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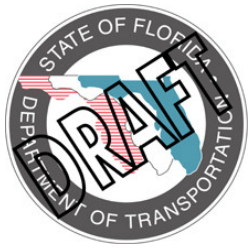
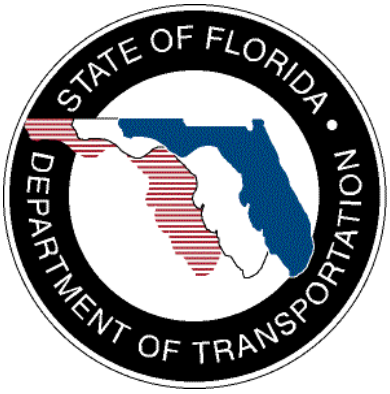


SunGuide℠ Software System Project

Independent Verification and Validation Test Plan for the District 4 Event Manager and Performance Measures Subsystems

December 28, 2006
Draft Version 1



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List of Acronyms

C2C ..... Center to Center
CCTV ..... Closed Circuit Television
CRC ..... Cyclic Redundancy Check
DMS ..... Dynamic Message Sign
FDOT ..... Florida Department of Transportation
HAR ..... Highway Advisory Radio
ITS ..... Intelligent Transportation Systems
IV&V ..... Independent Verification and Validation
LAN ..... Local Area Network
MDX ..... Miami-Dade Expressway Authority
MIB ..... Management Information Base
MIST ..... Management Information System for Transportation
NTCIP ..... National Transportation Communications for ITS Protocol
PDA ..... Personal Digital Assistant
PM ..... Performance Measures
RAM ..... Random Access Memory
RR ..... Road Ranger
RWIS ..... Road Weather Information System
RRPM ..... Road Ranger Performance Measures
STMCSLS ..... Statewide Transportation Management Center Software Library System
SwRI ..... Southwest Research Institute
TMC ..... Transportation Management Center
VMS ..... Variable Message Sign

1. Scope

This section provides an overview of the SunGuide℠ system acceptance test plan and the purpose of having an independent system test of the software.

1.1 Purpose

This document presents a detailed plan and procedures for setting up and conducting an independent verification that the SunGuide software meets the system requirements and that the requirements are operationally valid.

1.2 General Information

The SunGuide software was developed by Southwest Research Institute (SwRI) in San Antonio, Texas, and is based on the Texas Department of Transportation (TxDOT) transportation management center (TMC) software they developed in the late 1990s. The TxDOT software serves as the core for SunGuide and was modified based on the FDOT system requirements for a statewide software library for operational control and management of TMCs for each FDOT District, the Miami-Dade Expressway (MDX) Authority, and other government entities that need to access and control intelligent transportation system (ITS) devices. Southwest Research Institute derived their software requirements from the FDOT SunGuide system functional requirements. The SunGuide software is tested by SwRI at their facilities in San Antonio and again when they install the software at each site. Actual acceptance of the software by the FDOT depends on whether the software satisfies the system functional requirements in an operational environment, not in their own facilities in a test environment.

It can be expected that some requirements may not be met, but there will be ways to work around the failures and still use the software. When this occurs, the FDOT may decide to conditionally accept the software for a particular installation if SwRI will fix the problem later and issue an update. There may be cases where the software cannot meet the system requirement for reasons beyond SwRI's control and the FDOT may choose to accept the software as-is. When this occurs, SwRI and the FDOT may negotiate a form of compensation for the inability of the software to meet the requirement depending on the circumstances.

It is also expected that the software may meet the requirements but not be operationally useful in some way to the site where it is installed. In this case, additional requirements may be specified by the FDOT for incorporation in the software for an additional fee.

1.3 Project Background and Description

The FDOT is administering a program to develop SunGuide software. The SunGuide software is a set of ITS software modules that allows the control of roadway devices as well as information exchange among a variety of transportation agencies. The goal of the SunGuide software is to have a common software base that can be deployed throughout the state of Florida. The SunGuide software development effort is based on ITS software available from both the states of Texas and Maryland; significant customization of the software is being performed and new software modules are being developed.

Currently, the SunGuide software system does not support the collection and reporting of Road Ranger response data, and it does not generate performance measures reports. The Systems Management for Advanced Roadway Technologies (SMART) system developed by District 4 includes these features, as well as several others that are an integral part of District 4 operations. Release 2.2 of SunGuide will link key components of the SMART software and SunGuide to offer a quick response to District 4's immediate operational needs. The software developed by the IBI Group to be linked to SunGuide is collectively called the event manager (EM)/performance measures (PM) subsystems. Later versions of SunGuide, referred to as 3.x, will fully integrate the EM/PM subsystems' software into the SunGuide architecture and will result in two separate subsystems — the EM subsystem and the PM subsystem. This test document addresses only Release 2.2 requirements.

2. References

The following documents, of the exact issue shown, 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 requirement.

Invitation To Negotiate (ITN) Negotiation Number: ITN-DOT-02/03-9025-RR Statewide Transportation Management Center Software Library System Dated October 21, 2002	Florida Department of Transportation Traffic Engineering and Operations Office 605 Suwannee Street, M.S. 90 Tallahassee, Florida 32399-0450 (850) 410-5600
Statewide Transportation Management Center Software Library System Requirements Specification Dated June 3, 2003	Florida Department of Transportation Traffic Engineering and Operations Office 605 Suwannee Street, M.S. 90 Tallahassee, Florida 32399-0450 (850) 410-5600
Statewide Transportation Management Center Software Library System Requirements Specification for the Event Manager and Performance Measures Subsystems Final Version 4 Dated August 14, 2006	Florida Department of Transportation Traffic Engineering and Operations Office 605 Suwannee Street, M.S. 90 Tallahassee, Florida 32399-0450 (850) 410-5600
Consultant Services for Statewide Transportation Management Software Library System SunGuide℠ Engineering Change Order # 2.1 July 11, 2006	Florida Department of Transportation Traffic Engineering and Operations Office 605 Suwannee Street, M.S. 90 Tallahassee, Florida 32399-0450 (850) 410-5600

3. Test Plan

The SunGuide system requirements are allocated to the entire software system and to the functional subsystems, components of subsystems, elements of components and, in some cases, units of elements. Requirements were allocated to eliminate ambiguity and to provide structure, and are tracked in a requirements database. All allocated requirements have parents that ultimately trace back to the system functional requirements and to the FDOT's needs. There are 116 functional requirements for the additional EM/PM subsystems that are documented in the system requirements specification and that will be verified using this test plan.[1]

3.1 Test Philosophy

The test procedures will endeavor to demonstrate that the software meets the requirements through operator actions and system responses observed on the operator workstation. Any use of special test rigs, simulators, or other artificial means of stimulating the SunGuide software will be minimized as much as possible.

3.2 Test Site

Integration and testing of Release 2.2 of the SunGuide software will take place at SwRI's facilities in San Antonio, Texas, and will culminate in a factory acceptance test (FAT) conducted by SwRI. The FAT will verify that SunGuide Release 2.2 satisfies the design requirements established during the system design review that was held August 24, 2006. After passing the FAT milestone, the software will be installed in the District 4 TMC in Fort Lauderdale, Florida. After installation and verification by SwRI, the IV&V testing will be performed on a not-to-interfere basis with District 4 TMC operations to verify that SunGuide Release 2.2 satisfies the functional requirements. Upon conclusion of the testing, the FDOT will determine if the software is acceptable for operational use by District 4 or what further action is needed to bring the software into full compliance with the system requirements if there are any outstanding discrepancies.

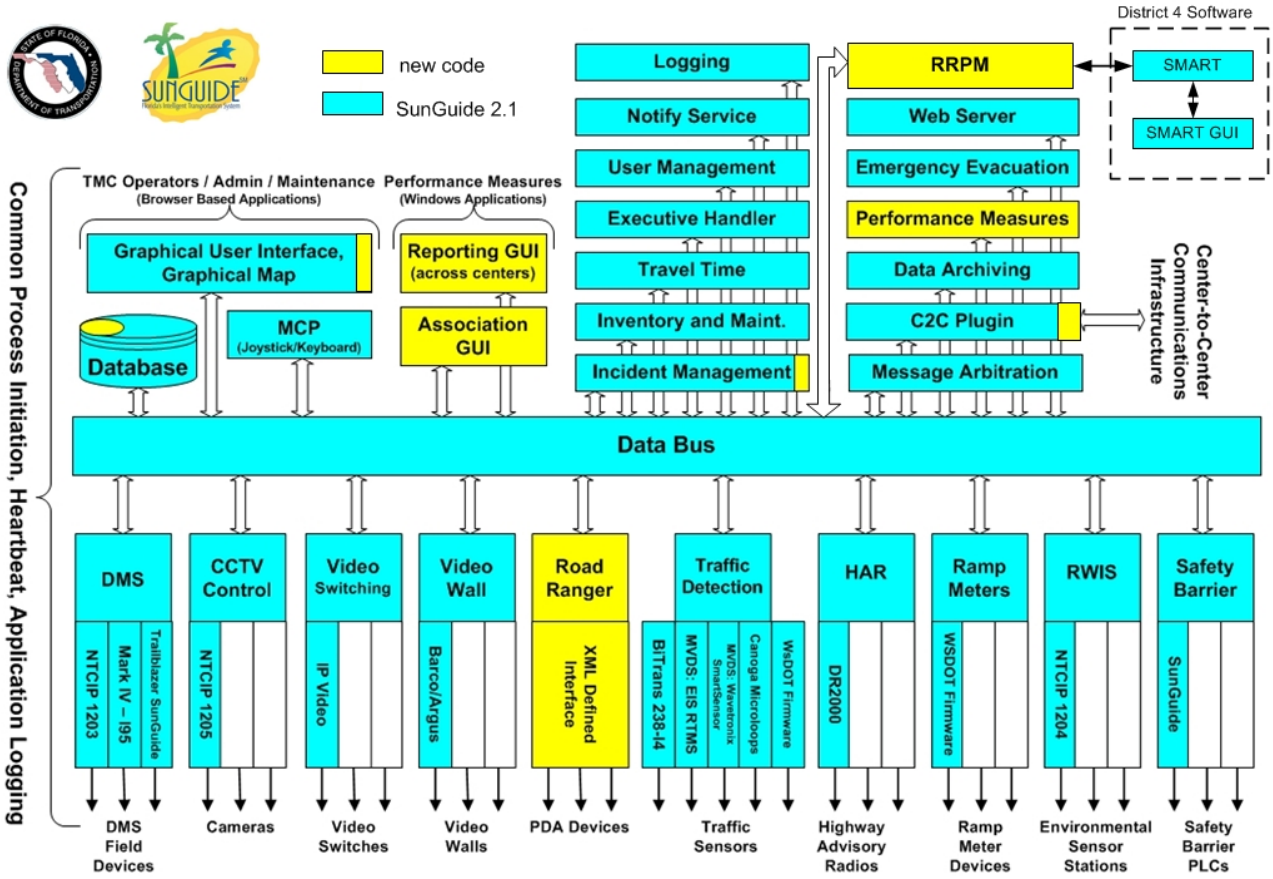
[1] There were 105 requirements documented in the EM/PM subsystems requirements specification. Thirteen more requirements were added before the requirements were frozen for release 2.2.

3.2.1 SunGuide℠ Software Release 2.2 Capabilities

SunGuide Release 2.1 provides enhanced basic functionality for the operation of the District 4 TMC. Generally, Release 2.2 provides the following functionality to the SunGuide software:

- SunGuide Release 2.1 capabilitiesCapabilities for the EM/PM subsystems, excluding SunGuide Release 3.x requirementsFigure 3.1 is a diagram of the SunGuide software modules with the Release 2.2 modules highlighted.

Figure 3.1 – SunGuide℠ Release 2.2 Software to be Tested



3.3 Requirements to be Verified

The system and subsystem requirements listed in Table 3.1 have been identified for the EM/PM enhancement to the SunGuide software for District 4 in Release 2.2. The subsystem requirements will be used to identify test cases that test procedures will be written for. Each subsystem requirement has one or more component requirements and, in some cases, the components have element level requirements. The test cases will group similar functional requirements together and the test procedures will verify that each requirement is met. A complete list of all the requirements is provided in Table 4.1 in *Section 4*. A requirement that begins with the letters "EM" belongs to the EM/PM subsystem. The letters "TM" refer to the SunGuide incident management (IM) subsystem. The letter "A" refers to a top-level user need and the letter "S" refers to a requirement that applies to all of SunGuide. Requirements are derived from the user needs and the requirements traceability matrix provides the linkage from the lowest level requirement back to the user need.

Table 3.1 – SunGuide℠ Event Manager / Performance Measures System Requirements

REQUIREMENT ID	REQUIREMENT	VERIFICATION METHOD
A012	The SunGuide software shall provide software for the management, dispatch, data collection and coordination of Road Rangers Service Patrols.	Demonstration
S032	The SunGuide software shall support the performance measures data collection of Road Rangers Service Patrols.	Demonstration
S033	SunGuide shall support the addition of new functionality by third party developers using an open architecture approach that conforms to the existing SunGuide Software architecture.	Analysis
EM001	The SunGuide software shall include a Road Ranger performance measures module that interfaces with District service patrol data collection and reporting devices.	Demonstration
EM002	The EM/PM subsystems shall have direct access to the SunGuide Oracle database to access Event Manager tables only.	Demonstration
EM003	The EM/PM subsystems shall be able to record free-text comments entered by the operator.	Demonstration
EM004	The EM/PM subsystems shall allow an operator to track the status of each Road Ranger vehicle (truck) in the fleet.	Demonstration

REQUIREMENT ID	REQUIREMENT	VERIFICATION METHOD
EM005	The EM/PM subsystems shall automatically calculate the notification time, on-scene time, and departure time for the Road Ranger agency.	Demonstration
EM006	The EM/PM subsystems shall record DMS message status changes from the DMS and MAS modules and maintain a log of posted message changes and the timestamp of the changes.	Demonstration
EM007	The EM/PM subsystems shall allow operators to send email alerts to subscribers with summary information about an event.	Demonstration
EM008	The EM/PM subsystems shall provide a mechanism through which the system and operator may enter "sensitive" information that shall only be sent to a pre-defined and privileged group of subscribers using email.	Demonstration
EM009	The EM/PM subsystems shall synchronize its event data with the IM subsystem using the SunGuide Incident Manager Subsystem ICD.	Demonstration
TM001	The SunGuide Software System incident management function shall minimize the number of key strokes for the entry of traffic incidents while providing drop-down menus, check boxes, and data interfaces with subsystems such as the road weather information systems (RWISs), vehicle detection, motorist aid, automatic vehicle identification (AVI), DMSs, and CCTVs.	Demonstration
TM019	SunGuide shall support an interface with a software subsystem that will interface with District 4 Road Ranger data collection equipment.	Demonstration

3.4 Operational Test Cases

Table 3.2 lists 22 operational test cases that will be used to verify that the EM/PM requirements for SunGuide Release 2.2 are satisfied. Additionally, there are three regression test cases to verify that previous SunGuide functionality was not lost with the addition of the EM/PM functions.

Each operational test case contains one or more EM/PM subsystems' functional requirements that are specified in the *Requirements Specification for the Event Manager and Performance Measures Subsystems* referenced in *Section 2*. In general, each test case focuses on verifying a particular subsystem requirement, and all the related component and element requirements. These are shown for each test case in Table 3.2. The highlighted rows indicate subtest cases.

Table 3.2 – Operational Test Cases

TEST CASE	DESCRIPTION	SUBSYSTEM REQUIREMENTS	COMPONENT REQUIREMENTS	ELEMENT REQUIREMENTS
PM	Road Ranger Performance Measures Requirements	EM001		
PM-01R	Reporting Component Requirements	EM001	EM001R, EM002R, EM003R, EM004R, EM005R, EM006R	EM001R1, EM001R2, EM003R1, EM003R2, EM005R1, EM005R2, EM005R3, EM006R1, EM006R2
PM-01G	EM/PM GUI Requirements	EM001	EM001G, EM002G, EM003G, EM004G, EM005G, EM006G, EM007G, EM008G, EM010G, EM012G, EM013G, EM014G, EM015G, EM016G	EM001G1, EM001G2, EM002G1, EM003G1, EM003G2, EM003G3, EM004G1, EM006G1, EM007G1, EM007G2, EM012G1, EM013G1
DB-01	EM/PM License Plate Match	EM002	EM001D, EM009G	EM001D2
OP-01	Related Free Text Requirements	EM003	EM002D, EM003D, EM011G, EM017G	EM011G1, EM017G1, EM017G2, EM017G3, EM017G4, EM017G5
TR-01	Tracking Requirements	EM004	EM001T, EM002T, EM003T, EM004T, EM005T, EM006T, EM007T	EM004T1, EM004T2, EM005T1, EM005T2
SG-01	SunGuide Requirements	TM001	TM001D, TM002D, TM003D, TM004D, TM005D	TM002D1, TM002D2, TM002D3, TM002D4, TM002D5
SG-02	Calculate and Export PM	TM001, EM005, EM006	EM006, TM006D, TM007D, TM009D, TM010D, TM012D	TM009D1, TM009D2, TM009D3, TM009D4, TM010D1, TM010D2, TM010D3, TM012D1
EM-01	Email Requirements	EM007, EM008		EM001E, EM002E, EM003E
SG-03	EM/PM Synchronization Requirements	EM009	EM001P, EM002P, TM003W	TM003W1, TM003W2, TM003W3, TM003W4, TM003W5, TM003W6
SP-01	SunGuide Road Ranger I/F Tests	TM019	TM001B, TM002B, TM003B, TM004B, TM005B, TM005W	TM004B1, TM005B1, TM005B3, TM005B5
RG	Regression Tests			

Test Case	Description	Subsystem Requirements	Component Requirements	Element Requirements
RG-1	DMS and CCTV Tests	TM003, DM003	TM001W, TM002W, TM003U, DM011M, DM003M, TM005R, TM001P, DM008M, TM014R	TM010R1, TM005R1
RG-2	Event Manager Tests	TM002, TM009, TB002	DM006M, DM007M	DM007M1
RG-3	DMS Sequence Tests	WS011	DM010A, TM006A, DM005D	

4. Requirements Testing

The functional requirements for the proportional font enhancement to the SunGuide software system are provided in the previous section. The requirements are presented in a parent-child relationship intended to show requirement traceability back to a higher-level system requirement and, in many cases, one or more business rules. Each requirement will be shown to meet its requirement using either Demonstration (D) or Test (T) verification methods.

Demonstration — Demonstration is a verification element that differs from the Test element in that it verifies only the specific situation demonstrated but not all possible situations that the equipment could be used in. Demonstration is used in lieu of the Test verification method when parameters cannot be accurately measured. The capability to conform to the requirement must be inferred from the successful completion of the specific demonstration.

Test — Test is a verification element that denotes the determination of the properties and characteristics of equipment or components by measuring specific performance parameters of the unit being test. The analysis of data derived from a test is an integral part of this verification element and should not be confused with the Analysis element.

Analysis — Analysis is an element of verification in the form of a statistical study of previously collected data resulting in calculated data that is intended to verify a requirement when an examination, test, or demonstration cannot feasibly be used to verify the requirement. Such data, collected during a tightly controlled test setup, may be composed of a compilation of acceptance test data, design solutions, or data derived from lower-level tests. Satisfaction of the requirement is performed by statistical analysis of the test data. An example is a verification of a mean time between failure (MTBF) requirement based on data collected during system integration and testing.

4.1 Road Ranger Performance Measures Requirements *(PM-01)*

The Road Ranger performance measures requirements (PM-01) is made up of two subtest cases — PM-01R that tests reporting requirements and PM-01G that tests EM/PM GUI requirements.

4.1.1 Reporting Component Requirements (PM-01R)

Table 4.1 lists the requirements verified by the PM-01R test procedure.

Table 4.1 – Requirements to be Verified using the PM-01R Procedure

REQUIREMENT ID	REQUIREMENT	VERIFICATION METHOD
EM001G1	The EM/PM GUI shall open automatically whenever the operator completes a log in to SunGuide.	Demonstration
EM001G2	The EM/PM GUI and the SunGuide map GUI screens shall open within 60 seconds from when the SunGuide URL is selected exclusive of operator log-in process.	Test
EM001R	The Event Manager/Performance Measures subsystems reporting component shall generate weekly and monthly reports, providing both summary and detailed performance measures when requested by a manager.	Demonstration
EM001R1	The performance measures compiled shall be based on ITS performance Measures, Final Report produced by Cambridge Systematics, Inc.	Analysis
EM001R2	The EM/PM reporting component shall be able to generate a daily chronology report of incidents based on time and day parameters entered by the operator.	Demonstration
EM002R	The SunGuide EM/PM subsystem shall be able to generate a report and display it on the operator's screen within 30 seconds of the last key stroke command that requests the report.	Test
EM003R	The SunGuide EM/PM subsystem shall support data editing within the EM/PM data fields only, no matter which subsystem the event originated in.	Demonstration
EM003R1	Changes to the data shall be able to be made in the data entry form and in the data editing component	Demonstration
EM003R2	It shall be possible to edit agency timeline data in real-time using the data entry form.	Demonstration
EM004R	A truck status report shall be capable of being produced using SunGuide data.	Demonstration
EM004R1	The truck status report shall allow the user to specify a date/time range to retrieve data to support the report.	Demonstration

REQUIREMENT ID	REQUIREMENT	VERIFICATION METHOD
EM004R2	The retrieved data shall list all activity for the truck(s) for the selected date/ time range including; all stops, logon information (including driver name), and logoff information.	Demonstration
EM004R3	The truck status data shall be able to be filtered by event type and/or disposition	Demonstration
EM005R	SunGuide shall provide data to support the generation of an activity summary report.	Demonstration
EM005R1	The user shall be able to select a specific truck number or all trucks, and a date/time range to retrieve the necessary data to generate the activity summary report.	Demonstration
EM005R2	The activity summary data shall contain the information necessary to summarize all activities for the given data range specified.	Demonstration
EM005R3	The activity summary data shall be able to be filtered by event type and/or disposition	Demonstration
EM006R	A Location report shall be available.	Demonstration
EM006R1	The Truck Location report shall list each GPS update for a given date and time, and the geographic location for that report.	Demonstration
EM006R2	The Truck Location report shall be filterable by truck (or all), and Driver ID.	Demonstration

The test prerequisites are identified below.

- SunGuide Release 2.2 that has passed the FAT
- Workstation connected to SunGuide Release 2.2
- Same workstation connected to a printer
- Access to a Road Ranger data file
- Workstation initially not logged in to SunGuide
- Stop watch accurate to one second or better

Table 4.2 provides the PM-01R verification procedures.

Table 4.2 – PM-01R Verification Procedures

STEP NO.	ACTION	EXPECTED RESULT	REQUIREMENT PASS / FAIL
1	Click on the SunGuide icon and start the stopwatch at the same time. Stop the clock when the GUI is fully opened	The SunGuide map GUI screens open within 60 seconds from when the SunGuide URL is selected.	Elapsed time _____ EM001G1 (P/F) _____ EM001G2 (P/F) _____

4.1.2 Event Manager / Performance Measures Graphical User Interface Requirements (PM-01G)

Table 4.3 lists the requirements verified by the PM-01G test procedure.

Table 4.3 – Requirements to be Verified using the PM-01G Procedure

REQUIREMENT ID	REQUIREMENT	VERIFICATION METHOD
EM001G	The EM/PM GUI component shall provide a user interface through which the operator may enter new event records.	Demonstration
EM002G	The EM/PM GUI component shall allow an operator to specify that the event has been verified.	Demonstration
EM002G1	At the time of specification, the current time shall be recorded in the EM/PM Subsystem as the verification time.	Demonstration
EM003G	The EM/PM GUI component shall allow an operator to specify the status of the event.	Demonstration
EM003G1	Status shall include that the event is unresolved indicating passive management, such as waiting for debris cleanup on the shoulder or towing an abandoned vehicle.	Demonstration
EM003G2	The EM/PM Subsystem GUI element shall represent unresolved events differently than active ones on the display.	Demonstration
EM003G3	The EM/PM Subsystem GUI element shall allow an operator to specify when an event has been terminated.	Demonstration
EM004G	The EM/PM GUI component shall allow an operator to specify that the information provided was false and the record is invalid.	Demonstration
EM004G1	Records flagged as invalid shall not be deleted by the database element.	Demonstration
EM005G	The EM/PMGUI component shall allow an operator to specify that the event was a 'false alarm,' which shall also flag the event as an invalid event.	Demonstration
EM006G	The EM/PM GUI component shall allow an operator to enter lane blockage data for any event.	Demonstration
EM006G1	All lane blockage entries shall be recorded with timestamps by the database element.	Demonstration
EM007G	The EM/PM GUI component shall provide a graphical display to the operator, allowing lane blockage information to be entered using point-and-click methods.	Demonstration
EM007G1	The EM/PM GUI element shall use predefined lane mappings to determine the number of lanes, shoulders, and exit ramp lanes to display to the operator.	Demonstration

REQUIREMENT ID	REQUIREMENT	VERIFICATION METHOD
EM007G2	The EM/PM GUI element shall allow the operator to change the lane configuration (i.e. number of lanes, shoulders, exit ramp lanes) at the event location. Changes shall only apply to the current event (the lane mapping adjustments shall not be saved).	Demonstration
EM008G	The EM/PM GUI component shall allow an operator to enter multiple vehicle descriptions for any event, with the following descriptive data: make, model, color, state, and tag.	Demonstration
EM010G	The EM/PM GUI component shall allow an operator to select the event type from a predefined list for each event record.	Demonstration
EM012G	The EM/PM GUI component shall allow the operator to specify the location of an event, using a graphical interface.	Demonstration
EM012G1	Events shall be geo-located using latitude and longitude coordinates in micro-degrees.	Demonstration
EM013G	The EM/PM GUI component shall allow the operator to specify the event: county, roadway, direction, relation to exit, nearest exit, and distance to exit, lane configuration.	Demonstration
EM013G1	Any lane configuration changes in any data entry screen will be reflected in any others that display lane configuration.	Demonstration
EM014G	The EM/PM GUI component shall allow the operator to define a point location along a roadway.	Demonstration
EM015G	The EM/PM GUI component shall allow the operator to specify congestion queues for an event, using a similar interface as is used to define the event location.	Demonstration
EM016G	The EM/PM GUI component shall allow the operator to specify weather conditions for the event.	Demonstration
EM018G	A Vehicle List window shall be provided that displays a tabular listing of all the AVL-enabled vehicles.	Demonstration
EM018G1	A "Find on map" option shall be provided from the list, which will 'zoom' the SunGuide map to the current position of the vehicle icon.	Demonstration
EM018G2	The tabular list shall include the following information for each vehicle: vehicle ID, status, location, speed, driver, beat, stopped time, incident ID (if available).	Demonstration

The test prerequisites are identified below.

- SunGuide Release 2.2 that has passed FAT
- A workstation connected to SunGuide Release 2.2
- Same workstation connected to a printer
- Access to a Road Ranger data file
- Completed PM-01C test procedure

Table 4.4 provides the PM-01G verification procedures. (It should be noted that all verification procedures are included in the *IV&V Test Procedures for the District 4 Event Manager and Performance Measures Subsystems* document.)

Table 4.4 – PM-01G Verification Procedures

STEP NO.	ACTION	EXPECTED RESULT	REQUIREMENT PASS / FAIL

4.2 Event Manager / Performance Measures License Plate Match Requirements (DB-01)

The DB-01 procedure tests the requirements to match license plate numbers and alert the operator.

Table 4.5 lists the requirements verified by this test procedure.

Table 4.5 – Requirements to be Verified using the DB-01 Procedure

REQUIREMENT ID	REQUIREMENT	VERIFICATION METHOD
EM001D	When a vehicle license plate number is entered, the Event Manager database component shall search the database to look for an event record with a matching tag number.	Demonstration
EM001D1	The EM/PM GUI element shall provide a link to view a report on an event that had an associated vehicle license tag	Demonstration
EM009G	The EM/PM GUI component shall provide an alert message to the operator if an event record matches a license plate number.	Demonstration

The test prerequisites are identified below.

- SunGuide Release 2.2 that has passed FAT
- A workstation connected to SunGuide Release 2.2
- Completed PM-01G test procedure

Table 4.6 provides the DB-01O verification procedures.

Table 4.6 – DB-01O Verification Procedures

STEP NO.	ACTION	EXPECTED RESULT	REQUIREMENT PASS / FAIL

4.3 Related Free Text Requirements (OP-1)

Table 4.7 lists the requirements verified by the OP-1 test procedure.

Table 4.7 – Requirements to be Verified Using the OP-01D Procedure

REQUIREMENT ID	REQUIREMENT	VERIFICATION METHOD
EM002D	The operator entered free text comments shall be stored in the Event Manager database associated with the related event.	Demonstration
EM003D	The EM/PM event records shall be synchronized with IM event records.	Demonstration
EM011G	The EM/PM GUI shall have a free text field for each event record that the operator can enter comments.	Demonstration
EM011G1	The free text field shall accommodate a maximum of 512 ASCII characters.	Test
EM017G	The operator shall be able to command the EM/PM subsystem to block one or more video camera displays on the SunGuide web page.	Demonstration
EM017G1	The EM/PM Subsystem GUI shall use a popup alert to remind the operator that one or more CCTV is blocked on the web site.	Demonstration
EM017G2	The popup alert shall be visible to all operators logged on to the SunGuide system.	Demonstration
EM017G3	The popup alert shall remain visible on the SunGuide operator's display until at least one operator confirms the blocked camera status by clicking on a button on the popup that will cause the popup to disappear for a configurable amount of time after which it will reassert itself until an operator again acknowledges it.	Demonstration
EM017G4	The EM/PM subsystem GUI shall allow any operator to unblock a blocked camera.	Demonstration
EM017G5	There shall be no timeout feature to unblock the cameras, the camera must be unblocked manually by an operator.	Demonstration

The test prerequisites are identified below.

- SunGuide Release 2.2 that has passed FAT
- A workstation connected to SunGuide Release 2.2
- Completed DB-01O test procedure

Table 4.8 provides the OP-01 verification procedures.

Table 4.8 – OP-01 Verification Procedures

STEP NO.	ACTION	EXPECTED RESULT	REQUIREMENT PASS / FAIL

4.4 Tracking Requirements (TR-01)

Table 4.9 lists the requirements verified by this test procedure.

Table 4.9 – Requirements to be Verified using the TR-01 Procedure

REQUIREMENT ID	REQUIREMENT	VERIFICATION METHOD
EM004	The EM/PM subsystems shall allow an operator to track the status of each Road Ranger vehicle (truck) in the fleet.	Demonstration
EM001T	The EM/PM tracking component shall track Road Ranger vehicle status conditions that shall include as a minimum: patrolling, assist-motorist, gas, meal, inspection, out of service.	Demonstration
EM002T	The EM/PM tracking component shall automatically track the billable/non-billable and available/unavailable for dispatch status of a truck based on its current status.	Demonstration
EM003T	The EM/PM tracking component shall allow the operator to change the status, radio number, beat, and driver for any given truck.	Demonstration
EM004T	The EM/PM tracking component shall allow the operator to record when a specific road ranger truck was dispatched to an event, arrived on-scene to an event, departed from an event, or had their dispatch order cancelled.	Demonstration

REQUIREMENT ID	REQUIREMENT	VERIFICATION METHOD
EM004T1	A road ranger vehicle may respond to the same event multiple times, and each response shall have its own notification/arrival/departure/cancel times.	Demonstration
EM004T2	The EM/PM tracking element shall allow an operator to record activities performed, along with timestamps for each activity, for each Road Ranger response on-scene.	Demonstration
EM005T	The EM/PM tracking component shall allow an operator to identify an agency that was notified and enter a timestamp indicating when an agency has been notified about an event or has detected an event.	Demonstration
EM005T1	The operator shall be able to indicate whether it was the TMC that notified a specific agency.	Demonstration
EM005T2	For agencies that are configured as responders (FHP, Fire, etc.) the EM/PM shall allow the operator to enter the time when they arrived on-scene, and the time when they departed.	Demonstration
EM006T	The EM/PM data entry screens shall populate IM data entry screens.	Demonstration
EM006T1	EM/PM subsystem shall calculate latitude/longitude coordinates in the background and provide them to the IM subsystem.	Demonstration
EM007T	SunGuide 2.2 shall be able to track queue lengths based on operator data entry being driven by CCTV images or VDS detector data.	Demonstration

The test prerequisites are identified below.

- SunGuide Release 2.2 that has passed FAT
- Workstation connected to the SunGuide Release 2.2
- Completed OP-01 test procedure

Table 4.10 provides the TR-01 verification procedures.

Table 4.10 – TR-01 Verification Procedures

STEP NO.	ACTION	EXPECTED RESULT	REQUIREMENT PASS / FAIL

4.5 SunGuide℠ Event Manager / Performance Measures Support Requirements (SG-01)

SG-01 verifies data storage requirements and reporting requirements. Table 4.11 lists the requirements that are verified by this test case.

Table 4.11 – Requirements to be Verified using the SG-01 Procedure

REQUIREMENT ID	REQUIREMENT	VERIFICATION METHOD
TM001D	SunGuide shall acquire and store the following data that is collected at the beginning of the Road Ranger Service Patrol Vehicle Operator's shift: A. Date B. Shift start time C. Operator name D. Truck number E. Route F. Beginning vehicle mileage This data shall be available to support the generation of reports concerning Road Ranger operations.	Demonstration
TM002D	The following data collected at each stop shall be stored by SunGuide℠ and made available for report generation and reviewing through the SunGuide EM/PM GUI: A. Dispatch time B. Arrival time C. License number D. State E. Vehicle type F. Direction of travel (NB, SB, EB, WB) G. Mile marker H. How discovered I. Lanes/Shoulder blocked J. Cause for stop K. Services provided L. Depart time M. Comment card (Y/N)	Demonstration
TM002D1	The following data collected about the vehicle type at each stop shall be stored and linked to the Road Ranger report containing the data: a. Passenger b. Pickup or van c. RV or bus d. Single-unit truck e. Tractor trailer f. Motorcycle g. Not Applicable (N/A)	Demonstration

REQUIREMENT ID	REQUIREMENT	VERIFICATION METHOD
TM002D2	The following data collected by the Road Ranger about how it was discovered at each stop shall be stored and linked to the Road Ranger report containing the data: a. Drive up b. Saw and changed route c. Road Ranger dispatch d. Notified by other Road Ranger operator/supervisor e. FHP dispatch/officer f. Other	Demonstration
TM002D3	The following data collected about the cause for the stop shall be stored and linked to the Road Ranger report containing the data: a. Accident (crash) b. Vehicle fire c. Disabled d. Abandoned e. Debris f. Pedestrian g. Other	Demonstration
TM002D4	The list of services that were provided at each stop shall be stored and linked to the Road Ranger report containing some of the following data: a. Extinguish fire b. First aid c. Absorbent d. Remove debris e. Relocate (to safer location)(> 250 feet) f. Tire g. Fuel h. Fluids i. Mechanical j. Jump start k. Called wrecker l. Secure load m. Mobile phone call n. Directions o. Transported p. Unable to locate q. Blocked lane/traffic control r. Tagged abandoned vehicle s. Relocate vehicle from travel lane (< 250 feet) t. Notify FDOT for road repair u. Other - describe v. No service - occupied w. No service - abandoned	Demonstration
TM002D5	The following data collected at the end of each Road Ranger shift: shall be stored by SunGuide and linked to the Road Ranger reporting the data. A. Shift end time B. Ending vehicle mileage	Demonstration

REQUIREMENT ID	REQUIREMENT	VERIFICATION METHOD
TM003D	The Road Ranger operator data shall be collected monthly and be able to be exported to Microsoft Excel or other compatible format.	Demonstration
TM004D	SunGuide shall support the compilation and report generation quarterly.	Demonstration
TM005D	SunGuide shall store the Road Ranger data for a minimum of 12 months and have it available for review and report generation within 120 seconds of when a specific piece of data is requested.	Demonstration

4.6 SunGuide℠ Performance Measures Calculations (SG-02)

SG-02 verifies response time calculations, incident cleared time calculations, and the interface with data collection equipment. Table 4.12 lists the requirements verified by this test case.

Table 4.12 – Requirements to be Verified using the SG-02 Procedure

REQUIREMENT ID	REQUIREMENT	VERIFICATION METHOD
TM006D	SunGuide shall interface with and be able to receive Road Ranger data using a file that is in XML format.	Demonstration
TM007D	SunGuide shall calculate and be able to display and export TMC performance measures.	Demonstration
TM009D	SunGuide shall calculate and save the Response Time for each incident confirmed by the SunGuide operator.	Demonstration
TM009D1	The date and time that law enforcement or Road Ranger service was initially notified of a confirmed SunGuide incident shall be recorded and associated with the incident.	Demonstration
TM009D2	For each incident confirmed by the SunGuide operator, the arrival time of law enforcement or the Road Ranger vehicle shall be recorded and associated with the incident.	Demonstration
TM009D3	SunGuide shall calculate the Response Time for each confirmed incident by subtracting the date/time of initial SunGuide notification of the incident from the date/time that law enforcement or Road Ranger arrives on scene. Response Timeincident ID = tLE/RR Arrives - tinitialnotification.	Analysis
TM009D4	SunGuide shall calculate the Average Response Time for a period of time or for a group of incidents specified by the SunGuide operator.	Analysis

REQUIREMENT ID	REQUIREMENT	VERIFICATION METHOD
TM010D	SunGuide shall calculate and save the Incident Clearance time for each incident confirmed by the SunGuide operator.	Demonstration
TM010D1	The date and time when the SunGuide operator decides that all traffic lanes are cleared shall be recorded and associated with the incident.	Demonstration
TM010D2	SunGuide shall calculate the Incident Clearance Time (ICT) by subtracting the date/time that law enforcement or road ranger vehicle arrive on scene from the time that the lanes are cleared. ICT = tlanescleared - tLE/RR Arrives	Analysis
TM010D3	SunGuide shall calculate the Average Incident Clearance Time for a period of time or for a group of incidents specified by the SunGuide operator.	Analysis
EM006	The EM/PM subsystems shall record DMS message status changes from the DMS and MAS modules and maintain a log of posted message changes and the timestamp of the changes.	Demonstration
TM012D	SunGuide℠ shall provide a driver to interface with different service vehicle collection data streams in accordance with published SunGuide Interface Control Documents.	Demonstration
TM012D1	SunGuide shall provide a driver to interface with the Xplore's iX104C2 tablet PC through a local area connection (LAN) to upload performance measures data recorded by the device in accordance with the District 4 RR PC Tablet Interface Control Document.	Demonstration

The test prerequisites are identified below.

- SunGuide R2.2 that has passed FAT
- Workstation connected to the SunGuide R2.2.
- Completed OP-01 test procedure

Table 4.13 – SG-02 Verification Procedures

STEP NO.	ACTION	EXPECTED RESULT	REQUIREMENT PASS / FAIL

4.7 Notification Related Requirements (EM-01)

EM-01 verifies the requirements related to notification. Table 4.14 lists the requirements verified by this test case.

Table 4.14 – Requirements to be Verified using the EM-01 Procedure

REQUIREMENT ID	REQUIREMENT	VERIFICATION METHOD
EM007	The EM/PM subsystems shall allow operators to send email alerts to subscribers with summary information about an event.	Demonstration
EM001E	The EM/PM email component shall create the email template with at least the following information: event type, event location, and lane blockage.	Demonstration
EM002E	The EM/PM email component shall allow the operator to enter free-text changes to the email.	Demonstration
EM003E	The EM/PM email component shall allow the operator to choose from one or more pre-defined email groups for sending emails.	Demonstration
EM008	The EM/PM subsystems shall provide a mechanism through which the system and operator may enter "sensitive" information that shall only be sent to a pre-defined and privileged group of subscribers using email.	Demonstration

The test prerequisites are identified below.

- SunGuide Release 2.2 that has passed FAT
- Workstation connected to the SunGuide Release 2.2
- Completed SG-02 test procedure

Table 4.15 provides the EM-01 verification procedures.

Table 4.15 – EM-01 Verification Procedures

STEP NO.	ACTION	EXPECTED RESULT	REQUIREMENT PASS / FAIL

4.8 Event Manager / Performance Measures Synchronization Requirements (SG-03)

Synchronization requirements between the EM/PM module and the SunGuide are verified by this operational test procedure. Table 4.16 lists the requirements are verified.

Table 4.16 – Requirements to be Verified using the SG-03 Procedure

REQ. ID	REQUIREMENT	VERIFICATION METHOD
EM001P	The performance measures component shall generate statistics and reports based on data entered via EM/PM data entry screens.	Demonstration
EM002P	All audit changes shall be logged in the system, including the previous values, the user who changed them, and the date/time it was changed.	Demonstration
TM003W	SunGuide graphical operator interface shall provide the ability for the operator to annotate an incident record with date/time information related to incident management and performance measures calculation.	Demonstration
TM003W1	SunGuide graphical operator interface shall provide the ability for the operator to enter the date and time that law enforcement or Road Ranger service were notified of a confirmed SunGuide incident. This is called Initial Incident Notification Time (tinitialnotification).	Demonstration
TM003W2	The initial notification time for Road Ranger service shall be associated with each incident if the data is available from the Road Ranger service.	Demonstration
TM003W3	SunGuide graphical operator interface shall provide the ability for the operator to enter the date and time that a law enforcement vehicle or a Road Ranger vehicle arrived on the scene of a SunGuide confirmed incident. This is called the Arrival Time of Law Enforcement/Road Ranger vehicle (tLE/RR Arrives).	Demonstration
TM003W4	The SunGuide graphical user interface shall allow a SunGuide operator with appropriate permissions to specify the date/time period or the incident IDs or range of IDs for SunGuide to calculate the average response time.	Demonstration
TM003W5	The SunGuide graphical user interface shall allow a SunGuide operator with appropriate permissions to specify the date/time that all traffic lanes resumed free flow operation following the confirmation of an incident by the SunGuide operator. This is called "tlanescleared".	Demonstration
TM003W6	Service patrol data downloaded after the event shall not overwrite the operator entered date/time for Road Ranger initial notification but shall fill in any missing data.	Demonstration

The test prerequisites are identified below.

- SunGuide Release 2.2 that has passed FAT
- Workstation connected to the SunGuide Release 2.2
- Completed EM-02 test procedure

Table 4.17 provides the SG-04 verification procedures.

Table 4.17 – SG-04 Verification Procedures

STEP NO.	ACTION	EXPECTED RESULT	REQUIREMENT PASS / FAIL

4.9 SunGuide℠ Road Ranger Interface Tests (SP-01)

This operational test case verifies the Road Ranger interface requirements. Table 4.18 lists the requirements verified.

Table 4.18 – Requirements to be Verified using the SP-01 Procedure

REQUIREMENT ID	REQUIREMENT	VERIFICATION METHOD
TM019	SunGuide shall support an interface with a software subsystem that will interface with District 4 Road Ranger data collection equipment.	Demonstration
TM001B	SunGuide incident management subsystem shall allow the ownership of an event to be assigned to a user when SunGuide is operating with a SMART software interface.	Demonstration
TM002B	The incident management subsystem shall allow a user with appropriate permissions to modify an event without first obtaining ownership when SunGuide is operating with a SMART software interface.	Demonstration
TM003B	The SunGuide GUI shall permit a user to log into a non-specific subsystem with a subsystem type of "URL" that is connected to the data bus when SunGuide is operating with a SMART software interface.	Demonstration

REQUIREMENT ID	REQUIREMENT	VERIFICATION METHOD
TM004B	The SunGuide GUI shall request a list of URLs from subsystems of type "URL."	Demonstration
TM004B1	For each subsystem of type "URL", the SunGuide GUI shall provide a menu with the list of URLs retrieved from that subsystem.	Demonstration
TM005B	SunGuide shall support the creation or modification of an incident by a standalone software module (the EM/PM Subsystems).	Demonstration
TM005B1	SunGuide shall identify the incident as having been created or changed by the EM/PM Subsystems.	Demonstration
TM005B3	Possible incidents detected through SunGuide TSS shall show up in the EM/PM GUI.	Demonstration
TM005B5	An event created or modified by the EM/PM Subsystems shall identify the owner as the person logged into the RRPM module that created or changed the incident.	Demonstration
TM005W	As a drop down menu option on the SunGuide Operator map, the SunGuide GUI shall provide a link to a standalone EM/PM GUI.	Demonstration

The test prerequisites are identified below.

- SunGuide Release 2.2 that has passed FAT
- Workstation connected to SunGuide Release 2.2
- Completed SG-04 test procedure

Table 4.19 provides the SP-01 verification procedures.

Table 4.19 – SP-01 Verification Procedures

STEP NO.	ACTION	EXPECTED RESULT	REQUIREMENT PASS / FAIL

5. Regression Tests

The following tests are to be run to verify that the changes made to SunGuide for the proportional font enhancement did not affect the performance of SunGuide. Table 5.1 lists the selected requirements to be re-verified.

Table 5.1 – Requirements to be Regression Tested

REQUIREMENT ID	REQUIREMENT	VERIFICATION METHOD
TM005R	The incident management response function shall recommend a set of DMS locations and messages for the workstation operator to select. In addition, HAR messages shall be activated.	Demonstration
TM005R1	The incident response plan shall suggest all DMS/HAR devices on roadways leading to the incident location within the distance specified with the severity level of the incident.	Demonstration
TM009	It shall be possible to create an incident, enter required basic information (listed below), and select appropriate signs and/or HARs within 60 seconds of when the operator confirms the incident. Required basic information consists of:· Incident description; Route; Direction; Cross street; Lane configuration	Test
TM014	When an incident is closed, the response plan associated with the incident shall be canceled.	Demonstration
A018	The SunGuide Software System shall provide software for traffic and delay prediction to support incident management and performance monitoring (including travel times and travel speeds).	Demonstration
S019	The SunGuide Software System shall provide an interface to changeable message signs (CMSs) through a minimum of three drivers supporting: • NTCIP protocol • Florida Management Information Base (MIB) (subset of the NTCIP standard) • The Management Information System for Transportation (MIST) system driver from District 5 • Device drivers from manufacturers as specified by the Department	Demonstration
DM003	The DMS software shall implement the District 4 DMS Message Matrix as specified in the "Guidelines for Dynamic Message Sign (DMS) Messaging" dated August 22, 2002, published by DMJM Harris.	Demonstration
DM003M	The DMS Message shall adhere to the following format: Line 1 = What (location of incident using lane reference shown in related picture) Line 2 = Where (problem that needs the DMS message) Line 3 = When or Reference Location (location)	Demonstration
DM006M	If a message is placed in the queue with a higher priority than the currently displayed message, the higher-priority message shall be displayed on the device.	Demonstration
DM007M	When a message is removed from the queue, the message with the next highest priority shall be activated.	Demonstration
DM007M1	If the queue for a device becomes empty, the device shall blank.	Demonstration

REQUIREMENT ID	REQUIREMENT	VERIFICATION METHOD
DM008M	The system shall allow the operator to specify a priority level when activating a message manually.	Demonstration
DM009M	The default priority level for manual message activation shall be the highest priority level.	Demonstration
DM010M	The default priority level for messages included in an automatic sequence shall be the lowest priority level.	Demonstration
DM011M	SunGuide shall provide a mechanism for prioritizing messages placed by the IM subsystem based on distance from the incident, with messages on signs closer to the incident being given higher priority.	Analysis

5.1 Regression Test One

Log in as "jbonds."

The precondition for the Regression Test One (RG-1) test procedure includes verifying that DMS unit ID 95SB31 and CCTV unit ID 931-CCTV [Broward County] can be accessed. The test procedure for the RG-1 test case is provided in Table 5.2.

Table 5.2 – Test Procedure for the RG-1 Test Case

STEP	ACTION	EXPECTED RESPONSE
1	Select Broward County from the drop-down menu on the navigation panel. Center the map on I-95 just north of the I-95 right-hand bend of I-95 by left clicking on the approximate latitude/longitude of 26.227500/80.137000. (The latitude and longitude are displayed in the navigation panel.)	The map re-centers on the part of I-95 that is north of the bend.
2	Select the zoom option that fills in seven yellow bars. (If the zoom option is limited or not available, right click on the map where there are no icons or roads, and select Preferences, Save Current Map View.)	The mile marker 36 icon is shown almost in the center. A DMS icon on the southbound side of I-95 is shown just below mile marker 35. Eight lanes are shown on I-95, four northbound lanes and four southbound lanes.

STEP	ACTION	EXPECTED RESPONSE
3	If cross streets are not displayed, right click on the map where there are no roads or icons, and select Preferences. Select Local Maps. On the row labeled District 4 in the State Roads column, click State Roads. Then click Update and Save. Close the window. Position the cursor, approximately 1 inch below the cross street (Atlantic Blvd) that is just below the mile marker 36 icon on the inside southbound lane. Right click and select Add New Event.	The Event Data menu pops up. The event name is New Event 95S-link18-2006-mm-dd. The following is automatically filled in: Route (Roadway) is 95 _____ (Y/N) Direction is Southbound _____ (Y/N) Cross Street: Atlantic Blvd _____ (Y/N) Lane Configuration Shown (4) w/ 2 shoulders on each side: _____ (Y/N) Mile Marker 36 _____ (Y/N) If all responses are "Y," pass Requirement TM001W. Requirement TM001W Pass _____ Fail _____ (Manual Creation Part) Are parts of the form automatically filled in to minimize operator keystrokes? _____ (Y/N) Requirement TM001 Pass ____Fail ____ Requirement TM002W Pass ____Fail ____ A question mark icon appears in the location you clicked to add a New Event.

STEP	ACTION	EXPECTED RESPONSE
4	In the Event Description field, type OTC-1-2 HAZMAT. Select Citizen Info as the source. Select Minor as the severity and type 1 hour, 00 minutes, for the expected duration. Select "At" in the Location for the Event is Located field. Confirm that there are 8 green arrows (lanes) depicted in the Lane Configuration. Click the third lane from the left in the diagram. Click the green arrow. Keep clicking until the orange and white striped barrel appears. Select Incident for the event type. Select Vehicle(s) in Roadway for Incident. Check the HAZMAT box. Select Wet for pavement conditions. Make no changes to the Vehicles Involved field. Under Other Details, select Adverse Weather, and check Rain and Reduced Visibility. Click the Save Conditions option. Change the latitude and longitude to 26227510 and -80137590, respectively. Click "Save Event" Verify that the direction can be changed using the window. Click the Save Event. Verify that the latitude and longitude display the new value. Leave the latitude and longitude at the new value, but change the direction to Southbound. Click Save Event.	The Severity can be entered. Requirement TM010R1 Pass ____Fail _____ The Incident icon changes to an orange triangle with a red border. The Save, Get Response, button is not available (i.e., grayed out). Requirement TM003W Pass ____Fail _____ Latitude Before Save _____ Longitude Before Save _____ Latitude After Save _____ Longitude After Save _____ Lat/Lon can be changed _____ (Y/N) Direction can be changed _____ (Y/N) (Both answers must be Yes.) Requirement TM003 Pass _____Fail _____
5	Click Confirm at the top of the Event Data window.	The Save, Get Response, button is now available.

STEP	ACTION	EXPECTED RESPONSE
6	Click the Save, Get Response, button. Verify that the messages on two signs are correct: DMS 95SB38: Left Lane Blocked At Atlantic Blvd. DMS 95SB40: Left Lane Blocked At Atlantic Blvd.	Two signs are displayed with priority decreasing from the top to the bottom (i.e., the priority number gets smaller). DMS 95SB40 has a bigger priority number than DMS 95SB38. Requirement DM011M Pass _____Fail ____ The Owner is the IM System. _____ (Y/N) Verify Line 1[2]: What the problem is ___ (Y/N) Verify Line 2: Where the problem is __ (Y/N) Verify Line 3: When or reference location _____ (Y/N) Requirement DM003 Pass _____ Fail _____ Requirement DM003M Pass _____Fail ____ Requirement TM005R Pass _____ Fail ____ Verify that the severity level is shown in the suggested Response Plan. Requirement TM005R1 Pass ____Fail ____ TM001P Pass_____ Fail _____
7	On the map, zoom out to five yellow bars.	The map displays two DMS with white circles around them north of the incident.
8	Hover the mouse over each sign that is circled and note the name of the sign. Verify the status of each sign that is circled by clicking on the sign. Note whether there is a message displayed. If a message is displayed, note what the message is. Close the DMS Status window.	The northern most sign is 95SB40. The next sign to the south is 95SB38. 95SB38 is an Active sign. 95SB38 msg: _____ 95SB40 msg: _____
9	Click Set as Response on the Suggested Response Plan window.	The response plan reappears with Edit and Remove options for each message.

[2] The wording matches the DMS message rules written by District 4. Each line represents what must be conveyed in text on each row of the DMS display.

STEP	ACTION	EXPECTED RESPONSE
10	Remove 95SB40.	The white circle around the northern most DMS icon disappears, leaving only one circled.
11	Edit 95SB38.	The Edit DMS window pops up. The current message, Left Lane Blocked At Atlantic Blvd., shows.

5.2 Regression Test Two

Regression Test Two (RG-2) verifies the ability to create an incident response plan within 60 seconds and to support the management of an incident.

Preconditions for the RG-2 test procedure include:

- A stopwatch that is accurate to $^{1}/_{10}$ of a second
- Availability of an operating SunGuide system

Table 5.3 – Test Procedure for the RG-2 Test Case

STEP	ACTION	EXPECTED RESPONSE
1	Wait for a segment of I-595 or I-95 to alarm and turn red. If TSS sensors are in service, manually enter an incident.	An audible TSS alarm is sounded and the lane on the segment flashes red.
2	Note the time, place the cursor over a flashing segment of roadway, and right click. Add an event. Complete the event data for an incident and confirm. Enter license plate number, make/model of the vehicle and select Jump Start. Save and get a response plan. Note the time the response plan was displayed. Answer the following questions: 1) Did SunGuide assist you in verifying an incident? 2) Did SunGuide provide a way for you to enter motorist information, such as license plate tag ID, the vehicle make/model, etc.? 3) Did SunGuide generate a response plan? 4) Did SunGuide support the management of the incident site by	a) Time Stopwatch Started: _____ 1) Incident Verification _____ (Y/N) 2) Motorist Information _____ (Y/N) 3) Response Plan _____ (Y/N) b) Time Stopwatch Stopped: _____ c) Elapsed Time: _____ (The answer is 60 seconds or less.) Requirement TM009 Pass ___ Fail ___ 4) Site Management _____ (Y/N) 5) Traffic Management _____ (Y/N) 6) Incident Clearance _____ (Y/N) Responses to 1) through 6) must be Yes. Requirement TM002 Pass ___ Fail ___

STEP	ACTION	EXPECTED RESPONSE
	providing messages to the DMS units; access to and control of CCTV cameras that are able to view the incident location; a list of personnel to contact; and the involved personnel with their available resources listed? 5) Did SunGuide provide the appropriate messages for the appropriate DMS units? 6) Did SunGuide assist in clearing the incident and restoring the DMS units to their previous states?	Note that the elapsed time between (a) and (b) must be less than 60 seconds.
3	Note what messages are active on which DMS units in District 4. Create a State of Florida DOT message and activate it with priority of 5 on one sign if no messages are displayed. Create an Amber Alert message as follows: Right click on a part of the GUI where no roads or icons are shown. Select the DMS option and select Device Groups. Look for an Amber Alert group. If it does not exist, click the New Group option and click on the first sign name displayed in the list of available signs. Hold down the shift key and scroll to the bottom of the list. Click on the last sign in the list. All signs should be highlighted. Click the Add option. Send this message to all DMS units in District 4 by right clicking on the GUI where there are no roads or icons and select DMS / Sequence Libraries. Enter Amber Alert Test as the name. Click the Create option. Select the Amber Alert Test Sublibrary and click the Add New Sequence option. Name OTC-1-6 Amber Alert as the new sequence. Click the Create option. Select the All Days and Continue Until Terminated options. Click the Add New Item option. Select the first sign in the list, hold down the shift key, and click on the last sign in the list. All signs should be highlighted. Click the Select Target option and enter the Florida Department of Transportation message.	This test is only for DMS units. The HAR system will be tested in Release 2 of the software. Number of DMS units that display the current message. _____ The message appears on all signs in the District 4 area of operations._____ (Y/N) Elapsed Time _____ The Amber Alert message supersedes all messages being displayed._____ (Y/N) Requirement DM006M Pass _____Fail ____

STEP	ACTION	EXPECTED RESPONSE
	Create a 12-hour duration. Click the Add New Item option and create the same message, but have it run for the other 12 hours. Make sure the message priority is 1. Click the Save Sequence option. Click Activate. Start the stopwatch. Stop timing when all DMS units indicate that a message is displayed. This is indicated when the center of the SunGuide GUI icon is yellow. (Timing is for informational purposes.)	
4	Wait 10 seconds after all the messages are displayed and cancel the Amber Alert by right clicking on an area of the GUI where no roads or icons appear and selecting DMS/Active Sequences. Select the OTC-1-6 Amber Alert sequence and click the Terminate option. The Amber Alert test message should be deleted from all signs and previous messages are redisplayed.	The Amber Alert messages are removed and the signs return to their former state. _____ (Y/N) Requirement DM007M Pass _____Fail ____ Signs that were blank before are blank now. Requirement DM007M1 Pass ____Fail ____ Note the number of signs remaining with messages on them._____ Requirement TB002 Pass _____ Fail _____

5.3 Regression Test Three

The precondition for the Regression Test Three (RG-3) test procedure includes verification that the RG-1 and RG-2 test procedures have been completed.

Table 5.4 – Test Procedure for the RG-3 Test Case

STEP	ACTION	EXPECTED RESPONSE
1	Right click on the Operator Map background and select DMS/Sequence Libraries. Click the Add New Sublibrary option and create a sequence library named IVVD4, then create a DMS sequence in that library named IVV-DMS-8 by clicking the Add New Sequence option in the lower half of the window. Click Create after filling in the name. Set the sequence to activate every other day of the week (i.e., Sunday/Tuesday/	Did the two messages in the created sequence display at the correct time on the correct signs? _____ (Y/N) Verify the priority level is set to the lowest level (i.e., 256)._____ (Y/N) Requirement DM010M Pass ____ Fail ____ Requirement TM006A Pass ____ Fail ____

STEP	ACTION	EXPECTED RESPONSE
	Thursday/Saturday). Adjust the start time of the sequence to begin five minutes from the current system time. Set the end date to today's date. Add two signs DMS-NTCIP-1 and DMS-NTCIP-2 to the sequence. Verify that the MAS queue is empty for the selected signs. Select Add New Item and select DMS 95SB31. Set the message to Florida Department of Transportation and the duration to two minutes. Save the item. Edit the item for DMS-NTCIP-2. Set the message to State of Florida DOT and the duration to two minutes. Save the item. Confirm the creation of the sequence. Activate the sequence by clicking on it and selecting the Activate option. Wait for five minutes for the messages to be displayed.	As each message is about to be displayed, verify that the operator is asked to confirm or resolve DMS message conflicts. Requirement DM005D Pass ____ Fail ___
2	Using the GUI, display all the data that is available from the device driver for DMS 95SB31 by left clicking on the sign icon. Then select the Detailed Status option. Click on the details for pixels. Click on the details for lamps. Click on the details for fans. Click on the details for power. Click on the details for temperature.	Data from the driver for the selected sign is displayed. Pixel Status _____ (Y/N) Lamp Status _____ (Y/N) Fans Status _____ (Y/N) Power Status _____ (Y/N) Temperature Status _____ (Y/N) All responses must be Yes. Requirement WS011 Pass ____Fail ____

6. Requirements Traceability Verification Matrix

Table 6.1 is the RTVM for the EM/PM subsystems' verification tests. The column labeled Para. No. refers to the paragraph in the EM/PM subsystems' requirements specification where the requirement is listed. The Test Proc. No. will be completed when the test procedures are complete and the Test Result column will be filled in after the IV&V is complete. The Requirement Summary is a paraphrasing of the requirement and does not necessarily fully describe the requirement. Refer to the operational test cases in *Section 4* to read the full requirement text.

Table 6.1 – RTVM for the EM/PM Subsystems IV&V

Requirement ID	Requirement Summary	Para. No.	Verification Method	Test Case	Test Proc. No.	Test Result
S032	SunGuide shall support the performance measures data collection of Road Rangers Service Patrols.	3.0	Demonstration	All		
EM002	EM/PM shall have direct access to the SunGuide Oracle database.	3.2	Demonstration	DB-01		
EM001D	EM data storage component shall search the database to look for an event record with a matching tag.	3.2.2	Demonstration	DB-01		
EM001D2	EM/PM shall provide a link to view a report on an event that had an associated tag #	3.2.2	Demonstration	DB-01		
EM009G	EM/PM module shall alert the operator if an event record matches a tag number.	3.2.1	Demonstration	DB-01		
EM007	Operators can send email alerts to subscribers with summary information about an event.	3.2	Demonstration	EM-01		
EM008	System and operator may enter "sensitive" information.	3.2	Demonstration	EM-01		
EM001E	Email template shall contain event type, event location, and lane blockage.	3.2.5	Demonstration	EM-01		
EM002E	EM/PM shall allow the operator to enter free-text changes to the email	3.2.5	Demonstration	EM-01		
EM003E	Operator can choose from one or more pre-defined email groups for sending emails.	3.2.5	Demonstration	EM-01		
EM003	EM/PM shall be able to record free-text comments.	3.2	Demonstration	OP-01		
EM002D	Free text comments shall be stored in the EM database associated with the related event.	3.2.2	Demonstration	OP-01		
EM003D	The EM/PM event records shall be synchronized with IM event records.	3.2.2	Demonstration	OP-01		
EM011G	EM/PM GUI shall have a free text field for each event record.	3.2.1	Demonstration	OP-01		
EM011G1	The free text field shall accommodate a maximum of 512 ASCII characters.	3.2.1	Test	OP-01		
EM017G	Block one or more video camera displays on the SunGuide web page.	3.2.1	Demonstration	OP-01		
EM017G1	Popup alert to remind the operator that one or more CCTV are blocked	3.2.1	Demonstration	OP-01		
EM017G2	The popup alert shall be visible to all operators logged on to the SunGuide system.	3.2.1	Demonstration	OP-01		

Requirement ID	Requirement Summary	Para. No.	Verification Method	Test Case	Test Proc. No.	Test Result
EM017G3	Popup alert shall remain on the SunGuide operator's display until operator confirms	3.2.1	Demonstration	OP-01		
EM017G4	The EM/PM subsystem GUI shall allow any operator to unblock a blocked camera.	3.2.1	Demonstration	OP-01		
EM017G5	No timeout feature to unblock the cameras,	3.2.1	Demonstration	OP-01		
EM001	SunGuide shall support the performance measures data collection of Service Patrols.	3.2	Demonstration	PM-01		
EM001G	The EM/PM module shall provide a user interface.	3.2.1	Demonstration	PM-01G		
EM001G1	EM/PM GUI shall open automatically when logging in to SunGuide.	3.2.1	Demonstration	PM-01G		
EM002G	EM/PM module shall allow an operator to specify that the event has been verified.	3.2.1	Demonstration	PM-01G		
EM002G1	The current time shall be recorded in the EM/PM subsystems as the verification time	3.2.1	Demonstration	PM-01G		
EM003G	EM/PM module shall allow an operator to specify the status of the event.	3.2.1	Demonstration	PM-01G		
EM003G1	Status shall include that the event is unresolved.	3.2.1	Demonstration	PM-01G		
EM003G2	Service Patrol module shall represent unresolved events differently than active ones.	3.2.1	Demonstration	PM-01G		
EM003G3	EM/PM subsystem shall allow an operator to terminate an event.	3.2.1	Demonstration	PM-01G		
EM004G	EM/PM module shall allow an operator to invalidate a record.	3.2.1	Demonstration	PM-01G		
EM004G1	Records flagged as invalid shall not be deleted.	3.2.2	Demonstration	PM-01G		
EM005G	EM/PM module shall allow an operator to specify that the event was a 'false alarm'	3.2.1	Demonstration	PM-01G		
EM006G	EM/PM module shall allow an operator to enter lane blockage data for any event.	3.2.1	Demonstration	PM-01G		
EM006G1	Lane blockage entries shall be recorded with timestamps by the database element.	3.2.2	Demonstration	PM-01G		
EM007G	EM/PM module shall provide a graphical display to the operator.	3.2.1	Demonstration	PM-01G		
EM007G1	EM/PM shall use predefined lane mappings.	3.2.1	Demonstration	PM-01G		
EM007G2	EM/PM shall allow the operator to change the lane configuration.	3.2.1	Demonstration	PM-01G		

REQUIREMENT ID	REQUIREMENT SUMMARY	PARA. NO.	VERIFICATION METHOD	TEST CASE	TEST PROC. NO.	TEST RESULT
EM008G	EM/PM module shall allow an operator to enter multiple vehicle descriptions for any event.	3.2.1	Demonstration	PM-01G		
EM010G	Operator shall be able to select the event type from a predefined list for each event record	3.2.1	Demonstration	PM-01G		
EM012G	Operator can specify the location of an event, using the Service Patrol graphical interface.	3.2.1	Demonstration	PM-01G		
EM012G1	Events shall be geo-located using latitude and longitude coordinates in micro-degrees.	3.2.1	Demonstration	PM-01G		
EM013G	Specify for the event: county, roadway, direction, relation to exit, nearest exit, and distance to exit	3.2.1	Demonstration	PM-01G		
EM013G1	Lane config changes will be reflected in any others that display lane config.	3.2.1	Demonstration	PM-01G		
EM014G	Allow the operator to define a point location, or a linear location along a roadway.	3.2.1	Demonstration	PM-01G		
EM015G	Specify congestion queues for an event, using a similar interface as is used to define the event location.	3.2.1	Demonstration	PM-01G		
EM016G	The EM/PM module shall allow the operator to specify weather conditions for the event.	3.2.1	Demonstration	PM-01G		
EM001G2	Open simultaneously within 60 seconds of the operator signing in.	3.2.1	Test	PM-01R		
EM001R	EM/PM shall generate summary and detailed performance measures reports.	3.2.3	Demonstration	PM-01R		
EM001R1	The performance measures compiled shall be based on ITS performance Measures Final Report	3.2.3	Analysis	PM-01R		
EM001R2	Generate a daily chronology report of incidents based on time and day parameters	3.2.3	Demonstration	PM-01R		
EM002R	Generate a report and display it on the operator's screen within 30 seconds	3.2.3	Test	PM-01R		
EM003R	Support data editing within the EM/PM data fields only.	3.2.3	Demonstration	PM-01R		
EM003R1	Changes to the data s made in the data entry form and data editing component	3.2.3	Demonstration	PM-01R		
EM003R2	Edit agency timeline data in real-time using the data entry form.	3.2.3	Demonstration	PM-01R		

REQUIREMENT ID	REQUIREMENT SUMMARY	PARA. NO.	VERIFICATION METHOD	TEST CASE	TEST PROC. NO.	TEST RESULT
TM001D	SunGuide data storage requirements for Road Ranger data	3.1.1	Demonstration	SG-01		
TM002D	SunGuide Road Ranger data storage requirements	3.1.1	Demonstration	SG-01		
TM002D1	Vehicle type data storage requirements	3.1.1	Demonstration	SG-01		
TM002D2	Road Ranger data requirements- - how discovered	3.1.1	Demonstration	SG-01		
TM002D3	Road Ranger data requirements for the cause for the stop.	3.1.1	Demonstration	SG-01		
TM002D4	Road Ranger data requirements services provided.	3.1.1	Demonstration	SG-01		
TM002D5	SunGuide Road Ranger end of shift data	3.1.1	Demonstration	SG-01		
TM003D	SunGuide Road Ranger reporting requirements	3.1.1	Demonstration	SG-01		
TM004D	SunGuide Road Ranger reporting requirements	3.1.1	Demonstration	SG-01		
TM005D	SunGuide Road Ranger storage requirements	3.1.1	Demonstration	SG-01		
EM005	Auto calculate notification time, on-scene time, and departure time for the Road Ranger agency	3.2	Demonstration	SG-02		
EM006	EM/PM module shall record DMS message status changes from the DMS/MAS modules	3.2	Demonstration	SG-02		
TM006D	SunGuide Road Ranger data acquisition requirements	3.1.1	Demonstration	SG-02		
TM007D	Calculate and be able to display and export TMC performance measures.	3.1.1	Demonstration	SG-02		
TM009D	Calculate and save the Response Time for each confirmed incident.	3.1.1	Demonstration	SG-02		
TM009D1	The date and time that law enforcement or Road Ranger service was initially notified	3.1.1	Demonstration	SG-02		
TM009D2	Arrival time of law enforcement or the Road Ranger vehicle shall be recorded	3.1.1	Demonstration	SG-02		
TM009D3	SunGuide shall calculate the Response Time for each confirmed incident	3.1.1	Analysis	SG-02		
TM009D4	SunGuide shall calculate the Average Response Time	3.1.1	Analysis	SG-02		
TM010D	SunGuide shall calculate and save the Incident Clearance time.	3.1.1	Demonstration	SG-02		
TM010D1	The date and time when all traffic lanes are cleared shall be recorded	3.1.1	Demonstration	SG-02		
TM010D2	SunGuide shall calculate the Incident Clearance Time (ICT)	3.1.1	Analysis	SG-02		
TM010D3	SunGuide shall calculate the Average Incident Clearance Time.	3.1.1	Analysis	SG-02		

REQUIREMENT ID	REQUIREMENT SUMMARY	PARA. NO.	VERIFICATION METHOD	TEST CASE	TEST PROC. NO.	TEST RESULT
TM012D	Provide a driver to interface with different service vehicle collection data streams	3.1.5	Demonstration	SG-02		
TM012D1	SunGuide shall provide a driver to interface with the Xplore's iX104C2 tablet PC.	3.1.5	Demonstration	SG-02		
EM009	EM/PM module shall synchronize its event data with the IM subsystem.	3.2	Demonstration	SG-03		
EM001P	PM statistics and reports shall be generated based on data entered via EM/PM data entry screens.	3.2.7	Demonstration	SG-03		
EM002P	All audit changes shall be logged in the system	3.2.7	Demonstration	SG-03		
TM003W	Annotate an incident record with date/time information for performance measures	3.1.3	Demonstration	SG-03		
TM003W1	Operator to enter the date and time that law enforcement/Road Ranger were notified	3.1.3	Demonstration	SG-03		
TM003W2	The initial notification time for Road Ranger shall be associated with each incident	3.1.3	Demonstration	SG-03		
TM003W3	Ability to enter time that a law enforcement or a Road Ranger arrived using the GUI	3.1.3	Demonstration	SG-03		
TM003W4	Specify the date/time period or the incident IDs for SunGuide to calculate avg RT.	3.1.3	Demonstration	SG-03		
TM003W5	GUI to allow specification of the date/time that all traffic lanes resumed free flow.	3.1.3	Demonstration	SG-03		
TM003W6	Downloaded data shall not overwrite operator entered data but shall fill in blanks	3.1.3	Demonstration	SG-03		
TM019	SunGuide shall support an interface with a Service Patrol Subsystem	3.1	Demonstration	SP-01		
TM001B	IM shall allow the ownership of an event to be assigned to a user.	3.1.2	Demonstration	SP-01		
TM002B	IM shall allow a user to modify an event without first obtaining ownership	3.1.2	Demonstration	SP-01		
TM003B	The SunGuide GUI shall permit a user to log into a non-specific subsystem.	3.1.2	Demonstration	SP-01		
TM004B	The SunGuide GUI shall request a list of URLs from subsystems of type "URL".	3.1.2	Demonstration	SP-01		

REQUIREMENT ID	REQUIREMENT SUMMARY	PARA. NO.	VERIFICATION METHOD	TEST CASE	TEST PROC. NO.	TEST RESULT
TM004B1	SunGuide GUI shall provide a menu with the list of URLs	3.1.2	Demonstration	SP-01		
TM005B	SunGuide shall support incident creation or modification by the EM/PM subsystems.	3.1.2	Demonstration	SP-01		
TM005B1	SunGuide shall flag the incident as having been created or changed by the RRPM module.	3.1.2	Demonstration	SP-01		
TM005B3	Incidents detected through SunGuide TSS shall show up in the EM/PM GUI.	3.1.2	Demonstration	SP-01		
TM005B5	The owner of an RRPM incident shall be the operator using the RRPM module.	3.1.2	Demonstration	SP-01		
TM005W	SunGuide GUI shall have an option to launch a separate EM/PM GUI	3.1.3	Demonstration	SP-01		
EM004	EM/PM module shall track the status of each service vehicle.	3.2	Demonstration	TR-01		
EM001T	Road Ranger vehicle status conditions shall include as a minimum:(list))	3.2.6	Demonstration	TR-01		
EM002T	Automatically track billable/non-billable and available/unavailable status of a service vehicle.	3.2.6	Demonstration	TR-01		
EM003T	Can change the status, radio number, beat, and driver for any given RR vehicle.	3.2.6	Demonstration	TR-01		
EM004T	EM/PM shall allow the operator to record data on a specific Road Ranger vehicle.	3.2.6	Demonstration	TR-01		
EM004T1	Each response shall have its own notification/arrival/departure/cancel times.	3.2.6	Demonstration	TR-01		
EM004T2	EM/PM shall allow an operator to record activities performed.	3.2.6	Demonstration	TR-01		
EM005T	EM/PM module shall allow an operator to identify an agency that was notified.	3.2.6	Demonstration	TR-01		
EM005T1	Indicate whether it was the TMC that notified a specific agency.	3.2.6	Demonstration	TR-01		
EM005T2	EM/PM module shall allow the operator to enter the time when responders arrived/departed on-scene.	3.2.6	Demonstration	TR-01		
EM006T	The EM/PM data entry screens shall populate IM data entry screens.	3.2.6	Demonstration	TR-01		
EM006T1	EM/PM subsystem shall calculate latitude/longitude coordinates.	3.2.6	Demonstration	TR-01		

REQUIREMENT ID	REQUIREMENT SUMMARY	PARA. NO.	VERIFICATION METHOD	TEST CASE	TEST PROC. NO.	TEST RESULT
EM007T	SunGuide 2.2 shall be able to track queue lengths based on operator data entry.	3.2.6	Demonstration	TR-01		