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This document summarizes the work completed for continued Intelligent Transportation Systems (ITS) demonstration, evaluation and technology transfer in rural northern California and southern Oregon. This work was completed under the seventh phase (Phase 7) of the California and Oregon Advanced Transportation Systems (COATS) project. The purpose of the overall COATS effort has been and continues to be encouraging regional, public and private sector cooperation between California and Oregon organizations to better facilitate the planning and implementation of ITS in a rural bi-state area extending between Eugene, Oregon and Redding, California.

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# **California and Oregon Advanced Transportation Systems (COATS) Phase 7: Final Report**

by

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A report prepared for the

State of California, Department of Transportation  
Division of Research, Innovation, and System Information

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## EXECUTIVE SUMMARY

This document summarizes the work completed for continued Intelligent Transportation Systems (ITS) demonstration, evaluation and technology transfer in rural northern California and southern Oregon. This work was completed under the seventh phase (Phase VII) of the California and Oregon Advanced Transportation Systems (COATS) project. The purpose of the overall COATS effort has been and continues to be encouraging regional, public and private sector cooperation between California and Oregon organizations to better facilitate the planning and implementation of ITS in a rural bi-state area extending between Eugene, Oregon, and Redding, California.

As COATS matured, it, as well as projects which have spun off from the effort, gained interest from surrounding states, specifically Washington, Nevada, and Utah. Consequently, the COATS region is now the Western States Rural Transportation Consortium (WSRTC), which includes California, Nevada, Oregon, Utah, and Washington. Although future research efforts will be conducted under the umbrella of the WSRTC, the work discussed in this document was conducted as part of COATS and is discussed as such.

The primary goal of COATS Phase 7 was to build on the success of earlier COATS phases to preserve and expand the COATS region as an innovator in rural ITS demonstration. To help the partnership achieve the COATS vision and mission, initiatives that were undertaken include technology transfer through the Western States Forum, a Handbook for the Forum, and maintaining and expanding the COATS web presence for the technology transfer of results of this effort.

## 1. INTRODUCTION

The purpose of this document is to summarize the work completed for continued Intelligent Transportation Systems (ITS) demonstration, evaluation and technology transfer in rural northern California and southern Oregon. This work was completed under the seventh phase (Phase 7) of the California and Oregon Advanced Transportation Systems (COATS) project. The purpose of the overall COATS effort has been and continues to be encouraging regional, public and private sector cooperation between California and Oregon organizations to better facilitate the planning and implementation of ITS in a rural bi-state area extending between Eugene, Oregon, and Redding, California.

As COATS has matured, it, as well as projects which have spun off from the effort (One Stop Shop (OSS), Integration of Aviation Automated Weather Observing System (AWOS) with Road Weather Information System (RWIS), Redding Responder, WeatherShare, Automated Safety Warning System Controller (ASWSC), etc.), have gained interest from surrounding states, specifically Washington, Nevada, and Utah. This work has also generated interest based on being finalists and award winners for the following:

- One Stop Shop
  - 2014 Best of ITS (Awarded)
  - 2013 California Transportation Foundation Tranny Awards (Finalist)
- Redding Responder
  - 2010 Best of Rural ITS Award (Awarded)
  - 2009 California Transportation Foundation Tranny Awards (Finalist)
  - 2007 Best of ITS Award (Finalist)
- Automated Safety Warning System Controller
  - 2014 Best of Rural ITS Award (Finalist)
- Western States Rural Transportation Technology Implementers Forum
  - 2012 Best of Rural ITS Award (Awarded)

Because of this interest, the COATS region evolved during the course of Phase 4 into the Western States Rural Transportation Consortium (WSRTC) with the states of California, Oregon, Washington and Nevada. Utah joined the Consortium in 2018. The WSRTC was established to facilitate and enhance safe, seamless travel throughout the western United States. The Consortium seeks to promote innovative partnerships, technologies and educational opportunities to meet these objectives. Additionally, the Consortium seeks to provide a collaborative mechanism to leverage research activities in a coordinated manner to respond to rural transportation issues among western states related to technology, operations and safety. Consequently, activities of the Consortium are focused on technology transfer/education (Western States Rural Transportation Technology Implementers Forum) and incubator projects (small scale research tasks intended to serve as a “proof of concept” for larger subsequent efforts) centered on the Consortium pillars of technology, operations and safety. Although future research efforts will be conducted under the umbrella of the WSRTC, the work discussed in this document was conducted as part of COATS and will be discussed as such.



## **1.1. COATS Vision**

As part of the shift from COATS to the WSRTC, the vision of the group has been defined as follows: “The WSRTC shall promote innovative partnerships, technologies and educational opportunities to facilitate and enhance safe, seamless rural travel throughout the western United States.” Throughout COATS Phase 7, the WSRTC vision has been employed in guiding the various efforts associated with the project.

## **1.2. COATS Mission**

The COATS Project serves to focus member agencies on a seamless, state-of-the art, multi-modal transportation network benefiting travelers, goods movement, economic activity, and transportation systems operators in California, Nevada, Oregon, Utah, and Washington. Collaboration between the COATS project and its partnership coalition provides information and serves to promote increased safety, mobility, traveler comfort, environmental quality, and operational efficiency and productivity. Again, as part of the shift from COATS to the WSRTC, the mission of this effort is presented as follows: “The WSRTC shall provide a collaborative mechanism to leverage research activities in a coordinated manner to respond to rural transportation issues among western states related to Technology, Operations and Safety.” The mission of the WSRTC guided the work for COATS Phase 7.

## **1.3. Phase 7 Goals**

The primary goal of COATS Phase 7 was to build on the success of earlier COATS phases to preserve and expand the COATS region as an innovator in rural ITS demonstration. To help the partnership achieve the COATS vision and mission, initiatives that were undertaken include technology transfer through the Western States Forum, a Handbook for the Forum, and maintaining and expanding the COATS web presence for the technology transfer of results of this effort.

## **1.4. Project Tasks**

The work plan for COATS Phase 7 consisted of the following five tasks:

- Task 1: Project Management
- Task 2: Project Technical Advisory Panel (PTAP) Meetings
- Task 3: Western States Rural Transportation Technology Implementers Forum (WSRTTIF)
- Task 4: Incubator Projects
- Task 5: Submit Final Report and Workshop Presentation

Central to the project were the needs and interests of stakeholders within the COATS region. Their input was used to identify what activities would be pursued, as well as provide feedback and information in support of on-going work. WTI managed the project in consultation with the Project Manager and the PTAP, to ensure integrity and unity in the project approach.

## **1.5. Report Organization**

This report presents a summary of activities completed during Phase 7 of the COATS effort. Specifically, this report provides an overview of the major efforts of the project, including the

Western States Forum and the development of the Western States Forum Handbook (incubator project).

## 2. TECHNOLOGY TRANSFER

### 2.1. Western States Rural Transportation Technology Implementers Forum

This task provided financial and logistical support for the 2017, 2018, and 2019 Western States Forums and a portion of the 2020 event as directed. An event focused on delivering high quality technology transfer and networking opportunities, the Forum targets an audience of professionals working in design and maintenance of ITS technologies in rural environments. It is unique nationally with respect to its audience and technical content, and its origin and development reflect the idea of using COATS as an incubator for innovations in the use of technology to address rural transportation challenges.

The 2017 Forum was held at the Holiday Inn Express, while the 2018 and 2019 events were held at the Best Western Miner's Inn. Both venues are in Yreka, California. Being close to the Oregon border facilitated participation from other states while remaining within Caltrans District 2. The venues were economical with the necessary facilities, including lodging within close proximity to the meeting facility. To promote continuity, the Forum has been held in the third week of June.

Individual participation at the Forum indicates its growth and success. Starting with 15 in 2006, the 2019 Forum saw a record 53 participants. In 2017, 48 individuals attended, with 46 participating in 2018. The Forum continues to attract a diverse audience from within the WSRTC and surrounding region. Participants have come from ten western and central states – California, Idaho, Montana, Nevada, Oregon, Texas, Utah, Washington, Wisconsin, and Wyoming – with Wisconsin being a new addition to the list of participant states. They represented ten of the 12 Caltrans Districts, several offices and divisions within Caltrans, five universities, a city transportation office, the California Department of Water Resources, the FHWA, the Idaho National Laboratory, the Southwest Research Institute, IBM, and Civil Science. It should be noted that while the Forum aims to maintain a smaller audience around 40-50 people, ongoing travel restrictions in California and other states have and will continue to cause attendance numbers to fluctuate.

Each year, the Forum has been distinguished by informative, in-depth technical presentations and demonstrations given by a diverse group of rural ITS practitioners. Presenters have delved into how solutions were developed, focusing on applications that have been deployed in the field and are being used in live traffic situations. Success stories have been shared along with failures and problems so that participants learned not only what does work, but also what doesn't work and why. The extended length of the presentations (60-120 minutes) and the informal atmosphere have allowed frank discussion of equipment functionality, vendor claims, system performance, and other key information that practitioners need to know for successful rural ITS projects. The Committee has specifically encouraged presentations that discuss and/or demonstrate a project implemented or improved because of participation in a past Forum.

The Western States Forum website ([www.westernstatesforum.org](http://www.westernstatesforum.org)) has been maintained and the Forum continues to have a presence on the Western States Rural Transportation Consortium (WSRTC) website ([www.westernstates.org](http://www.westernstates.org)). The Forum website includes a home page and individual pages that describe the Forum and its history and share pertinent information about the current Forum such as registration, lodging, maps and directions, and things to do around the Forum location. Each past Forum has a set of pages that includes downloadable versions of the technical content and an image gallery. Contact information is also easily accessible.

To increase awareness of the Forum and its value, a one-page fact sheet that describes the Forum was updated, distributed, and posted on the Forum website as well as the WSRTC website. The annual evaluations collected comments about how the participants would use the information from the Forum (projects, discussion points, philosophy, networking, etc.) as well as whether they or someone from their department implemented or improved a project because of participating in the Forum. A selection of these comments and others are on the Consortium website at <http://www.westernstates.org/Impact/WSF/Default.html>. This page details how the Forum is effectively impacting change across the WSRTC region.

Announcements about the Call for Abstracts and Forum registration were posted on the ITS Rocky Mountain website, and publicized in the ITS Rocky Mountain monthly e-newsletter, and the Transportation Communications Newsletter (TCN).

Participants repeatedly expressed a very high interest in attending a similar Forum the following year. Average evaluation ratings for quality, level of detail, relevancy and overall aspects of the Forum were consistently positive. Attendees appear to be satisfied with the length and general format of the Forum, including the small, focused group, detailed presentations, rural perspective, and excellent networking opportunities. The feedback suggests that the Forum is successfully meeting the needs of practitioners and the goals, mission and vision outlined for the Forum.

A more detailed review of this task can be found in the yearly reports completed as part of this task (1, 2, 3).

## **2.2. Project Technical Advisory Panel (PTAP) Meetings**

In addition to the technology transfer completed by the Forum, COATS/WSRTC PTAP meetings also provided an opportunity for discussion of current and future ITS activities in the region. Stakeholders also met and guided planning and decision-making related to the COATS project. The original proposal called for four PTAP meetings (two per year); with the no-cost time extension six meetings were held. Four of those meetings involved the entire PTAP, while the other two were held onsite during a host conference and attended by those participating in the respective conference. In completing this task, three PTAP meetings were held in Yreka, California, in conjunction with the annual Western States Forum – June 20, 2017, June 19, 2018, and June 18, 2019. A PTAP meeting was also held on March 13, 2018, in Corvallis, Oregon, in conjunction with the biannual Northwest Transportation Conference (NWTC). WSRTC members met in October of 2018 during the National Rural ITS Conference + Exhibit in Fort McDowell, Arizona, and at the ITE Annual Meeting + Exhibit (Rural ITS Track) in July of 2019 in Austin, Texas. Collectively, these meetings allowed for a discussion of the direction and focus of existing project tasks, presentation of initial and final task results, and discussion of future project directions. Presentations made at these meetings fulfilled the workshop presentation component of Project Task 5.

Teleconferences were also held on an as needed basis. This allowed for a travel savings which could then be applied to other aspects of the work, specifically the Western States Forum, travel to local conferences, and the progress and results of the incubator projects discussed later in this document. Aside from the organization and conduct of these meetings, associated deliverables included meeting presentations, meeting minutes, and related website updates.

### 2.3. Websites

Part of the goal for Task 1 of this project was to maintain and update the WSRTC and Western States Forum websites:

Western States Rural Transportation Consortium: <http://www.westernstates.org/Default.html>

Western States Rural Transportation Technology Implementers Forum: <http://www.westernstatesforum.org/>

These websites provide a publicly available web presence for the COATS project, spin-off projects, and the Western States Forum. Over the course of the project, quarterly progress reports for COATS were developed and posted to the Consortium website. PTAP meeting reports and materials (agenda, presentation, minutes) were posted along with any images from the meetings and conferences. New pages listing the Steering Committee members and Emeritus members were also developed and posted. And, project updates describing progress and results of related spin-off projects were compiled and posted.

Annual website updates documenting the Western States Forum were developed and posted on both the Forum and Consortium websites. These reports included the technical content, the schedule of events, and images from the event. The Forum website was also maintained and changed according to the planning calendar. The Call for Abstracts was posted followed by registration information, lodging information, maps/directions, and things to do around the Forum venue. After the event, a Past Forum page was developed which included technical content and an image gallery.

Additionally, the research team took some preliminary steps to ensure both websites will be accessible and compliant with required state and federal standards. This work will continue during future COATS/WSRTC tasks.

### 3. INCUBATOR PROJECTS

Caltrans and its partner states and institutes have developed a collaborative mechanism to leverage research activities in a coordinated manner to respond to rural transportation issues among western states related to technology, operations, and safety. Because of continued interest in collaboration and sharing research results, Caltrans determined that one of the best approaches for examining such issues was to pursue incubator projects under the scope of the COATS effort. Incubator projects are low-cost research efforts (e.g., limited time, scope, monetary resources) that investigate current rural ITS challenges and technology needs. These projects are not intended to completely resolve an issue but rather to better understand it, provide recommendations for next steps and potentially provide a “proof of concept” solution.

With this as the foundation, three incubator projects were initially proposed for work under COATS Phase 7:

- Safety/Operations: Rural Winter Travel Times
- Technology: Chain-Up Delay Tracking with Bluetooth (Part 2)
- Technology: Data Quality for Aggregation and Dissemination of DOT Traveler Information: An Analysis of Existing System Best Practices (Part 2)

However, since the start of this project, significant staffing changes have occurred at the Western Transportation Institute. Early in the project original Principal Investigator (PI) Doug Galarus left WTI as did staff member Daniell Richter. Dr. Craig Shankwitz stepped in as PI for a time but also left WTI. These departures left COATS project staffing levels and that of other work significantly reduced with no suitable replacements available. Reduced staffing especially impacted the incubator research projects. To address these changes, Caltrans’ needs, and team member experience, the following incubator projects were then proposed:

- Traveler Information Data Quality
- How-To Handbook/Manual for the Western States Forum
- Rural Cellular Communications Deployment

#### 3.1. Traveler Information Data Quality (Part 2)

The original goal for this incubator project was to develop a set of best practices for traveler information data quality. This was to include best practice methods and algorithms, and a test suite of algorithms. With the above-mentioned staffing changes, this would have been accomplished with the remaining research team member in conjunction with work on spin-off projects. Ultimately, the effect of the staffing changes on the hours and expertise needed to complete this project was significant. The project manager and PTAP deemed this incubator a lower priority for the research team than that of other project work. With that said, this project and its research outcomes are of importance to Caltrans and the topic may still be addressed in the future through other means.

#### 3.2. Rural Cellular Communications Deployment

This topic was proposed after several high-profile incidents that significantly impacted rural areas in California. However, it was temporarily set aside until the impact of the recent implementation of the FirstNet Public Safety Communications Network is observed and evaluated.

### 3.3. How-To Handbook / Manual for the Western States Forum

The upcoming 2020 Western States Rural Transportation Technology Implementers Forum will be the 15<sup>th</sup> annual event. The current COATS research team has been involved with the Forum on the Steering Committee for all but the first two events. The planning and execution of the Forum has been conducted by a four-person steering committee with assistance from an on-site event coordinator. The Handbook is intended to document the Forum in such a way that the event and its standard of excellence can be easily continued even as staffing and other inevitable changes occur. The Handbook is a practical, how-to guide for planning and executing the Western States Forum. A best effort was made to document the necessary activities and what has been done in the past in order to maintain the standards and expectations for the event.

The Handbook includes a description of the Forum with its goals and target audience. It discusses some of the history and background for the event in order to establish a foundation for why the event has been conducted as it has in the past. The Handbook then goes into detail on specific aspects, such as location, venue, facilities, lodging, and food and beverage services. Information is included on the schedule of events, technical program and agenda, networking, event promotion and marketing, registration, travel assistance, and meeting notebooks. The Handbook also discusses evaluation of the Forum and follow-up activities and includes a list of equipment that is part of the event.

In addition to the information about planning and conducting the Forum, the Handbook also contains a list of past topics, participation history, and sample materials. Original materials that can be minimally edited and used for future events are included in a separate compendium.

This Handbook is dynamic and is meant to be updated after each Forum to keep it current, applicable, and practical. The most recent version is *Western States Rural Transportation Technology Implementers Forum Handbook: A Practical How-To Guide for Planning and Executing the Forum, Version 2019 (4)*.

## 4. CONCLUSION

This report reviews the various activities conducted for the COATS Phase VII project. These activities centered on technology transfer, specifically the growth and continuation of the annual Western States Forum, development of a Forum Handbook, and website maintenance and development.

### 4.1. Summary of Major Efforts

The COATS Phase 7 project was active from February 2017 through January of 2020. The project focused on technology transfer and provided support for the 2017, 2018, 2019, and part of the 2020 Western States Forums. The Forum served as a technology transfer platform where informative, in-depth technical presentations were given by rural ITS practitioners. Presenters delved into how solutions were developed, focusing on applications that have been deployed in the field and are being used in live traffic situations. Success stories were shared along with failures and problems, so participants learned what does and doesn't work and why. The Forums included live demonstrations of rural ITS technologies and "hands-on" question and answer periods. Speakers and participants brought actual ITS equipment and gave informal "show and tell" sessions during breaks and networking opportunities. This event will continue under the scope of COATS Phase 8 / Western States Rural Transportation Consortium and is expected to keep providing a quality forum for the discussion of rural ITS applications, successes, and failures. One of COATS' primary goals is to promote technology transfer; by providing this venue for ITS discussion this goal has been met.

Developing a comprehensive Handbook for the planning and conduct of the Western States Forum will help ensure that this event will continue to meet the needs and expectations of rural ITS practitioners in the western states region. The websites will also continue to share valuable research efforts and impact change across the region.

### 4.2. Summary of Deliverables

During the course of COATS Phase VII, a number of deliverables were produced. Specific report documents are listed in the References section of this report.

The deliverables produced to meet the research objectives of COATS VII included:

- Quarterly progress reports and quarterly updates on the Consortium website (<http://www.westernstates.org/Projects/COATS/Default.html>);
- PTAP meeting minutes, meeting presentations, meeting agendas for Steering Committee meetings and conference calls; posted on the Consortium website (<http://www.westernstates.org/Documents/Default.html>);
- Organization and conduct of the Western States Rural Transportation Technology Implementers Forum in 2017, 2018, 2019; organization of the 2020 Western States Forum;
- Annual reports summarizing the Western States Rural Transportation Technology Implementers Forum (1, 2, 3);
- Annual website updates (Forum and Consortium websites) documenting the Western States Rural Transportation Technology Implementers Forum:
  - Forum website, Past Forums pages  
2017 - <http://www.westernstatesforum.org/PastForums/2017/Default.html>



- 2018 - <http://www.westernstatesforum.org/PastForums/2018/Default.html>
- 2019 - <http://www.westernstatesforum.org/PastForums/2019/Default.html>
- WSRTC website, Forum project pages
  - 2017 – *2017 Forum Continues Tradition of Detailed Discussion on Rural ITS Projects*,  
<http://www.westernstates.org/Projects/WesternStatesForum/Updates/2017-10-13.html>
  - 2018 – *Another Successful Forum in 2018!*,  
<http://www.westernstates.org/Projects/WesternStatesForum/Updates/2019-01-15.html>
  - 2019 – *14th Annual Forum Hits Milestone*,  
<http://www.westernstates.org/Projects/WesternStatesForum/Updates/2019-12-13.html>
- Maintenance and expansion of the COATS project pages (<http://www.westernstates.org/Projects/COATS/Default.html>), Western States Rural Transportation Consortium website (<http://www.westernstates.org/Default.html>), and Western States Forum website (<http://www.westernstatesforum.org/Default.html>);
- Development of Emeritus (<http://www.westernstates.org/Emeritus/Default.html>) and Steering Committee (<http://www.westernstates.org/SteeringCommittee/Default.html>) pages for the WSRTC website;
- Version 2019 of the Western States Forum Handbook, *Western States Rural Transportation Technology Implementers Forum Handbook: A Practical How-To Guide for Planning and Executing the Forum, Version 2019* (4).

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## 5. REFERENCES

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- 1 Koon, Leann A.F. Western States Rural Transportation Technology Implementers Forum, Review of 2017 Meeting. California Department of Transportation, Division of Research, Innovation, and System Information, February 2018.
- 2 Koon, Leann A.F. Western States Rural Transportation Technology Implementers Forum, Review of 2018 Meeting. California Department of Transportation, Division of Research, Innovation, and System Information, March 2019.
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