Pooled Fund Study Project TPF-5(054)
SDDOT Project SD2002 – 18
Development of Maintenance Decision Support System
Phase IV
FOURTH QUARTERLY PROGRESS REPORT
October – December, 2006

Overview

The primary focus of the Phase IV fourth quarter was spin-up activities associated with the Field Deployment Transition (FDT) taking place during the winter of 2006-07. Version 2.99 of the MDSS Graphical User Interface (GUI) was released on October 19th and Version 3.00 of the MDSS GUI was released on December 20th.

The quarter saw the addition of many new users and routes to the MDSS system. By the end of the fourth quarter there were approximately 200 maintenance routes within the MDSS system, with an additional 150 routes nearly ready for startup. This scale-up presented new challenges to the MDSS system and resulted in modifications to both the MDSS software and a significant increase in the bandwidth serving the MDSS.

This report will address the major tasks of the quarter, following the outline of the Phase IV Work Plan.

Implement version 2.0 of the PFS MDSS in state agency offices in individual and multi-state test regions as determined by the Technical Panel and evaluate its performance during 2005-06 winter operational maintenance activities (Task 1)

Task completed. No additional activities during quarter 4.

Identify required additional research necessary to continue the enhancement of MDSS within an operational environment (Task 2)

During the Demonstration Field Test – Year 2 (DFT-2), over a dozen intensive field case studies were conducted across the PFS-MDSS domain by both Meridian staff and DOT observers. A large volume of data was collected from these cases; including MDSS forecast data, photographic and subjective observations, camera imagery, as well as NWS and RWIS observations. A limited number of cases also included chemical samples collected by DOT observers.

Refinement of the MDSS modeling software based upon these case studies was carried out throughout the 2nd and 3rd quarters and finished up very early in the 4th quarter. A number of the case studies, their results, and summary of the resulting modifications to the MDSS software were presented at the October MDSS Technical Panel meeting. The data from these case studies has been archived with the intent of revisiting them each year as additional enhancements are made to MDSS in order to gauge changes in system performance over time.

These case studies, coupled with user feedback provided during the fall training sessions and a regular flow of suggestions from MDSS users, highlight topics that need further research. The prominent topics raised in Quarter 4 that emphasize needed research requirements include blowing snow modeling, better estimates of actual snowfall amounts where no instrumentation exists, maintenance procedures for situations where normal maintenance options are unable to keep up with precipitation accumulation rates, and phase diagrams for new chemical options and for mixtures containing more than one chemical type.

Prepare for the Field Deployment Transition (FDT) to be conducted during the winter of 2006-07 (Task 3)

Version 2.99 of the MDSS Graphical User Interface (GUI) was released on October 19th. Version 3.00 of the MDSS GUI was released on December 20th. GUI enhancements in these releases included printing capabilities for the MDSS Route View graphs, connection of the Alert Panel color bars to the time slider, options for limiting RWIS and METAR sites to the user's home state, improved integration of the Data Sync options with the corresponding menu items, modifications to the method of user authentication, added flexibility in the maintenance data entry form, as well as numerous other more subtle changes. The modifications to the authentication method were made to address scale-up issues, as an authentication-related server bottleneck had developed with the addition of so many new users. In addition, Meridian added additional bandwidth to support MDSS activities. The bandwidth available to MDSS was increased from the equivalent of 80% of a T1 upward to two T1s, or a 250% increase.

The annual MDSS training sessions were completed during November and the first week of December (see Table 1). The focus of the sessions this year was twofold: 1) introduction of the MDSS program to the large number of new users and 2) a full demonstration of the MDSS capabilities with emphasis on the new enhancements added to this year's FDT package. Most states continued to provide the training sessions to those participants who had been previously involved in the MDSS research program with the training at their operational facility or the district office. Since Iowa had expanded its participation to cover all Interstate routes within the state, they chose to have two sessions in Ames. New training was done at sites in Colorado, Kansas, and New Hampshire.

One of the key topics during the training sessions was the entry and transmittal of maintenance data. Indiana places considerable emphasis on the input of maintenance reports via the web interface page and they were looking for efficiencies in the entry of data from multiple trucks and routes. Their input was instrumental in the development of a modification to the data page that was integrated into Version 3.00. Users who have AVL systems raised numerous questions about the operational state of their AVL equipment, data entry techniques, how the data gets transferred to MDSS, and how they can see where their truck is and what was reported to the system. Trainers discussed these specific issues with the participants and demonstrated how actual reports appeared on the MDSS display.

Preparation was completed for the Caltrans training but the date for the training was moved to the first week of January due to conflicts in scheduling during the holiday season.

LOCATION	DATE	INSTRUCTOR
COLORADO		
Colorado Springs	Nov 2	Gordon Bell
Brush	Nov 6	Gordon Bell
Glenwood Springs	Nov 7	Gordon Bell
Denver	Nov 8	Gordon Bell
Aurora	Nov 8	Gordon Bell
Boulder	Nov 9	Gordon Bell
Evans	Nov 9	Gordon Bell
South Forks	Nov 13	Gordon Bell
Golden	Dec 14	Gordon Bell
Castle Rock	Dec 19	Gordon Bell
INDIANA		
Columbus	Nov 8	Bob Hart
Winamac	Nov 9	Bob Hart
IOWA		
Ames – statewide, group 1	Nov 6	Bob Hart
Ames – statewide, group 2	Nov 15	Bob Hart
KANSAS		
Topeka	Nov 17	Bob Hart
Dodge City	Training not requested	
MINNESOTA		
Alexandria	Dec 6	John Mewes Ben Hershey
NEW HAMPSHIRE		
Hooksett	Dec 6	Steve Gaddy
NORTH DAKOTA		
	Training not requested	
SOUTH DAKOTA		
Custer	Delayed until after AVL installation in January	
WYOMING		
Evanston	Nov 16	Gordon Bell
Cheyenne	Nov 17	Gordon Bell

Table 1. MDSS training sessions done prior to the winter of 2006 – 07.

Perform scientific validation of observed weather variables and comparison with input variables to the PFS MDSS (Task 4)

A presentation of the findings of the DFT-2 case studies was presented at the October MDSS Tech Panel meeting.

Perform an assessment of the validity, acceptance, utilization and operational requirements of MDSS within State DOT winter maintenance practices (Task 5)

No formal activities were performed on this task during the quarter. However, considerable subjective input was received from DOT participants during the fall training sessions. This input is contained in reports that were recorded after each of the training sessions.

Develop a strategy to transition the MDSS PFS to a broader state DOT audience and full deployment (Task 6)

As mentioned previously, the rapid growth of MDSS participation has resulted in numerous scale-up issues that were addressed during the 4th quarter. Changes made to both the MDSS GUI and the server-side MDSS modeling software have significantly improved performance of most MDSS components. There were approximately 950 registered MDSS users and 200 MDSS routes as of the end of the quarter, functioning on very nearly the same infrastructure that once supported only one third of this load. The growth in MDSS participation has given Meridian a much better opportunity to evaluate how the various components of MDSS may scale to statewide deployments and make modifications where significant obstacles are identified. It has also provided Meridian with a better idea of the amount of personal user support that may be required for statewide deployments.

From the participating states' perspectives, knowledge on obstacles to full MDSS deployment are being explored in several ways. The Iowa DOT is experimenting with expansion of MDSS to all Interstate highways. The North Dakota DOT is attempting to get MDSS routes scattered throughout all its districts so as to begin the process of exposing and familiarizing it employees with the system. The Colorado, Indiana, and Minnesota DOTs are all experimenting with district- or subdistrict-wide deployments of MDSS. In addition, nearly all PFS MDSS member states are experimenting with different methods of mobile data collection (MDC). The Colorado, Wyoming and Kansas DOTs have installed IWAPI touchscreen systems into nearly all of the trucks maintaining their MDSS test routes. The South Dakota DOT is working with Meridian and Intelligent Devices, Inc. to develop an MDC system that will collect data from the controllers on the snowplows as well as from the driver and put them into NTCIP-compliant reports. The Indiana and North Dakota DOTs are also experimenting with several different potential providers of MDC equipment.

In summary, avenues toward broader to full-scale MDSS deployment are being pursued from many different angles by both Meridian and the participating state DOTs.