final report

ITS Performance Measures

Detailed Definition of Performance Measures

prepared for

Florida DOT District 4

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date

November 2005

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1.0 Introduction

Performance measures provide accountability to the public and enhance communication between the operators and users of the system. They can aid in setting policy, allocating resources, and reporting on results. At the statewide level, the Florida Transportation Commission (FTC) is charged with evaluating the performance, operational productivity, and fiscal management of the Florida Department of Transportation (FDOT). The review includes performance measures on 18 major programs within FDOT; the impacts of intelligent transportation systems (ITS) deployments have not yet been recorded but a set of statewide ITS performance measures currently are being developed. This task aims to help District 4 define performance measures to meet objectives of the statewide reporting and to measure performance operations activities of the District. Specifically, this report will detail the measures selected by District 4 for periodic reporting and specify the needed functional requirements for the development of a data archive.

This report is the second and final of two reports to identify and recommend performance measures to assess the ITS program in District 4. The focus of the District 4 ITS performance measurement program is to measure outcomes and activities that are responsibilities of the Traffic Operations Division. The measures reported will be the accountability assessment of the District's ITS Program. Data on activities conducted by partner agencies may be collected but will not be reported as part of this program. The first report produced in May 2005 describes the development of a data collection plan and performance measures that will complement a number of existing FDOT activities and assist in achieving the goals and objectives established by the District. This task is intended to assist the District in meeting the goals and objectives of the ITS Business Plan and in achieving the stated vision of being the number one ITS program in the United States and will further the District as a leader in Florida in data collection and performance monitoring.

This report begins by identifying five general performance measure categories and 60 selected performance measures and the data required to support the reporting of those measures. A recommended set of functional requirements for a District 4 data archive is presented along with the current status of each of those requirements. In the final section lists of suggested measures for different audiences is presented. The appendix includes an example mock-up of a District 4 monthly performance report.

2.0 Recommended Performance Measures

This section of the report presents detailed definitions of outcome and output performance measures introduced in the Data Collection and Performance Measures Report. These performance measures will aid in achieving a number of District Business Plan goals and fulfilling statewide requirements for Florida's ITS Program.

Outcome measures relate to how well the agency is meeting its mission and stated goals. These measures will allow the District to report on the benefits of the ITS program from the perspective of the ultimate customer – the traveling public. In some cases outcomes measures will use ITS data to assess the outcome of District activities that are beyond the control of the Traffic Operations Division or even the FDOT. Output measures relate to the physical quantities of items, levels of effort expended, scale or scope of activities, and the efficiency in converting resources into a product. These are sometimes called "efficiency" measures and will allow the District to evaluate the effectiveness of their ITS operations.

It should be noted that the goal of the FDOT District 4 ITS program is to measure the performance of all the FIHS roadways within the District. Currently, ITS equipment is available on a portion of the freeways in the District. In the near future there is unlikely to be significant data available on non-instrumented roadways, particularly arterials. Manually collected data will be used as it is available and over time the ITS coverage will be expanded to the entire FIHS.

2.1 OUTCOME MEASURES

- **Congestion and Reliability –** Measures that capture average congestion conditions and those that identify travel reliability, or the variability in performance of the selected route.
- **Incident Duration –** Measures that capture incident conditions and delay from travel lane blockages.
- **Customer Satisfaction –** Measures that capture the perception of users of the transportation system and ITS infrastructure.

2.2 BENEFIT/COST MEASURES

Benefit/cost measures are needed to indicate the effectiveness of components of the District's ITS program or the program as a whole. As District 4's program is

being developed the entire program will be measured in terms of benefits and costs. As the program matures individual program elements also may be measured.

The Federal Highway Administration defines performance measurement as "a process of assessing progress toward achieving predetermined goals, including information on the efficiency with which resources are transformed into goods and services (*outputs*), the quality of those outputs (how well they are delivered to clients and the extent to which clients are satisfied) and *outcomes* (the results of a program activity compared to its intended purpose), and the effectiveness of government operations in terms of their specific contributions to program objectives." *Input* measures indicate the resources that go into a process and they useful in reporting *efficiency* measures (input versus output to show productivity and cost-effectiveness). A benefit/cost measure takes both the outputs and outcomes of the program into account, which is why this report includes these measures as a separate category.

2.3 OUTPUT MEASURES

- **System Coverage –** Measures that capture the coverage of traffic detectors, video cameras, traveler information, and communications equipment.
- **Traffic Flow –** Measures that capture the performance of traffic flow on the roadway network.
- **Incident Management –** Measures that capture incident management performance.
- **System Performance –** Measures that capture the equipment availability and performance.
- **Traveler Information –** Measures that capture the use and performance of traveler information infrastructure.

The complete list of recommended performance measures are presented in Table 2.1. Organized by the outcome and output measures categories described above, the table details the specific performance measures, with a brief definition, a list of qualifiers for the measure (i.e., recommended time response), its status (whether it is an existing district measure, a new performance measure, or is under development – the procedures and/or infrastructure are not yet in place to evaluate the measure), a reference to the formula (listed in Appendix A), and data needs. The data needs column details raw data needs to report on each individual measure, as well as the status (existing or new data field) and the source of the data points (i.e., SMART and/or SunGuide, see *Detailed Definition of Performance Measures, May 2005* for descriptions of these systems).

The following details the qualifiers ("Reported By") contained in Table 2.1 and the potential benefits they may have:

- **Roadway –** Segments of roadway on the network. This may aid in identifying problem areas or sections that need further analysis, more instrumentation, and/or closer proximity of emergency equipment.
- **Time period –** Time of day, day of week, month, season, year. This may aid in identifying temporal or seasonal problem areas as well as provide a historical reference.
- **Incident severity –** Incident severity level as defined by the Florida DOT. This may aid in identifying ways to better allocate resources and provide a better understanding of the incidents.
- **Type of incident –** Accident, road work, disabled vehicle. This may aid in identifying improvements for incident management strategies.
- **Type of equipment –** Equipment or software type. This may aid in identifying problem equipment.
- **System –** The entire transportation network under study, which currently is the freeway network in Broward County. This may aid in identifying overall performance and areas for improvement.

It should be noted that the area within District 4 is covered by the South Florida 511 traveler information system. This system is managed and reported by FDOT District 6, therefore 511 activities are not included in this report.

Table 2.1 Recommended Performance Measure Matrix

Performance Measure						Data Needs			
Measure	Definition	Reported By (as available)	Units	Reporting Frequency	Formula	Data Required	Status	Source	Use of Measure
Outcome Measures									
Congestion									
Travel Time Index	The ratio of average travel time to a free flow travel time.	Roadway, time period, system	None	Monthly	(1)	Actual travel time Speed (from detectors)	New	SunGuide	Indicates congestion level. Reporting is required by FHWA and FDOT Central Office. Planners travel time as alternative to level of service.
						Free flow travel time Free flow speed – Actual speeds for each road segment	New	SunGuide	
						Distance	Existing	SunGuide	
Total Delay	The additional time that is incurred when actual travel times are greater than free-flow travel times.	Roadway, time period, system	Vehicle-Hours	Annually	(2)	Actual travel time	New	SunGuide	Indicates congestion level. Alternate indicator to Travel Time Index. Should be calculated monthly and summed for annual reporting.
						Free flow travel time	New	SunGuide	
Percent of Congested Traffic	The ratio of congested VMT to total VMT. VMT is the sum of distances traveled by all motor vehicles in a specified highway system for a given period of time.	Roadway, time period, system	Percentage	Annually	(3)	Total VMT = Total traffic volume x the length of the road section (for the time period of interest)	Existing	SunGuide	Indicates congestion level. Alternate indicator to Travel Time Index. Should be calculated monthly and summed for annual reporting.
						Congested VMT = Traffic volume x the length of the road section that occurs below a preset threshold (for the time period of interest)	Existing	SunGuide	
Travel Time Reliability									
Planning Time Index	The 95th percentile travel time index.	Roadway, time period, system	None	Annually	(4)	Travel time index	New	SunGuide	Indicates variability of roadway congestion. Alternate indicator to Buffer Index. Should be calculated monthly and summed for annual reporting.
Buffer Index	The extra time most travelers add to their average travel time when planning trips.	Roadway, time period, system	Percentage	Monthly	(5)	Actual travel time: • Volume • Speed • Free flow speed • Distance	New	SunGuide	Indicates variability of roadway congestion. In urban areas travel time reliability provides a customer experience indication of freeway performance. Reporting is required by FHWA and FDOT Central Office.
Accuracy of Congestion (Travel Time) Information	Difference between predicted travel time information presented to public and the actual travel time experienced.	Roadway, time period, system, evacuation	Minutes, Percentage	Annually	(6) under development	Actual travel time: • Volume • Speed • Free flow speed • Distance	New	TMC Operators	Indicates validity of the travel time algorithm and accuracy of system detectors. Should be calculated monthly and summed for annual reporting.
						Predicted travel time	New	TMC Operators	
Incident Duration									
Total Incident Duration	Difference in time from when first agency is notified until all evidence of the incident is removed.	Roadway, a.m./p.m. peak, and off-peak time period, incident severity, incident type	Minutes	Weekly	(7)	Time of incident[a] occurrence	Existing	SMART	Indicates the total time of incident impact. Measures overall efficiency of TIM activities by partnering agencies.
						Time of return to normal traffic flow (if not possible, time when Road Ranger leaves site)[b]	Existing	SMART	

Performance Measure						Data Needs			
Measure	Definition	Reported By (as available)	Units	Reporting Frequency	Formula	Data Required	Status	Source	Use of Measure
Incident Duration (continued)									
TMC Detection Time Period	The difference between when the TMC is notified and when any agency is notified.	Roadway, a.m./p.m. peak, and off-peak time periods	Minutes	Weekly	(8)	Time of incident[a] occurrence	Existing	SMART	Measures the time it takes other agencies to notify the TMC. Value is zero when TMC detects the incident. A measure of agency coordination.
						Time of initial notification	Existing	SMART	
TMC Verification Time Period	The difference between the initial TMC notification time and when the incident is verified.	Roadway, a.m./p.m. peak, and off-peak time periods	Minutes	Weekly	(9)	Time of initial notification	Existing	SMART	Measures camera coverage and Road Ranger coverage, which are the primary factors in reducing verification time.
						Time of verification	Existing	SMART	
TMC Response Time Period	The difference between the initial TMC notification time and the time Road Rangers/SIRV arrive.	Roadway, a.m./p.m. peak, and off-peak time periods, incident severity	Minutes	Weekly	(10)	Track Road Rangers and SIRV separately: Time of initial notification	Existing	SMART	Measures time for Road Rangers/SIRV to arrive on the incident scene. Provides an indication of Road Ranger routes and coverage areas.
						Time of Road Ranger (RR) arrival	Existing	SMART	
Road Ranger Dispatch Time Period	The difference between initial TMC notification and when a Road Ranger is contacted for dispatch to an incident.	Roadway, a.m./p.m. peak, and off-peak time periods	Minutes	Weekly	(11)	Time of initial notification Time of Road Ranger (RR) dispatch	Existing	SMART	Component of TMC response time.
Road Ranger Response Time Period	The difference between when a Road is dispatched and when that Road Ranger arrives at the incident scene.	Roadway, a.m./p.m. peak, and off-peak time periods	Minutes	Weekly	(12)	Time of dispatch Time of Road Ranger (RR) arrival	Existing	SMART	Component of TMC response time.
Incident Clearance Time Period	The difference between the time Road Rangers/SIRV arrives and the lanes are cleared.	Roadway, a.m./p.m. peak, and off-peak time periods, incident severity, lane	Minutes	Weekly	(13)	Track Road Rangers and SIRV separately	Existing	SMART	A measure of interagency coordination since vehicle removal is primarily the responsibility of other agencies. Measures adherence to "Open Roads Policy."
						Time of Road Ranger (RR) arrival			
						Time that the lanes are cleared	Existing	SMART	
Incident Delay	Total delay per lane mile.	Roadway, a.m./p.m. peak, and off-peak time periods, incident severity	Vehicle-Hours	Annually	(14)	Incident duration Volumes Speeds	Under Development	SMART	Provides a quantitative measure of the congestion impacts of an incident.
						Queue length	Needed	SMART	
						Number of blocked lanes	Existing	SMART	
Number of Secondary Incidents	The number of events that occur due to the congestion from the primary event (designated as secondary incident by TMC).	Roadway, a.m./p.m. peak, and off-peak time periods, incident severity	Incidents	Annually	(15)	Number of secondary crashes	New	SMART	Provides an indication of reduced crashes, an important public benefit of Incident management.
Customer Satisfaction									
Satisfaction with ITS Program	Percentage of respondents satisfied with overall ITS program.	Annual survey	Percentage	Annually	Percentage responses from survey	Random public survey results	New	Central Office/ District 4 Annual survey	Provides a qualitative measure of public satisfaction of the ITS program.
Satisfaction with DMS	Percentage of respondents satisfied with DMS usage and performance.	Annual survey	Percentage	Annually	Percentage responses from survey	Random public survey results	New	Central Office/ District 4 Annual survey	Provides a qualitative measure of public satisfaction of the ITS program.
Satisfaction with Traveler Information SMART Sunguide and ITMS Web Site	Percentage of respondents satisfied with the traveler information web site.	Annual survey	Percentage	Annually	Percentage responses from survey	Random public survey results	New	Central Office/ District 4 Annual survey	Provides a qualitative measure of public satisfaction of the ITS program.
Satisfaction with Road Rangers	Percentage of respondents satisfied with Road Rangers service.	Annual survey	Percentage	Annually	Percentage responses from survey	Random public survey results	New	Central Office/ District 4 Annual survey	Provides a qualitative measure of public satisfaction of the ITS program.
Ease of Database Accessibility	Percentage of partnering agencies satisfied with database accessibility.	User feedback/survey	Percentage	Annually	Percentage responses from survey	User survey results	New	District 4 Annual survey	Provides a qualitative measure of system usability and indicates any user problems with the database and its accessibility.

Performance Measure						Data Needs			
Measure	Definition	Reported By (as available)	Units	Reporting Frequency	Formula	Data Required	Status	Source	Use of Measure
Benefit/Cost Measures									
ITS Program Benefit/Cost Ratio	Total ITS program benefits divided by total program cost.	Program	Ratio	Annually	Benefits/Cost	Estimates of ITS benefits, including travelers' time saved, freight time saved, crashes reduced, and secondary crashes reduced. Total District ITS programs costs	New	FDOT District 4	Provides an overall indication of the effectiveness of the District's ITS program.
Output Measures									
System Coverage									
ITS Miles Managed	Number of centerline miles covered/managed by ITS equipment in the network, (as defined in the 2004 Statewide ITS Performance Measures report).	Roadway	Miles	Annually	(16)	ITS roadway coverage	Existing	FDOT District 4	Measures ITS geographical coverage. Required by FDOT Central Office.
Percent Centerline Miles Managed	Percent of centerline miles covered/managed by ITS equipment in the network.	Roadway type	Percentage	Annually	(17)	ITS roadway coverage	Existing	FDOT District 4	Indicates the portion of the roadway system covered by ITS.
Number of ITS Devices	Number of ITS devices.	Type, roadway	Devices	Annually	(18)	Number of ITS devices	Existing	FDOT District 4	Indicates total number of ITS devices.
Traffic Flow									
Average Volume	The average number of vehicles.	Roadway, time period	Vehicles	Annually	(19)	Traffic count (detectors)	New	SunGuide	Traffic volumes are used by FDOT Planning.
Average Occupancy	The average percentage of time, during the sample period, that the detector sensed a vehicle.	Roadway, time period	Percentage	Annually	(20)	Traffic occupancy (detectors)	New	SunGuide	Vehicle occupancy measures traffic density. Occupancy is used in some traffic algorithms.
Average Travel Time	The average time to traverse a given highway segment.	Roadway, time period	Minutes	Monthly	(21)	Actual travel time	New	SunGuide	Travel time is the basic measure of congestion and reliability.
Average Density	The average number of vehicles that occupy one mile of road space.	Roadway, time period	Vehicles-Miles (all lanes in a direction)	Annually	(22)	Traffic flow (vph) – Hourly equivalent of count volumes: count, speed, distance	New	SunGuide	Density is used in some traffic algorithms. An alternate to occupancy measure.
Incident Management									
Total Number of Incidents	Number of incidents managed.	Roadway, .a.m/.p.m peak, and off-peak time periods, incident severity	Incidents	Weekly	(23)	Incident type	Existing	SMART	Indicates level of TMC activity, used in managing resource needs and benefit calculations.
						Incident severity	Existing	SMART	
TMC Incident Detection Method	System by which the TMC was notified.	Roadway, a.m./p.m. peak, and off-peak time periods, incident severity	None	Weekly	(24)	Incident detection Incident type Incident severity	Existing	SMART	Provides indication of the portion of incidents detected by TMC or Road Rangers.
Incident Level	Severity of lane blockage incidents.	Roadway, a.m./p.m. peak, and off-peak time periods, incident severity	None	Monthly	(25)	Incident detection Incident type Incident severity	Existing	SMART	Tracking incident severity provides stratification of incidents for incident duration calculations.
Incident Management Dollars Spent Per Incident Response	Incident management program annual cost divided by annual number of incident responses.	Program	Cost	Annually	(26)	Incident detection Incident type Incident severity	Existing	SMART	Provides an indication of the cost-effectiveness of the incident management program.
						Cost of incident management program	Existing	FDOT District 4	
Total Number of Requests for Road Ranger/SIRV Response	Number of requests for Road Ranger response.	Roadway, time period, incident type, county, truck, beat, zone, source	Calls	Monthly	(27)	Track Road Rangers and SIRV separately: Call type	Existing	SMART	Indicates level of Road Ranger/SIRV activity. Difference between requests and responses indicates gaps in Road Ranger coverage.
Total Number of Road Ranger/ SIRV Responses	Number of Road Ranger responses logged.	Roadway, time period, incident type, county, truck, beat, zone, source	Responses	Monthly	(28)	Track Road Rangers and SIRV separately: Response type	Existing	SMART	Indicates level of Road Ranger/SIRV activity. It will assist in Road Ranger resource allocation.
Total Number of Road Ranger/ SIRV Events	Number of Road Ranger events logged.	Roadway, time period, incident type, county, truck, beat, zone, source	Events	Monthly	(29)	Track Road Rangers and SIRV separately: Event type	Existing	SMART	Indicates level of Road Ranger activity and service performed. It will assist in Road Ranger resource allocation.

Performance Measure						Data Needs			
Measure	Definition	Reported By (as available)	Units	Reporting Frequency	Formula	Data Required	Status	Source	Use of Measure
Incident Management (continued)									
Total Number of Road Ranger/ SIRV Activities	Number of Road Ranger activities logged.	Roadway, time period, incident type, county, truck, beat, zone, source	Activities	Monthly	(30)	Track Road Rangers and SIRV separately: Activity type	Existing	SMART	Indicates the type of service performed. It will assist in Road Ranger resource allocation.
Average Road Ranger/ SIRV Assisting Time	Average length of a Road Ranger assist.	Roadway, time period, incident type, county, truck, beat, zone, source	Minutes	Monthly	(31)	Track Road Rangers and SIRV separately: Road Ranger activity log Emergency management timeline	Existing	SMART	Indicates the service time of Road Rangers. It will assist in Road Ranger resource allocation.
Average Road Ranger/ SIRV In-service Time	Average length of Road Ranger service – time the Road Ranger is available to provide assists or be dispatched.	Roadway, time period, incident type, county, truck, beat, zone, source	Minutes	Monthly	Total time Road Rangers are in service/number of RR vehicles	Track Road Rangers and SIRV separately: Road Ranger activity log	Existing	SMART	Indicates the service time of Road Rangers. It will assist in Road Ranger resource allocation.
Average Road Ranger Billable Time	Average length of Road Ranger billable time.	County, truck, beat, zone	Hours	Monthly	Total Road Ranger billable time/number of RR vehicles	Road Ranger activity log	Existing	SMART	Indicates the service time of Road Rangers. It will assist in Road Ranger resource allocation.
Number of Outgoing TMC Calls	Number of outgoing TMC calls.	Type	Calls	Monthly	(32)	Number of calls	Existing	TMC Operators	Measures number of times other agencies are contacted by the TMC.
Number of Incoming TMC Calls	Number of incoming TMC calls.	Type	Calls	Monthly	(33)	Number of calls	Existing	TMC Operators	Indicates number of times other agencies contact the TMC.
System Performance									
ITS Field Equipment and Communications Equipment									
Operational Field Equipment Percentage	Percent time equipment is operational.	Device type, roadway	Percentage	Monthly	(34)	Equipment uptime Time of equipment failure Time of equipment replacement/repair/resolution	Existing Existing	TMC Operators TMC Operators	Indicates ITS field equipment and systems reliability and efficiency of the ITS maintenance program.
Mean Time to Repair	Average downtime per preventative or emergency repair/failure.	Device	Hours	Annually	(35)	Equipment downtime Time of equipment failure Time of equipment replacement/repair/resolution	Existing	SMART	Indicates time needed to detect and repair equipment. Measures efficiency of maintenance program.
Mean Time Between Failures	Average time between equipment failure.	Device	Days	Annually	(36)	Time of equipment failure Time of equipment replacement/repair/resolution	Existing	SMART	Indicates how often a piece of equipment fails. Provides information on equipment quality and the manufacturer's warranty.
Cost per Equipment Repair/Failure	Cost of repair and impacts on a system due to an equipment failure.	Device	Cost	Annually	(37)	Cost of repair	Existing	FDOT District 4	Indicates cost of maintaining a piece of equipment. Provides information on equipment quality and the manufacturer's warranty.
TMC Software and Hardware									
Device/Module Uptime Percentage	Percentage of time a TMC device or software module is operational.	Software module, server, switch, firewall, and video wall controller	Percentage	Monthly	(38)	TMC hardware device uptime: Time of module failure, time of module replacement/repair/resolution	Existing	TMC IT	Indicates TMC equipment and systems reliability and efficiency of the TMC maintenance program.
Calls Sent to IT Helpdesk	Number of requests sent the District IT Helpdesk.	Category	Calls	Monthly	(39)	Calls	Existing	TMC IT	Indicates the total number of requests for IT assistance. Used to manage IT resource needs.
Helpdesk Calls Outstanding	Number of unresolved Helpdesk request at the end of the reporting period.	Category	Calls	Monthly	(40)	Call unresolved	Existing	TMC IT	Indicates calls that still need to be resolved. Used to manage IT resource needs.
Helpdesk Calls Closed	Number of Helpdesk requests that were completed.	Category	Calls	Monthly	(41)	Calls resolved	Existing	TMC IT	Indicates progress in completing requests for IT assistance.
Helpdesk Call Close Time	Time period from when a call was received by the Helpdesk until it was closed.	Category	Days	Monthly	(42)	Call resolve time	Existing	TMC IT	Indicates time needed to complete a request for IT assistance. Used to manage IT resource needs.

Performance Measure						Data Needs			
Measure	Definition	Reported By (as available)	Units	Reporting Frequency	Formula	Data Required	Status	Source	Use of Measure
Traveler Information									
Number of TMC Web Site Visits	Number of web site visits.	Time period, event	Hits	Monthly	(43)	Web site hits	Existing	TMC IT	Indicates how often the web site is used by the public. Also, indicates effectiveness of ITS marketing program.
TMC Web Pages Visited	Web page hits.	Page	Hits	Monthly	(43)	Web site hits	Existing	TMC IT	Indicates which pages are viewed most. Unused pages may be deleted or combined.
Referring Web Sites	Referring web sites.	Site	Sites	Monthly	(44)	Referring web pages	Existing	TMC IT	Indicates where users found reference to FDOT web site.
TMC Web Site Visit Data	Average web site visit data transmitted.	Site	Bytes of data	Monthly	(45)	Data transmitted per visit	Existing	TMC IT	Indicates how visitors use the web site and provides indications of bandwidth needs.
Number of DMS Messages	Number of DMS messages.	A.M./P.M. peak and off-peak time period, type, event	Messages	Monthly	(46)	Message type	Existing	SMART	Indicates how often DMS are used.
DMS Message Duration	Average length of time a message is displayed.	A.M./P.M. peak and off-peak time period, type, event	Messages	Monthly	(47)	Message duration	Existing	SMART	Indicates how long DMS are used.
Diversions Due to DMS Messages	Average increase in detector (ramp) volumes when an incident message is displayed.	A.M./P.M. peak and off-peak time period, type, event	Vehicles	Monthly	(48)	Vehicle counts	New	SunGuide	Indicates how many vehicles change behavior due to DMS.
Number of DMS Messages Posted in Response Another Agency Request	Number of DMS messages requested by a different agency (i.e., neighboring district, central office).	A.M./P.M. peak and off-peak time period, type, event	Messages	Monthly	(46)	Message type	Existing	SMART	Indicates how often other agencies need to utilize DMS infrastructure.
						Message owner	Existing	SMART	
DMS Message Posting Time	Difference in time from incident verification to when the first DMS message is posted on a sign.	A.M./P.M. peak and off-peak time period, type, event	Minutes	Monthly	(49)	Incident verification time Time when first message is posted	Existing	SMART	Indicates operator time needed to post a message, measures operator efficiency and ease of software use.

Note: For all data points specified here, it is assumed that the location and time and date stamp of the measure is collected as well.

[a] Actual time of incident occurrence is difficult to measure – often initial notification time is used as event start time.

[b] Return to normal flow is difficult to measure and will likely be a subjective estimate by operator. It is recommended that the time when all lanes are open be used until detector data can be used to indicate return to normal flow.

3.0 Functional Requirements of the Data Archive

Currently, the FDOT District 4 TMC is in the process of testing the statewide SunGuide software for traffic data collection and archiving. The SunGuide software collects traffic data from vehicle sensors, controls CCTV camera and DMS signs, evaluates traffic conditions, manages incidents, provides information to the general public and transportation agencies, and performs data logging and archiving. The FDOT District 4 TMC also is developing the System Management for Advanced Roadway Technologies (SMART) Software for incident data collection and archiving. The SMART software replaces FDOT's Incident Database System and Incident Tracking Database System with a centralized system that provides real-time access to incident data and supports mobile data collection by Road Rangers and Severe Incident Response Vehicles. The District also is building a new SMART module to obtain and archive traffic detector data.

The functional requirements presented here are based upon the discussions held with FDOT District 4 staff as well as the Cambridge Systematics' experiences with reviewing data archives from other areas. The functional requirements presented here are intended to define formally what needs to be done in TMC data archiving in order to report on the performance measures. A requirement is marked with a ✓ sign if current SMART/SunGuide system capabilities can meet its need, while an X sign means additional software development is needed.

Table 3.1 Data Archive Functional Requirements for Performance Measures

1. Provide for the collection and storage of several data types generated by the deployment of ITS and operational systems throughout the District.	
1.1. Provide for storage of Roadway-Based Traffic Data *Related Performance Measures: Congestion and Reliability, Traffic Flow, System Coverage*	
1.1.1. Provide storage of aggregations of traffic data (time/space summaries of volume, speed, occupancy)	
1.1.1.1. Provide storage of raw ("as received from field," unedited) data online for at least 24-hours	✓
1.1.1.2. Provide storage of raw data offline for a period of at least one year	✓
1.1.1.3. Provide storage of aggregations of 5-minute by lane	✓

1.1.1.4. Provide storage of aggregations of 1-hour by station (one direction)	✓
1.1.1.5. Provide storage of aggregations of 24-hour by roadway (both directions)	✓
1.2. Provide for storage of Incident Data on roadways under the direct management of traffic management centers *Related Performance Measures: Congestion and Reliability, Incident Duration, Incident Management, Customer Satisfaction, System Coverage*	
1.2.1. Provide for storage of points on the "incident timeline" as follows:	
1.2.1.1. Incident Start Time	X
1.2.1.2. Incident Notification Time	✓
1.2.1.3. Incident Verification Time	✓
1.2.1.4. Road Rangers/Law Enforcement Dispatch Time	✓
1.2.1.5. Road Rangers/Law Enforcement Arrival Time	✓
1.2.1.6. Additional responders (Fire, Rescue, EMS, Wrecker) Dispatch Time	✓
1.2.1.7. Additional responders Arrival Time	✓
1.2.1.8. Incident Lane Blockage Clearance Time	✓
1.2.1.9. Incident Scene Departure Time	✓
1.2.1.10. Normal Traffic Resume Time	X
1.2.2. Provide for storage of incident characteristics as follows:	
1.2.2.1. Incident type (e.g., crash, breakdown, debris) following the District's definition	✓
1.2.2.2. Crash severity (incident level)	✓
1.2.2.3. Number and types of vehicles involved	✓
1.2.2.4. Incident milepost location and the location relative to the highway cross-section: in-lane, shoulder, median, gore, and combinations of these	✓
1.2.2.5. The number of lanes affected	✓
1.2.3. Provide capability to receive incident information from other TMC centers	✓
1.2.4. Provide capability to extract selected incident data and allow access to incident data via external system interfaces	✓
1.2.5. Provide capability to log Road Rangers activities	✓
1.3. Provide capability to collect and store Roadway Weather Data *Related Performance Measures: Congestion and Reliability, System Coverage*	
1.3.1. Provide capability to integrate roadway weather data with other (congestion, incident, closure) data by geographic location	X
1.3.2. Provide capability to access roadway weather data via external system interfaces	X

1.4. Provide capability to capture and store information regarding **Planned Incidents** (e.g., special events, lane/road closures) *Related Performance Measures: Incident Duration, Incident Management*	X
1.5. Provide capability for storing **DMS messages** *Related Performance Measures: Customer Satisfaction, Traffic Information, Incident Management, System Coverage*	
1.5.1. Provide capability to create message library to store and recall DMS messages	✓
1.5.2. Provide capability to provide access to traffic and incident (including road closures) information to other centers	✓
1.5.3. Provide capability to receive DMS information from other centers	✓
1.5.4. Provide capability to relate DMS messages to incidents	✓
1.6. Provide capability for collecting and storing **Traffic Detector and DMS Location Data** *Related Performance Measures: System Coverage, System Performance*	
1.6.1. Provide capability for map displays of detector and DMS locations	✓
1.6.2. Provide capability for matching linear reference location of detectors and DMS to other FDOT-maintained data systems	✓
1.6.3. Provide HPMS Section Identifications for all detectors and DMS	✓
1.7. Provide capability for collecting and storing Traffic Detector and DMS Installation and Maintenance Activities and Cost *Related Performance Measures: System Coverage, System Performance*	
1.7.1.1. Type of activity	X
1.7.1.2. Activity start/end times and cost	X
1.7.1.3. Test results	X
1.7.1.4. Comments	X
1.8. Provide capability for collecting and storing **Traveler Information Web Site Activities.** *Related Performance Measures: Customer Satisfaction, Traveler Information, System Coverage*	
1.8.1. Provide capability for collecting and storing web site visitor information (number of visits, durations of visits, page requested, source IP address, referring sites)	X
1.8.2. Provide tools to monitor and log web site health (peak periods, uptime, downtime, repair cost, load time, transactions, intrusions, server loads)	X
2. Provide for Traffic Data Processing Functions	
2.1. **Data Transformations:** Provide capability of transforming and storing field-measured data from roadway devices *Related Performance Measures: Congestion and Reliability, Traffic Flow*	
2.1.1. Provide capability of transforming spot speeds to travel times by assuming a link length of half the distance to nearest upstream and downstream detectors	X
2.1.2. Provide storage of link travel times at the 5-minute by lane level	X
2.1.3. Provide capability of transforming lane volumes into maximum capacities by location	X

2.1.4. Provide storage of capacities at the 15-minute by lane level	X
2.1.5. Provide capability of transforming spot speeds into HCM-based levels of service (LOS)	X
2.1.6. Provide storage of LOS at the 1-hour by direction level	X
2.2. Traffic Data Imputation: Provide capability of imputing missing roadway-based traffic data at the 5-minute by lane level *Related Performance Measures: Congestion and Reliability, Traffic Flow*	X
2.3. Traffic Data Quality Control: Provide capability of assessing the quality of data received from roadway-based traffic detectors *Related Performance Measures: Congestion and Reliability, Traffic Flow, System Performance*	
2.3.1. Provide capability of automatically detecting data of poor or suspicious quality from roadway-based traffic detectors	X
2.3.2. Provide periodic quality reports as follows:	
2.3.2.1. Provide Daily Detector Health Reports	X
2.3.2.2. Provide Quality Control Test Results Report	X
2.3.2.3. Provide Normalcy Reports	X
2.3.2.4. Provide System Quality Control Reports	X
2.4. Linkage to Legacy Systems: Provide capability of transmitting data to other units within FDOT, as defined by needs of FDOT District 4	
2.4.1. Provide capability of producing standard traffic measurements for use in Florida TTMS (AADT, K-/D-factors)	X
2.4.2. Provide capability of sending crash information to safety office for identifying crashes not reported by police officers on the Police Accident Report	X

To ensure data availability in performance measures, data archiving modules in SMART and SunGuide should use the listed requirements as a reference in their software development process. Special attention should be given to the X marked requirements that are not yet implemented in current SMART and SunGuide software.

4.0 Reporting Format

It is recommended that a number of different reports are used to convey the performance measures results to a variety of audiences. Visual representations of the data should be included in the reports (bar graphs, pie charts, and maps, where appropriate). Information regarding the previous reporting period and (when available) the same period from the previous year should be included as a reference to improve readers understanding of the performance measures by providing context and showing trends of improvement or regression. Aberrations in the reports should be explained in text.

Weekly Report (optional)

Audience: TMC managers and staff.

Performance Measures: Currently focused on incident management and Road Ranger activities. Optional information on traveler information and field device maintenance may be added as available.

Event Report (optional)

Audience: TMC managers, EOC managers, other FDOT districts, and the FDOT Central Office. The focus of this report is measures that best summarize hurricane (or other) evacuation management performance.

Performance Measures

- Accuracy of congestion information
- Number of secondary incidents
- Traveler Information
  - Number of web page visits
  - Number of DMS messages
  - Diversions due to DMS messages
  - Number of DMS messages managed by different agency

Monthly Report

Audience: TMC managers and staff.

Performance Measures: See Appendix B for a mock-up of the Monthly Report.

- Traveler Information
  - Smart SunGuide web site
    - » Total visits
    - » Web site data transmitted
  - Total number of DMS messages
  - Average DMS message duration
  - Number of DMS messages posted due to other agency request
  - DMS message posting time
- Incident Management
  - Total incident duration
  - TMC detection time
  - TMC verification time
  - TMC response time
    - » Road Ranger dispatch time
    - » Road Ranger response time
  - Incident clearance time
  - Total number of incidents
  - Incident detection method
  - Incident level (Lane blocking incidents)
  - Number of requests for Road Ranger response
  - Number of Road Ranger responses
  - Number of Road Ranger events
  - Number of Road Ranger activities
  - Average Road Ranger assist time
- Congestion and Reliability
  - Systemwide Travel Time Index
  - Systemwide Buffer Index
  - Speed map – average speed or travel time (weekday peaks) by road segment

- Devices (for detectors, CCTV, DMS, and Road Rangers vehicles)
  - Total number of devices by type
  - Operational field equipment percentage
  - TMC device/module uptime percentage
  - Calls sent to IT Helpdesk
  - Calls to IT Helpdesk outstanding
  - Calls to IT Helpdesk completed
  - IT Helpdesk call close time
- System Coverage
  - Number of outgoing TMC calls
  - Number of incoming TMC calls
- Miscellaneous monthly
  - Description of one or two worst incidents and analysis of these incidents
  - Segment of roadway where there are the most number of incidents
  - Project updates
  - Discussion of events that affected operations

Quarterly Report

Audience: FDOT District 4 management, other FDOT districts, and the FDOT Central Office. The focus of this report is outcome measures and select output measures that best summarize an activity. These measures should be presented in no more than two or three pages.

Performance Measures

- Congestion and Reliability
  - Travel Time Index
  - Buffer Index
- Total incident duration
- Number of incidents
- Number of severe incidents (Level 3)
- Traffic Flow
  - Average speed
  - Average travel time

Annual Report

Audience: Florida Transportation Commission, general public. The focus is on outcome measures and a few high-level output measures. The existing annual report format is sufficient for the internal DOT annual report, but a high-level graphic-oriented brochure format may be better received by the public.

Performance Measures

- Congestion and Reliability
  - Travel Time Index
  - Total Delay
  - Percent of congested traffic
  - Planning Time Index
  - Buffer Index
- Total incident duration
- Customer satisfaction survey results
- Traffic Flow
  - Average travel time
- System coverage
- Number of incidents
- Cost per incident response
- Smart SunGuide web site visits

Required Report for Statewide ITS Measures

Audience: These measures will be included in the *Performance and Production Review of the Florida Department of Transportation* published annually. Please note that these requirements have not yet been finalized.

Performance Measures

- Total Annual Road Ranger Stops (by District, State Total)
- FIHS Limited Access Miles Managed by ITS (by District, State Total)
- Incident duration with breakout of response time and clearance time
- Congestion and Reliability
  - Travel Time Index
  - Total Delay
  - Percent of congested traffic
  - Planning Time Index
  - Buffer Index
- Customer satisfaction based on a random general public survey

5.0 Assessment of the FDOT District 4 Performance Measurement Program

FDOT District 4 is in the process of developing one of the Nation's premier performance measurement programs. The amount and range of data currently being collected is well beyond most traffic management centers performance measurement programs. When traffic data begins to be collected and archived the District will have a comprehensive performance measurement program that will enable the District to assess all aspects of their ITS activities and to describe to FDOT management and the public quantitative benefits of the ITS Program and active management and operations of the District's freeway system. The data collection and performance measurement program described in this document will enable FDOT District 4 to be a model program for TMCs across the Country.

Appendix A

List of equations for Performance Measure and Data matrix…

1.	Travel Time Index:[1]	*For a specific road section and time period :* $TTI = \frac{\overline{TT}}{TT_{freeflow}}$ *For several road sections and time periods :* $TTI_{average} = \frac{\sum_{i=1}^{n} (TTI_n \times VMT_n), \text{ for each section and time period}}{\sum_{i=1}^{n} (VMT_n), \text{ for each section and time period}}$
2.	Total Delay:	$Delay = \left(\overline{TT} - TT_{freeflow}\right) \times Volume$ $Total\ Delay = \sum_{i=1}^{n} Delay_n$
3.	Percent of Congested Traffic:	$= \frac{VMT_{congested}}{VMT_{total}} \times 100\%$
4.	Planning Time Index:[2]	$PTI = TTI_{95^{th}\ percentile}$ $PTI_{average} = \frac{\sum_{i=1}^{n} (PTI_n \times VMT_n), \text{ for each section and time period}}{\sum_{i=1}^{n} VMT_n, \text{ for each section and time period}}$

[1] Turner, S., R. Margiotta and T. Lomax (2004). *Monitoring Urban Freeways in 2003: Current Conditions and Trends from Archived Operations Data*, Texas Transportation Institute and Cambridge, Systematics, Inc., FHWA-HOP-05-018, Washington, D.C.

[2] Ibid.

5.	Buffer Index:[3]	$BI = \frac{TT_{95^{th}\,percentile} - \overline{TT}}{\overline{TT}} \times 100\%$ $BI_{average} = \frac{\sum_{i=1}^{n} (BI_n \times VMT_n),\ for\ each\ section\ and\ time\ period}{\sum_{i=1}^{n} VMT_n,\ for\ each\ section\ and\ time\ period}$
6.	Accuracy of Congestion Information:	Methodology under development
7.	Total Incident Duration:	$Incident\ Duration = t_{normal\ flow} - t_{incident\ occurs}$ $Total\ Incident\ Duration = \sum_{i-1}^{n} ID_n,\ for\ each\ incident$ $Average\ Incident\ Duration = \frac{\sum_{i-1}^{n} ID_n}{n}$
8.	TMC Detection Time Period:	$Detection\ Time = t_{initial\ notification} - t_{incident\ occurs}$ $Average\ Detection\ Time = \frac{\sum_{i-1}^{n} DT_n}{n}$
9.	TMC Verification Time Period:	$Verification\ Time = t_{verification} - t_{initial\ notification}$ $Average\ Verification\ Time = \frac{\sum_{i-1}^{n} VT_n}{n}$
10.	TMC Response Time Period:	$Response\ Time = t_{RR\ arrives} - t_{initial\ notification}$ $Average\ Response\ Time = \frac{\sum_{i-1}^{n} RT_n}{n}$
11.	Road Ranger Dispatch Time Period:	$Dispatch\ Time = t_{RR\ dispatch} - t_{TMC\ notification}$ $Average\ Dispatch\ Time = \frac{\sum_{i-1}^{n} DT_n}{n}$
12.	Road Ranger Response Time Period:	$RR\ Response\ Time = t_{RR\ dispatch} - t_{RR\ arrives}$ $Average\ RR\ Response\ Time = \frac{\sum_{i-1}^{n} RRRT_n}{n}$

[3] Turner, S., R. Margiotta and T. Lomax (2004). *Monitoring Urban Freeways in 2003: Current Conditions and Trends from Archived Operations Data*, Texas Transportation Institute and Cambridge, Systematics, Inc., FHWA-HOP-05-018, Washington, D.C.

13. Incident Clearance Time:	$Incident\ Clearance\ Time = t_{lanes\ cleared} - t_{RR\ arrives}$ $Average\ Incident\ Clearance\ Time = \frac{\sum_{i-1}^{n} CT_n}{n}$
14. Incident Delay:	Methodology under development, interim formula is: *total volume X incident duration (minutes) X 5 minutes per vehicle*
15. Number of Secondary Incidents:	$Total\ Secondary\ Incidents = \sum_{i-1}^{n} SI_n$, *for each incident* $Average\ Secondary\ Incidents = \frac{\sum_{i-1}^{n} SI_n}{n}$
16. ITS Miles Managed:	$Total\ Miles\ Managed = \sum_{i=1}^{n} mile_n$, *for each mile managed*
17. Percent Miles Managed:	$\%\ Miles\ Managed = \frac{Total\ Miles\ Managed}{Total\ miles\ in\ system} \times 100\%$
18. Number of ITS Devices:	$Total\ ITS\ Devices = \sum_{i=1}^{n} device_n$, *for each device of type n*
19. Average Volume:	$Average\ Volume = \frac{\sum_{i-1}^{n} volume_n}{n}$
20. Average Occupancy:	$Average\ Occupancy = \frac{\sum_{i-1}^{n} occupancy_n \times volume_n}{\sum_{i=1}^{n} volume_n}$
21. Average Travel Time:	$Travel\ Time = t_{x_2} - t_{x_1}$, *time taken by a vehicle to traverse a fixed segment* $Average\ Travel\ Time = \frac{\sum_{i-1}^{n} TT_n}{n}$
22. Average Density:	$Density = \frac{52.8}{length_{avg\ vehicle} + length_{detection\ zone}} \times occupancy$ $Average\ density = \frac{\sum_{i-1}^{n} density_n}{n}$
23. Total Number of Incidents:	$Incidents = \sum_{i-1}^{n} incidents_n$, *for each qualifier of interest*
24. TMC Incident Detection Method:	$Incident\ Detection = \sum_{i-1}^{n} incidents_n$, *for each detection method*

25. Incident Level:	$Incident\ severity = \sum_{i\text{-}1}^{n} incidents_n$, *for each severity level*
26. Incident Management Dollars Spent per Incident:	$IM\$ = \frac{Incident\ Management\ \$}{Total\ number\ of\ incidents}$
27. Road Rangers Calls:	$Total\ RR\ Calls = \sum_{i=1}^{n} RRcalls_n$, *for each type of call and time period*
28. Road Ranger Responses:	$Total\ RR\ Assists = \sum_{i=1}^{n} RRresponses_n$, *for each type of response and time period*
29. Road Ranger Events:	$Total\ RR\ Events = \sum_{i=1}^{n} RRevents_n$, *for each type of event and time period*
30. Road Ranger Activities:	$Total\ RR\ Activity = \sum_{i=1}^{n} RRactivity_n$, *for each type of activity and time period*
31. Road Ranger/SIRV Assisting Time:	$RR\ Assist\ Time = t_{RRdeparts} - t_{RRarrives}$ $Average\ RR\ Assist\ Time = \frac{\sum_{i=1}^{n} RRAT_n}{n}$
32. Number of Outgoing Calls:	$Total\ Outgoing\ Calls = \sum_{i=1}^{n} outgoingcalls_n$, *for each type of call*
33. Number of Incoming Calls:	$Total\ Incoming\ Calls = \sum_{i=1}^{n} incomingcalls_n$, *for each type of call*
34. Operational Percentage:	$Average\ Operational\ Percentage = \frac{\sum_{i=1}^{n} \frac{uptime_n}{total\ time_n}}{n}$, *for each equipment type*
35. Mean Time to Repair:	$Repair\ Time = t_{Trouble\ Report\ Closed} - t_{Trouble\ Report\ Created}$ $Average\ \ Repair\ Time = \frac{\sum_{i=1}^{n} Repair\ Time_n}{n}$, *for each equipment type*
36. Mean Time between Failures:	$Failure\ Time = t_{i,Trouble\ Report\ Created} - t_{i\text{-}1,Trouble\ Report\ Closed}$ $Average\ \ Time\ Between\ Failure = \frac{\sum_{i=1}^{n} Failure\ Time_n}{n}$, *for each equipment type*
37. Cost per Equipment Repair:	$Average\ \ Cost\ \ for\ Repair = \frac{\sum_{i=1}^{n} cost_n}{n}$, *for each equipment type*

38. Device Uptime Percentage:	$Percent\ \ Uptime = \frac{Device\ uptime}{total\ time}$, *for each equipment type*
39. Calls Sent to IT Helpdesk:	$Total\ Helpdesk\ Calls = \sum_{i=1}^{n} helpdeskcalls_n$, *for each type of call*
40. Helpdesk Calls Outstanding:	$Outstanding\ Helpdesk\ Calls = \sum_{i=1}^{n} helpdeskcalls_n - \sum_{i=1}^{n} helpdeskcallsclosed_n$, *for each type of call*
41. Helpdesk Calls Closed:	$Helpdesk\ Calls\ Closed = \sum_{i=1}^{n} helpdeskcallsclosed_n$, *for each type of call*
42. Helpdesk Call Close Time:	$Help\ Desk\ Call\ Close\ Time = t_{callclosed} - t_{callreceived}$ $Average\ \ Help\ Desk\ Call\ Close\ Time = \frac{\sum_{i=1}^{n} HDCCT_n}{n}$
43. Number of TMC Web Site Visits:	$Total\ Hits = \sum_{i=1}^{n} webhits_n$, *for each page and time period*
44. Referring Web Sites:	$Referring\ page = \sum_{i=1}^{n} web\ referral_n$, *for each page and time period*
45. Web Site Visit Data:	*Web site data transmitted per visit = Number of bytes of data transmitted*
46. DMS Messages:	$Total\ DMS\ Messages = \sum_{i=1}^{n} message_n$, *for each type, roadway and time period*
47. DMS Message Duration:	$DMS\ Msg\ Length = t_{end\ time} - t_{start\ time}$ $Average\ \ DMS\ Msg\ length = \frac{\sum_{i=1}^{n} DMS\ ML_n}{n}$, *for each type and time period*
48. DMS Diversions:	$Diversions = volume_{n,t}$ - $Average\ Volume_{n,t}$, *for each message*
49. DMS Message Posting Time:	$DMS\ Posting\ Time = t_{DMSstarttime} - t_{incidentverification}$ $Average\ \ DMS\ Posting\ Time = \frac{\sum_{i=1}^{n} DMS\ PT_n}{n}$, *for each type and time period*

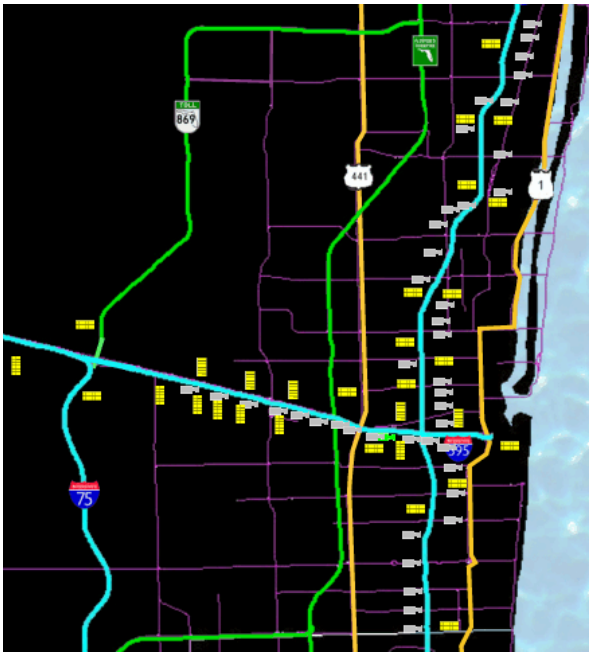
Appendix B

2005 October Monthly SMART SunGuide TMC Performance Measures

FDOT District 4
Traffic Operations
3400 West Commercial Boulevard
Fort Lauderdale, Florida 33309

Notes

- Four new CCTV cameras and one new DMS sign were activated on Monday, October 17 as a part of ITS Deployment Phase II.
- One new Road Ranger Unit was added.
- Construction work on I-75 caused long delays and high 511 call numbers.
- Incident durations and number of were significantly lower than the previous month when major storms impacted the area.



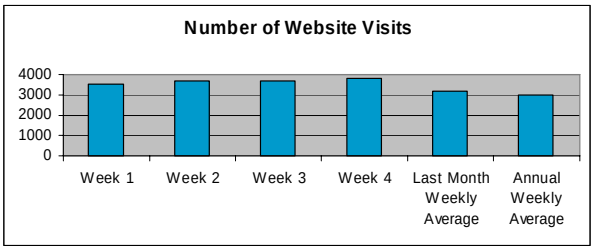
This Month at a Glance

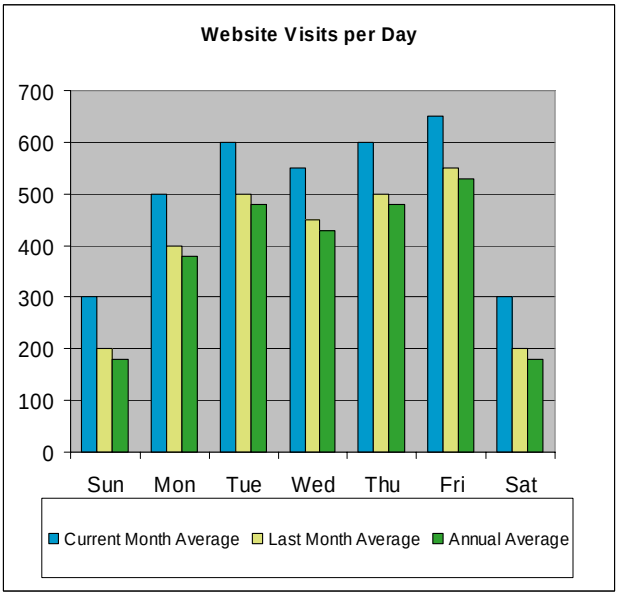
Smart SunGuide Web Site Visits	
Total Visits	15,000
Web site Data Transmitted	500 MB
DMS Messages	
Total Number of DMS Messages	300
Average DMS Message Duration	15 min
Number of DMS Messages Posted due to Other Agency Request	5
DMS Message Posting Time	5 min

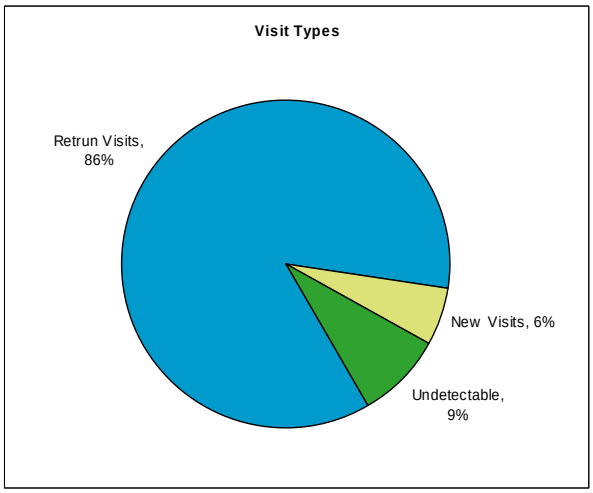
Incidents Managed	
Incident Duration	20 min
TMC Detection Time	1 min
TMC Verification Time	1 min
TMC Response Time	8 min
Road Ranger Dispatch Time	2 min
Road Ranger Response Time	6 min
Average Incident Clearance Time	10 min
Total Number of Incidents	1,000
Congestion & Reliability	
Systemwide Travel Time Index (weekday peak-hours)	1.20
Systemwide Buffer Index (weekday peak-hours)	20%

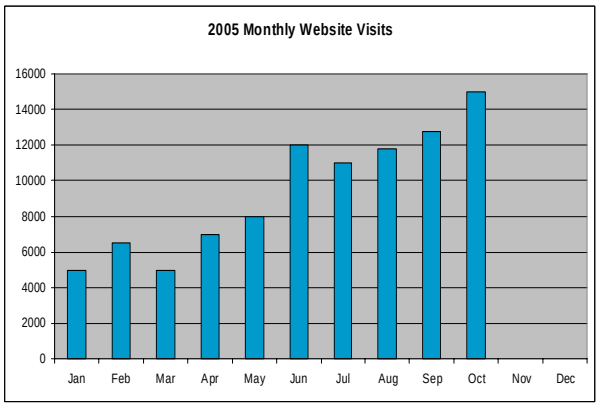
Devices		
Filed Equipment	Total Numbers	Operational Percentage
RTMS	100	80%
CCTV	50	90%
DMS	20	90%
Road Rangers Vehicles	10	97%
System Coverage		
Number of Incoming TMC Calls		100
Number of Outgoing TMC Calls		90

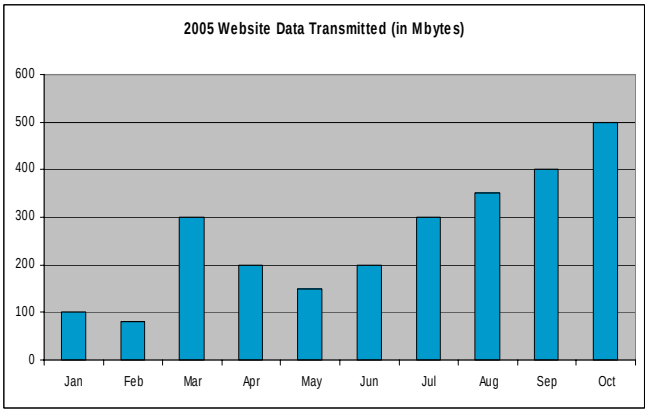
Smart SunGuide Web Site Visits



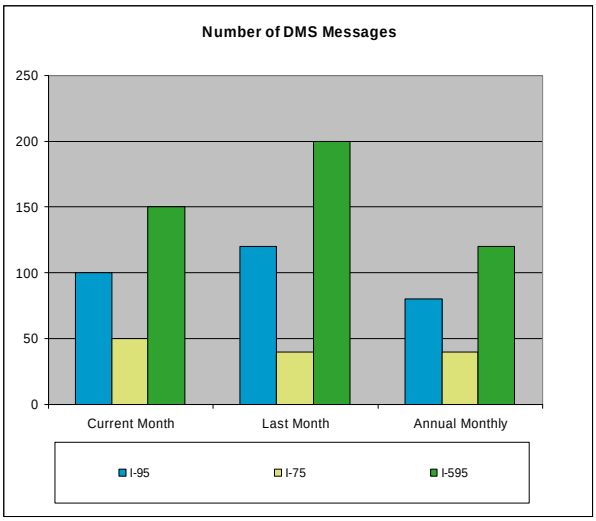


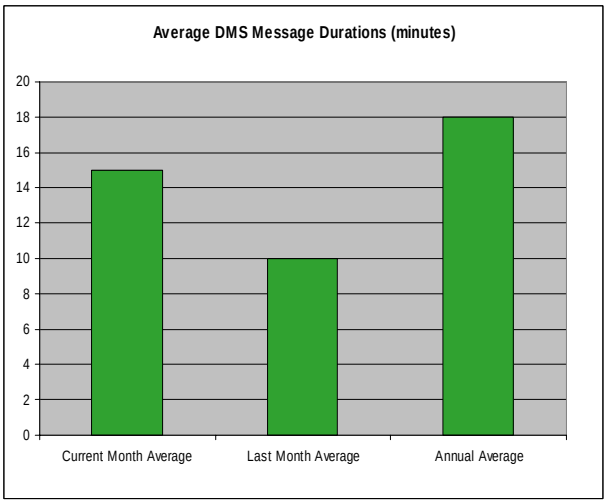


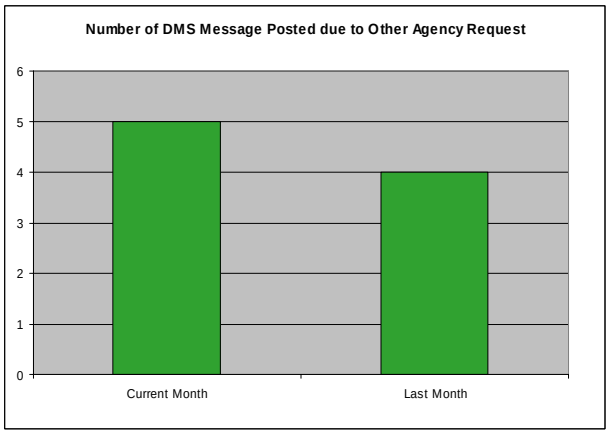


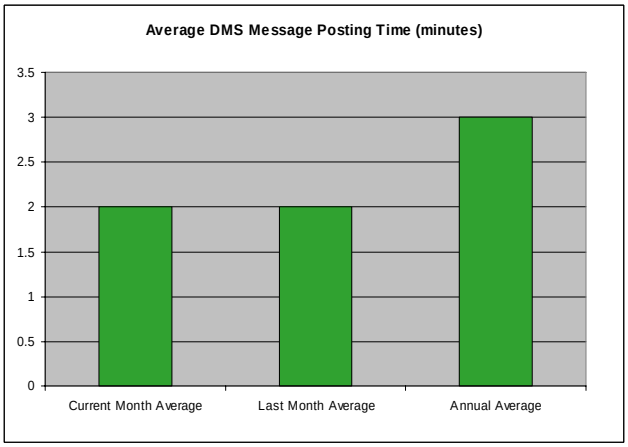


DMS Messages

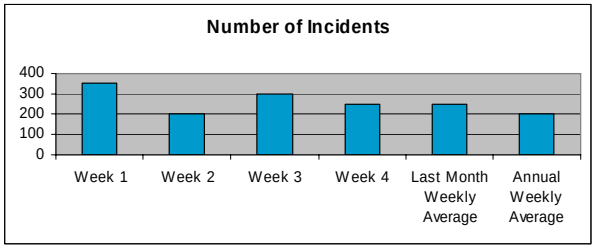


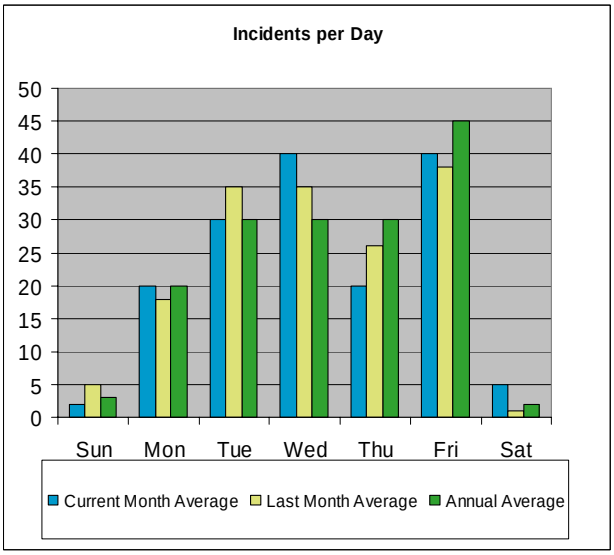


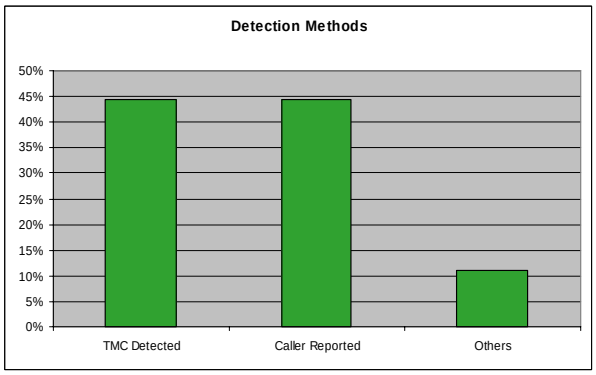


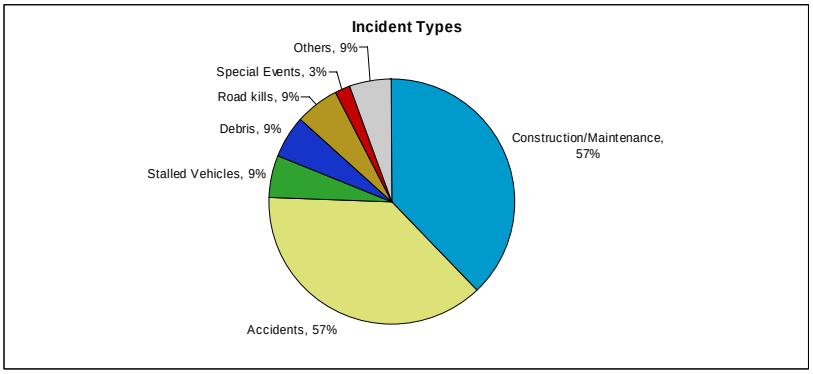


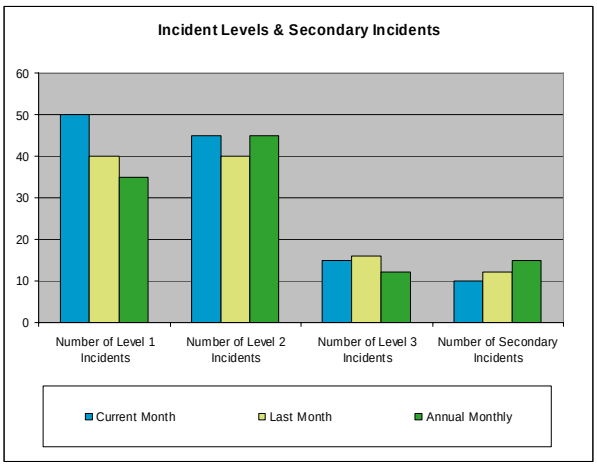
Incidents

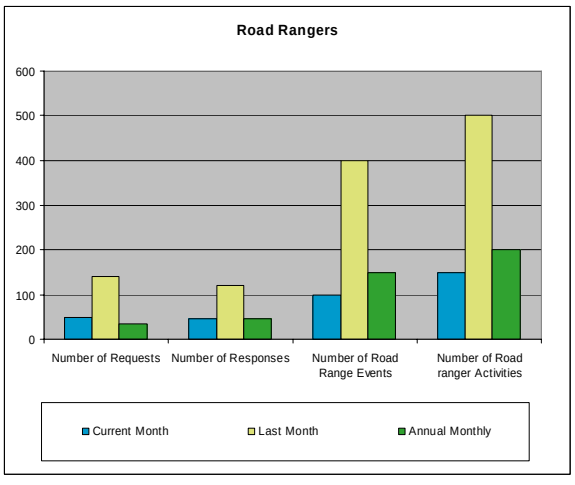

Number of Incidents
400
300
200
100
0
Week 1
Week 2
Week 3
Week 4
Last Month Weekly Average
Annual Weekly Average

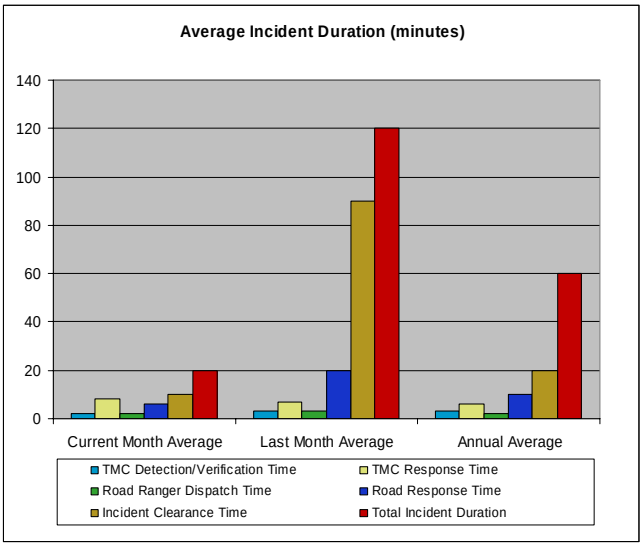

Incidents per Day
50
45
40
35
30
25
20
15
10
5
0
Sun
Mon
Tue
Wed
Thu
Fri
Sat
Current Month Average
Last Month Average
Annual Average

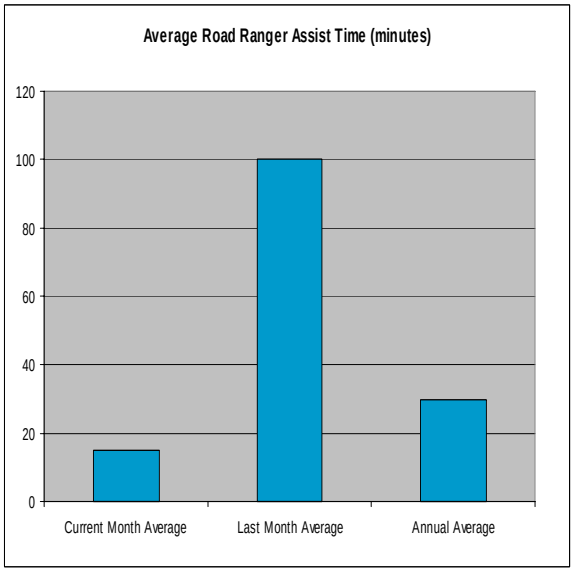

Detection Methods
50%
45%
40%
35%
30%
25%
20%
15%
10%
5%
0%
TMC Detected
Caller Reported
Others

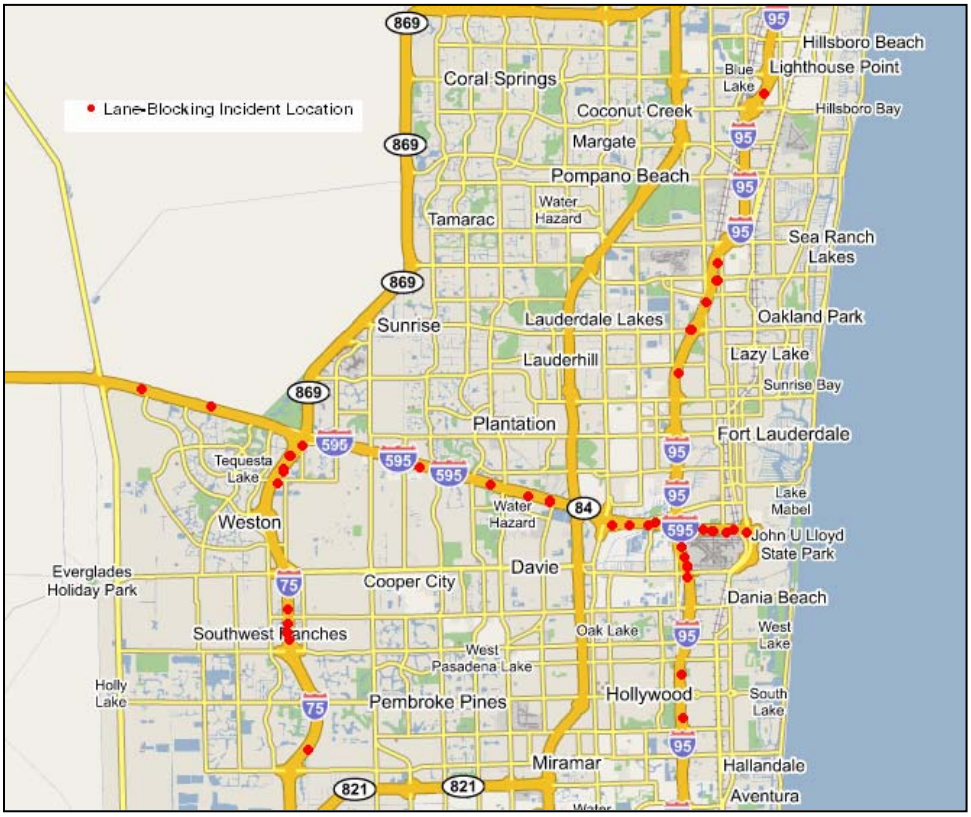

Incident Types
Others, 9%
Special Events, 3%
Road kills, 9%
Debris, 9%
Stalled Vehicles, 9%
Construction/Maintenance, 57%
Accidents, 57%


Incident Levels & Secondary Incidents
60
50
40
30
20
10
0
Number of Level 1 Incidents
Number of Level 2 Incidents
Number of Level 3 Incidents
Number of Secondary Incidents
Current Month
Last Month
Annual Monthly

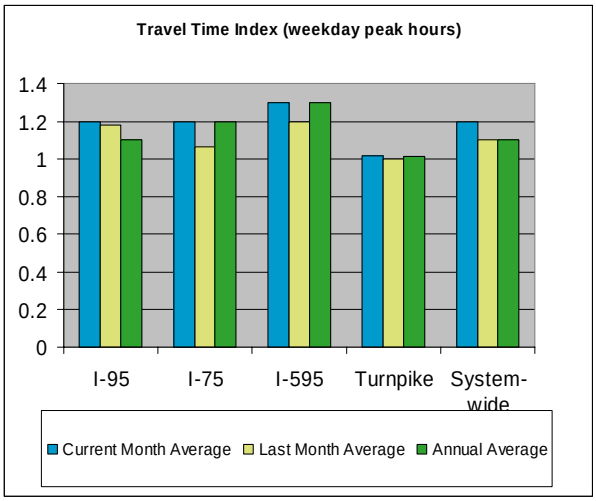

Road Rangers
600
500
400
300
200
100
0
Number of Requests
Number of Responses
Number of Road Range Events
Number of Road ranger Activities
Current Month
Last Month
Annual Monthly

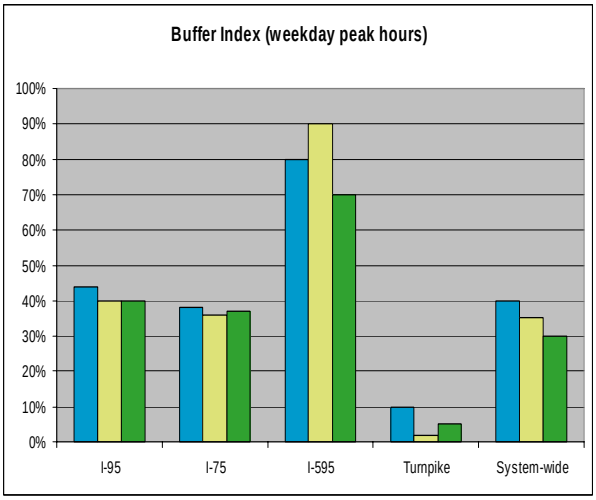

Average Incident Duration (minutes)
140
120
100
80
60
40
20
0
Current Month Average
Last Month Average
Annual Average
TMC Detection/Verification Time
TMC Response Time
Road Ranger Dispatch Time
Road Response Time
Incident Clearance Time
Total Incident Duration

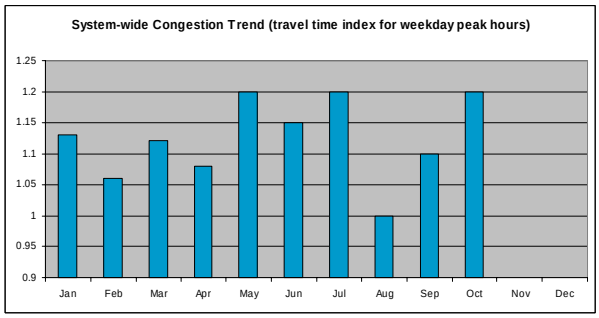

Average Road Ranger Assist Time (minutes)
120
100
80
60
40
20
0
Current Month Average
Last Month Average
Annual Average

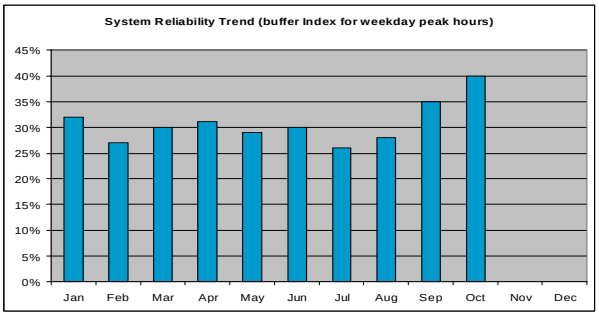

Lane-Blocking Incident Location
Coral Springs
Coconut Creek
Margate
Pompano Beach
Tamarac
Water Hazard
Sunrise
Lauderdale Lakes
Lauderhill
Plantation
Weston
Tequesta Lake
Everglades Holiday Park
Cooper City
Davie
Southwest Ranches
Pembroke Pines
West Pasadena Lake
Holly Lake
Oak Lake
Hollywood
Miramar
Hallandale
Aventura
Dania Beach
Fort Lauderdale
Lazy Lake
Sunrise Bay
Oakland Park
Sea Ranch Lakes
Lighthouse Point
Blue Lake
Hillsboro Beach
Hillsboro Bay
Lake Mabel
John U Lloyd State Park
West Lake
South Lake
869
95
595
596
84
75
821

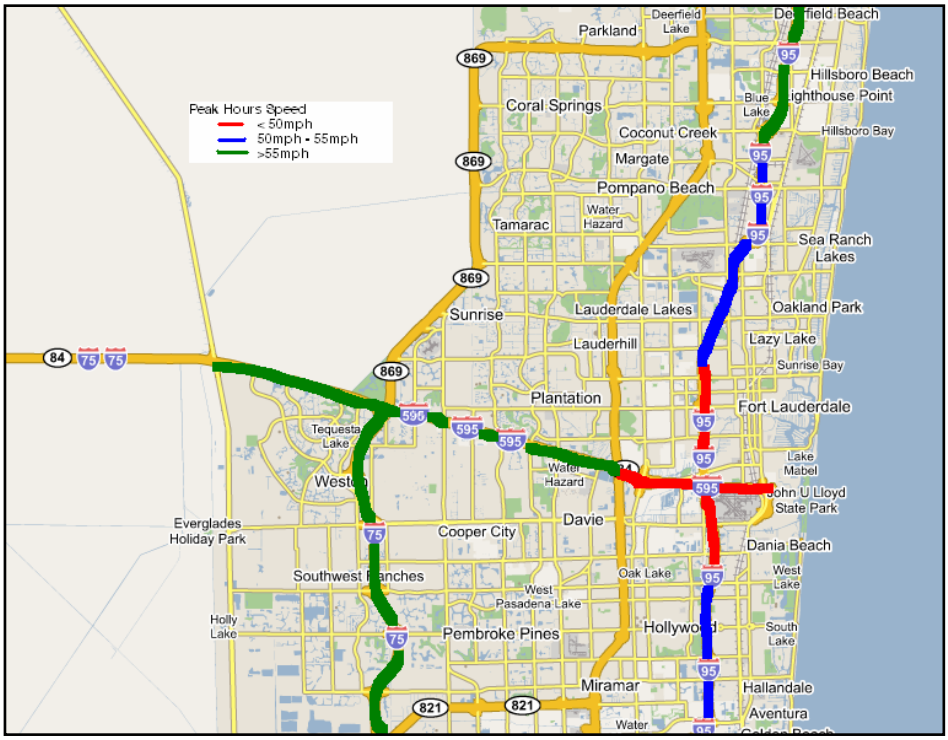
Congestion and Reliability



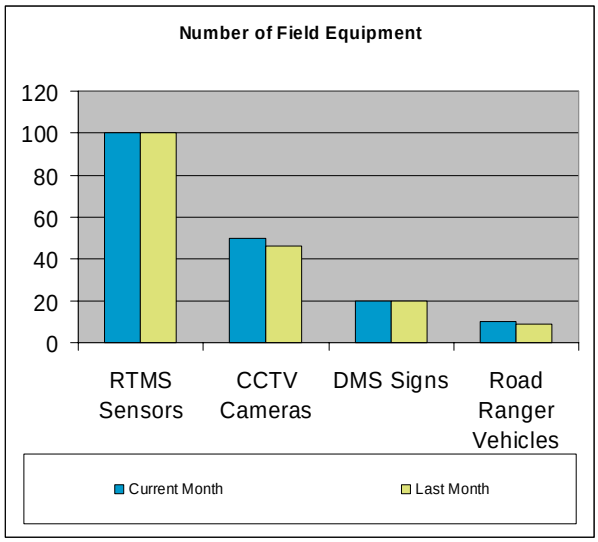


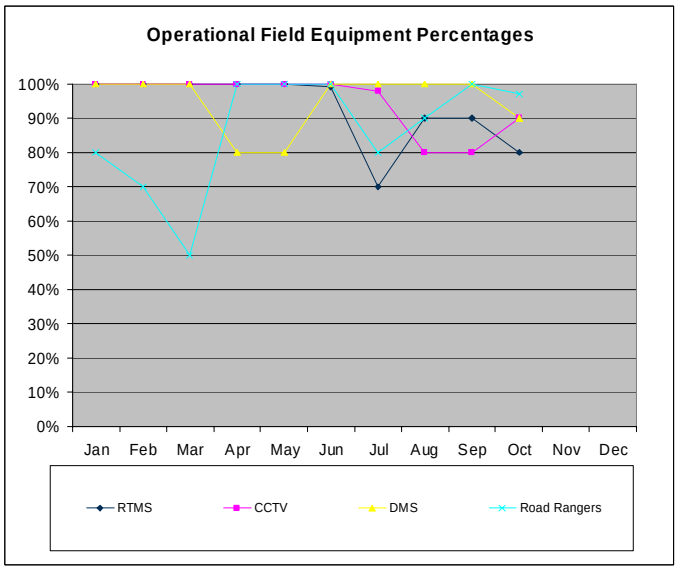


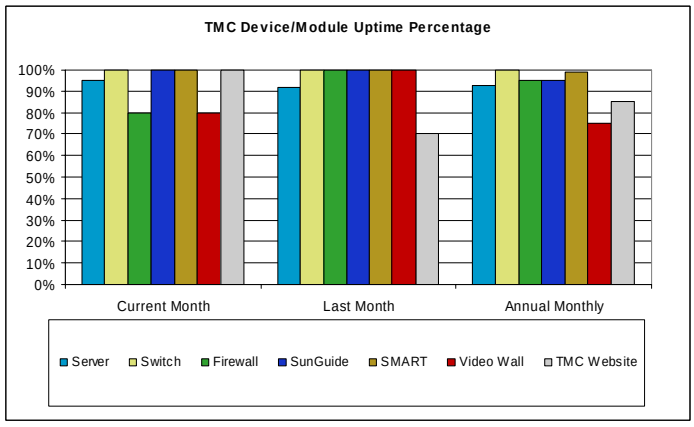


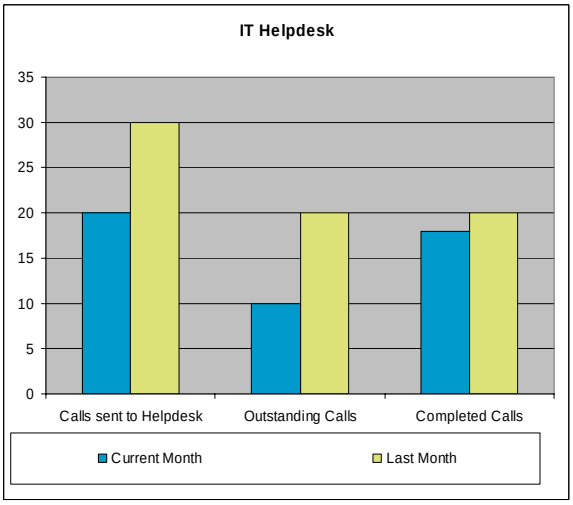


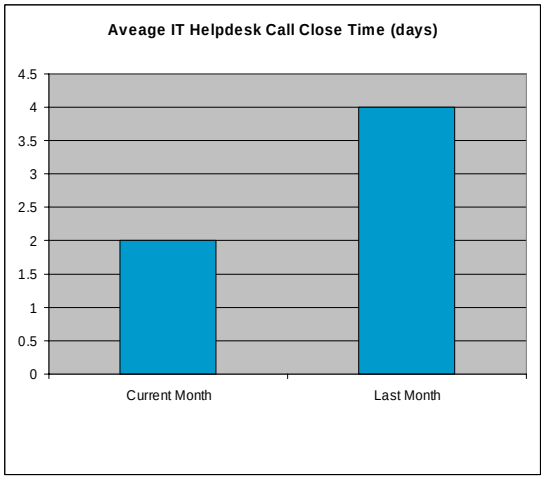
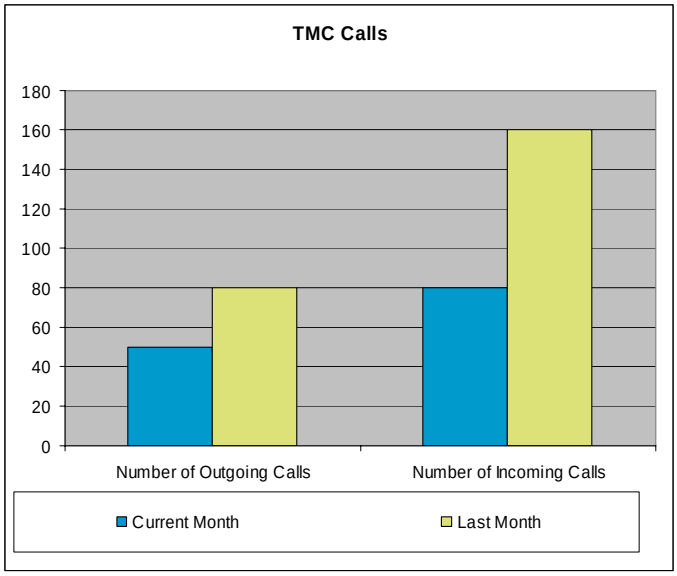
Devices


Number of Field Equipment
120
100
80
60
40
20
0
RTMS Sensors
CCTV Cameras
DMS Signs
Road Ranger Vehicles
Current Month
Last Month


Operational Field Equipment Percentages
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
RTMS
CCTV
DMS
Road Rangers


TMC Device/Module Uptime Percentage
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Current Month
Last Month
Annual Monthly
Server
Switch
Firewall
SunGuide
SMART
Video Wall
TMC Website


IT Helpdesk
35
30
25
20
15
10
5
0
Calls sent to Helpdesk
Outstanding Calls
Completed Calls
Current Month
Last Month


Aveage IT Helpdesk Call Close Time (days)
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
Current Month
Last Month

System Coverage