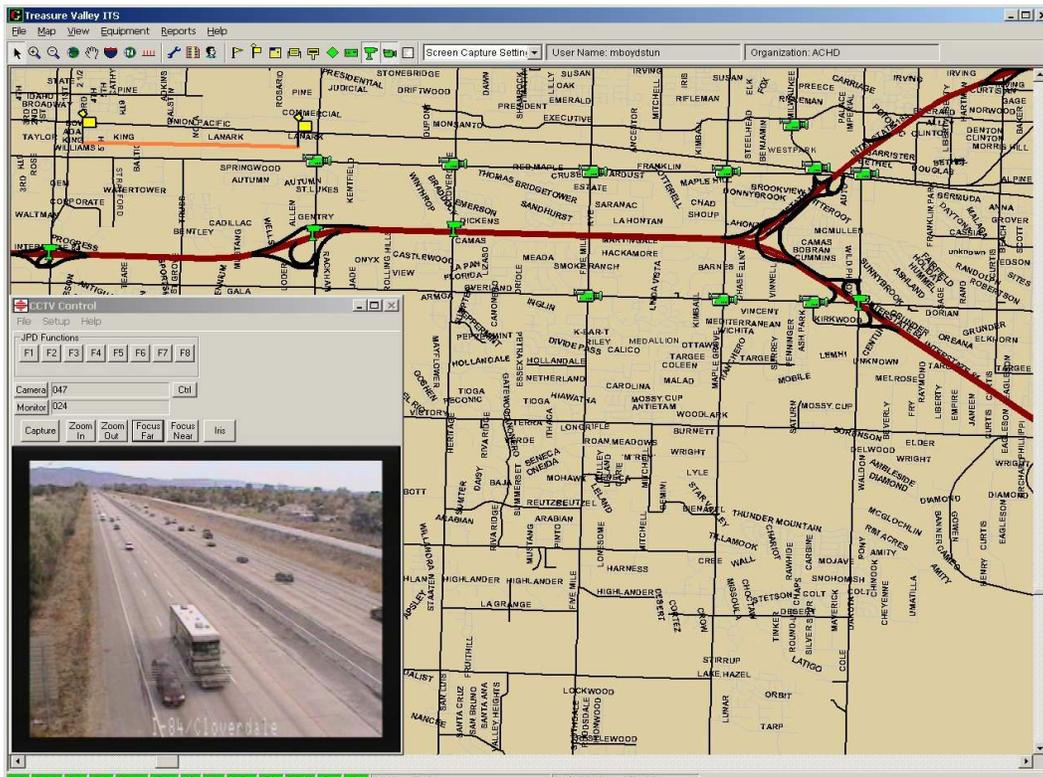


FY00 Treasure Valley ITS Deployment Project

Advanced Traffic Management System (ATMS) Software Procurement and Implementation Process

Final Self Evaluation Report

ITS Earmark Project # ITS-0003(131), Key # 8022



Prepared by:

Jim Larsen
Ada County Highway District
Traffic Operations Engineer
Boise, ID

August 2, 2006



Executive Summary

In 2000, the Treasure Valley area of the State of Idaho received a federal earmark of \$390,000 to develop an Advanced Transportation Management System (ATMS) for the Treasure Valley region of Idaho. The Ada County Highway District (ACHD), located in Boise, Idaho, was the lead agency for this project funded through the Federal Highway Administration (FHWA), with the addition of other local funds.

An ATMS software package was needed to incorporate Intelligent Transportation Systems (ITS) stand alone software packages into a single software control package. This would also allow one common ITS control system for all Treasure Valley agency users.

A structured procurement and implementation process was initiated with the following major tasks:

- Development of an ATMS software request for proposals (RFP) document
- ATMS RFP assessment plan
- System software implementation and testing plan
- Project evaluation

Background

The tremendous growth experienced by the Treasure Valley over the past ten years placed extreme stress on the area's transportation infrastructure. The Treasure Valley includes the cities of Boise, Garden City, Meridian, Eagle, Kuna, Star, Middleton, Nampa and Caldwell in Ada and Canyon county, Idaho. Looking to the future, area transportation agencies initiated a planning effort in 1997 to investigate the potentials of utilizing modern Intelligent Transportation Systems (ITS) devices to reduce Treasure Valley's congestion levels, to increase safety and enhance traveler comfort, as well as to increase system efficiency. This plan, completed in 1999, outlined 59 ITS projects to be implemented over the next 20 years. The plan outlined three major projects:

1. The design, construction and implementation of a Traffic Management Center (TMC) for the Treasure Valley
2. The development of an Incident Management Plan to encompass the freeway and the arterial systems, and
3. The design and implementation of ITS devices on I-84, I-184 and parallel arterials that serve as freeway diversion routes.

In 1999, the Treasure Valley received \$441,470 in FHWA ITS earmark funds to develop an integrated freeway and arterial traffic information system in an area that includes the I-84 corridor in both Ada and Canyon Counties and I-184 in Ada County. The stated goal of the funded project was to provide the information needed by the transportation

agencies in the Treasure Valley to efficiently operate and manage the region's transportation system and to provide the information needed by the region's travelers to make the best use of its transportation system. The traffic information system would provide a way to gather real-time traffic data, to disseminate the information and to use it to make optimal decisions concerning traffic management. Additional funds to provide for the integrated freeway and arterial traffic information system came from the Congestion Mitigation and Air Quality (CMAQ) improvement program and other local agency funds.

The primary emphasis of this FY2000 ITS project was to continue the work started with the FY99 ITS project. This project was funded through a combination of ITS integration funds, CMAQ funds and local agency funds.

The FY99 ITS project installed ITS devices such as closed circuit television (CCTV) cameras and freeway detection equipment on I-84 within the Treasure Valley. The FY99 ITS project also developed a preliminary ATMS request for proposal (RFP) document. Multiple software packages were required to control the various ITS devices deployed within the region.

The primary purpose of the FY00 ITS project was to procure a fully functional Advanced Transportation Management System (ATMS) control software package which contains all required functionality to control existing and planned ITS devices on the Treasure Valley freeway and arterial street system. The ATMS software package was also needed to allow TMC operators to post incidents and construction events on a GIS based mapping system.

Though being applied on a State owned freeway corridor, this project was led by the Ada County Highway District with assistance from regional agencies, state universities and the Idaho Transportation Department (ITD). The system will be wholly controlled from the ACHD Traffic Management Center (TMC), see Figure 1, in the near and mid-term future with a regional traffic management center planned in the long term. It is expected that the software control package procured in this project will be able to control the initial ITS deployment items from the TMC, with the ability to expand and incorporate control of long term elements in the future as needed. Initial ITS elements that will be controlled by this software shall include CCTV cameras, vehicle detection stations, and dynamic message signs.



Figure 1 - Ada County Highway District Traffic Management Center

The ATMS initially needed to provide for the monitoring and control of forty-five closed circuit television (CCTV) cameras, four dynamic message signs (DMS) and twelve freeway vehicle detection stations over both fiber optic and wireless communication networks. Details of the initial and future expansion of the system are shown in the Table 1 below.

DEVICE TYPE	INITIAL DEPLOYMENT 2003	MID-TERM FUTURE, 1-5 YRS	LONG-TERM FUTURE, 5-15 YRS
CCTV	45	80	150
Dynamic Message Signs	5	10	30
Vehicle Detection	12	50	120
Ramp Metering	--	4	20
Weather Monitoring Stations	--	5	10
Connection to Traffic Signal System (number of signals)	--	100	300
Connections to Other Users	2	2-5	~ 15

Table 1: Treasure Valley ATMS Deployment Plan

This report will describe the initial project tasks, a summary of work completed during those tasks and lessons learned.

This project was conducted by a project team consisting of staff from the Ada County Highway District (ACHD), Idaho Transportation Department (ITD), Boise State University, and the University of Idaho.

A brief description of the initial project tasks as they were defined in the FY00 ITS scope of work are outlined below. Each task has a brief explanation and identifies the agencies assigned to the task.

Project Tasks

Task 1. Development of an ATMS software specification (RFP) document

The development of an ATMS system software specification for the Treasure Valley freeway system was a task associated with the FY99 ITS Deployment project. A Consultant was hired to assist the project team in the development of a detailed request for proposals (RFP).

The first task of this FY2000 ITS project is to take the final document from the FY99 ITS project and make any modifications needed to send this RFP out to interested ITS software venders. It was anticipated that the RFP would be sent out to approximately 12 ITS venders throughout the U.S. with experience in developing ITS software systems.

This task will be conducted jointly by ACHD and ITD. The project team will investigate whether a consultant is needed to help in this RFP distribution, evaluation and selection process.

Task 2. Evaluate RFP submittals from venders.

The purpose of this task is to evaluate vender proposals and rate each vender using the criteria developed in the RFP requirements. A breakdown of the evaluation criteria used is shown below in Table 2. Each criteria below references a section in the RFP document.

Description	Points
Proposer's Information and Support (100)	
Proposer's Organization and Supporting Documentation	100
Software Functionality (750)	
Vender Performance items	75
General System Environment (Sec. 6.0)	25
Configuration Management and System Admin. (Sec. 7.0)	25
System Security (Sec. 8.0)	25
Communication (Sec. 9.0)	50
Software User Interface (Sec. 10.0)	50
System Map Display (Sec. 11.0)	75
CCTV Camera Subsystem (Sec. 12.0)	75

Display System (Sec. 13.0)	50
CMS Control Subsystem (Sec. 14.0)	75
TMS Detection Subsystem (Sec. 15.0)	75
Incident Detection (Sec. 16.0)	25
Incident Tracking and Management (Sec 17.0)	50
Event Tracking and Logging (Sec. 18.0)	25
Additional System Functions (Sec. 19.0 to 22.0)	25
System Expansion (Sec. 23.0)	25
Deployment Schedule (50)	
Proposer's schedule for deploying the system	50
System Cost (100)	
Cost Proposal (Sec 24.0)	100
TOTAL	1000

Table 2 – ATMS Consultant Selection Evaluation Criteria

ACHD, ITD, University of Idaho (U-I), Boise State University (BSU) and a consulting firm will jointly conduct this task.

Task 3. Vender selection and award.

This task will select the highest rated vender in Task 2 and finalize contract negotiations, scope of work and a project schedule.

ACHD, ITD and a consulting firm will jointly conduct this task.

Task 4. System software implementation and testing.

This task will oversee and review vender documentation, review/track schedule, review system acceptance test procedures and oversee installation and integration.

ACHD, ITD, U-I, BSU and a consulting firm will jointly conduct this task.

Task 5. Project evaluation.

This task will be conducted by ACHD, University of Idaho and Boise State University.

This task will evaluate the overall project using the guidelines established by FHWA.

Project Task Completion Summary

Task 1. Development of an ATMS software specification (RFP) document

The project team selected a consultant with knowledge in ATMS systems to assist in the selection of a software vender. The consultant also served on the oversight team during software implementation and reviewed the initial RFP document and recommended several changes to the document before it was sent out to interested vendors.

The project team felt it was essential to hire a consultant with ATMS system knowledge to assist the project team in all phases of this vender selection and implementation. The project team had limited knowledge in ATMS systems and felt that outside expertise was needed for a successful installation.

The project team sent the final RFP document out to 17 venders on November 7, 2001.

Task 2. Evaluate RFP proposals from venders.

The project team received 5 vender proposals from the RFP solicitation. The proposals were reviewed by the team and three venders were chosen for interviews in Boise, ID. Interviews in Boise were held on April 2-3, 2002.

The interviews consisted of a list of structured questions by the project team followed by an in-depth demonstration of the system software. The software demonstration proved to be a key in the final selection of a vender.

Each vender was required to complete a compliance matrix taking each section of the RFP requirements and stating whether the vender complied or didn't comply to each shall and should RFP requirement. This compliance matrix was evaluated by the project team prior to the final interviews with the venders. A sample form a vender is shown in Table 3.

Section	Requirement	Should/ Shall	Comply/Non -Comply	Remark
7.1.3.a	Files editable while system online	Should	Partial	All configuration and parameters can be modified while the system is online, but some do not take effect until the system is restarted.
7.1.3.b	Changes reflected within 1 minute	Shall	Comply	
7.1.4	GUI interface for general users	Shall	Comply	
7.2	<i>Device Configuration and Creation/Editing</i>			
7.2.1.a	Unique GUI for each type of static device accessible by System Administrator:	Shall	Comply	
7.2.1.b	Users have read only access:	Shall	Comply	
7.2.1.1.a	CCTV Cameras	Shall	Comply	
7.2.1.1.b	CCTV Cameras Others	Should	Non Compliant	Application software will be modified with requirements confirmed during the Rapid Application Development (RAD) workshop.

Table 3 – Sample Compliance matrix from Consultant

Each vendor was required to provide a minimum of three ATMS project references. These references were called and each reference was asked a set of questions developed by the project team to judge the performance of the consultant on that particular project.

Task 3. Vendor selection and award.

ACHD completed work on the software "Professional Services Agreement" and the contract was signed between ACHD and the winning Vendor on June 28, 2002. An official "Notice to Proceed" was given to the Vendor the first week in July, 2002. The project was scheduled to be completed approximately nine months after the NTP was issued.

Task 4. Software system implementation and testing.

The winning vendor was required to submit a detailed outline of tasks to the project team showing completion dates of major milestones. Some of the tasks the vendor included were:

Rapid Application Development (RAD) – A RAD meeting was held at the vendors facility shortly after the notice to proceed was given. This RAD meeting went thru the detailed RFP requirements and the vendor discussed their approach to each requirement. The vendor established an ATMS compliance matrix, see Table 3 above, which outlined each RFP requirement . This matrix was submitted with the initial RFP submittal and was modified during the RAD meeting discussions.

Factory Acceptance Testing (FAT) – The vendor wanted to test existing local agency ITS devices at the vendors testing facility. The vendor encouraged local agency staff to come to the vendors facility for this testing which proved to be very valuable.

System Acceptance Testing (SAT) – The vendor developed a detailed SAT testing procedure and came to Boise for this 4 day test.

A vendor payment schedule for the completed project milestones was developed by the project team and is shown in Table 4 below.

MILESTONE	PAYMENT PERCENTAGE
<p>Project Initiation This pay item relates to project initiation activities and includes the submittal of a detailed work plan and quality assurance plan.</p>	5
<p>System Design The System Design includes conducting the Rapid Application Development (RAD) workshop and associated documentation, including finalizing the system functionality, GUI prototype and the hardware interface descriptions.</p>	10
<p>Hardware procurement This pay item includes the ordering of the computer hardware and COTS software.</p>	15
<p>Software Development This task will focus on device integration. This pay item will include detailed testing and the preparation of test documents to demonstrate the necessary interfaces to the devices. The testing will be done at the vendors test facility. Payment will be made when the test plans demonstrating successful integration are submitted and approved by ACHD.</p>	15
<p>Factory Acceptance Testing This will demonstrate the full operation of the system in the lab and include the GUI and associated functionality, reports. and integration to representative devices. Payment for this item will be made when successful test results have been submitted and approved by ACHD</p>	15
<p>System Installation This involves delivery, installation and configuration of the System in the ACHD Traffic Management Center.</p>	10
<p>Acceptance Testing This involves the testing of the system in accordance with the ACHD approved Acceptance Test Plan. A pre-condition to this is that all systems and devices as installed and made operational by others is operating in an acceptable manner.</p>	15
<p>Operations Testing This includes the full use of the system following the Systems Acceptance. Included in the operational testing are user documentation, on-site training and support for the operational test period. Payment will be made upon the successful completion of the testing as determined by ACHD and vender.</p> <p>Final Payment shall be made after successful completion of 90 days Operational Field Test.</p>	15

Table 4 – Vender Payment Schedule

Change Orders

There was only one change order issued during the project and it was for some additional work that was not in the initial RFP and vender scope. An automated fax/e-mail component was added to the ATMS software that would send all incident and construction information out to interested agencies as the events occurred in real-time.

This function was intended for a future upgrade but the project team felt it was a valuable feature for the initial deployment.

The project team saw this function in operation in other ATMS systems during the scanning tour and agencies said it was a very valuable feature.

Consistency with National ITS Architecture

A Treasure Valley ITS Architecture was developed in 1999 that outlined 59 projects to be completed in the region within a 20 year time frame. One of the key projects in the plan was the development of an area wide ATMS system to control all area ITS devices.

The development of the ATMS system was based on the elements identified in the ITS Architecture to be incorporated in the region over the next 20 years. The ATMS software was required to be NTCIP compliant and talk to all NTCIP compliant devices.

Project Challenges

The biggest challenge for the project team was the lack of knowledge in ATMS software. The project team had a general understanding of ATMS systems but no real expertise in detailed ATMS functions. The project team made a few key decisions to assist in the ATMS selection and testing process. The project team decided to hire a consulting firm, with experience in ATMS, to assist in a system selection, and to assist the project team in detailed ATMS system testing.

The project team also solicited expertise from the FHWA Western Region office in San Francisco. FHWA staff were more than willing to assist the project team in the document review and selection of the ATMS vender. Staff from FHWA were present in Boise for the vender interviews and software demonstrations. The FHWA staff provided valuable input to the project selection team.

The project team feels that these two decisions were a key to the successful installation of the ATMS software system.

Also prior to developing the ATMS RFP the project team took a scanning tour to see other ATMS systems in operation across the US. The team visited Milwaukee, WI, Albany, N.Y., Atlanta, GA, Colorado Springs, CO and Salt Lake City, UT. This scanning tour proved to be invaluable in gaining knowledge on ATMS systems. The

project team talked to agency engineers and TMC operators and gained some valuable lessons learned from these agencies that were incorporated into the ATMS RFP.

Institutional Issues

A major project challenge involved the project team and vendors interaction with the lead agencies Information Technology (IT) department. The new ATMS servers were tied into the agency network which involved close interaction between the vendor and local agency IT staff.

A major lesson learned was to get the IT staff involved early on in the project and educate them on ATMS features and desired system use.

Technical Issues

There were a few technical problems that were associated with the ATMS software integration with existing agency ITS devices. An existing arterial DMS sign, which the DMS vendor assured was NTCIP compliant, was found to be non-compliant after several months of integration testing. As a result this sign couldn't be incorporated into the ATMS software.

For the most part, co-operation between ITS device vendors and the ATMS vendor was very good and few technical problems were faced.

Monthly meetings were held during the software installation and testing process and a matrix was developed to track any outstanding software development issues. Table 5 below is an example of the Consultant Outstanding Issues Matrix.

Reqmt #	Basic Function	Required Functionality	Demo	Revised	Mod. to software	Cost or Sch. Mod.	Follow-up Required ?
7.2.1	To configure devices	<ul style="list-style-type: none"> CCTV – OK as is, ACHD to check on the use of the video switch to provide “video text label” DMS – OK as is TMS – OK as is, drop requirement for “polling interval” and “aggregate bin sizes”, consider use of ATC for new loop detectors 	Yes	Yes	Yes – develop CCTV detailed screen	No	Yes - ACHD to check on the use of the video switch to provide “video text label”
7.2.2.4	Set channel on tuner						ACHD to clarify requirement
9.2.4	VCR control	NTCIP based control of VCR not required	No	Yes	No	No	No
10.1.4	Good display for operator	Consultant needs to revise to single monitor display of 1192 x 864	Yes	Yes	No	No	No
10.1.11	Provide master clock	Defer till latter					Consultant to respond in SRS

Table 5 – Consultant Outstanding Issues Matrix

Project Delays

There were several issues that came about during the project that caused various delays. Some of the issues included:

- An ATMS server failed shortly after the initial installation,
- There were several device integration problems,
- Non-disclosure agreements had to be signed between the ATMS vender and multiple ITS vendors.
- The integration work between the ATMS vender and ITS vendors moved fairly slow,

A change order that was issued for additional software development, testing and installation also added to this delay.

The result from these various delays was the project timeframe being extended by nearly 10 months.

Lessons Learned

Some of the key lessons learned were:

- The development of a detailed ATMS RFP is critical for a successful system,
- A scanning tour to see ATMS systems in operation in other cities is a great benefit if it can be worked into the project early on in the planning stages,
- The selection of a good project team is desirable,
- Utilize FHWA staff to assist in project evaluation, often times this is a no cost service to the local agency via the Peer-to-Peer program,
- On site consultant interviews and an ATMS demonstration were key factors in the project teams selection,
- A factory acceptance test plan and system acceptance testing plan are critical to project success,
- Get the local agency IT staff involved in the project early on and keep them well informed,
- Detailed ATMS documentation and operator training are a critical aspect of system deployment,
- Delays in completing this type of software implementation and testing can be expected due to the complexity of the project, thus a flexible schedule is needed,
- A good problem tracking system by the vender is needed during the implementation and testing phases,
- A long term maintenance agreement for the ATMS should be developed for continued system support,

- A web based software issue tracking system should be developed by the vendor for the client to enter any ATMS problems for easy tracking and resolution. (See Appendix A)

Future ATMS Integration

One of the key factors in the selection of the ATMS system was the ability of the system to be able to add different modules in the future to control other ITS devices. The project team was interested in the future integration of existing RWIS systems and signal systems into the ATMS software.

Also future systems such as HAR and police computer aided dispatch software may likely be incorporated into the ATMS system.

Data sharing to local agencies

One of the key benefits of this ATMS system has been the sharing of information with other local agencies. ACHD has installed fiber to local police dispatch centers, both county and state, the local DOT offices, local universities and the media.

The universities and DOT's are most interested in vehicle detector data on the freeway system that is tied into the ATMS network. Thirty second vehicle counts and speed data is stored in the ATMS oracle servers and this data can be accessed by any system users.

The ATMS software will also be installed on police dispatch, DOT and university computers to allow real time sharing of information to these agencies.

Appendix A

	#	P	Reported	Project	Status	Assigned To	System	Summary
	2828	Yellow	7/14/2004 12:57:09 PM	1556	Open		Central - Server	ACHD Logo on E-mails viewed internally is missing again.
	2441	Red	6/2/2004 3:19:11 PM	1556	Open		Central - Server	Logging into the system with /NODE1 TMS-SYS is not working
	2338	Yellow	5/12/2004 8:55:21 PM	1556	Open		Central - Server	Response Plans for the Wye Interchange Ramps are not consistent. Some ramps generate a DMS Response, but no Fax / E-mail Response, while others generate NO Response Plan at all.
	2336	Red	5/12/2004 8:32:24 PM	1556	Open		Central - Server	Connectivity Missing from I-84 WB to I-184 WB
	2335	Red	5/12/2004 8:12:47 PM	1556	Open		Central - Server	Queue's No Longer Generate an E-mail Response
	2214	Red	4/20/2004 3:16:07 PM	1556	Assigned	Author, Bobby	Central - Server	Disk Failure
	2098	Green	3/31/2004 6:53:36 AM	1556	Open		Workstation	Traffic Data - Traffic Summary Report
	2047	Green	3/23/2004 1:27:20 PM	1556	Assigned	Fitzpatrick, Mike	Central - Server	DMS Parameters need changed
	2045	Green	3/23/2004 1:01:38 PM	1556	WIP	Cima, Bart	Central - Server	RAID FAILURE
	2043	Green	3/23/2004 10:37:30 AM	1556	Assigned	Bullock Mara	Workstation	Reports at remote workstations state \\TMS-SYS\ARCHIVE is not a valid path
	2040	Green	3/23/2004 10:29:02 AM	1556	Assigned	Fitzpatrick, Mike	Field	Retest DMS when they are connected with fiber
	2039	Green	3/23/2004 10:27:29 AM	1556	Assigned	Fitzpatrick, Mike	Field	McCain DMS driver

1 of 1

Figure A-1 Web based ATMS vender tracking site