Appendix A: ITS Architecture

1. VAST Regional ITS Architecture for Southwest Washington Update

This document describes the update to the Regional ITS Architecture for Southwest Washington; the Regional ITS Architecture complements the WSDOT Southwest Region ITS Architecture, which itself is a component of WSDOT's Statewide ITS Architecture. The Regional ITS Architecture provides a framework for integration of existing and planned ITS systems by agencies across the region.

The primary distinction between the Regional ITS Architecture and the Southwest Region ITS Architectures are:

- More limited geographic focus on urbanized Clark County (the VAST Region); and
- Inclusion of ITS systems, user services, market packages, and stakeholders that are not directly interfaced with WSDOT systems (e.g. C-Tran Automatic Passenger Counting).

The ITS architecture contains a comprehensive resource listing of various ITS components and the connections that unite them into an overall context for ITS deployment in the County. The ITS architecture is essentially a framework for understanding and simplifying more complex relationships between the transportation agencies that share information and technologies in order to operate and maintain the transportation system.

The relationships and resources within the ITS architecture will be managed in a database known as *Turbo Architecture*™; this software application assists planners and system integrators in the development of regional and project architectures using the National ITS Architecture as a starting point. The National ITS Architecture and its requirements are explained in greater detail in the following section.

1.1. The National ITS Architecture

The National ITS Architecture is the defining resource for providing guidance to state and local jurisdictions that are implementing intelligent transportation systems.[1] This resource was developed on behalf of the U.S. Department of Transportation (U.S. DOT) to serve as a common framework for planning, defining, and integrating ITS. The Regional ITS Architecture for Southwest Washington was developed using Version 5.0 of the National ITS Architecture.

Final regulations issued by the U.S. DOT require regions that are deploying ITS to develop a Regional ITS Architecture in order to ensure institutional agreement, as well as the technical integration of the implemented systems. All ITS projects that use Federal Highway Trust Funds are subject to this requirement. Thus, the architecture developed for the VAST region and individual ITS projects proposed in the TSMO Implementation Plan must conform to the National ITS Architecture and other Federal ITS requirements.

The National ITS Architecture provides a common framework for planning, defining and integrating intelligent transportation systems. It is a mature product that reflects the contributions of a cross-section of the ITS community (transportation practitioners, systems engineers, system developers, technology specialists, etc.). The architecture defines:

- The **functions** (e.g. gather traffic information or request a route) which are required for ITS applications;

[1] http://www.iteris.com/itsarch/

- The **physical entities** or **subsystems** where these functions reside (e.g. the roadside or the vehicle); and

- The **information flows** that connect these functions and physical subsystems together into an integrated system.

Regional architectures are not intended to specify the particular technologies that will be used in ITS deployments; rather, they are used to define the functions that the technologies must perform. The architecture provides structure for defining general ITS functional requirements during the planning and design process.

1.1.1. User Services

The National ITS Architecture utilizes "User Services" to document what ITS should aspire to accomplish from a user's perspective; for example, "Provide Pre-Trip Traveler Information" or "Provide Transit Route Guidance." User services for a region can be selected by considering the needs and problems in the region and looking at how ITS can provide services to address these issues. As such, the User Services have been chosen to reflect the specific needs and desires of the Clark County region.

1.1.2 Physical Architecture

The physical architecture provides a framework for the physical elements of ITS systems. These elements include cars, people, computers, buses, trucks, etc. Figure 21 provides an illustration of the physical architecture. The physical elements are broken into large groups called subsystem categories; these are functional categories that describe what their associated physical entities (subsystems) do.

The four major subsystem categories are:

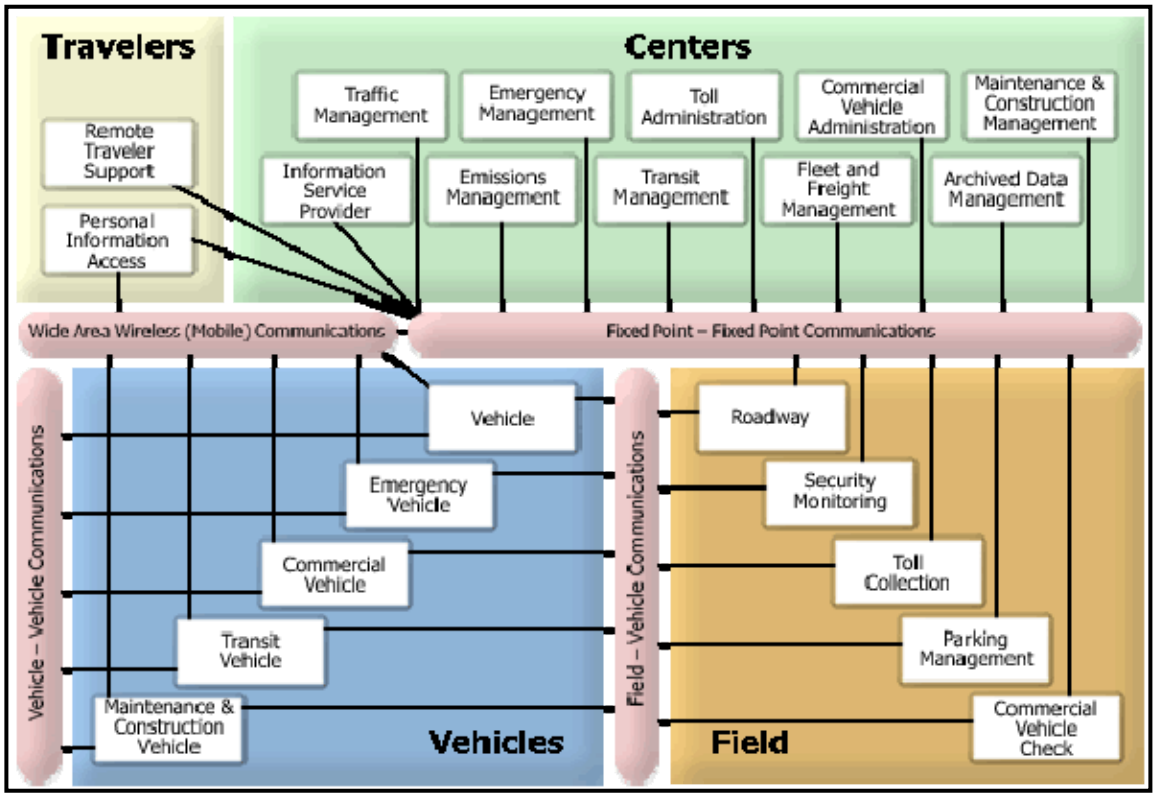
- **Traveler Subsystems**: Systems or applications that provide information to travelers (e.g. traffic conditions).

- **Center Subsystems**: Systems or applications that process and use information to control the transportation network (e.g., signal timing).

- **Vehicle Subsystems**: Systems or applications that provide driver information and safety on vehicle platforms (e.g., in-vehicle signing).

- **Field Subsystems**: Systems or applications deployed in the field that collect transportation data and are ideally controlled from a center (e.g., traffic signals).

Figure 1: Physical ITS Architecture (USDOT National ITS Architecture)



The oblong "bubbles" between the subsystem categories represent the communications medium. For example, the Roadway subsystem (within the "Field" subsystem category) could potentially be communicating with the vehicle, the transit vehicle, the commercial vehicle, and the emergency vehicle subsystems (within the "vehicle" subsystem category) via short-range wireless links. Communications from the field devices to their respective center would be via fixed-point communications.

1.1.3 Equipment Packages

The subsystems generally provide a full set of capabilities, more than would be implemented at any one place or time. Equipment packages break up the subsystems into deployment-sized pieces; an example equipment package is Roadway Basic Surveillance, which is part of the Roadway Subsystem, and includes fixed equipment used to monitor traffic conditions, together with loop detectors and CCTV cameras.

1.1.4 Architecture Flows

An architecture flow is simply the information that is exchanged between subsystems and terminators in the Physical Architecture. These architecture flows and their communication requirements define the interfaces which form the basis for much of the ongoing standards work in the National ITS Architecture program. The current US DOT guidelines require that a Regional ITS Architecture be developed at a sufficient level of detail to show subsystems and architecture flows.

1.1.5 Terminators

Terminators are generally defined as people, systems and general environments that are outside the control of ITS, but still impact ITS systems. Interfaces between subsystems and terminators need to be defined, but there are no ITS-related functional requirements associated with terminators. Since regional architectures are usually developed from a specific agency(s) perspective, an entity that impacts ITS but is out of the bounds of the primary agency's perspective

is called a terminator. This is done to illustrate ownership/control of the proposed services. Examples of terminators include "Transit Vehicle Operator", "Other Traffic Management" (such as a traffic management center that is outside of the study area but that still interacts with entities within the study area), and "Financial Institution" (such as a bank that holds revenues from transit fares or toll collection).

1.1.6 Market Packages

Market Packages provide an accessible, deployment-oriented perspective to the National Architecture. Market Packages group various elements of the physical architecture (subsystems, equipment packages, architecture flows and terminators) together to provide a specific ITS service. A key step in the Regional ITS Architecture development process is selecting which of the 85 National ITS Architecture market packages are applicable to the region and the status of deployment (existing or planned) of each. From that point, the Market Packages are reviewed individually to determine which physical architecture components in each are applicable to the region.

Market packages are grouped in the National ITS Architecture based upon the category of the service provided, as follows:

- **Advanced Traffic Management Systems (ATMS)**: Manage operation of the roadway network.
- **Advanced Traveler Information Systems (ATIS)**: Provide real-time information to travelers.
- **Advanced Public Transportation Systems (APTS):** Manage transit operations and make transit use more convenient and safer.
- **Emergency Management (EM)**: Manage emergency response operations.
- **Maintenance and Construction Management (MCM)**: Manage maintenance and construction activities and operations.
- **Commercial Vehicle Operations (CVO)**: Provides for the electronic monitoring of commercial vehicle safety assurance and regulation, and exchange of related information.
- **Archived Data Management (AD)**: Store and retrieve transportation system information for future analysis.
- **Advanced Vehicle Safety Systems (AVSS)**: Adds capability for improved safety to vehicles. Generally AVSS are private-sector industry initiatives.

1.2 Regional ITS Architecture Development Approach

In order to deliver an ITS architecture that is relatively easy to update and maintain, a *Turbo Architecture*™ database was created for the Southwest Washington region. This database containing the Regional ITS Architecture is a resource for future regional ITS regional planning and project-level implementation, and is housed and maintained by the Regional Transportation Council (RTC) of Southwest Washington.

Turbo Architecture™ is a software tool used for regional and project-level ITS architecture development. The benefit of using the software to create and store the regional ITS architecture is that it is developed using a standardized format that can be handed off from the original developer to a local agency, which will update and maintain the database.

For stakeholder review purposes, simple reports can be created with *Turbo Architecture*™, just as with any typical database program. Version 5.0 (the most recently released version at the close of this project) of the *Turbo Architecture*™ software was used to develop the VAST TSMO Regional ITS Architecture. Version 5.0 was designed to be compatible with the most recent version of the National ITS Architecture, and provides greatly increased functionality over previous versions.

The ITS architecture and implementation plan for the VAST region provides an overall vision and conceptual framework for ITS deployments and integration in the region. This section has been prepared as a supplement to the *Turbo Architecture*™ database, developed for RTC.

In developing this database, the following steps were taken:

- **Initial Information:** A general description, time frame, and geographical scope of the region were entered into the *Turbo Architecture*™ database.

- **Inventory of Stakeholders:** A Steering Committee of regional stakeholder agencies (both key and secondary) was compiled during the TSMO planning process. These agency stakeholders are listed in Table 1 on the following page.

- **Inventory of Systems:** The region's existing and planned ITS inventory, as documented from stakeholder interviews and presented in Chapter 2, was used as input to the Turbo Architecture database. Relevant National ITS Architecture subsystem(s), terminator(s) and a primary stakeholder were assigned to each inventory element.

- **Selection of Market Packages:** Based upon this inventory, as well as information gathered from the user needs assessment, market packages from the National ITS Architecture were selected for inclusion in the Regional ITS Architecture and relevant ITS inventory elements assigned to each. The review of selected Market Packages was a key focus of the Regional ITS Architecture workshop.

- **Operational Concept Roles and Responsibilities:** One of the required elements of a Regional ITS Architecture is the Regional Concept of Operations that describes how stakeholder agencies will cooperate in the implementation and operation of ITS. Chapter 4 provides an operational concept for interagency relationships and information flows, plus Turbo Architecture was used to document specific roles and responsibilities for each agency in the regional deployment of ITS.

- **ITS Functionality:** ITS functional areas, related ITS elements, and general system functional requirements were selected in support of the existing and planned ITS in the region.

- **ITS Standards:** ITS Standards that could potentially support compatibility and interoperability among regional transportation systems were selected.

- **Agreements:** Interagency agreements needed to support the Operational Concept were documented.

- **Interconnects and Flows Customization:** A Regional ITS Architecture defines flows of information that are exchanged between subsystems (i.e. between WSDOT SWR and Clark County). A key task in Turbo Architecture is customizing the selection of flows between subsystems in order that the appropriate flows are included as part of the architecture database.

An additional benefit of using Turbo Architecture is the various options for preparing customized diagrams and reports based upon the regional ITS architecture developed during this process. These reports and diagrams can be filtered to focus on selected elements, depending on end-user needs.

1.2.2 Compliance with Federal ITS Regulations

Effective on April 8, 2001, the Federal Highway Administration (FHWA) issued regulations and the Federal Transit Administration (FTA) issued a policy[2] that requires ITS projects funded through the

[2] http://ops.fhwa.dot.gov/its_arch_imp/docs/architecture.pdf

Highway Trust Fund conform to the National ITS Architecture and applicable standards. Conformance with these federal ITS requirements included the development of a Regional ITS Architecture based upon the National ITS Architecture and the subsequent adherence of ITS projects to the Regional ITS Architecture and the completion of systems engineering analysis. The purpose of the Regional ITS Architecture is to serve as a guide for the development of ITS projects and programs and be consistent with ITS strategies and projects contained in applicable transportation plans.

The Federally-required elements of the Regional ITS Architecture for SW Washington are listed below, with associated references to where they can be found:

- Description of the Region (please refer to *Regional TSMO Plan*, Chapter 1, p. 7)
- Identification of Stakeholders (please refer to *Regional TSMO Plan*, Chapter 1, p. 5)
- Operational Concept (please refer to *Regional TSMO Plan*, Chapter 5)
- Agreements (please refer to *Regional TSMO Plan*, Chapter 5, p. 43 and Turbo Architecture file)
- System Functional Requirements (please refer to Turbo Architecture file)
- Interface Requirements and Information Exchanges (please refer to Turbo Architecture file)
- Identification of ITS Standards (please refer to *Regional TSMO Plan*, Chapter 8, p. 98)
- Sequence of Projects Required for Implementation (Contained within this document (near-term programmed projects)) and *Regional TSMO Plan*, Chapter 8 (Ten-Year Implementation Plan, p. 94).

Table 1: Stakeholders Included in the Regional ITS Architecture for SW Washington

Stakeholder Name	Stakeholder Name
City of Camas	Oregon Department of Transportation (ODOT)
City of Vancouver	Port of Vancouver
Clark County	Portland State University
Clark Regional Emergency Services Agency (CRESA)	Railroad
CTRAN	Southwest Washington RTC
CVISN Program	Travelers
Human Services Council	VAST
Emergency Responders	Washington State Emergency Management
Local Media	Washington State Patrol (WSP)
Local Transit Agencies	WSDOT Headquarters
Local Transportation Agencies	WSDOT Regions
Motor Carriers	WSDOT Southwest Region (SWR)
ODOT Region 1	WSDOT SWR Maintenance and Construction

1.3 Statewide ITS Architecture Coordination

The ITS Architecture for the SW Washington region is a complement to its statewide equivalent, the Washington State ITS Architecture (2006). The statewide architecture provides guidance for surface transportation technology deployment across all regions in the State, including infrastructure and systems, such as the 511 telephone traveler information system.

Several framework concepts from the statewide architecture have been used to guide the development of the VAST Region ITS architecture. This ensures not only a consistent approach to ITS technology implementation across the state, but also allows the VAST region and the participating agencies within to leverage technology tools and investments, and tailor them local needs and conditions.

1.3.1 Coordination with Other ITS Architectures and Plans

This project also took into consideration plans developed by adjacent WSDOT regions and other agencies with which the VAST Region shares geographic boundaries and/or has a close operational working relationship. These include:

- WSDOT Southwest Washington Region (SWR) Regional ITS Architecture; and
- ODOT Region 1 Architecture.

1.3.2 Statewide Initiatives

The Statewide ITS Architecture contains information on existing and planned statewide initiatives and infrastructure, including:

- Traveler information, including website, 511 telephone information and highway advisory radio (HAR) systems;
- Electronic Toll Collection;
- Washington State Patrol computer-aided dispatch (CAD) interface;
- Commercial Vehicle (CVISN) systems;
- Security and safety systems;
- Establishing a WSDOT Emergency Operations Center (EOC);
- Congestion pricing for traffic management; and
- Center-to-Center (C2C) integration of traffic management centers (TMCs).

1.3.3 Statewide Operational Concept

Furthermore, the statewide ITS architecture articulates an Operational Concept built around eleven program areas:

- Congestion management;
- Traveler information;
- Incident management;
- Safety management;
- Maintenance and construction management;
- Transit management;
- Freight mobility;
- Electronic toll collection;
- Vehicle-infrastructure integration; and
- Data management.

Relevant ITS Program Areas of the WSDOT Statewide ITS Architecture have been incorporated into the Regional ITS Architecture as a basis for its Operational Concept.

1.3.4 Statewide ITS Standards Plan

- The Statewide ITS Architecture also outlines an ITS Standards Plan for WSDOT; these are technical standards established by consensus that provide rules, guidelines, or characteristics for data interfaces between systems. They are essential to ensuring that disparate ITS systems, subsystems and components can communicate with each other, and operate in an integrated fashion.

It is anticipated that future USDOT rulemaking to adopt ITS standards as part of the National ITS Architecture will result in a mandatory, uniform body of national standards applicable to all federally-funded ITS projects. In the interim, the WSDOT Statewide ITS Architecture recommends compliance with the emerging body of both national and international standards.

1.4 VAST TSMO Regional ITS Architecture

This section is a further discussion of National ITS Architecture user services, subsystems, and market packages, as they apply to the VAST region. Additional detail may be found in the VAST Region Turbo Architecture database. While the Southwest Region encompasses a 7-county area, VAST has historically assumed primary ITS planning and coordination responsibility for most of Clark County.

Furthermore, VAST, with WSDOT participation, has recently taken the lead in developing project concepts for the next generation (Phase II) Advanced Traveler Information Systems (ATIS) in the region. These projects were developed via multi-agency collaboration and also vetted with representatives of the WSDOT statewide traveler information systems program. WSDOT is a key lead or participating agency in many of the proposed initiatives; rather than creating a redundant set of new ATIS initiatives, many of these VAST-developed ATIS projects were included as part of WSDOT's Southwest Region ITS Implementation Plan.

In addition, the Regional ITS Architecture for Southwest Washington has been updated to include a project that was recently awarded to the Human Services Council (HSC) of Southwest Washington; this is known as the Veteran's Transportation Technology Improvement Project. The Southwest Washington Regional Transportation Council (RTC) and the Skamania and Klickitat Regional Transportation Planning Organization (RTPO) Human Services Transportation Plan, which covers SW Washington, was updated in 2010. The HSC participated with each agency's outreach efforts to gather community input, identify transportation needs and rank transportation projects submitted in RTC's three county region of Clark, Klickitat and Skamania counties.

HSC plays a vital role in the Regional Transportation Advisory Committee, and encourages open communication regarding Veterans' transportation needs in SW Washington. For these reasons, HSC is included as an extended stakeholder (within the 'Local Transit Agencies' stakeholder group) in the Regional ITS Architecture for Southwest Washington, to provide information services to Veterans. As such, all applicable market packages and ITS elements are included and a description of this project is included in the Regional ITS Plan, therefore, this project is included in the Regional ITS Architecture.

1.4.1 VAST Region User Services

Based on the user needs assessment and the associated stakeholder meeting, the following user service bundles were selected to address the identified transportation system needs in the Clark County region:

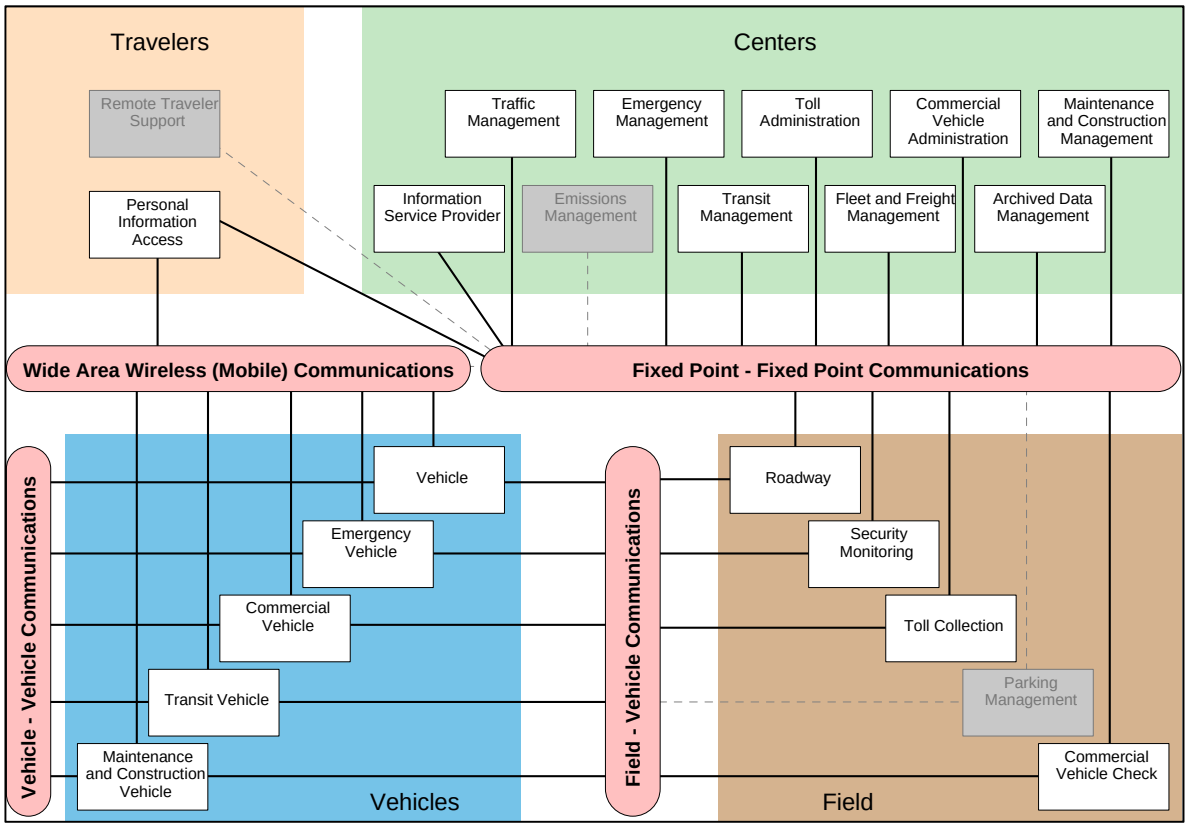
- Traveler Information
- Regional Management and Operations
- Roadway Management and Operations
- Transit Management and Operations
- Freight Management and Operations

The full list of user service needs is documented in Chapter 3 (pg.18 – the 'Regional TSMO Toolkit') of the TSMO Plan; these needs were rolled up into the above major categories, and the user service bundles were selected by mapping the major categories of user needs to the National ITS Architecture user services.

1.4.2 VAST Region Physical Architecture Subsystems

Figure 2 is a version of the figure that appears on the previous page, which has been customized for the SW Washington region. The intent is to show the existing and planned subsystems in the region, and the types of communications links between them.

Figure 2: VAST Region Physical Architecture Subsystems



1.4.3 VAST Region Market Packages

Table 2 on the following page lists all of the market packages, grouped by user service bundles, which are encompassed by the Regional ITS Architecture for Southwest Washington. The table includes key stakeholders associated with each market package. The selection of market packages was based upon existing and planned ITS projects, user needs, and consultation with agency representatives regarding potential future ITS applications.

Table 2: VAST Region Market Packages by Stakeholder

Market Package	Clark County	City of Vancouver	RTC	WSDOT	PSU PORTAL	C-TRAN	City of Camas	Port of Vancouver
Information Management (AD)								
AD1: ITS Data Mart (E)	X	X	X	X	X	X	X	X
AD2: ITS Data Warehouse (P)	X	X	X	X	X	X	X	X
AD3: ITS Virtual Data Warehouse (P)	X	X	X	X	X	X	X	X
Transit Management & Operations (APTS)								
APTS01: Transit Vehicle Tracking (E)						X		
APTS02: Transit Fixed-Route Operations (P)						X		
APTS09: Transit Signal Priority (P)	X	X	X			X		
APTS07: Multi-Modal Coordination (P)	X	X	X	X		X	X	
APTS08: Transit Traveler Information (P)						X		
Traveler Information (ATIS)								
ATIS01: Broadcast Traveler Information (P)	X	X		X	X			
ATIS02: Interactive Traveler Information (E)	X	X		X	X			
ATIS06: Transportation Operations Data Sharing (E)	X	X	X	X	X	X	X	X
Roadway Management & Operations (ATMS)								
ATMS01: Network Surveillance (P)	X	X		X	X			
ATMS03: Surface Street Control (E)	X	X					X	X
ATMS04: Freeway Control (E)	X	X	X	X	X	X	X	X
ATMS06: Traffic Information Dissemination (E)	X	X	X	X	X	X	X	X
ATMS07: Regional Traffic Management (E)	X	X		X				
ATMS08: Traffic Incident Mgmt. System (E)	X	X	X	X	X	X		
ATMS13: Standard Railroad Grade Crossing (E)	X	X					X	X

Market Package	Clark County	City of Vancouver	RTC	WSDOT	PSU PORTAL	C-TRAN	City of Camas	Port of Vancouver
ATMS19: Speed Monitoring (P)				X	X			
ATMS21: Roadway Closure Mgt. (P)	X	X		X		X		
Emergency Management (EM)								
EM01: Emergency Call Taking and Dispatch (E)					X			
EM02: Emergency Routing (P)	X	X		X	X	X	X	X
EM04: Roadway Service Patrols (E)								
EM06: Wide Area Alert (E)					X			
Freight/Commercial Vehicle Management (CVO)								
CVO02: Freight Administration (E)								X
CVO03: Electronic Clearance (E)								X
CVO04: CV Administrative Process (E)								X
CVO06: Weigh-in Motion (E)								X
CVO07: Roadside CVO Safety (P)								X
Maintenance and Construction Management (MC)								
MC02: Maintenance and Construction Vehicle Maintenance (P)	X	X		X		X	X	X
MC03: Road Weather Data Collection (E)	X	X		X		X	X	X
MC04: Weather Information Processing and Distribution (E)	X	X		X		X	X	X
MC06: Winter Maintenance (E)	X	X		X		X	X	X
MC07: Roadway Maintenance and Construction (E)	X	X		X		X	X	X
MC08: Work Zone Management (E)	X	X		X		X	X	X
MC09: Work Zone Safety Monitoring (P)	X	X		X		X	X	X
MC10: Maintenance and Construction Activity Coordination (E)	X	X		X		X	X	X

1.5 Regional ITS Architecture Maintenance Plan and Responsibilities

As ITS projects are implemented in the region, the Regional ITS Architecture will need to be updated to reflect new ITS priorities and strategies that emerge through the transportation planning process to account for expansion in ITS scope, and to allow for the evolution and incorporation of new ideas. The VAST Architecture has a ten-year time horizon, as are the majority of regional ITS architectures that support the higher level statewide architecture.

The purpose of maintaining an ITS architecture is to keep it current and relevant, so that stakeholders will use it as a technical and institutional resource when developing specific ITS project plans. The VAST Region ITS Architecture should be continuously maintained to assure that:

- The architecture is consistent with state plans and priorities;
- New projects properly integrate with existing systems;
- New projects do not duplicate current systems;
- The region is spending resources efficiently; and
- New projects are eligible for Federal funding.

1.5.1 Regional ITS Architecture Maintenance Responsibilities and Procedures

The Regional Transportation Council of Southwest Washington is the primary agency for maintenance and upkeep of the Regional ITS Architecture. RTC has established collaborative relationships with FHWA, FTA, WSDOT, C-TRAN, Cities, ODOT, and other stakeholders in the region for ITS planning and implementation.

Through its VAST standing committee and technical working groups, RTC provides a forum for project-level Architecture coordination and regional discussion of proposed updates to the ITS architecture.

The ongoing monthly VAST project coordination meetings, as well as direct meetings among project participants will be used to identify potential changes to the Regional ITS Architecture based on changing conditions, needs, and/or project implementations. Based on this initial assessment, one or more of the following Regional ITS Architecture maintenance activities may occur:

- Convening of a committee of regional stakeholders that may be impacted by a potential change in the ITS Architecture (e.g., addition of new market packages);
- Incorporation of minor changes directly in the regional ITS architecture (e.g. update of interconnect from ‘planned’ to existing’ or change in the formal name of a Stakeholder agency).
- Logging of potential issues for further consideration in the next comprehensive update of the Regional ITS Architecture.

1.5.2 Comprehensive Updates to the Regional ITS Architecture

In addition to ongoing maintenance, it is anticipated that the Regional ITS Architecture will undergo a comprehensive update every three to five years. Factors that will influence the timing of comprehensive regional updates include:

- Updates to the National ITS Architecture that significantly impact user services, market packages, or other features
- Emergence of substantial new regional transportation needs, stakeholders, or entities;
- Updates and changes to the WSDOT Statewide ITS Architecture; and/or
- Other Federal or State-Level guidance pertaining to Regional ITS Architectures.

1.6 Project Status

The key projects in the VAST 20-yr. Plan are similar in nature to the planned projects in the Regional TSMO Plan; they have included a transit management system to allow tracking of transit vehicle locations; implementation of cameras and VMS on I-5, I-205 and SR-14; and fiber optic cable connections between the state DOTs. The continuing deployment of these and similar systems will provide data to WSDOT on incidents and traffic conditions, and allow the state agencies to share information in order to better manage the transportation system.

The TSMO Plan presents an opportunity to carry the endeavors of VAST further and to achieve even more collaboration among cooperating agencies. A matrix of the newly elected projects and their brief descriptions can be found in Appendix A. The project matrix represents changes in the original ITS projects and provides a status column representing the present day status of each project.

Implementation of cameras, detectors and variable message signs (VMS) on I-5, I-205 and SR-14, as well as fiber-optic cable connections between the transportation management centers of Washington and Oregon State DOT's, has allowed the state agencies to share information in order to better manage the operation of the freeway system. Additional installation of fiber optic cable on the arterial system, along with new signal controllers and equipment, allow for signal-timing modifications where needed. Appendix B presents some of the recently completed projects (some of which are still underway) that are important to the VAST region. However, as mentioned earlier in this section, the new project list is included in the adopted Regional TSMO Plan (please refer to Chapter 8, pg. 95 of the Regional TSMO Plan).

ITS/TSMO PROJECT MATRIX

Traveler Information

Ref. #	Traveler Information Project Title	Project Description	Priority (H/M/L)	Project Participants	Status	Current Updates
1	Traveler Information for Fire, Police, and 911	Design cost effective means of providing video and congestion data to Fire, Police and 911.	H	WSDOT, Fire Dept., 911, WSP, Police Dept.	Complete	• CRESA (Clark Regional Emergency Services Agency) has a project funded to get a direct communications (fiber) to WSP Dispatch. This project has started and should be completed soon.
2	Phase II of Regional ATIS Website Development	Expand development of Regional ATIS.	H	Cities of Camas & Vancouver, C-TRAN, Clark County, RTC, WSDOT	Planned	• Evaluation/scoping of ATIS Phase II are complete; project selection and development to be complete by July 2012. Project completion could be sooner based on other WSDOT project commitments and resources.
3	SR-503 Traveler Information, Incident Management and Communications Project	Provide a new fiber optic communication system installation for cameras at major intersections for traffic and incident management and arterial VMS; to be deployed at key driver decision-points to convey traveler and incident information to the public.	H	WSDOT	2010/2011 CMAQ	• SR-503 is a major north/south arterial route that provides a significant commuter route link • The traffic data generated by this project will be shared with the VAST/TSMO agencies • Traffic data will be shall be archived and made available to numerous private and public entities via PSU's PORTAL data archive system
4	I-5 Variable Message Sign	Install variable message signs (VMS) at strategic locations/major interchange areas along Interstate-5	M	WSDOT	2011/2012	• One sign soon to be installed will be located near Mill Plain and 112th • Project funds not yet obligated for other planned sites

Transit Operations and Management

Ref. #	Transit Operations & Management Project Title	Project Description	Priority (H/M/L)	Project Participants	Status	Current Updates
1	Bus Locating System	Install AVL equipment on buses and software at the transit control center.	H	C-TRAN	Complete	• C-TRAN has purchased and installed new AVL devices. Pending final testing and systems acceptance, this project will be complete.
2	Automatic Passenger Counter	Deploy automated passenger counters on all buses in the C-TRAN fleet.	H	C-TRAN	Complete	• C-TRAN Changed to "High" Priority • C-TRAN has purchased and installed APC devices on 22 Vehicles. • C-TRAN will outfit remaining vehicles in 2006.
3	Real-Time Arrival and Departure Information	Provide real-time arrival and departure times for each bus route on message boards at major bus transfer points, at Park-and-Rides, on Freeway CMS displays and on-line.	M	C-TRAN	Planned	• With the AVL and APC data now available to C-TRAN, this has been identified as a high priority project for C-TRAN. • C-TRAN is in the process of overhauling their current website to include transit trip planning. New Trip Planning capabilities will be able to interface with TriMet. • The next phase of the website overhaul is to include real time bus information (such as "next bus arrival" via the website.
4	Paratransit and Dispatch Data Exchange System	Install CAD system for C-Van paratransit system.	M	C-TRAN	Complete (	• CAD/AVL system currently in systems acceptance. Covers both fixed and paratransit fleets. • Pending final testing and systems acceptance, this project will be complete.
5	Automated Fare Collection System	Install smart card validators on high-demand vehicles and pass management system. In second phase, install validators on remaining vehicles and deploy smart fare boxes.	L	C-TRAN	Future	• Phase III of C-TRAN ITS Plan, will include smart card capabilities. This entails purchasing new fare boxes.

Regional Management and Operations

Ref. #	Regional Management and Operations Project Title	Project Description	Priority (H/M/L)	Project Participants	Status	Current Updates
1	CCTV Camera Deployment for Freeways	Provide complete coverage of the freeways in the region. • I-5: I-205 to bridge • I-205: SR-500 to bridge • SR-500 at Andresen [A] • SR-14 and SR-500: I-5 to I-205 • I-205: SR-500 to I-5 • SR-14: I-205 to Camas	H M L	Cities of Camas & Vancouver, WSDOT, Clark County	Underway	• WSDOT has deployed CCTV on I-5 from Marine Drive to 134th o SR 500 at Thurston Way and 112th & Gher Road o I-205 from Columbia Blvd to Mill Plain, and o SR 14 east and west of I-205.
2	CCTV Camera Deployment for Local Arterials	Provide coverage of highly congested local arterials and key intersections. • Mill Plain, Fourth Plain, 164th and Burton Road • NE 134th Street, Andresen, SR-503, 164th , Padden Expressway, Burton Road, 192nd Avenue NE, Highway 99 and Downtown Vancouver • 112th Avenue NE, NE 78th Street, SR-503, SR-502, Padden Way and Andresen • 192nd, Mill Plain, Fourth Plain • Padden Parkway	H M L M M	Cities of Camas & Vancouver, WSDOT, Clark County	Planned	• Clark County and the City of Vancouver have limited CCTV at 78th, Mill Plain (east and westbound directions, 134th • Clark County added Padden Way and Andresen for CCTV deployment (low priority) as reliability improves. • City of Vancouver added 192nd, Mill Plain and Fourth Plain as a medium/low priority. • WSDOT has recently acquired part of Padden Way as their jurisdiction, and intend to install CCTV Cameras along the corridor.
3	Freeway and Arterial Detector Station Deployment	Install detector stations every 0.5 miles along the freeways to collect volume, speed and occupancy data. • I-5 and I-205 from their interchange to Columbia River, Mill Plain, 164th Ave. and Burton Road [A] • SR-500 and SR-14 from I-5 to I-205, 192nd, Andresen and Fourth Plain • SR-503, SR-502, Andresen, SR-14 east of I-205, 78th Street, Main Street and other misc. locations	H M L	WSDOT, Cities of Camas and Vancouver, Clark County	Underway	• WSDOT has deployed on segments of I-5, I-205 and SR 500. • WSDOT plans to deploy on detectors on SR 14 from I-205E to Camas • Clark County is waiting on WSDOT to install their detectors to ensure compatibility

[A] This phase is partially funded through the VAST CMAQ funded project and through other projects outside of the VAST program.
[A] This project is partially funded through the VAST CMAQ funded project.

Ref. #	Regional Management and Operations Project Title	Project Description	Priority (H/M/L)	Project Participants	Status	Current Updates
4	Central System Upgrade	Upgrades to the central communications systems	M	City of Vancouver	Planned	• Next round of CMAQ funding
5	Freeway Operations and IM	Operations plan and user's manual	M	WSDOT	Underway	• Operations plan and users manual complete; Phase 1 PS&E to be completed by June 2009. • Implementation in 2010?
6	VAST Planning	Continuation of the VAST program	H	RTC	Ongoing	•
7	Communications deployment	This project will provide communications (fiber optics, twisted wire pair, microwave or other) to each TMC and ITS field device in the region.	H	Cities of Vancouver & Camas, Clark County, WSDOT, C-TRAN, RTC, PORTAL	Ongoing	• To the extent practical, all field devices shall be connected by a redundant fiber optic communications backbone
8	ITS Network Enhancements	Project improved mobility, travel reliability, and reduced congestion with the implementation of integrated and interconnected systems	H	Cities of Vancouver & Camas, Clark County, WSDOT, C-TRAN, RTC	Ongoing	• Project design and implementation completed by June 2009 • Equipment chosen was compatible between the County, City and State
9	192nd Avenue	Fiber Optic Installation and Signal Integration	M	City of Vancouver	Planned	•

Roadway Management and Operations

Ref. #	Freeway Operations & Management Project Title	Project Description	Priority (H/M/L)	Project Participants	Status	Current Updates
1	Freeway Operation System	This project would deploy a Freeway Operation System for managing the various ITS technologies deployed throughout WSDOT's freeway system in SW Washington. [A]	H	WSDOT	Underway	• WSDOT is implementing ODOT Region 1 ATMS (NES)
2	Ramp Meter Deployment Project	Deploy ramp meters on designated ramps in the region as part of the Columbia River Crossing (CRC) project	M	WSDOT	Future	• WSDOT is estimating that up to 10 ramp meter installations
3	Freeway Operations and Interchange Management	This project will upgrade traffic signals; there were not enough funds to implement modifications to local traffic signals for allowing timing changes per plan	M	Cities of Camas & Vancouver, Clark County, WSDOT	Future	• Phase 1 & 2 of PS&E and implementation to be completed by July 2011
4	Probe Vehicle System	Deploy probe vehicle detectors on select freeway and arterial corridors in the region. • Fourth Plain and Mill Plain • I-5, I-205, SR-14 and SR-500	M L	Cities of Camas & Vancouver, C-TRAN, WSDOT, Clark County	Future	• C-TRAN buses would be the likely probe vehicles. • This is a future vision that will most likely be driven by RTC or a transportation agency.
5	Data Warehouse (PORTAL)	Deploy data collection system at RTC for storing all traffic-related data for the region.	H	Cities of Camas & Vancouver, WSDOT, C-TRAN, Clark County, RTC	Underway	• RTC will coordinate with the PORTAL Project as part of the TSMO Plan • Some WSDOT data, which is shared with ODOT already, make it into the PSU PORTAL System.
6	Advanced Vehicle Control Initiative	This project will help support private agencies in the deployment of advanced vehicle control equipment in the region.	L	All public agencies in Vancouver Urban area	Future	•

[A] This project is partially funded through the VAST CMAQ funded project.

Freight Management and Operations

Ref. #	Freight Management and Operations Project Title	Project Description	Priority (H/M/L)	Project Participants	Status	Current Updates
1	Freight Vehicle Signal Priority Deployment	The City of Vancouver would, at some point in the future, possibly implement freight vehicle priority along the western segment of Mill Plain and/or Fourth Plain to reduce truck congestion	L	City of Vancouver and Port of Vancouver	Future	• Freight Grant possible • Possible to use loop detectors • One challenge is that freight priority doesn't work in coordination with other typical signal types. • This type of project

Roadway Management and Operations

Ref. #	Roadway Management and Operations (RMO) Project Title	Project Description	Priority (H/M/L)	Project Participants	Status	Current Updates
1	Controller Upgrade Projects	Upgrade/replace traffic signal controllers as needed to interconnect them with the local signal system	M	Cities of Camas & Vancouver, WSDOT, Clark County	Complete	• City, County and State have all upgraded to ATMS.now
2	Integration of Traffic Signals	• Integrate Vancouver, Clark County, and WSDOT traffic signals. [A] • Integrate traffic signals with WSDOT signal system. A remote workstation for the WSDOT signal system will be provided to Camas.	H M	Cities of Camas & Vancouver, WSDOT, Clark County	Underway	• City of Vancouver will integrate traffic signals on Thurston Rd. • City of Vancouver will integrate traffic signals on Andresen Rd • City of Vancouver will integrate traffic signals and install fiber optic cable on 192nd Avenue
3	Clark County Traffic Signal System	Replacement or upgrade of existing traffic signal system. New system should work with all types of controllers installed on County roadways.	M	Clark County	Partially complete	• Some remaining intersections
4	Interagency Traffic Signal Communications Project and Software Integration	Create center-to-center communication system for sharing regional traffic data. The project also covers other miscellaneous software integration that will be needed in the region.	H/M/L	Cities of Camas & Vancouver, WSDOT, Clark County	Future	•

Ref. #	Roadway Management and Operations (RMO) Project Title	Project Description	Priority (H/M/L)	Project Participants	Status	Current Updates
5	78th Street Signal Optimization Project	The NE 78th Street traffic signal optimization (TSO) project will improve the traffic signal system along a portion of the NE 78th St. corridor in Clark County	M	Clark County and WSDOT	2010/2011 CMAQ	• The existing traffic signal components currently do not operate properly and the lack of communications from a master controller creates serious operational problems in the corridor • Project goal is to have all the traffic signals in these corridors in communication and coordination with each other using an Ethernet system
6	162nd Ave. Fiber and Communications Project	A portion of 162nd between Poplar and 4th Plain was not built and this proposal will complete the missing link of 1.2 miles	M	City of Vancouver	2010/2011 CMAQ	• With this project, the transportation agencies in the City and County are going to be able to reach the Northeast corners of the urban area and access traffic signals on two major corridors • This project will complete the redundancy on the fiber network rings for the regional ITS communications network in the event of a failure elsewhere in the system