

## USE OF RWIS BY CALTRANS

*This chapter documents current use of and planned expansions for RWIS for Districts 1 through 12 and Headquarters in California.*

In 1990, Caltrans began using RWIS for the first time when District 7 installed three sites on the Grapevine between Los Angeles and the Central Valley. Since then, ten of the twelve Districts have begun to use RWIS. Currently, there are 80 RWIS sites throughout California with plans to install 179 more sites in the future. The number of sites currently in each District and the number of proposed sites are illustrated in TABLE 3-1 with the current sites and the proposed sites shown in FIGURE 3-1.

**TABLE 3-1 District RWIS Sites and Proposed Sites**

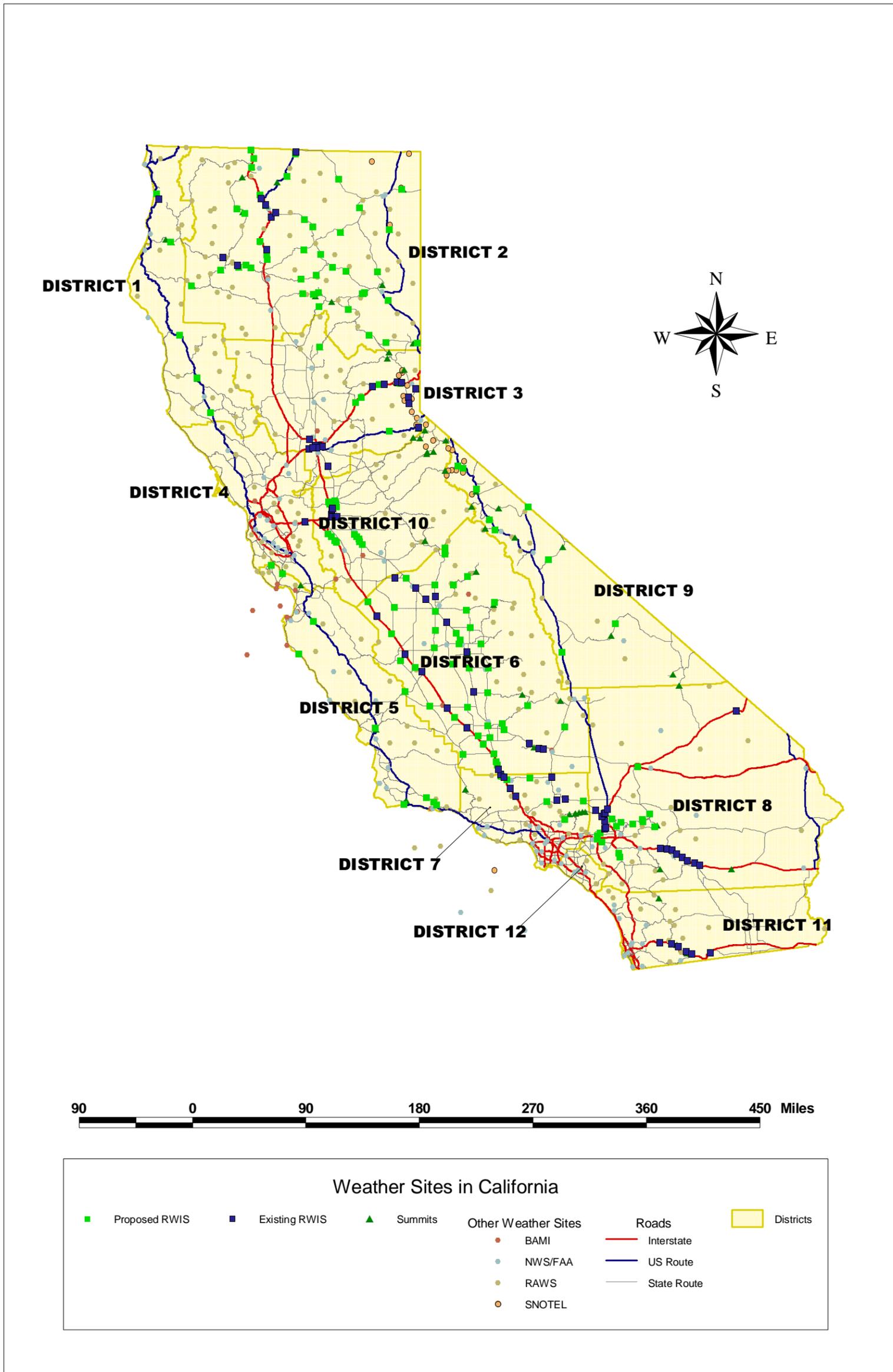
District	Current	Planned	Future Total # of Sites
1	1	5	7
2	8	42	50
3	16	6	22
4	1	0	1
5	0	0 (10 potential locations)	7
6	12	40	52
7	8	0 (6 potential locations)	13
8	17	30 - 40	47 - 57
9	3	10	22
10	9	19	28
11	6	0	6
12	0	0	0
	<b>81</b>	<b>Approx. 170</b>	<b>Approx. 250</b>

To document the status and use of RWIS throughout the state, project researchers interviewed RWIS users in each District. This included an initial phone interview

and an inventory survey for the technical advisory committee member and visits with RWIS users. Data collected included the history and purpose of their system; current and planned sites; equipment and maintenance; partnerships with other agencies; and best practices. This information is summarized in this chapter by District, and followed by a summary discussion. More detail is provided in Appendix B – RWIS Site Inventory and Appendix D – Data Collected from Districts.

Each District procures and operates RWIS independently, although only three RWIS vendors are in use in California. Most of the sites in the state are SSI, with some sites from Vaisala and Qualimetrics. The differing products are identified here for the purpose of clarifying discussion. SSI users access their RWIS data through a DOS-based application on a desktop computer (Scan) or through the web-based ScanWeb. SSI also provides an automated alarm and paging service that some Districts have used called ScanSentry. Some of the Districts also use the SSI pavement-temperature forecasting service ScanCast. Vaisala's user interface, IceCast, is a desktop application available on computers where the District has purchased software licenses. Vaisala does not provide forecasting services but encourages its customers to work with companies that do (in the case of District 11, Northwest Weather Net). Qualimetrics, used only by District 10, does not have any specialized names for its products and its PC-based user interface. Qualimetrics also provides an automatic anti-icing system that interests many Districts.

Beyond RWIS, this document identifies three other products related to weather information for transportation. Meteorlogix, which just changed its name from DTN, provides weather monitoring and satellite images in a format that can be configured for the needs of the District. Most Districts are currently in the process of upgrading to the newest Meteorlogix product. District 1 also has deployed Davis Weather Stations on their roadways. These stations, which cost less than RWIS stations, collect meteorological data but do not collect the pavement and subsurface temperatures. Finally, users in each District obtain regional weather information via public sources – NWS forecasts, television, weather radio, and Internet sites. Internet web sites identified most frequently include The Weather Channel, Weather Underground, Accuweather, and National Weather Service.



**FIGURE 3-1 RWIS locations statewide.**

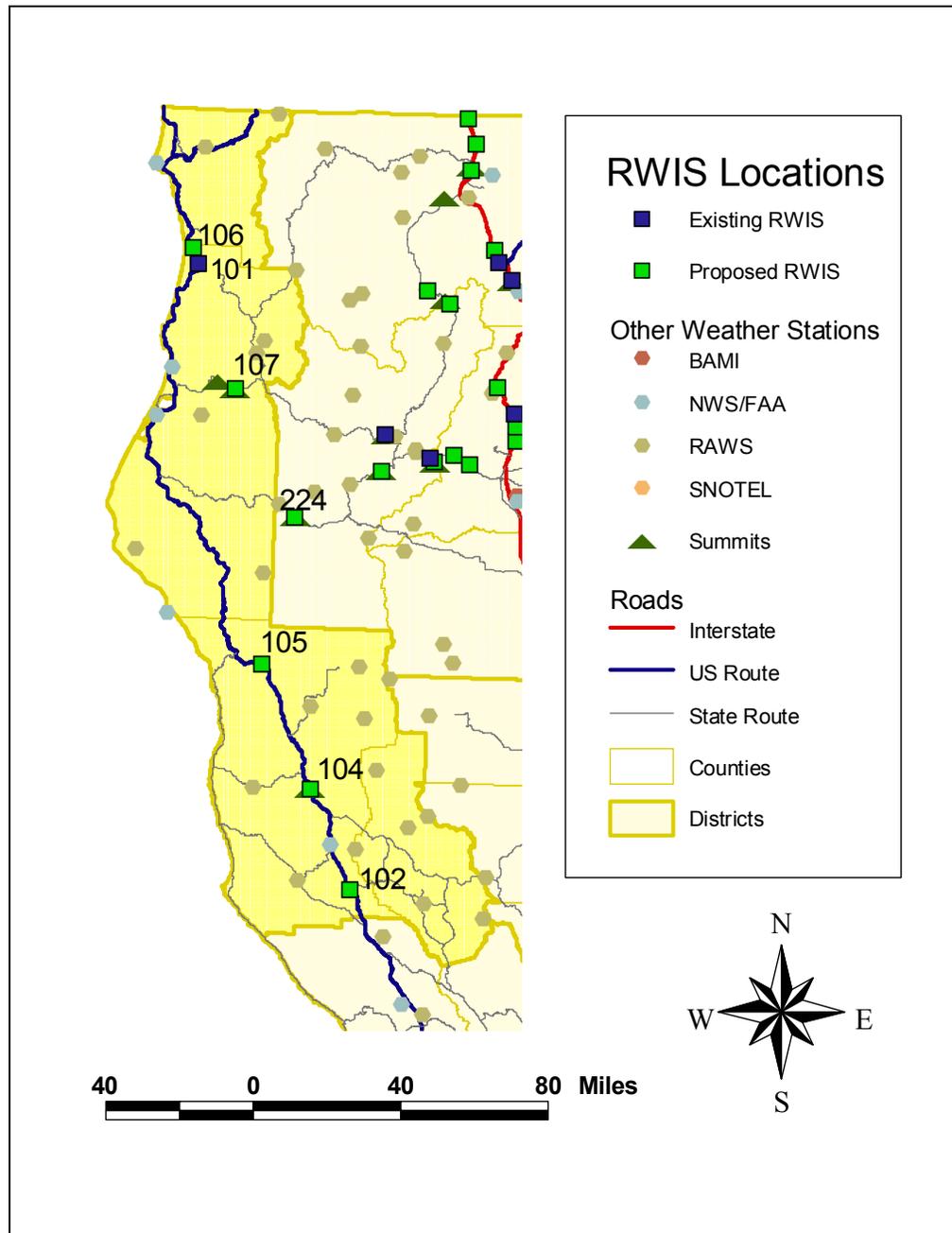
## **District 1**

District 1 includes the northern coast of California. The District began using RWIS in 1992 for frost and ice detection. Weather challenges that exist in the northern part of the state are limited mainly to rain, ice, and fog events.

### **RWIS Use**

District 1 currently has one station with ScanCast forecasts twice per day. The District is in the process of upgrading and moving this station and adding six new stations (see FIGURE 3-2). With the new project, SSI has upgraded the DOS-based user interface to a web-based application (ScanWeb).

Currently, maintenance uses the system primarily for frost and ice detection. RWIS information will be available in the Traffic Management Center once it is complete and operational.



**FIGURE 3-2 District 1 RWIS locations.**

People interviewed are generally satisfied with their limited system. The District feels that the ScanCast are accurate and extremely valuable. When the forecasting is incorrect, staff contacts SSI to alert them. Related to data access, the District has developed an agreement and contract that allows them to have full access to their data and re-package it as needed. During the first three years of deployment,

SSI had performed system maintenance once a year, but Caltrans staff now maintains its own system.

New site selection was conducted using input from maintenance crews. Maintenance identified sites where they felt they will be the most effective. They prioritized the sites that have frost and ice problems first and other problem areas, such as north slopes, second. Site placements were not limited by availability of communications and power service. Instead, they will use radios and solar panels to overcome this problem.

The existing site relies upon solar panels as the power source. Shortly after initial deployment, thieves broke into the cabinets and stole the solar panels. Since the District replaced the panels, welded them together, and added security to the cabinets, the panels have not been stolen again.

### **Other Weather Applications**

Separate from RWIS, the District has two types of equipment installed in the field. Two Davis weather stations are collocated with CCTV and CMS. TMC staff monitor this weather information for posting warnings on the CMS and putting information onto a traveler information system. Eighteen additional Davis weather stations are planned. The District also has visibility and pavement sensors for an icy curve warning system.

Dispatch and maintenance use DTN (Meteorlogix) StormSentry for weather tracking of mesoscale weather events. The system has storm cell tracking ability and is very configurable.

### **Future Improvements**

The District is in the process of upgrading their RWIS and adding additional sites. The existing station is being moved to a location that better represents local conditions. The station was located on a bridge deck that, when placed, was assumed to freeze first. They discovered, though, that the bridge-deck is facing south and therefore tends to be warmer than the surrounding roads. The new sites will be placed on summits where ice and frost are common. All of these sites are expected to utilize frost and ice sensors, as well as to employ radio communication or cell phones for data access.

### **Current and Potential Partners**

Staff would like to share information with Oregon DOT and with NWS. Currently, District 1 accesses Oregon DOT RWIS data through their public web site. The District has also contacted the Eureka NWS office.

## District 2

District 2 includes the northeastern counties of California, all the way to the Oregon border. The mostly rural District includes the Cascade Range and the most northern portion of the Central Valley. The region faces snow and ice frequently during the winter.

### RWIS Use

District 2 currently has 8 sites with 4 under construction, 5 in design, and 47 in planning phase (see FIGURE 3-3). District 2 began using RWIS in 1993 to improve maintenance, scheduling, staffing, and operations. Currently they also use RWIS for high wind warnings. Users can access data from 6 stations through ScanWeb, with the other two stations on the old Scan system. ScanCast pavement temperature forecasts are provided for the 6 sites. There are 4 CCTV units collocated with current RWIS sites. The District plans to install CCTV on all new RWIS sites and to update the existing sites with CCTV.

Approximately 12 people in the District are trained to use RWIS and approximately 6 are trained to maintain the system. Maintenance staff is generally receptive to RWIS. Staff follows the lead of the Chief of Maintenance and Operations, who is an advocate for quality use of RWIS. One problem noted is the feeling that the user interface is not very good. Also, access to the information is currently limited to the vendor-provided application, although the District is in the process of paying the vendor for full access. For example, staff believe that RWIS would be beneficial if they could export the information to the public.

RWIS is used extensively for snow and ice control, including anti-icing. Options for treatment include solid salt, magnesium chloride, cinders, and salt brine. In choosing when and how much to apply chemicals and abrasives, some maintenance supervisors rely on the chemical factor measurement, the pavement temperature, and the subsurface temperature. The pavement temperature sensors, although important, have reliability problems and sometimes are covered in paving and sealing work.

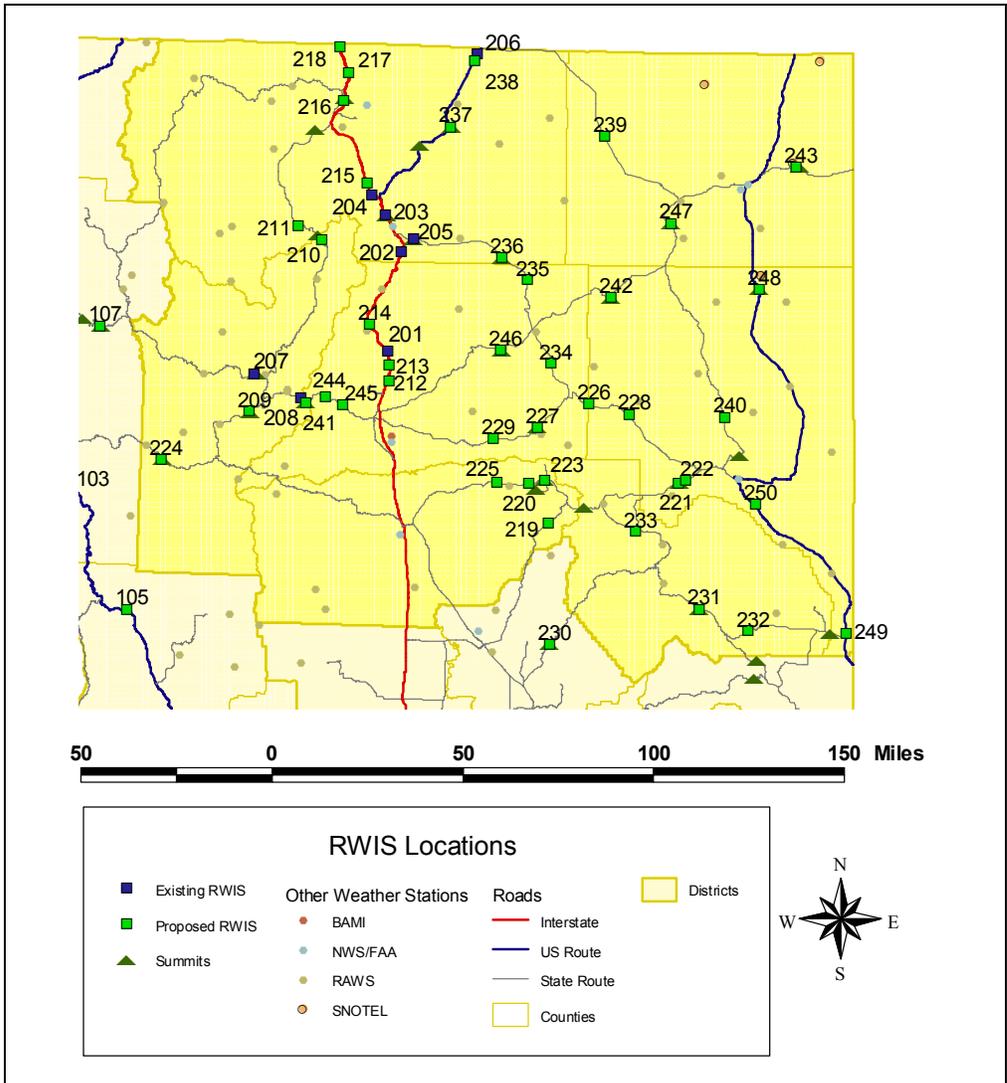


FIGURE 3-3 District 2 RWIS locations.

**Other Weather Applications**

The District is testing truck-mounted infrared pavement temperature sensors. Also, the District uses DTN (Meteorlogix). In making weather-related decisions, users also access Internet weather web sites.

**Future Improvements**

The District is trying to get two initiatives off the ground. First, the District plans to use RWIS information in the TMC to help manage decisions during storm events, including posting messages on CMS. Second, the District is working on

posting information on the Internet for the traveler. The test web site, with RWIS data from six SSI sites, was published in the spring of 2002.

The District also has three projects using RWIS and automated messages. The Fredonyer summit project will use data measured pavement temperatures to trigger an automatic icy road message on a CMS. A similar project is being developed for Spring Garden on Plumas SR 70. Another automated warning system is located on I-5.

### **Current and Potential Partnerships**

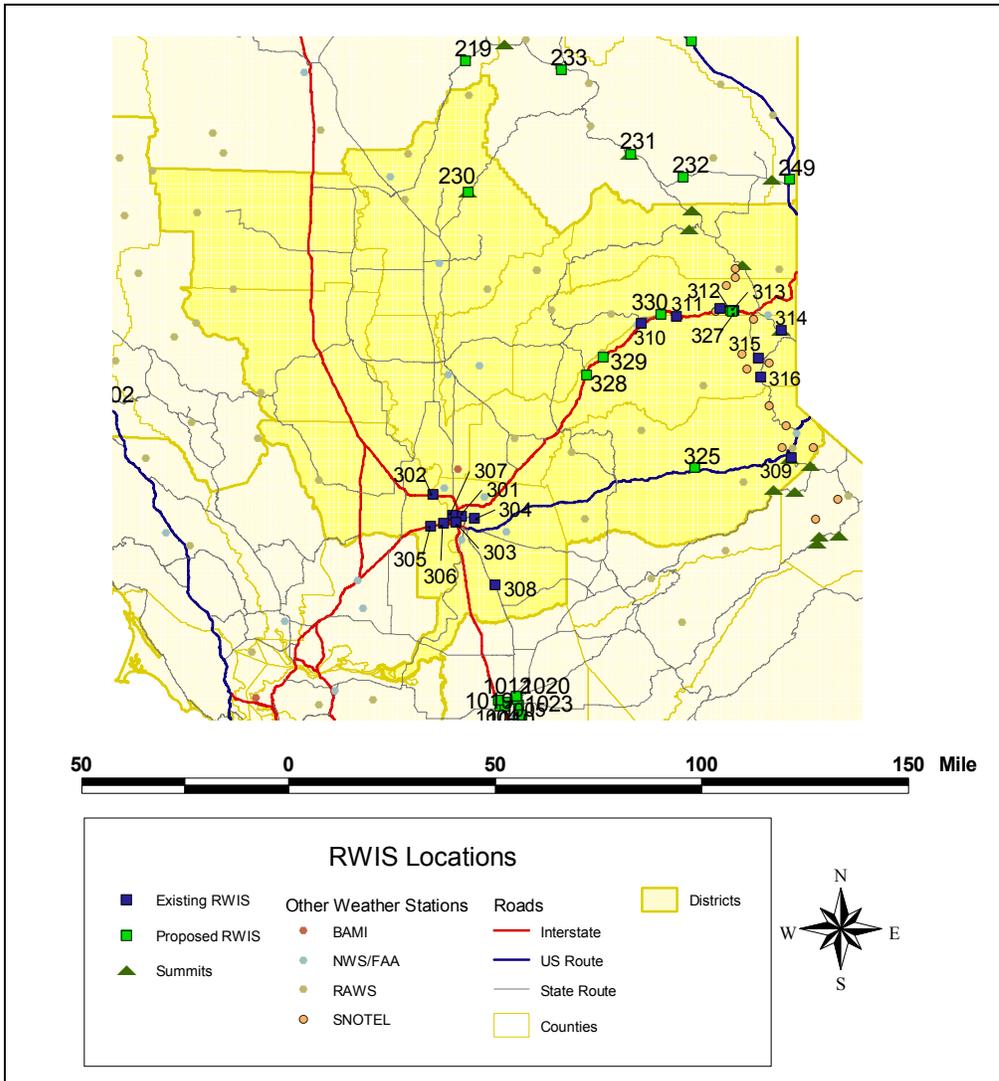
District 2 feels that it is important to form partnerships with other agencies to share costs and data. They have identified some possible partners, including California Department of Forestry and Fire Protections, USFS, BLM, and the California Department of Water Resources. These organizations currently use Remote Activated Weather Stations (RAWS) and can benefit from sharing data. Once the District posted RWIS data on their web site, they received interest in the information from local emergency responders.

## **District 3**

District 3 includes the greater Sacramento area and the northern Sierra Nevada (Lake Tahoe) region. This District started using RWIS in 1995, mainly for maintenance purposes.

### **RWIS Use**

District 3 has 16 operational RWIS sites and 6 planned sites (see FIGURE 3-4). In 1995, Caltrans installed eight SSI stations in the mountains for winter road maintenance. Eight more Vaisala sites were installed in 2000 in the valley area, primarily for wind and visibility. The valley sites are also used by maintenance to monitor icing on the bridges. Five of the Vaisala sites include color cameras with pan and tilt control; two of the older SSI locations have fixed black and white cameras. Approximately five people are trained to use RWIS information with maybe two people trained on maintenance. Electrical maintenance has just recently begun to maintain the sites but very limited training has been given. No training has been provided for the older SSI sites, which make them more difficult to maintain.



**FIGURE 3-4 District 3 RWIS locations.**

District 3 is the only District in California with both Vaisala and SSI systems deployed. The District would like to see the output integrated into one user interface, and is working with Vaisala and SSI to become NTCIP compliant. They have also approached MnDOT for assistance with these efforts.

Currently, District 3 is using ScanWeb and IceCast. TMC operators manually check surface temperatures and wind conditions every hour. District 3 uses ScanCast for its forecast services. There is also a licensed IceCast for one of the workstations. The Vaisala System has IceAlarm, to alert maintenance of icy conditions. Cameras are on all the SSI sites. District 3 feels that staff members need more training to maximize the efficiency of RWIS. They also feel that operation policies need to be determined that will extend RWIS capabilities.

## **Other Weather Applications**

The District uses Jcorr, a callbox-based system at 14 different locations to determine visibility. Traffic operators also call the airport, which borders the I-5, to determine measured conditions in that area.

## **Current and Potential Partnerships**

District 3 would like to form better relationships with other agencies. They have determined possible partners, including local fire departments, NWS, the Sacramento airport, and the Nevada DOT (NDOT).

## **District 4**

District 4 includes the nine San Francisco Bay Area counties. This District first installed RWIS in 1992 at the request of maintenance for the purpose of ice detection. Typically, January and February are the only months when icing may occur on select roads.

### **RWIS Use**

District 4 has one operational site with no plans to install any more sites (see FIGURE 3-5). Installed in 1992, the system was substantially changed and upgraded in 1999. The current RWIS system uses SSI ScanWeb for its information relay, and ScanSentry Paging for maintenance notification. The RWIS system was deployed for ice detection capabilities, but there has been no ice detected in the last three years. A possible explanation for this is the increase in traffic volumes on the road between Stockton and Livermore. It is possible that the increase in vehicle numbers, paired with warmer winters, have been sufficient enough to heat up the roadway to the point where ice no longer forms there.

District users are located in the TMC and in the Livermore Maintenance Station. Between 5-10 people are trained to use the RWIS information, with 3-4 people trained to maintain the system. TMC operators rarely use the data and post warning messages on the CMS only if maintenance staff in the field verified icy conditions. District staff believes that it would be favorable to give the RWIS information to the public. Caltrans maintains the system and have never calibrated the sensors.

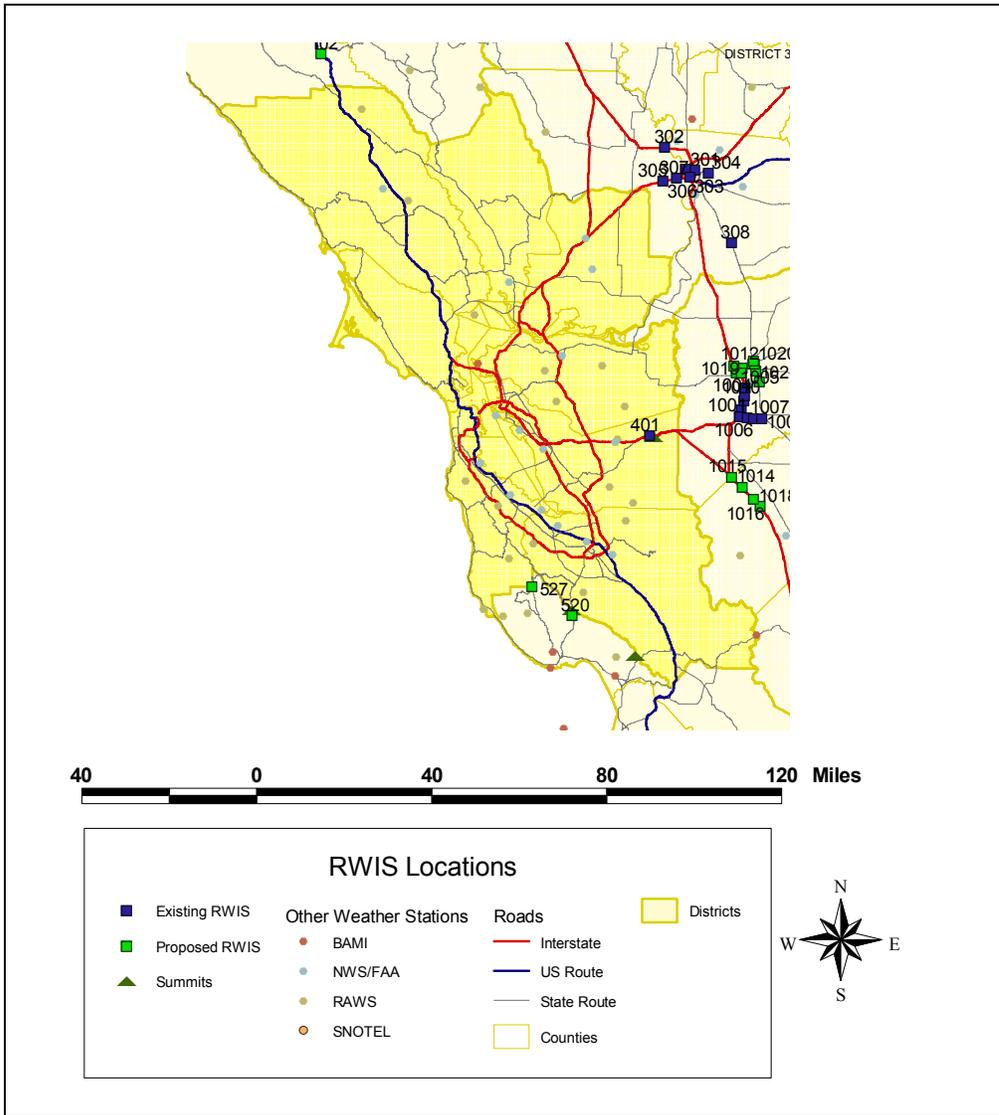


FIGURE 3-5 District 4 RWIS locations.

**Other Weather Applications**

A flood warning system with triggers to a static warning sign is located in Pittsburgh on Highway 4. Besides RWIS, District 4 uses Internet web pages to monitor storms.

**Future Improvements**

There are no plans to upgrade the system.

## Current and Potential Partners

District 4 does not feel it would gain much benefit through working with any external partners. However, District 5 has identified a site on the District 4 border at the summit of Highway 17 that, if installed, District 4 may want to access.

## District 5

District 5 covers the central coast of California, including Santa Cruz, San Benito, Monterey, San Luis Obispo, and Santa Barbara Counties. Weather on the central coast is a relatively minor concern, although there are areas that experience occasional icing problems, visibility problems, and wind problems. Although typical RWIS applications do not usually address them, the district has rock/mud slide problems and intense rain as well.

Weather issues that the district identified were, in order of significance:

- Rain
- Snow (1-2 times per year) on SR154, SR 101 (on Cuesta Grade), and SR 17
- Wind (somewhat a factor; Gaviota Pass on US101 was identified as a location with these problems)
- Ice (occurs 1-2 times per year)
- Freezes

## RWIS Use

The district currently has no RWIS stations deployed.

## Other Weather Applications

Currently TMC and maintenance staff obtains weather data from the Meteorlogix system and from forecasts and current conditions available on television and the Internet. For maintenance, when forecasts indicate potential icing conditions, supervisors will put staff on duty or on standby during the evening to monitor trouble spots.

## Future Improvements

The Central Coast ITS Strategic Deployment Plan and District 5 staff identified potential locations for RWIS deployment as shown in TABLE 3-2 and FIGURE 3-6 although these deployments are of lower priority than other traffic management types of deployments (vehicle detectors, CCTV cameras, changeable message signs).

TABLE 3-2 Possible District 5 RWIS Locations

County	Route	Description	Condition	Priority
Santa Barbara	154	Near summit (PM 24.5)	Freezing, Rain, Wind, Fog	High
	154	East of Summit (between summit and Rte 246)	Freezing, Rain, Wind, Fog	Medium
	154	West of Summit (between summit and Rte 192)	Freezing, Rain, Wind, Fog	Medium
	101	Near Rte 1 and Rte 101 Junction	Rain, Wind, Fog	Medium
San Luis Obispo	41	Near Cottonwood Pass (approx. PM 50)	Freezing, Rain, Wind	Medium
	101	At/near Cuesta Grade Summit ( approx. PM 35)	Freezing, Rain, Wind, Fog	High
Monterey	1	Near Big Sur (approx. PM 40)	Rain, Wind, Fog	Low
	101	Between King City and Salinas	Rain, Wind, Fog	Low
Santa Cruz	9	At/near Summit (approx. PM 21)	Freezing, Rain, Wind, Fog	Medium
	17	At/near Summit (approx. PM 12.5)	Freezing, Rain, Wind, Fog	High

### Current and Potential Partners

Participating staff are interested in teaming with other agencies to get more detailed weather data. District staff identified potential useful weather-related applications including wind warnings, ice warnings, site-specific forecasts, mud slide or rock slide detectors, flood detection, and ice detection (spot locations). They also noted that a good application would be a portable weather station to be placed on roadways impacted by active wild fires.

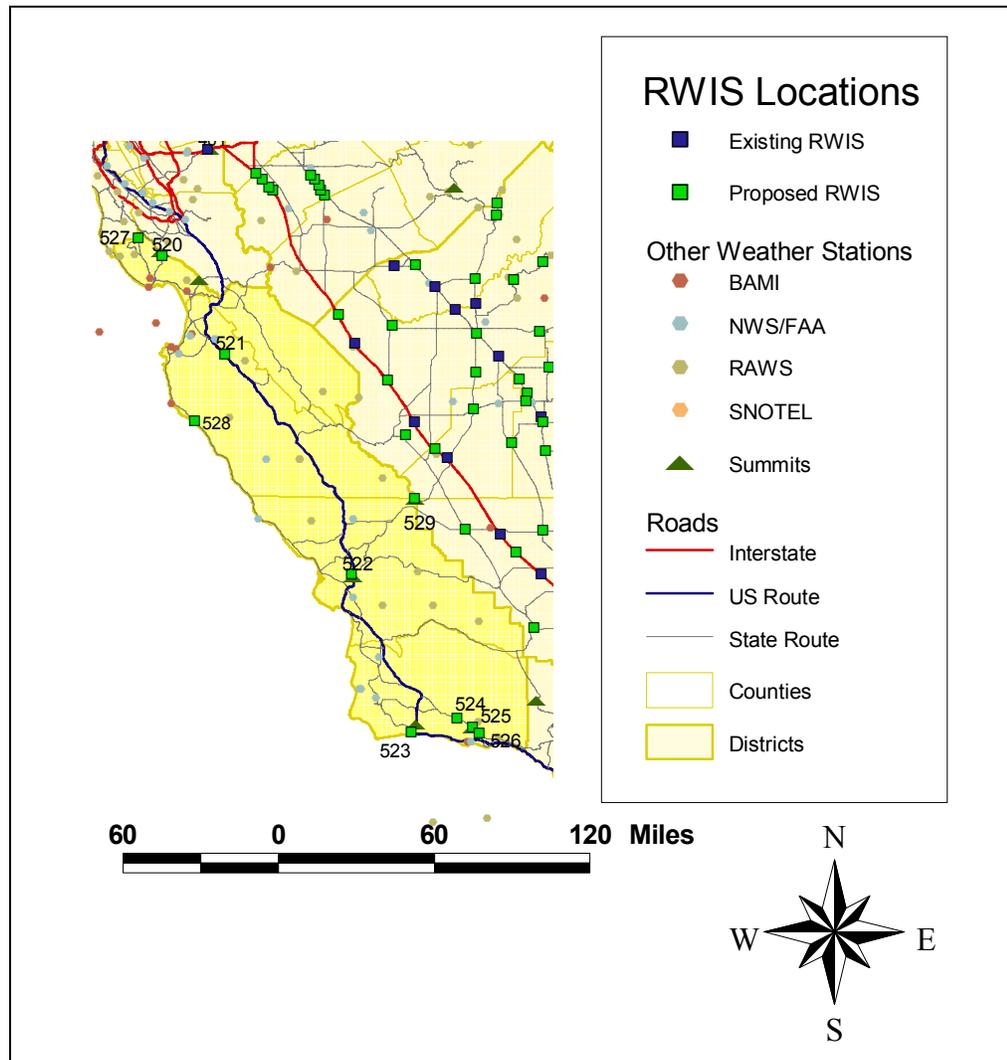


FIGURE 3-6 District 5 potential RWIS locations.

## District 6

District 6 includes the southern counties of the California Central Valley and portions of the Sierra Nevada. Maintenance requested the first installation of RWIS in 1991 to monitor ice on bridges, with installation occurring two years later. Now traffic operators in the TMC primarily use most of the data. District 6 uses sand only for their ice/snow control and do not use any chemical de-icing techniques.

## **RWIS Use**

The District currently has 12 RWIS sites operating with plans to install 40 new RWIS systems as shown in FIGURE 3-7. District 6 RWIS operates fully on an SSI system without ScanCast forecasts. Currently, District 6 uses RWIS mainly to monitor and react to low visibility conditions such as fog. The RWIS will alarm the TMC operator, who requests a verification from a California Highway Patrol (CHP) officer before posting messages on CMS. The users are generally satisfied and see it as another tool to do their job better.

Large fog-related incidents led to the deployment of RWIS and the development of the following task forces: Operation Fog, Operation Snowflake, and Operation Wind. These task forces have sought to improve safety in their district using traditional strategies in conjunction with ITS applications. For example, the Tulle fog in the Central San Joaquin Valley can reduce visibility to only a few feet. To address this, Operation Fog prescribes the use of ramp metering and pilot vehicles to pace traffic through the fog along with CMS to notify drivers ahead of the conditions.

An estimated 19 people in the District have been trained on the use of RWIS data, and 10 have been trained on maintenance. The District has moved away from the vendor-provided maintenance service to maintaining with District staff. Electrical and maintenance staff are now able to perform calibration once a month as compared to the annual service the contract provided. Every year they train their TMC operators on procedures and policies that involve RWIS. As a result of their training focus, District 6 was perceived as one of the most proactive Districts in the state as related to RWIS.

ScanCast forecasts were initially used, but were discontinued because the service was unable to provide the accuracy on forecasted fog as desired by District staff.

## **Other Weather Applications**

The District uses DTN (Meteorlogix) for forecasting-related decisions.

## **Future Improvements**

The District is working towards NTCIP compliance. They also identified potential research ideas that would assist them. First, research into practices for driving safely in the fog. Second, staff would like to see research into applications to seed and dissipate the fluffy Tulle fog.

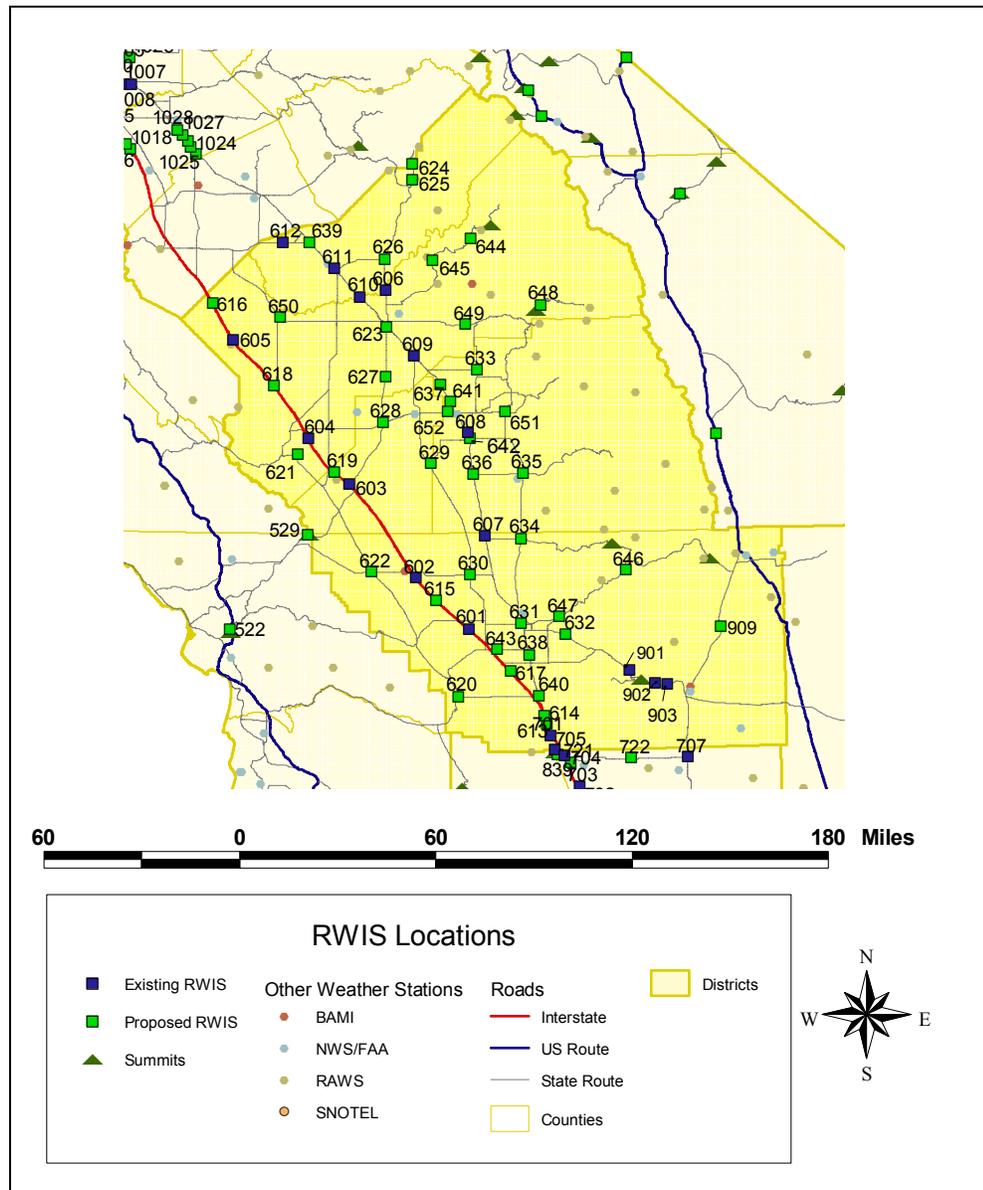


FIGURE 3-7 District 6 RWIS locations.

### Current and Potential Partnerships

District 6 is interested in pursuing partnerships. They currently work with the NWS, and are interested in weather information from Districts 3 & 7. They have identified NDOT as one possible partner.

## **District 7**

District 7 includes the Los Angeles and Ventura Counties. It began using RWIS in 1990 for snow and ice detection on Interstate 5.

### **RWIS Use**

The first installation in 1990 included three RWIS sites: Tejon, Lee Avery, and Fraiser. In 1993 and 1994, five more sites were installed. Through discussion during this project, District 7 maintenance staff identified five additional sites for problem areas. The current and planned RWIS sites are shown in FIGURE 3-8. The RWIS systems that are used are solely SSI, including ScanWeb for information structure and ScanCast for forecasting services. District 7 is not identified as a snow district, but every winter Interstate 5 has snow and ice problems. The snow line is usually three to ten miles long in variable terrain. To address the snow and ice challenges the District has begun recently to add de-icing chemicals to the sand that they apply on the roadway.

Currently, District 7 uses RWIS for scheduling, determining road conditions, and determining when maintenance is needed. North Maintenance region maintenance staff primarily use the information, and TMC traffic operators have access but rarely use the information. CCTV is used for visibility testing and to verify reports that are received from the CHP. ScanCast is used for forecasting, with mixed feelings among users of its perceived accuracy and reliability.

### **Other Weather Applications**

District 7 maintenance uses NWS, DTN (Meteorlogix), and Internet weather sites.

### **Future Improvements**

In the future, District 7 wants to deploy more stations and sensor arrays, although they do not currently have the necessary financial resources.

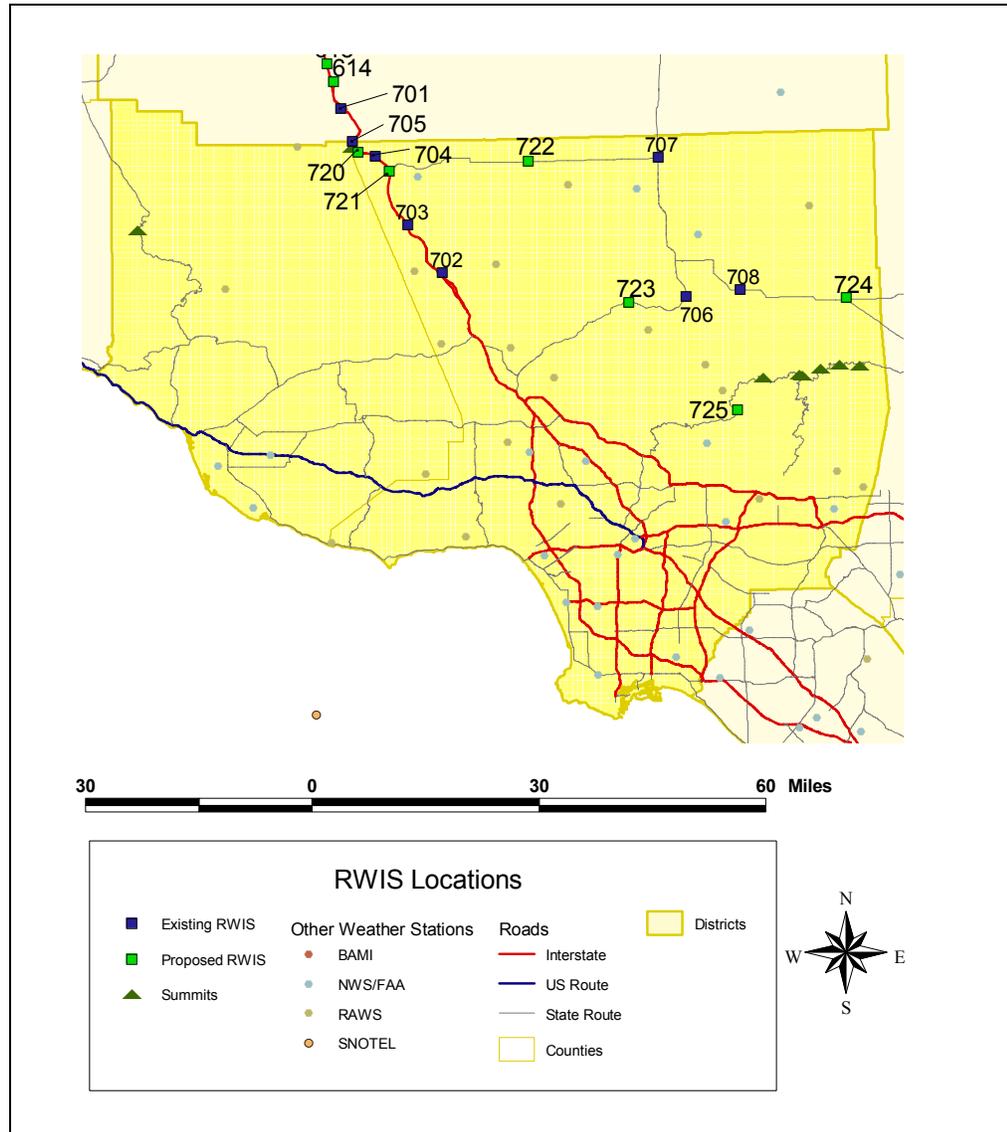


FIGURE 3-8 District 7 RWIS locations.

**Current and Potential Partnerships**

The CHP office in charge of the Grapevine accesses the RWIS data and interacts with District staff in its interpretation. District 7 maintenance staff identified potential improved partnerships with the LA County DOT and the District 7 TMC. They would like to extend their partnership with the County to enhance the amount of RWIS data that is shared. The TMC has cameras that that can be used in conjunction with RWIS to further improve ATMS. They are also interested in using other Districts’ information for determining where weather is coming from.

## **District 8**

District 8 includes San Bernardino and Riverside Counties. The region covers desert and mountains and faces problems with wind, blowing sand, fires, snow, and ice.

### **RWIS Use**

Currently, District 8 has 17 RWIS sites, with two of them installed in the past year.. This District started using RWIS in 1999 in Cajon Pass in response to a 150-car incident. They have identified 4 more sites for near-term installation, 11 other priority locations, and the need for 15 to 25 other sites for 30 to 40 planned sites. The total number of sites will be 47 to 57 sites (see FIGURE 3-9). RWIS is used to monitor wind and visibility conditions and assist with winter maintenance operations. District 8 uses the older desktop SSI program, with ScanCast forecasts at the three Cajon locations and ScanSentry.

The District maintains and calibrates all of District 8's sites. Staff is generally positive about RWIS because it informs the public of potential dangers on the road. It also prevents having snow removal crews up on the mountain all night long and saves overtime pay. However, maintenance crews do not feel that the forecasts are reliable. Staff also have had difficulties accessing the raw data from SSI for TMC custom configuration..

Staff have faced a challenge by using ScanSentry to page in case of high wind conditions. The threshold values and algorithm are not variable enough to allow for moderate weather shifts. This results in the pager being activated too frequently for conditions that do not warrant an operations or maintenance response.

### **Other Weather-related Applications**

The District uses DTN (Meteorlogix).

### **Future Improvements**

The District plans on adding more RWIS sites.

### **Current and Potential Partners**

District 8 has developed partnerships with the Air Quality Management District (AQMD) and the Southern California Association of Governments (SCAG). In particular, these organizations are interested in measuring particulates in the air around construction projects. The District has expressed little interest in getting

data from other districts, but they are interested in identifying local Universities that are able to assist in forecasting meteorological conditions.

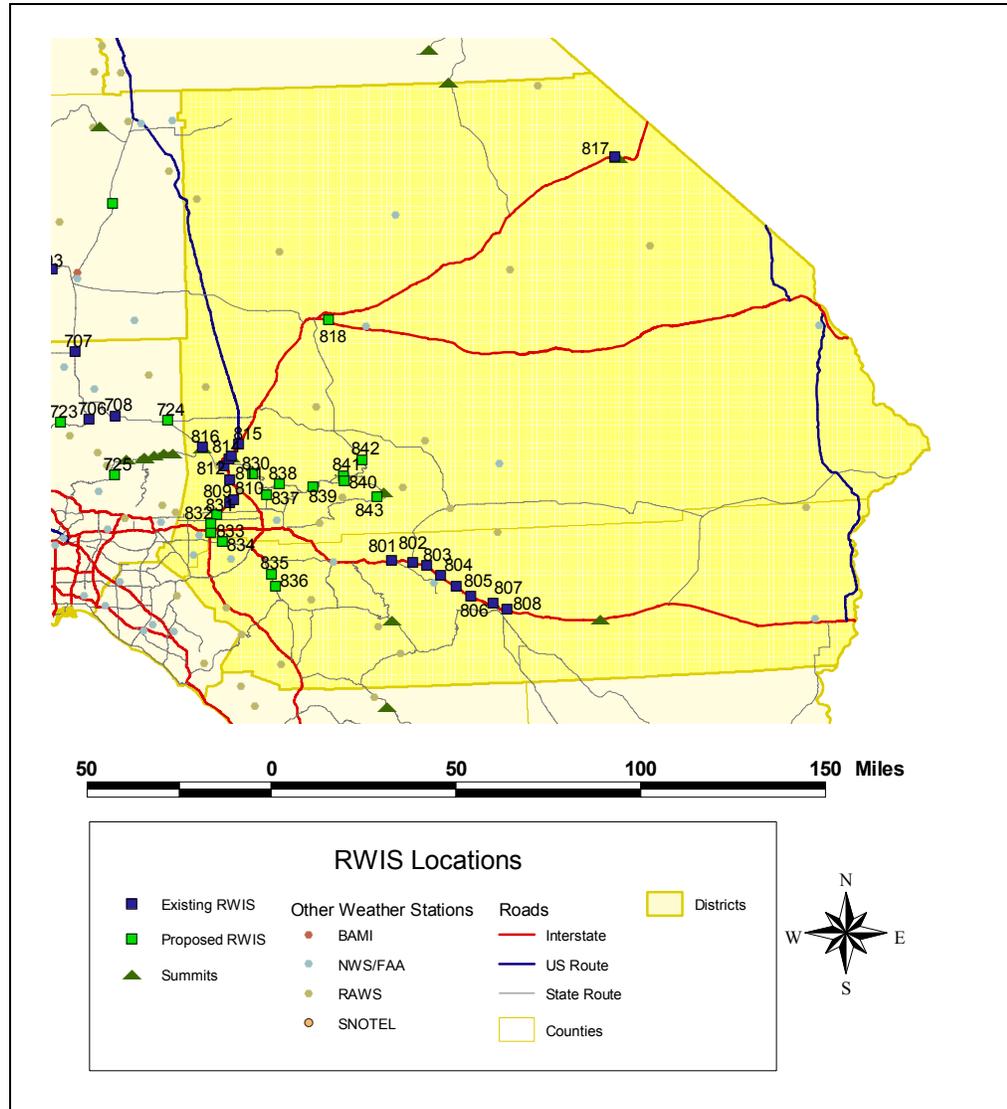


FIGURE 3-9 District 8 RWIS locations.

## District 9

District 9 includes the eastern Sierra Nevada counties of California. Besides its own District, maintenance serves the Mojave region of District 8. The region faces wind, snow, and ice issues.

## RWIS Use

Currently the District has a total of three RWIS sites with a 10 year-plan to install 10 more sites. As shown in FIGURE 3-10, the current locations are within the region of District 8 that District 9 maintenance maintains. The SSI system installed in 1994 runs on ScanWeb at the District office and DOS Scan system at the Maintenance office. The District just recently contracted ScanCast forecasting service and is expecting a one year period of forecast calibration.

The District cannot access the raw data but can access the information over the Internet on RoadWeather.com. The District chose the sites and funded the system, then the vendor put everything together. Dispatch primarily uses the system, with the Maintenance division having access through the DOS system. The system is seen as a labor-saving device. Previously, the maintenance person would sit on the pass overnight, watch for poor conditions, then radio dispatch to get crews onto the road. However, the District feels that the cost of the RWIS may be more than the labor cost.

Because the Mojave Maintenance Division is a few hundred miles away from the main District office in Bishop, it is difficult for Bishop staff to accurately gage the effectiveness of RWIS.

The District perceives that the current limited number of sites is not sufficient to give accurate forecasting. However, with the cost of each site, further deployment in the District is not seen as a big part of the 10-year plan.

## Other Weather Applications

DTN (Meteorlogix) is used significantly for making weather-related decisions. Dispatch staff also heavily monitors numerous websites:

- <http://cad.chp.ca.gov/>
- <http://weatherunderground.com/cgi-bin/findweather/getForecast?query=93515>
- <http://www.nevadadot.com/>
- <http://intellicast.com/Local/USLocalWide.asp?loc=kbfl&seg=LocalWeather&prodgrp=RadarImagery&product=RadarLoop&prodnave=&pid=none>
- ScanWeb web site
- <http://www.wrh.noaa.gov/wrhq/javaLinks/index.html>
- <http://www.wrh.noaa.gov/satellite/wr4kmvisanim.html>
- <http://www.wrh.noaa.gov/sacramento/html/rawsmmap.html>
- <http://lwf.ncdc.noaa.gov/oa/ncdc.html>

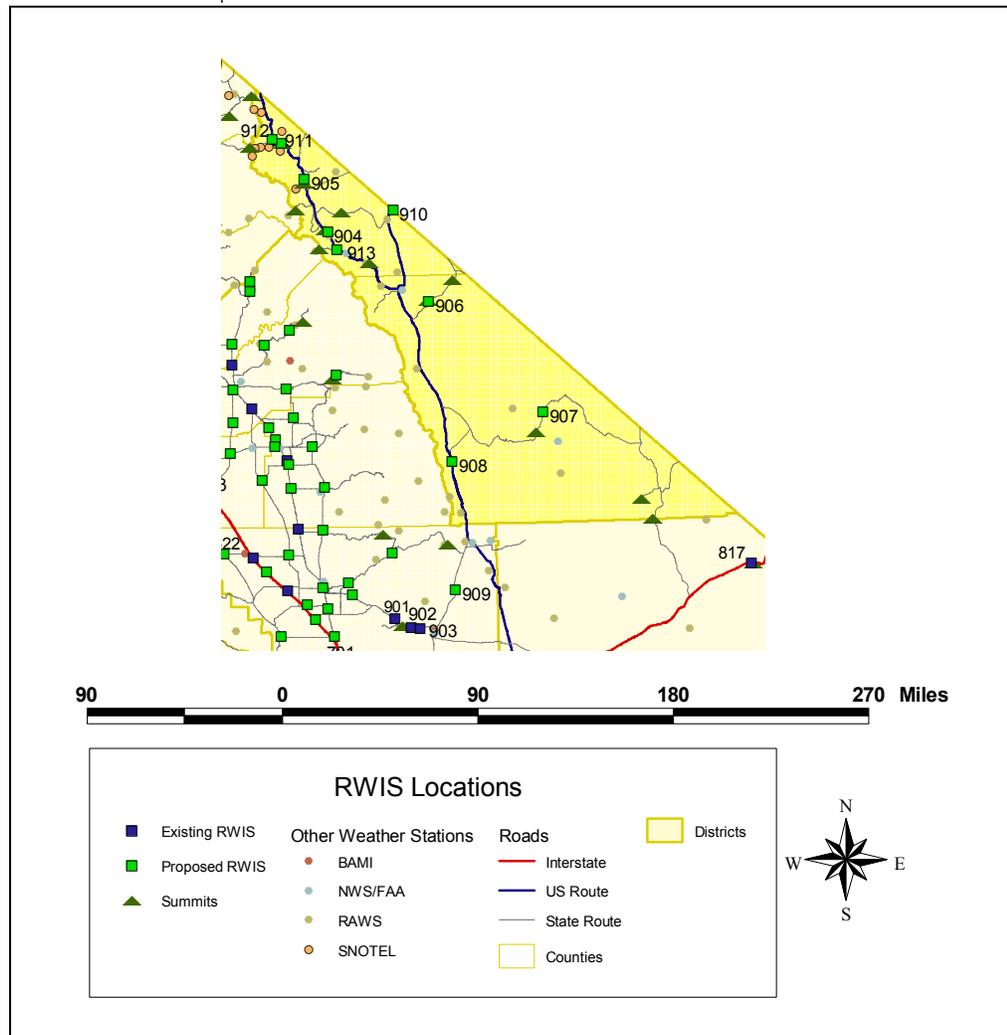


FIGURE 3-10 District 9 RWIS locations.

### Future Implementations

No system improvements were identified.

### Current and Potential Partnerships

District 9 would be interested in pursuing partnerships with Edison, DWP, BLM, and IntraWest, the owners of the Mammoth Ski Resort. All partners have RAWS stations in their area. District 9 also has a current partnership with District 7 pertaining to the three Tehachapi sites. These sites are physically in District 9, but District 7 is responsible for their upkeep and communications.

# District 10

District 10 did not participate in any of the data collection exercises. RWIS locations according to the existing Caltrans database are shown in Figure 3-10.

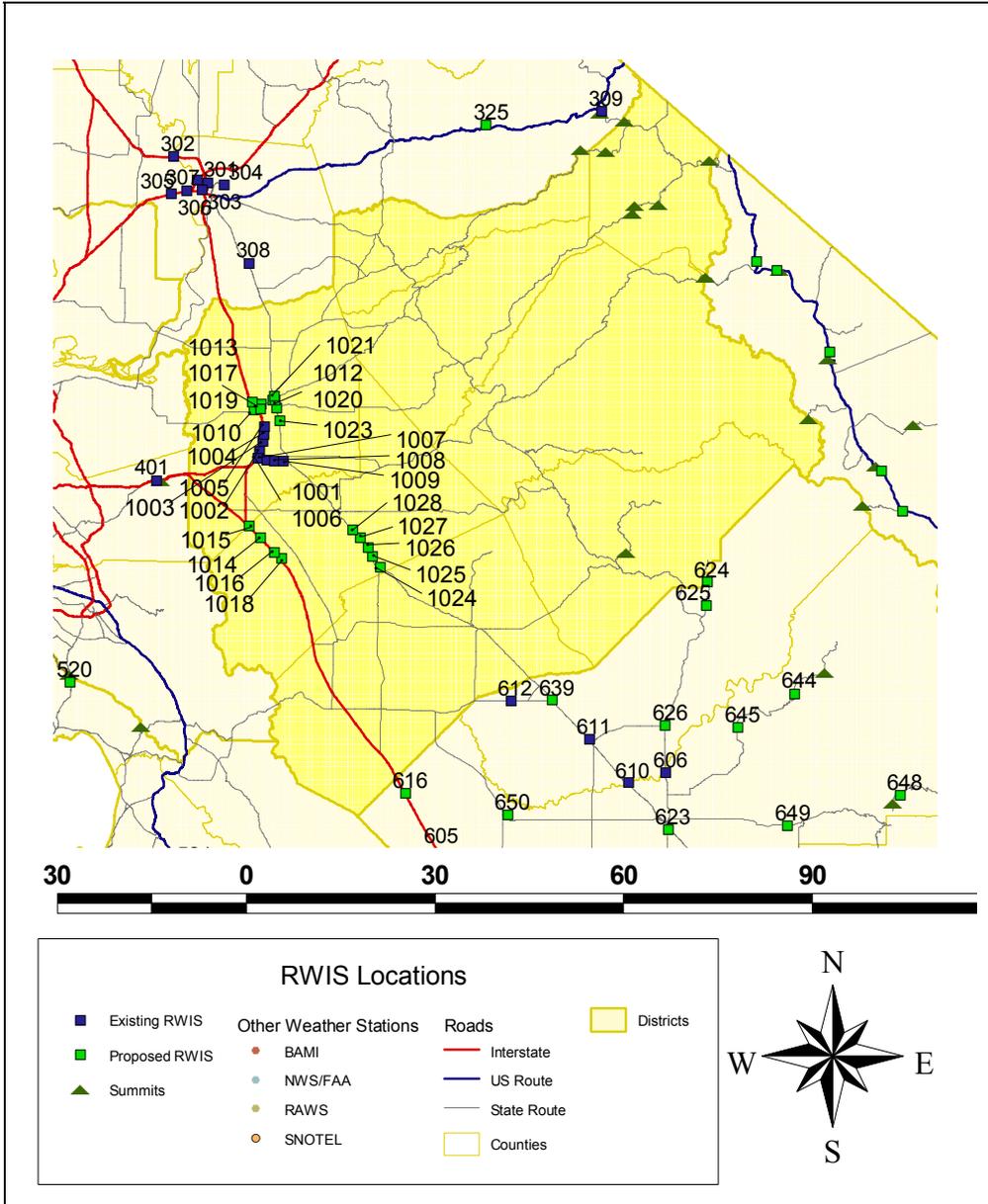


FIGURE 3-11 District 10 RWIS locations.

## District 11

District 11 includes San Diego and Imperial Counties. The urban portion of San Diego County has an ideal temperate climate but the mountains surrounding the area are susceptible to occasional snow and ice from November to March. In this region, snowfall attracts people to the region and causes more traffic. This District began using RWIS in 1994.

### RWIS Use

District 11 currently has 8 RWIS sites with no more planned. Stations are on I-8 in eastern San Diego County as shown in FIGURE 3-12. District 11 uses Vaisala equipment and forecasts from Northwest WeatherNet. Data from the RWIS is available only at dedicated workstations at the Region 1 Maintenance headquarters with no access at the TMC. When needed, maintenance will email forecasts or other weather information to the TMC. RWIS polling frequency is changeable, and maintenance sets it to every 15 minutes during stormy season and twice daily during the summer. Four maintenance staff know how to use the system, and 2 Caltrans people are trained on system maintenance. The District also has an annual maintenance contract with Vaisala. When problems develop between Vaisala visits, Caltrans staff initiates some trouble shooting with the assistance of the Vaisala help desk. Forecasts are sent via email to maintenance staff at least once a day with an update sent as needed. With this format, access to forecasts is available from home.

Overall, maintenance users are satisfied with forecast services. Forecasts are more accurate than commercial data. The District believes that the forecasts have saved money in scheduling. They also felt that the forecasts were immediately accurate.

Maintenance and the TMC have a joint-use agreement for the CMS in the region. During the day, messages can be posted from the Maintenance office, but at night control is turned over to the TMC. Maintenance supervisors also can control the signs from their home.

The solar power for the RWIS is causing no problems, although initially the District faced theft problems. Upon reinstallation, the panels were raised and theft has not reoccurred. The energy collected through the panels have been adequate for all locations since the theft problem was addressed.

### Other Weather Applications

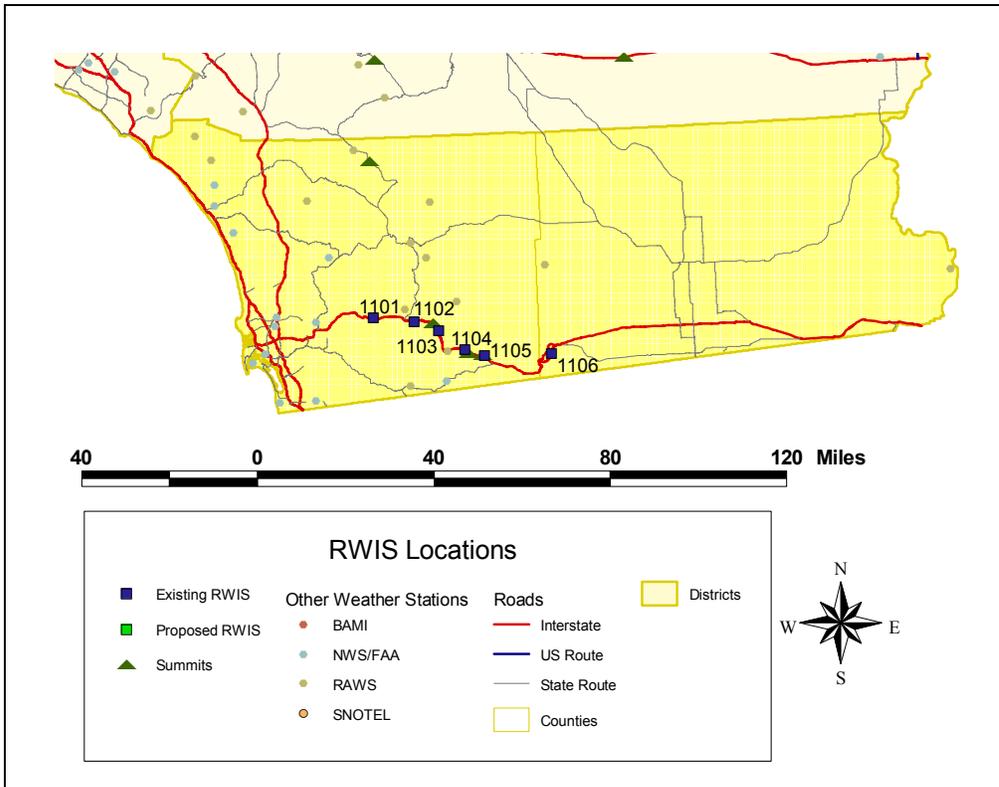
DTN (Meteorlogix) is running at maintenance yards in Santee, El Centro, Descanso, and Lake Henshaw. The system will be upgraded to the new Meteorlogix system this year.

**Future Improvements**

No future improvements are currently scheduled.

**Current and Potential Partners**

No partners were identified.



**FIGURE 3-12 District 11 RWIS locations.**

**District 12**

District 12 includes Orange County. The District faces only 10-15 days of rain per year and does not have the high winds on passes. Fog is sometimes an issue on SR 73, San Joaquin Hills Corridor, as it passes through coastal mountains and over the summit. Other routes, including SR 241 through the inland mountains and SR 74 (Ortega Highway) through the inland mountains, occasionally experience snow, rain, and landslides. SR 1, Pacific Coast Highway, faces occasional flooding during high tide. This District does not have any RWIS sites. However, District 12 has expressed an interest in RWIS for other purposes.

## Headquarters Use of RWIS

Currently, Caltrans Headquarters provides research, design, technical, and contractual guidance and support to the development of RWIS. The actual RWIS systems have been implemented at the District level to address localized needs. Since the systems are not formally networked, Caltrans Headquarters can only view information from Districts that access their data through an IP address. Headquarters is interested in developing a system that allows RWIS data to be shared with Caltrans headquarters and other agencies, for example an Internet site containing the data from all state RWIS sites. Administration staff has also identified potential partnerships with the Oregon Department of Transportation, Nevada Department of Transportation, and the large metropolitan areas within California.

Operationally, headquarters maintenance is interested in accessing data during significant storm events. A statewide Emergency Operations Center is sometimes setup for storms with likely major highway damage. The ability to access and utilize the data at Headquarters would be beneficial to planning a response. Statewide Traffic Operations personnel at Headquarters are other potential users.

## Summary

The use of RWIS by the Districts and Headquarters is summarized in TABLE 3-3.

TABLE 3-3 Summary of RWIS Use

	Current RWIS sites	Planned RWIS Sites	RWIS Uses	Equipment/ Software	Other Weather Applications	Planned Improvements	Partners	Potential Partners
District 1	1	5 and relocate existing	Frost/Ice	SSI Scanweb	Davis weather stations; CCTV CMS for road conditions DTN (Meteorlogix) StormSentry	Add'l RWIS sites & Davis stations; upgrades	---	Oregon DOT; NWS
District 2	8	42	Snow/Ice High Wind	SSI Scanweb	Pavement sensors; DTN (Meteorlogix); Initial traveler information web site deployed with RWIS data	Traveler web site	Emergency responders	CDFFP USFS BLM CDWR
District 3	16	6	Ice, Wind, Visibility	Vaisala IceCast and IceAlarm SSI Scanweb	DTN (Meteorlogix) Jcorr (callbox system for visibility)	NTCIP compliance	---	Fire Dpts; NWS; Sac airport; NV DOT
District 4	1	0	Ice	SSI Scanweb; Scan Sentry Paging	DTN (Meteorlogix) Flood warning system	---	---	District 5
District 5	0	0 (10 potential)	---	---	DTN (Meteorlogix); TV & Internet forecasts	Possible RWIS deployment	---	---
District 6	12	40	Ice, Fog	SSI	DTN (Meteorlogix) Heavy CMS use for road/weather conditions	NTCIP compliance	NWS	Districts 3 & 7; Nevada DOT

	Current RWIS sites	Planned RWIS Sites	RWIS Uses	Equipment/Software	Other Weather Applications	Planned Improvements	Partners	Potential Partners
District 7	8	0 (6 potential)	Snow, Ice	SSI Scanweb Scancast RWIS with CCTV	NWS DTN (Meteorlogix) Internet	More stations & sensor arrays	CHP	LA County DOT
District 8	17	30 – 40 (4 near-term, 11 other locations identified)	Wind, Fire, Snow/Ice	SSI Scanweb ScanCast Scan-Sentry	DTN (Meteorlogix)	Add'l RWIS sites	AQMD SCAG	Universities
District 9	3	10	Wind, Snow, Ice	SSI DOS Scan ScanCast	DTN (Meteorlogix) Internet weather sites	---	District 7	Edison DWP BLM Intra-West
District 10	9	19	---	---	---	---		---
District 11	6	0	Snow, Ice	Vaisala Northwest Weather-net	DTN (Meteorlogix)	Upgrade DTN (Meteorlogix) system	---	---
District 12	0	0	---	---	---	---	---	
Caltrans HQ	---	---	Planning, Design, new developments	---	---	RWIS access at EOC	---	Oregon DOT; Nevada DOT, California metro areas