



## Technical Memorandum

## SunGuide<sup>®</sup> Software System



## SunGuide Software Release 6.0 Independent Verification and Validation Test Plan

Version 1.1

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### Prepared for:

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## List of Acronyms and Abbreviations

AMBER.....	America's Missing: Broadcast Emergency Response
AVL .....	Automated Vehicle Location
AWAM.....	Anonymous Wireless Address Matching
C2C .....	Center-to-Center
CCTV .....	Closed-Circuit Television
DMS .....	Dynamic Message Sign
EIS .....	Electronic Integrated Systems
EM .....	Event Management
FDOT .....	Florida Department of Transportation
FP .....	Footprint
ITS .....	Intelligent Transportation Systems
IV&V.....	Independent Verification and Validation
LEO.....	Law Enforcement Officer
MAS .....	Message Arbitration Subsystem
MS.....	Microsoft
NTCIP .....	National Transportation Communications for ITS Protocol
ODS.....	Operational Data Store
RITIS.....	Regional Integrated Transportation Information System
RR.....	Road Ranger
TERL.....	Traffic Engineering Research Laboratory
TSS.....	Traffic Sensor Subsystem
TTI .....	Texas A&M Transportation Institute
TvT.....	Travel Time

# 1 Background

This document provides an overview of the independent verification and validation (IV&V) test plan for SunGuide® Software Release 6.0, including new requirements, issue resolutions, and regression testing.

## **1.1 Document Identification**

This document presents a detailed plan for setting up and conducting an IV&V test that will determine if this release of the SunGuide software meets system requirements and whether these requirements are operationally valid. The first sections of this document describe the software and resource management needed in order to conduct the test. The last sections of this document specify the new requirements and footprints (FP) to be verified by this IV&V test. The regression testing is detailed in an external regression testing document or document bundle.

## **1.2 Project Overview**

The Florida Department of Transportation (FDOT) SunGuide Support, Maintenance, and Development Contract, contract number BDQ69, addresses the necessity of supporting, maintaining, and performing enhancement development to the SunGuide software. The SunGuide software was developed by FDOT through a contract beginning in October 2003. The SunGuide software is a set of intelligent transportation systems (ITS) software that allows control of roadway devices as well as information exchange across a variety of transportation agencies; it is deployed throughout the state of Florida. The SunGuide software is based on ITS software available from the state of Texas with significant customization and development of new software modules to meet FDOT's needs. Figure 1 provides a graphical view of the SunGuide software.

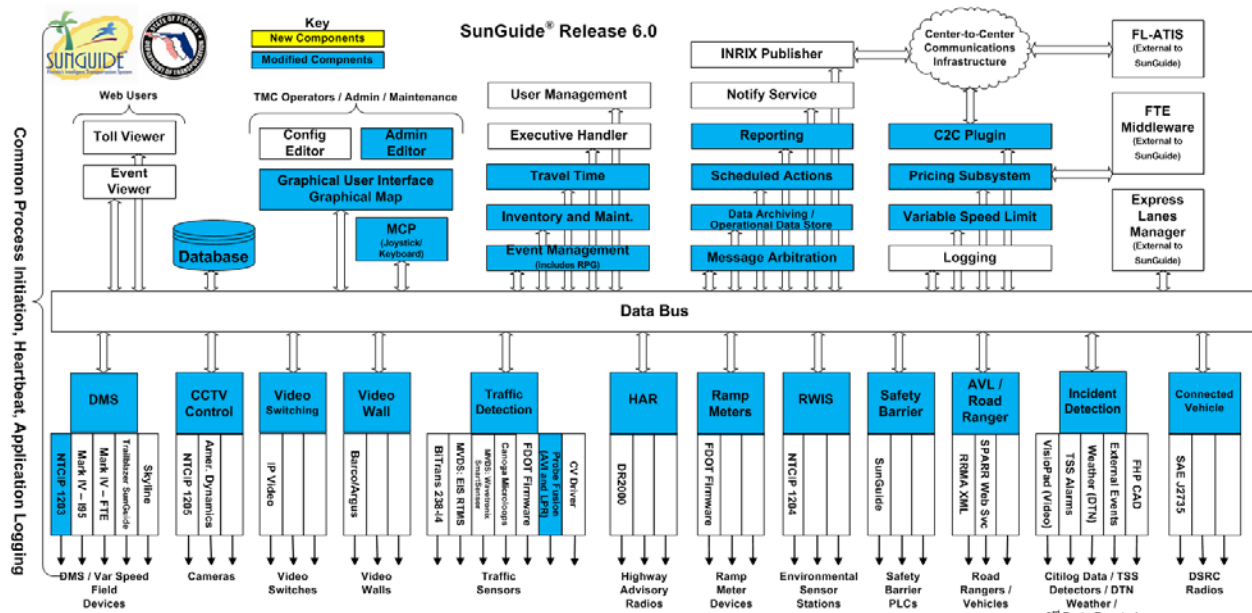


Figure 1.1 – High-Level Architectural Concept

The SunGuide software development effort began in October 2003; several major releases have been developed and this document addresses an incremental update of the most recent release. After development, the software will be deployed to a number of regional and local transportation management centers throughout Florida and support activities will be performed.

### 1.3 References

The following document and information sources form a part of this document to the extent specified herein. In the event of a conflict between the documents referenced herein and the contents of this document, this document shall be considered the superseding document.

- *SunGuide® Software Support, Maintenance, and Development Scope of Services*  
[http://sunguidesoftware.com/sunguidesoftware/documentlibrary/ReadingRoom/Contract % 20Documents/BDQ69% 20Scope% 20of% 20Services.pdf](http://sunguidesoftware.com/sunguidesoftware/documentlibrary/ReadingRoom/Contract%20Documents/BDQ69%20Scope%20of%20Services.pdf)
- Letter of Authorization # 007: SunGuide Releases 5.1.1 and 6.0
- Cost\_2011.11.27.FDOT\_Breakdown.pdf
- Schedule\_12.01.2011Release 6.0 Development Schedule.pdf
- Requirements\_Release\_6.0.pdf
- Supplement to Letter of Authorization # 007: SunGuide Releases 5.1.1 and 6.0
- Cost to Complete for LOA 7.xlsx
- <http://fdotweb.datasys.swri.edu/footprints>
- *SunGuide 6.0 System Requirements Specification*
- TERL\_Cameras\_and\_Streams\_v1\_2013-02-21.xlsx



These documents are available from the document library on the SunGuide software project web site at <http://sunguidesoftware.com>.

Alternatively, they can be obtained by request to:

Florida Department of Transportation  
Traffic Engineering and Operations Office  
605 Suwannee Street, M.S. 90  
Tallahassee, Florida 32399-0450  
(850) 410-5600

## 1.4 Contacts

The following is a list of contacts for the SunGuide software project:

- Arun Krishnamurthy, FDOT SunGuide Project Manager,  
[arun.krishnamurthy@dot.state.fl.us](mailto:arun.krishnamurthy@dot.state.fl.us), 850-410-5615
- Clay Packard, Atkins Project Manager,  
[clay.packard@dot.state.fl.us](mailto:clay.packard@dot.state.fl.us), 850-410-5623

## 2 Release Scope

This section provides details of how resources will be allocated to setup and conduct the IV&V testing.

### 2.1 SunGuide Software Release 6.0 General Information

FDOT enhanced the SunGuide software to implement new requirements, fix reported software issues, and maintain the current functionality established in previous versions of the software.

Enhancement modifications implemented in this release include:

- Color dynamic message signs (DMS) – Update DMS driver to support National Transportation Communications for ITS Protocol (NTCIP) 1203 version 3 for color DMS. Also, update the DMS user interface.
- Travel time (TvT) scheduling – Allow TvT and camera presets to be scheduled depending on the time-of-day.
- Microsoft (MS) SQL Server compatibility – Allow SunGuide software to support MS SQL Server as well as Oracle. Also, the unique identifier in the software will be modified to uneditable identifier instead of the currently used edited user entered field.
- Video on desktop – Develop an application that is integrated with the SunGuide software Operator Map. This window will play real-time camera feeds from the SunGuide

software on the operator workstation desktop and allow for video management to enhance user experience.

- Volume weighted averaging – Allow individual lane speeds to be weighted by volume when calculating the link speed. Also, when calculating the roll-up average for the link speed, either within the SunGuide software system for the two-minute rolling average or the operational data store (ODS) or any archive, the individual values at each time interval used in the roll-up will be weighted by their volume. This calculation has the following formula: Volume weighted average speed equals the sum of the products of the component speeds, each divided by their own volume:

$$speed_{VWA}(x_{rollup\ interval\ or\ link}) = \frac{\sum_{c\ poll\ cycle\ or\ lane=1}^n (speed_c * volume_c)}{\sum_{c=1}^n (volume_c)}$$

## 2.2 IV&V Plan Summary

The IV&V testing will be conducted on candidate versions for SunGuide software Release 6.0. The IV&V testing event will be conducted against SunGuide software version 6.0 in greater part at the Traffic Engineering Research Laboratory (TERL) in Tallahassee from May 13, 2013 to May 31, 2013, from 9:00 a.m. to 4:00 p.m. Immediately following the IV&V testing events, the issues found will be documented and sent to the contractor the following business day. These issues will be addressed by requirement waivers, test procedure corrections, or SunGuide software corrections. A test report will be produced to list the final results of the second round of testing events. This will conclude the first round of testing events.

There will be additional preparation for this testing event as adding support for a second database, MS SQL Server, is a significant modification to the system and will require careful, thorough testing. All tests will undergo a parallel execution between two systems, one having an Oracle database and another having an MS SQL Server database. The regression test will also be significant to cover all of the areas in the software that were modified to support connecting to and accessing the database. Furthermore, in order to determine if any issues are newly introduced or are latent defects, a SunGuide software version 5.1.1 system will also be tested in parallel by a third tester. The environment will need to have additional simulators to exercise these systems in parallel. A tool that can modify configuration data to allow for rapidly deploying simulators would be helpful and used if available.

### 2.3 Schedule

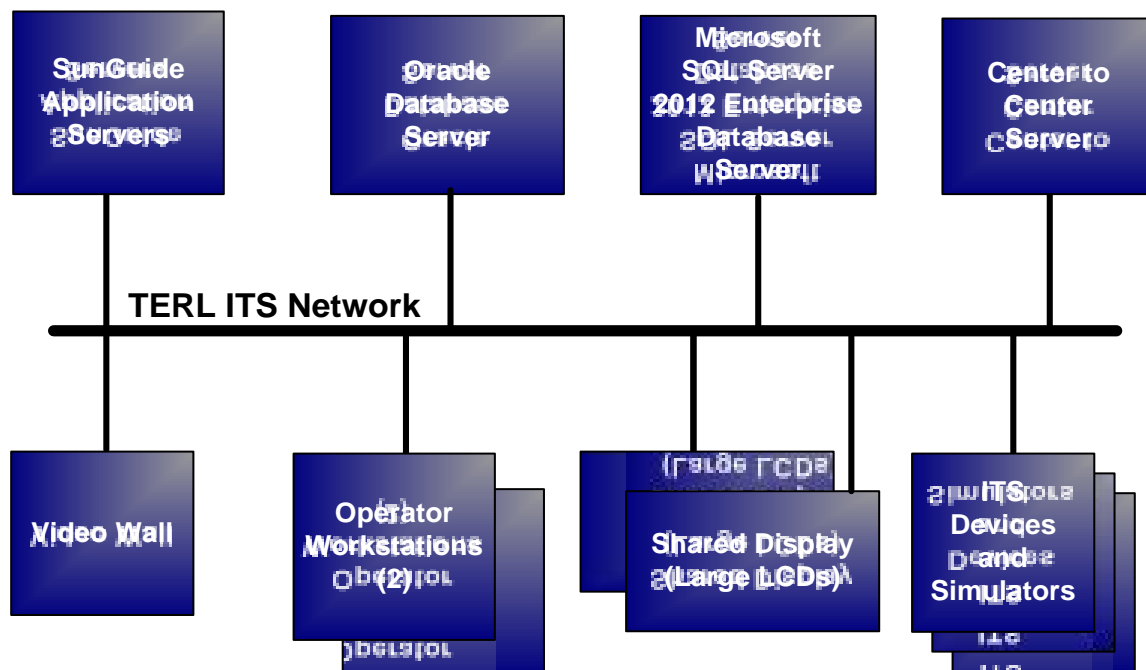
Table 2.4 shows a schedule for the release 6.0 IV&V testing activities. Milestones are in bold.

**Table 2.4 – Release 6.0 IV&V Test Schedule**

Activity	Date (2013)
<b>Finalize Test Plan</b>	<b>3/1</b>
<b>Draft Test Procedures</b>	<b>4/5</b>
<b>6.0.1 - Early Installation Package</b>	<b>4/15</b>
Environment Preparations	4/10 - 4/26
<b>Finalize Test Procedures</b>	<b>4/19</b>
<b>6.0.2 - FAT Installation Package</b>	<b>4/22 8:30 a.m. CST</b>
Dry Run	4/29 - 5/10
<b>6.0.3 - IV&amp;V Build</b>	<b>5/9</b>
Execution	5/13 - 5/31
<b>Issues List</b>	<b>5/31</b>
<b>6.0.4 –Corrections Candidate</b>	<b>6/7</b>
Retesting and Correcting as needed	6/10 - 6/21
<b>Release 6.0 media delivered to FDOT</b>	<b>6/25</b>
<b>Test Report</b>	<b>6/28</b>

### 2.4 IV&V Environment

Figure 2.1 illustrates the TERL systems environment used for testing.



**Figure 2.1 – Diagram of the TERL Systems Environment**

The TERL systems environment will include multiple SunGuide software systems supporting the testing. TERL has a primary system configuration that is well-suited to integrate devices under evaluation and test as well as to test general software functionality. This configuration will be used for the majority of the testing of various software features. There will need to be multiple instances or copies of this deployment, one for each database vendor and another for the previous version. SunGuide software instances will also be deployed for several FDOT Districts.

Table 2.1 lists each resource required to conduct the testing.

**Table 2.1 – Test Site Resources**

<b>Resource (quantity, if more than one)</b>
SunGuide software 6.0 TERL deployment with Oracle
SunGuide software 6.0 TERL deployment with MS SQL Server 2012 Enterprise
SunGuide software 5.1.1 TERL deployment for regression testing
SunGuide software 6.0 District deployment with Oracle
SunGuide software 6.0 District deployment with MS SQL Server
SunGuide software application test servers (3) with Windows server 2008
Oracle 11g database container with TERL database (2)
District databases
MS SQL Server Enterprise 2012 database server
SunGuide software release 5.1.1 software distribution
SunGuide software release 6.0 software distribution
IV&V configuration data loaded
Operator workstations (2)
Video graphics array-shared display
Video wall display (Jupiter)
Access to various network and systems management tools
ERWin studio version 8.2 or higher
ERWin model design review list of required items
Database scripts and tools list of required items
SunGuide software release 6.0 System Requirements Specification
Safety barrier simulator
Center-to-center (C2C) test client and test server suite
Android with Smartphone Application for Road Rangers installed (with external display data cord)
Advance vehicle location-license plate reader Sim/ SunGuide software XML client
Microsoft Excel

Resource (quantity, if more than one)
DMS simulator (Skyline, Mark IV FTE, and color DMS sims)
TransCore encompass device
Electronics Integrated Systems (EIS) G4 detector
BlueTOAD™ data simulator
TERL cameras and streams

**Table 2.1 – Test Site Server and Database Resources**

Usage
SunGuide software 6.0 TERL deployment with Oracle
SunGuide software 6.0 TERL deployment with MS SQL Server 2012 Enterprise
SunGuide software 5.1.1 TERL deployment for regression testing
SunGuide software 6.0 District deployment with Oracle district databases
SunGuide software 6.0 District deployment with SQL Server district databases
SunGuide software application test servers (3) with Windows server 2008
Oracle 11g database container with TERL database (2)
SQL Server 2012 Enterprise

## 2.5 Test Preparation Tasks

Table 2.2 lists the tasks required to prepare for the IV&V testing event.

- Leave the existing 5.1.1 SunGuide software system in place as-is
- Build an MS SQL Server database with plenty of storage area network (500 gigabyte)
- Build six new virtual machines as application servers. Have the server images ready for cloning for other uses.
  - SunGuide software release 6.0 with TERL's 5.1.1 Oracle database upgraded from 5.1.1
  - SunGuide software 6.0 with TERL's converted MS SQL Server database
  - SunGuide software 6.0 with newly created Oracle database
  - SunGuide software 6.0 with newly created MS SQL Server database
  - SunGuide software 6.0 for use with District databases (two of these servers)
- Prepare configuration files for at least two other Districts that have release 5.1.1 databases from which to upgrade
- Reconfigure the configuration files for each server's internet protocol address
- Prepare two applications servers according to the version description document
- Prepare a mechanism launch and configure simulators into both the 5.1.1 and 6.0 systems.
- Perform analysis on the database models, database conversion scripts, database creation scripts, and the tools provided to verify that they are sufficient for usage in deployment and maintenance of the SunGuide software as it pertains to the database in both Oracle and MS SQL Server. This will take some time and can then be discussed and verified at the testing event.

## 2.6 Staffing

Table 2.2 lists the participants and their roles in the IV&V testing event.

**Table 2.2 – IV&V Testing Team at TERL**

	Install	Dry Run	Test Readiness	Execution
<b>Arun Krishnamurthy, FDOT</b>				Witness
<b>Brian Ritchson, MCG</b>		Conductor	Moderator	Moderator
<b>Clay Packard, Atkins</b>	Support	Support	Support	Support
<b>David Chang, Atkins</b>			Advisor	Advisor
<b>Derek Vollmer, Atkins</b>	Support			
<b>Ron Meyer, Atkins</b>	Advisor			
<b>Steve Novosad, Atkins</b>				Conductor
<b>Vernell Johnson, Atkins</b>	Conductor	Conductor	Conductor	Conductor
<b>Lexi Bijelic, Atkins</b>		Conductor		Conductor

## 3 Release 6.0 Enhancement Test Cases

The following test cases will be included in the IV&V test. The enhancements will be tested first followed by the FP test cases. The procedures for the enhancements and FPs are described in the following sections. The procedure for FPs will be to verify that the described issue is resolved. In some cases this may require reproducing the issue in the prior version of the SunGuide software.

### 3.1 Release 6.0 Enhancement Test Cases

#### 3.1.1 Test Case 1: SunGuide software and database upgrade

The objective of this test is to verify that the installation package and documentation is sufficient to perform the upgrade to the software and the database. This verification will include comparing the ERWin database model against the SunGuide software database to qualitatively view how the model conforms to the SunGuide software database design, while verifying that the items agreed upon in discussions between FDOT and the contractor are included in the model documentation and applied to all appropriate database objects in the model. Also included will be to verify that the database tools provided meet the needs of the installation technician to perform the conversion and other necessary database operations.

#### 3.1.2 Test Case 2: Oracle and MS SQL Server compatibility

The objective of this test is to verify that SunGuide software supports both MS SQL Server 2012 and Oracle version 11.2. Also, the unique identifier for objects in the database will be modified to an uneditable numeric identifier instead of the currently used user entered name of the object. This test will verify that the name is now editable and no longer used as the identifier.

### ***3.1.3 Test Case 3: Color DMSs***

The objective of this test is to verify that the DMS subsystem and driver is updated to support NTCIP 1203 version 3 for color DMSs. Also, the functions of the new user interface controls for color DMSs will be tested and verified.

### ***3.1.4 Test Case 4: TvT scheduling***

The objective of this test is to verify that SunGuide software allows TvT and camera presets to be scheduled depending on the time-of-day.

### ***3.1.5 Test Case 5: FP 1498 – Ownership of DMS messages when using predefined and generated response plans***

The objective of this test is to verify that SunGuide software associates the correct user as the owner of messages from predefined and generated response plans.

### ***3.1.6 Test Case 6: FP 1591 – Bulk updates for automated vehicle location (AVL) for Road Ranger***

The objective of this test is to verify that SunGuide software processes messages containing multiple updates from Road Ranger (RR) mobile applications.

### ***3.1.7 Test Case 7: FP 1455 – “Nearest closed-circuit television (CCTV)” doesn’t populate with geographically closest cameras***

The objective of this test is to verify that the “Nearest CCTV” field is populated with the geographically closest camera.

### ***3.1.8 Test Case 8: FP 1999 – AVL Alerts need to be logged***

The objective of this test is to verify that AVL alerts will be stored in the database for historical reporting needs.

### ***3.1.9 Test Case 9: FP 1634 – Populate contact phone numbers if contact is already defined in event management (EM)***

The objective of this test is to verify that if a predefined contact is selected, the phone field will allow for a dropdown selection of the contact's defined phone numbers.

### ***3.1.10 Test Case 10: FP 1579 – Allow construction/planned construction events to have “zones” like congestion***

The objective of this test is to verify that special event, bridge work, visibility, weather, and flooding events support having a starting and ending location as their affected area. This test will also verify that these starting and ending locations will be transmitted via C2C as the primary and secondary locations of the event.



### ***3.1.11 Test Case 11: Add vehicle alert templates***

The objective of this test is to verify that there are unique vehicle alert templates for America's Missing: Broadcast Emergency Response (AMBER), Silver, and law enforcement officer (LEO) event types.

### ***3.1.12 Test Case 12: TransCore Encompass driver update***

The objective of this test is to verify that SunGuide software communicates with the TransCore Encompass device via transmission control protocol over internet protocol. Also, SunGuide software will provide support for more than 256 TransCore devices within one software driver.

### ***3.1.13 Test Case 13: Video on desktop***

The objective of this test is to verify that SunGuide software plays real-time camera feeds and allows for video management to enhance user experience.

### ***3.1.14 Test Case 14: FP 2301 – Store priority in DMS message library***

The objective of this test is to verify that the DMS message library saves message priority with the stored message.

### ***3.1.15 Test Case 15: Detect no traffic conditions***

The objective of this test is to verify that speed is an optional value that will be excluded when volume is zero.

### ***3.1.16 Test Case 16: TvT message templates without units***

The objective of this test is to verify that SunGuide software allows TvT message templates to be configured to not have units of time automatically included.

### ***3.1.17 Test Case 17: EIS G4 detector support***

The objective of this test is to verify that SunGuide software supports the EIS G4 detector through the remote traffic microwave sensor driver.

### ***3.1.18 Test Case 19: Volume weighted averaging***

The objective of this test is to verify that when aggregating speed over any composing elements or time intervals, the composing speeds are weighted by volume. This includes link averages, rolling averages, and operational data store roll-ups.

### ***3.1.19 Test Case 20: Minimum volume threshold for alerts***

The objective of this test is to verify that traffic alerts respect a configurable minimum volume threshold for traffic sensor subsystem (TSS) alert generation.

### ***3.1.20 Test Case 21: BlueTOAD plug-in***

The objective of this test is to verify that the plug-in included with SunGuide software consumes the BlueTOAD third-party data feed and makes the data available to SunGuide software as well as the Florida 511 system.

## **3.2 Release 6.0 FP Test Cases**

The following FP test cases will be verified to be resolved. The general approach for some issues will be to verify that a procedure will reproduce the issue in the previous version of the software and then use that procedure to verify the issue no longer exists in the current software version being tested.

***3.2.1 Test Case 22: FP 1492 – Unable to create new lane blockage records using audit function***

***3.2.2 Test Case 23: FP 1595 – ODS\_DMS\_MESSAGES inconsistently failed to provided CURRENT\_TVT value***

***3.2.3 Test Case 24: FP 1636 – Loop detectors reporting zero speed***

***3.2.4 Test Case 25: FP 1958 – Floodgate issue***

***3.2.5 Test Case 26: FP 2095 – Unable to view floodgates***

***3.2.6 Test Case 27: FP 2129 – Video cannot be switched via manual control panel***

***3.2.7 Test Case 28: FP 2138 – Find on map button not enabling when AVL vehicle is selected***

***3.2.8 Test Case 29: FP 2150 – DMS subsystem and driver forced to restart***

***3.2.9 Test Case 30: FP 2154 – FL511 is not posting in the event chronology***

***3.2.10 Test Case 31: FP 2158 – Some subsystems take longer to load***

***3.2.11 Test Case 32: FP 2159 – Message arbitration subsystem (MAS) stuck on pending***

***3.2.12 Test Case 33: FP 2161 – AVL RR truck indicator***

***3.2.13 Test Case 34: FP 2163 – MAS is showing all DMS in a pending state.***

***3.2.14 Test Case 35: FP 2172 – Unable to configure vehicle operator***

***3.2.15 Test Case 36: FP 2195 – EM/RPG "Input string was not in a correct format" error***

***3.2.16 Test Case 37: FP 2225 – Cannot generate response plan if a device template uses "(Use Default)"***

***3.2.17 Test Case 38: FP 2243 – TSS Alerts Incidents***

- 3.2.18 Test Case 39: FP 2248 – MAS will not resend unmerged message*
- 3.2.19 Test Case 40: FP 2254 – Floodgate: Issues saving recorded messages*
- 3.2.20 Test Case 41: FP 2273 – Floodgate dialog - Set multiple issues*
- 3.2.21 Test Case 42: FP 2294 – Audit Error - Chronology data outside bounds of neighbors*
- 3.2.22 Test Case 43: FP 2299 – Wrong message template being used for SH-EXIT-SH lane configuration*
- 3.2.23 Test Case 44: FP 2307 – Populate EM dialog "Mile Marker" field with EM location mile marker, if defined*
- 3.2.24 Test Case 45: FP 2310 – Adding reports*
- 3.2.25 Test Case 46: FP 2336 – Additional parameter for set "publish" flag for INRIX data*
- 3.2.26 Test Case 47: FP 2337 – Jupiter driver service fails to start*
- 3.2.27 Test Case 48: FP 2345 – Null reference using new message template*
- 3.2.28 Test Case 49: FP 2347 – RR events are not showing up in status reports (ref FP 2211)*
- 3.2.29 Test Case 50: FP 2352 – DMS stops sending status updates*
- 3.2.30 Test Case 51: FP 2354 – Error setting ramp metering controller active*
- 3.2.31 Test Case 52: FP 2355 – RR activity is not mandatory in SunGuide software release 5.1.1*
- 3.2.32 Test Case 53: FP 2361 – Approved words being check even though it's disabled*
- 3.2.33 Test Case 54: FP 2362 – TSS reporting "Value formatted incorrectly: class"*
- 3.2.34 Test Case 55: FP 2366 – Wavetronix high definition detector not available to be selected in Admin Editor and CRC check failing*
- 3.2.35 Test Case 56: FP 2367 – Jupiter driver not connecting to Jupiter controller*
- 3.2.36 Test Case 57: FP 2368 – Beacons not set for variable speed limits*
- 3.2.37 Test Case 58: FP 2380 – None of our detectors on the Canoga driver seem to be working since the 5.1.1 upgrade*
- 3.2.38 Test Case 59: FP 2396 – Unable to create new DMS sequence*
- 3.2.39 Test Case 60: FP 2417 – Traffic detectors not being displayed in the Regional Integrated Transportation Information System (RITIS)*
- 3.2.40 Test Case 61: FP 2423 – Allow sorting by columns on TvT tab*

### 3.3 Release 6.0 Regression Test Cases

The following regression test cases will verify that seemingly unrelated SunGuide software functionality has not been disturbed during the development of SunGuide software release 6.0. The procedures for this test case will test many functions throughout SunGuide software with a special focus sections of the software that interact with the database.

#### 3.3.1 Test Case 62: Operator map regression testing

#### 3.3.2 Test Case 63: Administrative editor regression testing

## 4 Requirements

Table 4.1 contains requirements that will be used for testing.

**Table 4.1 – Release 6.0 System Requirements**

ReqPro Tag	SunGuide ID	Name	Requirement Text
FEAT1.2.22	DB022	Database ID	Database objects that have an ID within the software shall have an internal numeric identifier that is not used for naming of objects by the users of the system
FEAT1.2.23	DB023	Business Logic	The software shall implement business logic (not sequences) within the Windows processes (not from within the Database itself)
FEAT1.2.23.1	DB023A	Business Logic Exceptions	Exceptions will be made for sequences of primary key/IDs and for exceptionally performance intense operations upon approval by Central Office.
FEAT1.2.24	DB024	Supported Databases	The software shall support the use of SQL Server 2012 Standard Edition and Oracle Database Server version 11.1.0.7.0.
FEAT1.2.25	DB025	Database Model	The software shall have a database model from which a blank SQL Server and Oracle database can be created using ERWIN, a Commercial off the shelf database modeling tool
FEAT1.2.26	DB026	Database Configuration Data	Static configuration data (such as subsystem permissions and system users) shall be included as a versioned data set.
FEAT1.2.27	DB027	Database Management	The software shall be equipped with tools to import or export data from any SunGuide database
FEAT1.2.27.1	DB027A	Configurable Options	The tool shall be configurable with the following optional parameters: 1) Database schemas to include in the import or export

ReqPro Tag	SunGuide ID	Name	Requirement Text
FEAT1.2.28	DB028	High Availability and Disaster Recovery	The software shall support the use of high availability and disaster recovery solutions for both Oracle and SQL Server (i.e. Failsafe/RAC/clustering, and DataGuard, respectively and the SQL Server equivalents)
FEAT1.2.29	DB029	Batch Inserts	Periodic data archiving shall use batch inserts to insert data into the database, where possible and appropriate.
FEAT1.2.30	DB030	Database Performance	When running against a system with 10,000 detector links configured, with appropriate hardware, the SQL Server database server shall archive TSS data to the database no later than two batch insert time periods following the distribution of the data from TSS.
FEAT1.2.31	DB031	Regression Testing Oracle	A regression test of the software using Oracle will be performed after a change to the software is made
FEAT1.2.32	DB032	Regression Testing SQL Server	A regression test of the software using SQL Server will be performed after a change to the software is made
FEAT1.2.33	DB033	Ceased Use Flag	<p>A database object that can be deleted by a user shall include a flag that signifies the state of the object.</p> <p>This requirement shall apply to the following tables:</p> <p>COUNTY  EM_LANEMAP  RS_REPORT_MENU  RS_COST  EM_VEHICLETYPE  EM_VEHICLEMODEL  EM_REFERENCEPOINT  EM_OFFSETTYPE  EM_MAILLIST  EM_LOOKUP  EM_LOCATION  EM_LANETYPE  EM_INJURYTYPE  EM_EVENTTYPE  EM_EVENTSTATUS  EM_CONTACT  EM_CONDITION  EM_AGENCY  EM_ACTIVITY</p>
FEAT1.2.33.1	DB033A	Ceased Use Not Deleted	Records no longer in use shall be flagged to indicate their usage as ceased, but they will not be deleted from the table

ReqPro Tag	SunGuide ID	Name	Requirement Text
FEAT7.14.29	EM040	Affected Area head/tail	When a Construction, Special Event, Bridge Work, Visibility, Weather or Flooding event is created, the user shall have the ability to set the head and tail of the affected area.
FEAT7.14.30	EM041	Populate Event Contact Phone Number	When an event contact is selected and a phone number for that contact has been configured, the software shall automatically populate the contact phone number field
FEAT7.14.31	EM042	Nearest CCTV Camera	When an event location is selected, the Nearest CCTV Camera will be set to the geographically closest camera to the event.
FEAT7.14.31.1	EM042A	Changing Nearest CCTV Camera	When changing an event location, if the Nearest CCTV Camera is not the geographically closest camera, the Nearest CCTV selection will not change.
FEAT7.27	VOD001	Video on Desktop	The software shall provide Video on Desktop capabilities
FEAT7.27.1	VOD002	Launch Window from context menus	The operator shall be able to launch the Window from the context menu of the operator map, closed-circuit television (CCTV) camera device icons, and the menu of another Window already open
FEAT7.27.2	VOD003	Drag and drop video sources	The software shall provide drag and drop operation of CCTV icons onto the Video on Desktop
FEAT7.27.3	VOD004	Launch to Viewer to last open Window	When video is launched via context menu, the user shall choose the Window in which the video should be displayed and the new Viewer shall be placed in the last position
FEAT7.27.4	VOD005	Auto-arrange Viewers	When a Viewer is added to, removed from, or moved within the Window, the Window will automatically arrange Viewers
FEAT7.27.5	VOD006	Auto-arrange Viewers in order	When a Viewer placement modification is made, the Window shall automatically rearrange Viewers by moving them on the right side of the placement modifications, filling positions in order towards the right and continuing towards the lower rows of the modification in the same order as they were prior to the placement modification
FEAT7.27.6	VOD006	Auto-arrange Viewers to maximize size	The auto-arrange behavior will resize and position the fewest number of Viewers on the same row and column as possible to maximize the area of each viewer

ReqPro Tag	SunGuide ID	Name	Requirement Text
FEAT7.27.7	VOD007	Drag and drop tour creation	When a source is dragged and dropped on top of an existing Viewer within a Window, the source will combine with the source(s) already in the Viewer as an ad-hoc tour where each source dwells for a default time of 5 seconds before switching. The user may change the dwell time as desired.
FEAT7.27.8	VOD008	Drag and drop indicator	When a source is being dragged over the center area of a Window, the Window will visually indicate if the source would be placed inside another Viewer to create a tour or if the source would be added as a new Viewer
FEAT7.27.9	VOD009	Viewer center area for drag and drop	The center area of a Viewer used for a drag and drop location for combining sources in a tour will not consume the entire Viewer allowing room to drag and drop Viewers between or on the outside of existing Viewer's' center areas
FEAT7.27.10	VOD010	Move Viewers	The Window will allow users to drag and drop Viewers into different positions and into different Windows
FEAT7.27.11	VOD011	Maintain Viewer aspect ratio	The Viewer will maintain the aspect ratio of the video source
FEAT7.27.12	VOD012	Viewer source label	The top portion within the Viewer will contain a one-line label indicating the video source name or tour name
FEAT7.27.13	VOD013	Viewer sources in tour list	The Viewer shall provide a means for a Video on Desktop Viewer Tour List to appear listing the video sources that are in the tour
FEAT7.27.14	VOD014	Reorder and remove sources from tour	The list items in the Video on Desktop Viewer Tour List will allow the user to reorder and remove items in the tour list
FEAT7.27.15	VOD015	Edit tour	The Viewer tour list's name, viewer sources, and dwell time will be changeable from the Viewer tour list
FEAT7.27.16	VOD016	Save and cancel tour modifications	The Video on Desktop Window Viewer Tour list shall contain save and cancel buttons that will either update or not update the name, the video sources, and the dwell times in the tour, respectively, and will both close the list
FEAT7.27.17	VOD017	Store tours in database	The Video on Desktop Window Viewer Tours, including their name, sources, and dwell times, shall be saved as a user-specific preference when either the viewer tour list is saved or the Window configuration is saved

ReqPro Tag	SunGuide ID	Name	Requirement Text
FEAT7.27.18	VOD018	Store Window layouts in SunGuide database	The Window shall allow the user to save the Window preset information in the SunGuide database as a user-specific preference
FEAT7.27.19	VOD019	Window layout data	The Window layout data shall include the Viewers and their positions, their video sources, and their saved or unsaved tours
FEAT7.27.20	VOD020	Recall Window layout information	The Window shall allow the user to recall the Window preset information from the menu
FEAT7.27.21	VOD021	Launch layout Window from Operator Map	The Operator Map context menu shall allow the user to launch a Window with any of the configured Window presets in addition to a no-preset option that launches an empty Window
FEAT7.27.22	VOD022	Resize Window	The Window shall be resizable by the user
FEAT7.27.23	VOD023	Maximize Window as full screen	The Window shall enter a full screen mode when maximized
FEAT7.27.24	VOD024	Exit full-screen mode of Window	The Window shall exit full-screen mode when the user presses the escape key or the restore window size control
FEAT7.27.25	VOD025	Translucent controls in Viewer	The Viewer shall have translucent command controls and translucent pan-tilt-zoom (PTZ) controls that can be animated to fade in to be revealed and fade out to be hidden
FEAT7.27.26	VOD026	Hide Viewer PTZ controls	The Viewer shall hide PTZ controls when the mouse pointer is not positioned over the Viewer.
FEAT7.27.27	VOD027	Reveal Viewer PTZ controls	The Viewer shall reveal PTZ controls when the mouse pointer is positioned over the Viewer and the user has a lock on the camera.
FEAT7.27.28	VOD028	Nudge controls	The Viewer PTZ controls shall include nudge buttons that command the camera to nudge in the selected direction
FEAT7.27.29	VOD029	PTZ visual indicator	The Viewer shall reveal a PTZ control that is a visual indicator that the Viewer is in PTZ mode and shall hide the visual indicator when, and only when, the Viewer is no longer in PTZ mode
FEAT7.27.30	VOD030	Engage panning in PTZ mode and left mouse down	Panning shall be engaged when the Viewer is in PTZ mode and the user drags the PTZ control in the desired direction.
FEAT7.27.31	VOD031	Pan using range of speeds	The Viewer PTZ controls shall allow the camera to be panned in a range of speeds, depending on how close to the center or the edge of the Viewer the mouse pointer is positioned
FEAT7.27.32	VOD032	Viewer zoom controls	The Viewer's PTZ controls shall include zoom controls.



ReqPro Tag	SunGuide ID	Name	Requirement Text
FEAT7.27.33	VOD033	PTZ controls contain camera preset buttons	The Viewer's PTZ controls shall include preset buttons that command the camera to move to a stored preset
FEAT7.27.34	VOD034	PTZ controls allows save presets	The Viewer's PTZ controls shall include a save to preset control that, when clicked, allows the user to save to existing or new camera presets
FEAT7.27.35	VOD035	Launch CCTV details	The Viewer's command controls shall include a method of launching the CCTV detail status dialog
FEAT7.27.36	VOD036	Video on Desktop performance warning	The Viewer shall prompt the user with a warning and request for confirmation when attempting to launch additional viewers and the workstation resource utilization is high
FEAT7.27.37	VOD037	Performance of non-local user interface response	All user interface responses of adding video streams shall occur within 1 second of the completion of the user's command
FEAT7.27.38	VOD038	Non-blocking user interface	While the software is processing a user command, it shall not prevent the user from further interactions with the software while a previous command is being processed.
FEAT7.27.39	VOD039	Performance of user interface response	All local user interface responses that do not require adding video streams shall occur within 100 milliseconds of the completion of the user's command.
FEAT7.27.40		Snapshot over CCTV icons when mouse hovers	The Operator Map shall show a snapshot that is no older than one minute when the mouse hovers over the camera icon within 100 milliseconds.
FEAT7.27.41		Send Viewer contents to shared video	The Viewer shall have a context menu item named "Send to Shared Viewer" with child context menu items of shared destination video walls and virtual video walls from which to choose for placing the Viewer's video or video tour contents
FEAT7.27.42		Send Viewer contents to shared Video Wall Viewer	Once the operator selects the shared destination video wall to send the Viewer's video or tour to, the software shall launch a video wall control dialog video from which the operator can place the video or tour via one click on the desired viewer
FEAT9.4.1	DM002A	DMS Priority	When creating a DMS library message, the user shall be able to configure a message priority.
FEAT9.16	DM016	Color DMS	The software shall support the use of color DMSs.
FEAT9.17	DM017	Color DMS through C2C	The software shall support the transmission of the color DMS status via Center to Center.

ReqPro Tag	SunGuide ID	Name	Requirement Text
FEAT9.18	DM018	Archival of Color DMS	The software shall support the archival of the transmission of color DMS messages in the database
FEAT10.25	TD020	EIS G4	The software shall allow the user to configure a detector to use the EIS G4 protocol
FEAT10.25.1	TD020A	Data Collection	The software shall support communicating to the detector using the EIS G4 protocol including receiving speed, volume, occupancy, and classification data.
FEAT10.26	TD021	Volume Weighted Average	TSS shall produce the average speed based on a volume weighted averaging method.
FEAT10.26.1	TD021A	Lane Average	The rolling average for a lane shall weight the speed on each vehicle in the rolling average period equally.
FEAT10.26.2	TD021B	Link Average	For a given poll cycle, the TSS link speed average shall weight the speed of each vehicle in each lane equally.
FEAT10.26.3	TD021C	Link Rolling Average	The rolling average for a TSS link shall weight the speed on each vehicle in the rolling average period equally.
FEAT10.26.4	TD021D	No Volume Condition	For a given poll cycle, if the volume reported 0, the lane shall not report a speed for that period
FEAT10.26.5	TD021E	Types of Link Averages	TSS links shall provide an average link speed based on raw data and an average based on a rolling average.
FEAT10.26.5.1	TD021E1	Discard Lane Average for 0 Volume	For a given poll cycle, if the volume reported 0, the lane shall not be included in the raw data link average
FEAT10.26.5.2	TD021E2	Discard Link Average for 0 Volume	For the rolling data link average, if the link reports 0 volume for a given poll cycle, that cycle shall not be include in the rolling data link average.
FEAT10.26.5.3	TD021E3	No Data Condition	If no data is available for the link average, the link average shall not report a speed for that period
FEAT10.27	TD022	Minimum Volume Threshold for alert generation	The software shall have a configuration parameter specifying the minimum volume needed for a lane in order to produce an alert.
FEAT10.27.1	TD022A	Non-alert Conditions	The software shall not generate an alert if the poll cycle reports a volume less than the minimum volume needed to produce an alert.

ReqPro Tag	SunGuide ID	Name	Requirement Text
FEAT13.20	CC006	Head/Tail Location sent to FLATIS	When an "affected area" event is selected and the user has set the head and tail of the event, the head of the event shall be sent as the primary event location and the tail of the event shall be sent as the secondary event location
FEAT18.3.9	TMT039	Enable/Disable Systemwide	The software shall accept a command from a user that will enable or disable travel time message generation on a system-wide basis
FEAT18.3.10	TMT0310	Enable/Disable for a single DMS	The software shall accept a command from a user that will enable or disable travel time message generation for a specified DMS
FEAT18.3.11	TMT040	No Units	The software shall have a configuration parameter that will allow travel times to be posted to DMS without including the units.
FEAT20.4	SAS004	Travel Time Message Scheduling	The software shall allow the scheduling of the enabling and disabling of travel time messages.
FEAT20.4.1	SAS004A	Scope of Enable/Disable	The travel time message scheduling shall allow for the invocation of a disable travel times messaging command and an enable travel times messaging command on a per DMS basis as well as a system wide basis.
FEAT20.5	SAS005	Schedules	The software shall allow the user to schedule a series of predefined actions within the system.
FEAT20.5.1	SAS005A	Schedule Parameters	The schedule shall have the following parameters: 1. The start and end time of the schedule shall be a date and time of day 2. The default value of the start time shall be the clock time ending in 0 or 30 minutes immediately after the current system time and the end time will default to one hour after the start time 3. When the start time is adjusted, the end time shall preserve the current duration of the event 4. The duration shall be displayed as a non-editable value near the end time 5. An all day event button shall be displayed near the start time and when clicked shall set the start time to 12:00:00 AM and the end time to 11:59:59 PM 6. The schedule shall allow the user to select the days on the week the schedule should execute when the schedule is active.
FEAT20.6	SAS006	Sequences	The software shall allow for sequences, or a set of actions, to be configured within the schedule configuration

ReqPro Tag	SunGuide ID	Name	Requirement Text
FEAT20.6.1	SAS006A	Available Camera Actions	The software shall support the following actions against a user selected camera: pan for a user specified amount of time, tilt for a user specified amount of time, zoom for a user specified amount of time, and move to a user specified preset.
FEAT20.6.2	SAS006B	Available options for travel time scheduling	The software shall support the following actions for travel time message generation: 1. Enabling or disabling travel time message generation for a single DMS 2. Enabling or disabling travel time message generation for all DMS signs
FEAT20.6.3	SAS006C	Enable/Disable Schedule within a Schedule	The software shall support an action of invoking an enable command and a disable command on a user selected schedule, not including the schedule itself
FEAT20.6.4	SAS006D	Pausing schedule during execution of next item	The software shall support an action of pausing for a specified number of hours, minutes and seconds before performing the next action.
FEAT20.7	SAS007	Schedule Naming	The software shall allow the user to specify a name for the schedule
FEAT20.7.1	SAS007A	Unique Name	The name shall be required to be unique
FEAT20.7.2	SAS007B	Storing Schedule Name	The name shall be able to be modified and not be used as a primary key
FEAT20.7.3	SAS007C	Default Name	The name shall initially default to "New Schedule"
FEAT20.7.3.1	SAS007C1	If default name is in use	If the name "New Schedule" is in use, a space and the number one or the next available whole number will be appending to the default schedule name in order to make the name unique
FEAT20.8	SAS008	Schedule Copying	The software shall allow the user to copy a schedule from an existing schedule
FEAT20.8.1	SAS008A	Copied Schedule Default Naming	The name shall default to the exiting schedule's name appended with a space and the text "Copy"
FEAT20.8.1.1	SAS008A1	If default name is in use	If the default name is in use, a space and the number one or the next available whole number will be appending to the default schedule name in order to make the name unique
FEAT20.9	SAS009	Enable/Disable Schedule	The software shall allow the schedule to be enabled or disabled by the user
FEAT24.6.6	AV014A	Bulk Updates	AVL shall log vehicle positions messages sent in bulk directly to the database without generating updates to the Operator Map.

ReqPro Tag	SunGuide ID	Name	Requirement Text
FEAT24.10	AV014B	Bulk Update for RRXML Driver	The RRXML driver will support a method for sending multiple position updates as a single request.
FEAT24.11	AV014C	Logging Alerts	The software shall log stop alerts and geofence alerts including operator responses to the database
FEAT26.2.6	EM030A	Construction Event Type	EM shall have an event type of "Construction"
FEAT26.2.7	EM030B	Amber Alert Event Type	EM shall have an event type of "Amber Alert"
FEAT26.2.8	EM030C	Leo Alert Event Type	EM shall have an event type of "Leo Alert"
FEAT26.2.9	EM030D	Silver Alert Event Type	EM shall have an event type of "Silver Alert"
FEAT27.2.6	EM026	Abbreviating Messages	The software shall support the abbreviation of phrases when automatically generating messages for a response plan
FEAT27.2.6.1	EM026A	Multi Word Abbreviations	The software shall allow the user to configure a multiple word abbreviations
FEAT27.2.6.2	EM026B	Abbreviation Priority Precedence	If two abbreviations have the same priority, abbreviations with multiple words shall take precedence over abbreviations consisting of a single word
FEAT27.2.7	EM031A	Device Message Ownership	If an operator activates a response plan, the operator shall be the owner of any device messages posted due to the response plan
FEAT27.4.3	EM032A	Amber Alert template	When configuring a device template or a default device template, the user shall be able to configure a template for events with the event type of "Amber Alert"
FEAT27.4.4	EM032B	Leo Alert Template	When configuring a device template or a default device template, the user shall be able to configure a template for events with the event type of "Leo Alert"
FEAT27.4.5	EM032C	Silver Alert Template	When configuring a device template or a default device template, the user shall be able to configure a template for events with the event type of "Silver Alert"
SUB7.4	DMS04	Color DMS	
SUB7.4.1	DMS041	NTCIP v3 Support	The software shall additionally support the NTCIP version 3 protocol
SUB7.4.2	DMS042	Color DMS Templates	The software shall have a standard color DMS layout for creating color DMS messages and templates

ReqPro Tag	SunGuide ID	Name	Requirement Text
SUB7.4.2.1	DMS042A	Standard DMS layout	The standard color DMS layout shall include one graphic and one text message per phase
SUB7.4.2.2	DMS042B	Graphic Height	The graphic shall occupy the entire height of the sign
SUB7.4.2.3	DMS042C	Graphic Aspect Ratio	The graphic shall maintain its aspect ratio
SUB7.4.2.4	DMS042D	Graphic Left Justified	The graphic shall be left justified within the layout
SUB7.4.2.5	DMS042E	DMS Text Area	The text area shall be the remaining portion of the layout not occupied by the graphic
SUB7.4.2.6	DMS042F	Centered Text	The text message shall be centered within the text area
SUB7.4.2.7	DMS042G	Text Too Large	In the event that the text is too large to fit in the text area, text will be placed on the next phase on the DMS message.
SUB7.4.2.8	DMS042H	Removing the Graphic	When generating a response plan, if the text is too large to fit in the text area after abbreviations are applied a response plan shall remove the image and the text area will occupy the entire layout.
SUB7.4.2.8.1	DMS042H1	Adding sign to a response plan	If a message generated using templates within a response plan is unable to fit on the DMS sign, the user shall have the option of adding the sign to the response plan and manually specifying the message.
SUB7.4.3	DMS043	Graphics Library	The software shall have a graphics library with add and delete functionality for color DMS images to be used in the messages or templates.
SUB7.4.3.1	DMS043A	Icon type	The graphics shall have information stored with them to indicate if they are a shield of a roadway, an icon associated with an event type, or just an image with no association.
SUB7.4.3.2	DMS043B	Content of message to sign	The software shall verify images and messages each time a message is activated on the sign using a cyclic redundancy check on the message and on each image
SUB7.4.3.3	DMS043C	Deleting graphics in use	The software shall handle the scenario of a user attempting to delete a graphic that is associated to one or more stored or active messages.
SUB7.4.3.3.1	DMS043C1	User Notification	The user will be notified of the list of messages that have the graphic associated to them.
SUB7.4.3.3.2	DMS043C2	User Confirmation	DELETED- The software will confirm that the user still wants to delete the graphic.

ReqPro Tag	SunGuide ID	Name	Requirement Text
SUB7.4.3.3.3	DMS043C3	Disassociate Graphic	DELETED-If the user confirms to delete the graphic, the software will first disassociate all references to the graphic and then delete the graphic.
SUB7.4.3.3.3.1	DMS043C3A	Unable to Disassociate Notification	If a subsystem which uses DMS graphics is not running when a user attempts to delete a graphic, the user shall be notified this check cannot be performed.
SUB7.4.3.3.4	DMS043C4	Notification of graphic use	If the graphic is in use in a stored or active message at the time the user tries to delete the graphic, the user shall be unable to delete the graphic and be notified of the locations where the graphic is in use.
SUB7.4.4	DMS044	Color DMS message template generation	The software shall support color DMS message and color DMS message template generation
SUB7.4.4.1	DMS044A	Background and Text Color	The software shall allow the user to change the default background and default text color of messages and message templates.
SUB7.4.4.1.1	DMS044A1	MUTCD Colors	For user defined color schemes, the software shall present the user with options of color that are allowed by the MUTCD.
SUB7.4.4.1.1.1	DMS044A1A	Text Color Options	Text color options are red, white, yellow, orange, fluorescent yellow-green, fluorescent pink, and amber.
SUB7.4.4.1.1.2	DMS044A1B	Background Color Options	Background color options are black, blue, green
SUB7.4.4.1.2	DMS044A2	Default Colors for EM templates	The software shall provide a default background color of black and default text color of yellow for event management templates.
SUB7.4.4.1.3	DMS044A3	Background Colors other than EM	The software shall provide a default background color of black and default text color of amber for all templates other than event management templates.
SUB7.4.4.1.4	DMS044A4	Using graphics in templates	The software shall generate color DMS messages from templates for events using graphics available in the graphic library
SUB7.4.4.1.4.1	DMS044A4A	Using Event Type Graphic	If the event type graphic is available, it shall be used
SUB7.4.4.1.4.2	DMS044A4B	Using Shield Graphic	If the event type graphic is not available and the shield corresponding to the incident's location is available, the shield graphic shall be used
SUB7.4.4.1.5	DMS044A5	Travel time template shield graphic	The software shall allow the user to select the appropriate shield graphic for a device's travel time template.

ReqPro Tag	SunGuide ID	Name	Requirement Text
<b>SUB7.4.5</b>	<b>DMS045</b>	Color DMS Display	The software shall support color DMS message status display showing a visual representation of each pixel of the sign that shall appear in the short status, detailed status, and hover over of the DMS sign from the operator map.
<b>SUB12.3.4.1</b>	<b>DA03D1</b>	Rollup - Volume Weighted Speed Average	The rollup average for a TSS link shall weight the speed on each vehicle in the rollup interval equally.
<b>SUB27.2.10</b>	<b>SPARR031</b>	Bulk Update	The driver will support a web service method for sending multiple position updates as a single request.