
| *Virtual TMC* | The predominantly rural nature of the eastern Washington State area necessitates that the traffic management task is a distributed responsibility shared amongst the various TMCs, the maintenance groups, WSP and other stakeholders. | ATMS providing data input routines over web access allow for broad accessibility to the system. This allows many operating partners to contribute to the operation, and thereby improves the timeliness and comprehensiveness of the data captured. |
| *Roadway Closure Management* | The need to better coordinate with Emergency Operations Centers (EOC) was expressed. | C2C interfaces between ATMS and emergency service provider CADs are commonly implemented to allow timely and convenient access to police and EOC event information. Typically this interface allows the EOC to use its own CAD, and the event is automatically transferred to the TMC ATMS and an alarm is set to bring the event to the Operator's attention. Alternatively, EOC may have remote access to the ATMS (with appropriate security levels) in a manner similar to the other TMCs. |
| *Archived Data Management* | WSDOT HQ has identified the need to track performance measurements. | These systems track data entry, data dissemination, and system operational statistics and generate user-configurable performance reports. |

| FUNCTIONAL REQUIREMENT AREA | EXISTING OPERATIONAL CONCERNS | HOW AN ATMS ADDRESSES THIS ISSUE |
|---|---|---|
| **Broadcast and Interactive Traveler Information** | | |
| | Observations of local practices suggest that the manual entry of data greatly increases the time required to disseminate information. | ATMS integrate the message generation and delivery of information onto the traffic management routine. Therefore, in managing the event (i.e., entering the event data, updating the status as-needed, etc.) the appropriate traveler information is disseminated automatically. There is no risk that the Operator will not get an opportunity to send the appropriate messages. |
| | Observations of local practices suggest that the manual entry of data, and potentially by different personnel, introduces inconsistency in provision of traveler information. Separate processes are used to establish messages to be delivered via HAR, Kiosks, DMS, and the information provided to other TMCs and WSP. | ATMS use two strategies that alleviate this concern: form-based data entry, and automated message generation.<br><br>Because the 'manual component' of response generation, and message scripting is automated, there is a higher degree of consistency in information dissemination. |
| | Concerns were expressed about the quality of information sent from CARS to 511. Currently, CARS generates a message based on the user inputs and 511 looks at the CARS SQL database to retrieve the message. The grammar and content of these messages are not always appropriate. The SCTMC has subsequently established a direct automated link with 511 to circumvent CARS. This has introduced the possibility of information inconsistencies between CARS and 511. | Mature ATMS have a higher degree of sophistication in their message development than event logging systems (e.g., CARS). ATMS must integrate the potential responses for multiple device types and account for the differences between text formats for various DMS, and the voice message capabilities of HAR, IVR, etc. In deploying a mature ATMS, there should be no concerns whatsoever in the quality of the messages generated by the system. Further, in such a system, these messages should be highly configurable to ensure that local requirements can be achieved. |

| FUNCTIONAL REQUIREMENT AREA | EXISTING OPERATIONAL CONCERNS | HOW AN ATMS ADDRESSES THIS ISSUE |
|---|---|---|
| **Commercial Vehicle Operations** | | |
| | Commercial operators need specific information related to long-haul routes, road restrictions, weigh facilities, border clearance, parking, etc. | ATMS providing statewide (versus regional) information are ideal for this application. The traffic information combined with other live and 'static' information on licensing, rest and weigh facilities, etc. would be of significant interest and benefit to these stakeholders. |
| **Maintenance and Construction Vehicle Maintenance** | | |
| | The desire to integrate the 'smart trucks' into the SCTMC operating environment was expressed. Currently, these trucks have road and air temperature, and friction sensors. The drivers radio in periodically with reports. | As with other types of remote sensing, the outputs from these sensors may be integrated into the ATMS with appropriate alarm thresholds. This would alleviate the need for the routine phone calls. |

## 3.2 Issues and Challenges

There are no significant technological impediments to implementing systems that suit the stated functional requirements. Rather, the potential constraints may be more institutional in nature. They include the following potential challenges:

- The regions have been working independently, and have invested time, money and effort toward systems to suit their needs. There is a need for a 'cultural change' toward cooperatively developed systems that suit mutual needs and WSDOT HQ objectives.
- The regional TMCs and headquarters have invested in various systems already, and there may be a reluctance to give these up (versus leveraging their existing investment – despite the fact that there may be limited potential to leverage this investment, or the time line may be unacceptable).

## 3.3 Proposed Alternatives

A range of center-to-center architecture solutions is available to WSDOT, representing a range of functionality (and thus compliance with functional requirements), costs and level of deployment of effort.

It should be noted that the premise for each alternative is that:

- An integrated Advanced Traffic Management System (as described in Section 3.1) will be implemented to provide automated system monitoring and response logic to automatically generate response plans for each of the ITS devices employed (including the statewide systems for HAR, DMS and 511).
- Each TMC would participate in the development of an SOP agreement that would be struck to establish a common understanding of operational responsibilities under normal and emergency operating conditions.

Using this as a basis for the minimum requirements for each deployment model alternative, the options include:

1. The 'Do Nothing' option
2. The 'Autonomous Operation' Model
3. The 'Virtual TMC Model (Eastern TMCs Only)'
4. The 'Virtual TMC Model (Statewide)'

The following sections detail the approach, a high-level operational description, and potential risks associated with each of these models.

### 3.3.1 'DO NOTHING' OPTION

***Approach***

The 'Do Nothing' option entails the continued autonomous growth of the various Regional TMC systems. To-date, the Regional offices have been responsible for the development of systems to meet their local needs, with the exception of the statewide traveler information initiatives, such as the deployment of the HAR control software, CARS, etc. In the 'Do Nothing' option, this organic growth would continue, with locally developed solutions meeting (primarily) local needs.

***Operational Description***

In this model, each TMC would:

- Work with WSDOT HQ to define the functionality and framework for regional incident and emergency management, and signal response.
- Continue to manage the local road network from its own TMC.
- Continue to coordinate with other TMC over phone, email, radio, etc.
- Provide operational backup of all functions via use of PCAnywhere.

***Potential Risks***

The potential risks associated with the 'Do Nothing' Option include:

- This option does not adequately meet the needs of WSDOT. Specifically:
  - It does not provide for an over-arching information dissemination capability in the event of an emergency. There would be a continued need to coordinate for local deployment of emergency information amongst each of the local TMCs.
  - It does not provide emergency backup (business continuity) of each TMC. This is because the current use of PCAnywhere for remote emulation relies on the continued operation of the software and all related systems at the local TMC. If it is temporarily, or permanently off-line (e.g., due to natural or man-made disasters), control of its related ITS devices will be lost.
  - It would make the collection of uniform performance measurements difficult and thus compromise the ability to provide uniform reporting across the state and to compare operational environments between Regions.
- Operationally, the use of PCAnywhere has been known to provide inconsistent results, and occasional lapses in availability of control capabilities.
- Would still require manual contact with other TMCs to determine status of road conditions and equipment, and to request the setting of devices.
- There is a potential for inconsistencies between regional responses in the course of an area-wide event.
- More difficult to achieve the broad involvement of area emergency service providers.
- Does not take advantage of the broader base of operational support available within a larger collective of TMCs.
- Does not allow for the simple (and possibly even) automated collection of performance measures.

### 3.3.2 AUTONOMOUS OPERATION MODEL

***Approach***

The 'Autonomous Operation Model' would have the TMCs continue to operate on separate platforms, but share data with each other (and with the rest of the state) through a "publish & subscribe" C2C process. In this instance, specific data flow requirements between each TMC would be identified. Those with specific data needs would 'subscribe' to a data stream provided (or 'published') by another TMC.

***Operational Description***

In this model, each TMC would:

- Coordinate with other TMCs via the new C2C connection. This will provide sight of monitoring equipment status, and allow concurrent control of equipment under the jurisdiction of other TMCs. Appropriate authority levels will be established to ensure the 'home TMC' has control priority over other C2C participants.
- Maintain a set of uniform performance measurements. The need to have uniform data formats for the purposes of mutual control and monitoring will facilitate uniform reporting across the state and allow the operational comparisons between Regions.
- Provide operational backup of all TMC functions via use of the C2C connection.
- Allow for the participation of emergency service providers (e.g., WSP and other EOCs) through connections with their CAD.
- Work with WSDOT HQ to define the functionality and framework for regional incident and emergency management, and signal response.
- Continue to manage the local road network from its own TMC.

***Potential Risks***

The potential risks associated with the 'Autonomous Operation Model' include:

- This option does not adequately meet the needs of WSDOT. Specifically:
  - It does not provide for an over-arching control capability in the event of an emergency. There would be a continued need to coordinate for local deployment of emergency information amongst each of the local TMCs.
  - It does not provide emergency backup (business continuity) of each TMC. While the issues surrounding the use of PCAnywhere would be removed by moving to a true C2C operation, device control is still routed through the 'home TMC'. Therefore, as with remote emulation, if the TMC is temporarily, or permanently off-line (e.g., due to natural or man-made disasters), control of its related ITS devices will be lost.
- There is a potential for inconsistencies between regional responses in the course of an area-wide event.
- Does not take full advantage of the broader base of operational support available within a larger collective of TMCs.

### 3.3.3 VIRTUAL TMC MODEL (EASTERN TMCS ONLY)

***Approach***

The implementation of the 'Virtual TMC Model' would have the TMCs operate on a common 'Eastern Washington platform' that would:

- Share a common application server, hosted within one of the eastern Washington TMCs.
- Provide a common ATMS platform providing data entry and robust response logic configured for all TMC devices.
- Incorporate a desktop application (i.e., the user interface) that provides all the functionality of a TMC Operator workstation but accessible from any networked PC (with the appropriate user passwords and permissions).

- Employ communications connectivity to control all field devices through TCP/IP addressing.

This 'made in the east' solution would be oriented toward fulfilling the functional requirements necessary for the eastern Washington TMC needs, but would share data with the rest of the state through the type of "publish & subscribe" process described under the 'Autonomous Operation Model'.

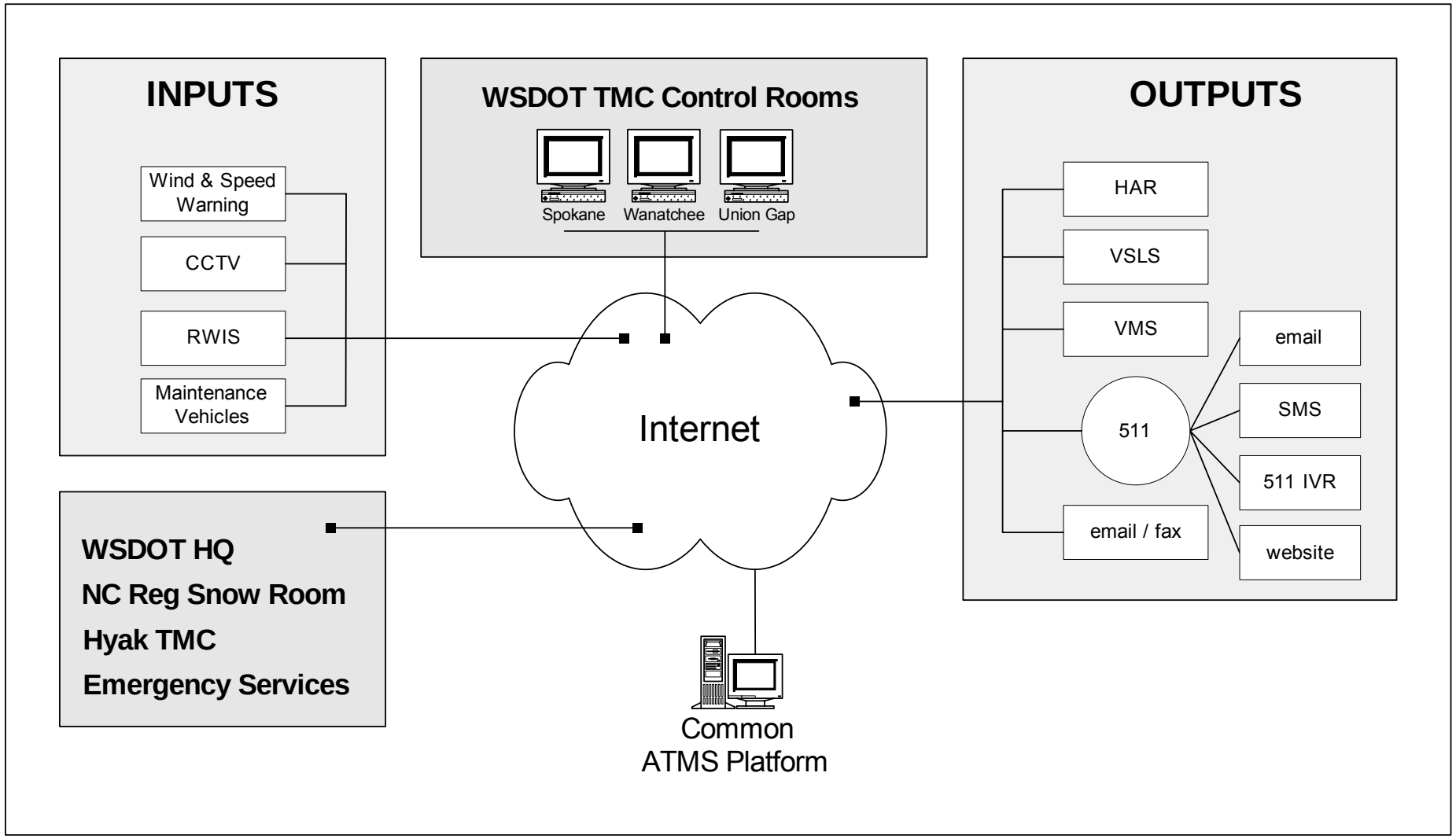
***Operational Description***

The implementation of the 'Virtual TMC Model' would:

- Allow TMCs to coordinate traffic management via the new common ATMS platform. This common platform and user interface will provide all users (with appropriate permissions) access to the same traffic management information, GIS map-based interface, data entry screens, response generation, device status, etc. As with the 'Autonomous Operation Model', appropriate authority levels will be established to ensure the 'home TMC' has control priority for their devices.
- Enable fully cross-jurisdictional operational backup between each TMC of all traffic management and traveler information functions via the new common ATMS platform.
- Provide emergency backup of all TMC functions via the common platform, regardless of the operational status of the affected TMC.
- Store data, and have access to a common data repository, thereby greatly facilitating performance measurement tracking and uniform reporting across the TMC users.
- Allow for the participation of emergency service providers (e.g., WSP and other EOCs) through integration with their CAD.
- Allow for the further participation of additional operational partners (who do not currently operate a CAD or other system) by providing data entry tools and partner services over the Internet.
- Provide WSDOT HQ with a valuable tool to monitor conditions in the implementation of a regional incident and emergency management system.
- Continue to manage the local road network from its own TMC.

This system configuration is illustrated in Exhibit 3.2.

**Exhibit 3.2 – Post ATMS Implementation ITS Connectivity**



***Potential Risks***

The 'Virtual TMC Model' addresses most of the potential risks associated with the earlier models. However, its deployment as a platform for eastern Washington TMCs alone leaves the following issues outstanding:

- The ATMS platform, configured as a virtual TMC, provides good system accessibility and emergency backup (business continuity) capabilities for the eastern TMCs. It does not provide for a statewide control capability in the event of an emergency. There would be a continued need to operate a C2C connection between the eastern ATMS platform and the western TMCs. This would provide operational backup, but would not address emergency backup and business continuity, if the western TMCs are temporarily, or permanently off-line.
- There is a potential for inconsistencies between eastern and western TMC responses in the course of an area-wide event.

### **3.3.4** VIRTUAL TMC MODEL (STATEWIDE)

This approach is identical to the previous model, but the implementation of the *statewide* 'Virtual TMC Model' would have all WSDOT TMCs operate on a common ATMS platform. Due to the scale of the deployment, the ATMS operation may be provided:

- Through a 'fat client' configuration, where the software is resident on a WSDOT server (likely at Olympia).
- Through an application service provider.

The operational mandate of this approach is far broader than that envisioned for the eastern-only deployment model, and would necessarily require a more in-depth examination of WSDOT's statewide traffic and emergency management needs.

This deployment model would share all of the operational advantages of the previous model, but would also:

- Through the provision of a statewide virtual TMC, provide for full cross-jurisdictional emergency backup capabilities that provide for business continuity across the state.
- Provide for response and traveler information consistency across the state for local and area-wide events.
- Best serve the needs of Commercial Vehicle Operators in obtaining local and statewide services.

### 3.3.5 MODEL COMPARISON

Exhibit 3.3 illustrates the degree to which the deployment model alternatives support the identified functional requirements from Section 3.1.

**Exhibit 3.3 - Deployment Model Compliance with Functional Requirements**

| Functional Requirements | Do Nothing | Autonomous Operation | Virtual TMC (East Only) | Virtual TMC (Statewide) |
|---|---|---|---|---|
| *1. Operational Requirements* | | | | |
| Traveler Information | P | P | Y | Y |
| Emergency Management | N | P | P | Y |
| Standard Operating Procedures (SOP) | P | P | Y | Y |
| Performance Management | N | P | P* | Y |
| *2. Traffic Management* | | | | |
| Network Surveillance | P | P | Y | Y |
| Surface Street Control | P | P | Y | Y |
| Freeway Control | P | P | Y | Y |
| Traffic Information Dissemination | P | P | Y | Y |
| Virtual TMC | N | N | P* | Y |
| Roadway Closure Management | P | P | P* | Y |
| Archived Data Management | P | P | P* | Y |
| *3. Broadcast & Interactive Traveller Information* | P | P | P* | Y |
| *4. Commercial Vehicle Operations* | P | P | P | Y |
| *5. Maintenance and Construction Vehicle Maintenance* | P | P | Y | Y |

**Legend:**

N – Does not adequately address Functional Requirements

P – Partially addresses Functional Requirements

Y – Complies with Functional Requirements

* *Compliant for Eastern Washington Region, but may not fully meet WSDOT HQ Objectives*

## 3.4 Another Day in the Life of a WSDOT TMC – with an ATMS

The following is an illustration of a hypothetical work shift in the SCR TMC after the deployment of either of the 'Virtual TMC' models described above. It is intended to illustrate the improved and substantially simplified operational processes that a TMC operator may experience by working with a proven ATMS.

It's a Friday afternoon in the second week of April, and Bob arrives for his shift working as an operator in the control room in the South Central Region of WSDOT (at Union Gap).

It's soon time to gear-up for the afternoon rush, and so the activity level in the TMC increases. After scanning the CCTV displays available, Bob checks the ATMS user display. The graphical interface features a map with thematic event icons that identify at a glance each of the active and planned events. 'Hover text' provides a high-level description of the event. Clicking on the icon provides the full details.

An alarm chime sounds, and Bob's attention is drawn to a pop-up window identifying a possible event. An RWIS station has detected an icy road condition and transmitted the related information to the ATMS. The ATMS has received the information and generated appropriate response plans for 511, HAR and two different DMS types in the field, and has presented these proposed plans to Bob on-screen for his approval. While he has the option of editing these, they look fine to him, and so he releases them for distribution. Having done so, the ATMS sends the control commands and information to the appropriate systems.

Soon, a second alarm chime sounds and Bob notes that an alert has been received from the WSP CAD. From the display, Bob learns there has been a major collision on I-90 at Vantage that will impact travel in both directions. All the details of the event are already in the ATMS, having been retrieved from the CAD-ATMS C2C interface. The TMC response to the event will proceed as follows:

- The ATMS has already:
  - Determined the best detour for the rerouted traffic based on stored predetermined plans and the live conditions on the alternate routes.
  - Determined which devices (511, HAR, DMS, etc.) can be used to advise motorists of the incident.
  - Generated the appropriate responses (controls and messages) to set on each of these devices. These responses are appropriate for the device location (relative to the incident) and its technical functionality (e.g., not all DMS can display the same length or type of message). It has formulated all appropriate traveler information, including bulletins to important stakeholders, including IDT.
- Once Bob briefly reviews and approves the plans suggested by the system, the ATMS will send the control commands to each of the related systems (e.g., each of the four DMS control software applications to set messages on the DMS, 511, HAR control software, etc.).
- By this time, the signal control technician has left for the day. But a preset traffic signal control plan was part of the ATMS-suggested response plan, and so when Bob approved the plans, the signal plan was automatically put into effect.
- Bob will continue to work with WSP and other in-field responders to manage the on-going event.

Having confidence in the ability of the ATMS to generate accurate and effective traffic event messages, Bob knows that the 511 system will be satisfactorily populated with a message (automatically generated by the ATMS) that is appropriate for the event.

Later in his shift, when the incident is finally cleared and operations are trending toward normal, Bob will 'clear' the event from the ATMS user interface, and the system will send the appropriate commands to each of the related devices. Appropriate logs of all actions will be maintained in a central database, and Bob need not maintain any separate procedural logs. Any user with appropriate permissions may access these logs.

Once he's done and things settle down a bit, Bob receives a fax notification of a planned construction event for early in the coming construction season. He enters the event information into the ATMS as a 'future event', providing a similar level of detail as for active events. The ATMS will generate an appropriate response plan, as with the active event described above. Bob can review this plan now, but when the future event is about to become active, the ATMS will set an alarm and remind the Operator at that time to review and approve the plan for implementation. The plan will include a list of who needs to be notified of the event.

Being early spring, heavy snow isn't out of the question, and its now coming down heavy through the Snoqualmie Pass. The North Central TMC would normally take care of pass management, but their overnight operations just shut down for the season the previous week, so it is up to the SCR TMC to help out. As the NCR TMC is working off the same ATMS platform, Bob simply uses the same web-based system interface and accesses the system again to declare the weather incident for the relevant location. The system will again process the information and recommend a response in the same manner as described above for an active event. Following Bob's approval, the system will control the NCR TMC devices in the same manner. The NCR TMC will be able to track all the work that SCR TMC has done for them by reviewing the logs and observing on-screen which events are still active once they are back on shift.

# 4. RECOMMENDATIONS AND NEXT STEPS

Although the regional TMCs are able to manage the current activity load, it must be noted that they are staffed with highly experienced operators who control a lesser number of ITS devices than will eventually be implemented. As the TMCs grow, a greater number of ITS devices and new personnel will significantly increase the operational requirements of the TMCs. The analysis of the regional needs and ATMS configuration options has identified that the Virtual Statewide TMC model would best meet the needs of WSDOT, in terms of providing a statewide network of ITS devices, pre-defined response plans, and a single interface for all types of devices. However, the implementation of such a system is a large undertaking, and would require significant buy-in from the WSDOT regions. It is therefore recommended that WSDOT begin with the deployment of the Virtual TMC model in the Eastern regions as a test site, with future expansion planned to follow the successful demonstration of the concept.