Technical Memorandum No. 4.1

ITS Corridor Master Plans:

Concept of Operations ITS Deployments along Florida's Principal FIHS Limited-Access Corridors

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List of Acronyms

ABT ..... Alcohol, Beverage and Tobacco
ADA ..... Americans with Disabilities Act
AMS ..... Arterial Management System
APTA ..... American Public Transit Association
ATIS ..... Advanced Traveler Information System
AVI ..... Automated Vehicle Identification
AVL ..... Automated Vehicle Location
CCTV ..... Closed Circuit Television
CEI ..... Construction Engineering Inspection
CVISN ..... Commercial Vehicle Information Systems Network
CVO ..... Commercial Vehicle Operations
DMS ..... Dynamic Message Sign
E-911 ..... Enhanced 911
EPS ..... Electronic Payment Systems
ETC ..... Electronic Toll Collection
FCC ..... Federal Communications Commission
FDLE ..... Florida Department of Law Enforcement
FDOT ..... Florida Department of Transportation
FFN ..... Florida Fiber Network
FHP ..... Florida Highway Patrol
FHWA ..... Federal Highway Administration
FIHS ..... Florida's Intrastate Highway System
FMS ..... Freeway Management System
FTE ..... Full-Time Equivalent
HAR ..... Highway Advisory Radio
HAZMAT ..... Hazardous Materials
HEFT ..... Homestead Extension of Florida's Turnpike
HOV ..... High Occupancy Vehicle
HPMS ..... Highway Performance Monitoring System
ICC ..... Interstate Commerce Commission
IEEE ..... Institute of Electrical and Electronics Engineers
IFTA ..... International Fuel Tax Agreement
IMS ..... Incident Management System
ISP ..... Information Service Provider
ITS ..... Intelligent Transportation System

IVR ..... Interactive Voice Response
JTF ..... Joint Task Force
LOS ..... Level of Service
MCCO ..... Motor Carrier Compliance Office
MDX ..... Miami-Dade Expressway Authority
MOT ..... Maintenance of Traffic
MOU ..... Memorandum of Understanding
MPO ..... Metropolitan Planning Organization
NEPA ..... National Environmental Policy Act
NHS ..... National Highway System
NITSA ..... *National ITS Architecture*
OOCEA ..... Orlando-Orange County Expressway Authority
ORT ..... Open Road Tolling
PD&E ..... Project Development and Environmental
PTMC ..... Portable Traffic Management Center
RCC ..... Regional Communications Center
RR Service Patrols ..... Roadside Rangers Service Patrols
RTMC ..... Regional Traffic Management Center
RWIS ..... Roadway Weather Information System
SEMP ..... Systems Engineering Management Plan
SEOC ..... State Emergency Operations Center
SIS ..... Strategic Intermodal System
SITSA ..... *Statewide ITS Architecture*
STMC ..... Satellite (or Secondary) Traffic Management Center
STPAHNET ..... Strategic Network of Highways for Defense
SUL ..... Special-Use Lanes
THCEA ..... Tampa Hillsborough County Expressway Authority
TiRN™ ..... Traveler Information Radio Network
TMC ..... Traffic Management Center
TRS ..... Telecommunications Relay Services
TTMS ..... Telemetered Traffic Monitoring Sites
VMS ..... Variable Message Sign
VMT ..... Vehicle-Miles Traveled
VTMC ..... Virtual Traffic Management Center
WIM ..... Weigh-in-Motion

1. Purpose

The purpose of this *Concept of Operations* is to bring together a summary of major issues, approaches, and roles and responsibilities that will guide the deployment, operations, and management of the intelligent transportation system (ITS) deployments along the Florida Intrastate Highway System (FIHS) limited-access corridors. The FIHS limited-access corridors are identified in Figure 1.1 and the total mileage covered is identified in Table 1.1.

This *Concept of Operations* was developed based on guidelines for a concept of operations provided by the Institute of Electrical and Electronics Engineers (IEEE) Standard 1220-1998, *Standard for the Application and Management of the Systems Engineering Process,* and summarizes:

- Existing ITS services and deployments;
- Need for and basic concepts of a new system;
- Analysis of the proposed system;
- Roles and responsibilities for deployment, operations, and management of the systems; and
- Other related issues that support the deployment of ITS along these corridors and their operations and management over the full life-cycle of their deployment.

The initial *Concept of Operations* developed in accordance with the IEEE Standard was then refined as the deployment concepts were refined through the *ITS Corridor Master Plans* prepared for Interstate 4 (I-4), Interstate 10 (I-10), Interstate 75 (I-75), Interstate 95 (I-95), and Florida's Turnpike. The amended C*oncept* addresses operations and management requirements based on guidance provided in the *ITS Strategic Plan.* This additional effort forms the basis of estimating the additional funding needs for the operations of regional traffic management centers (RTMCs) and field personnel to support operations under the proposed deployment concept and the responsive and preventative maintenance associated with the deployments. The additional analysis provided is high-level and operational plans will be required for each RTMC to refine and customize the operational concepts for the specific conditions and styles of each district.

The summary provided in this document is sufficient to formulate a high-level understanding of how the Florida Department of Transportation (FDOT) will arrive at the future ITS and its operations and management requirements. Some of these issues are discussed in detail in other documents and some of this material is intentionally duplicative with that of other deliverables to provide the user a sufficient understanding of the proposed deployments and operational concept.

Figure 1.1 – FIHS Limited-Access Corridors

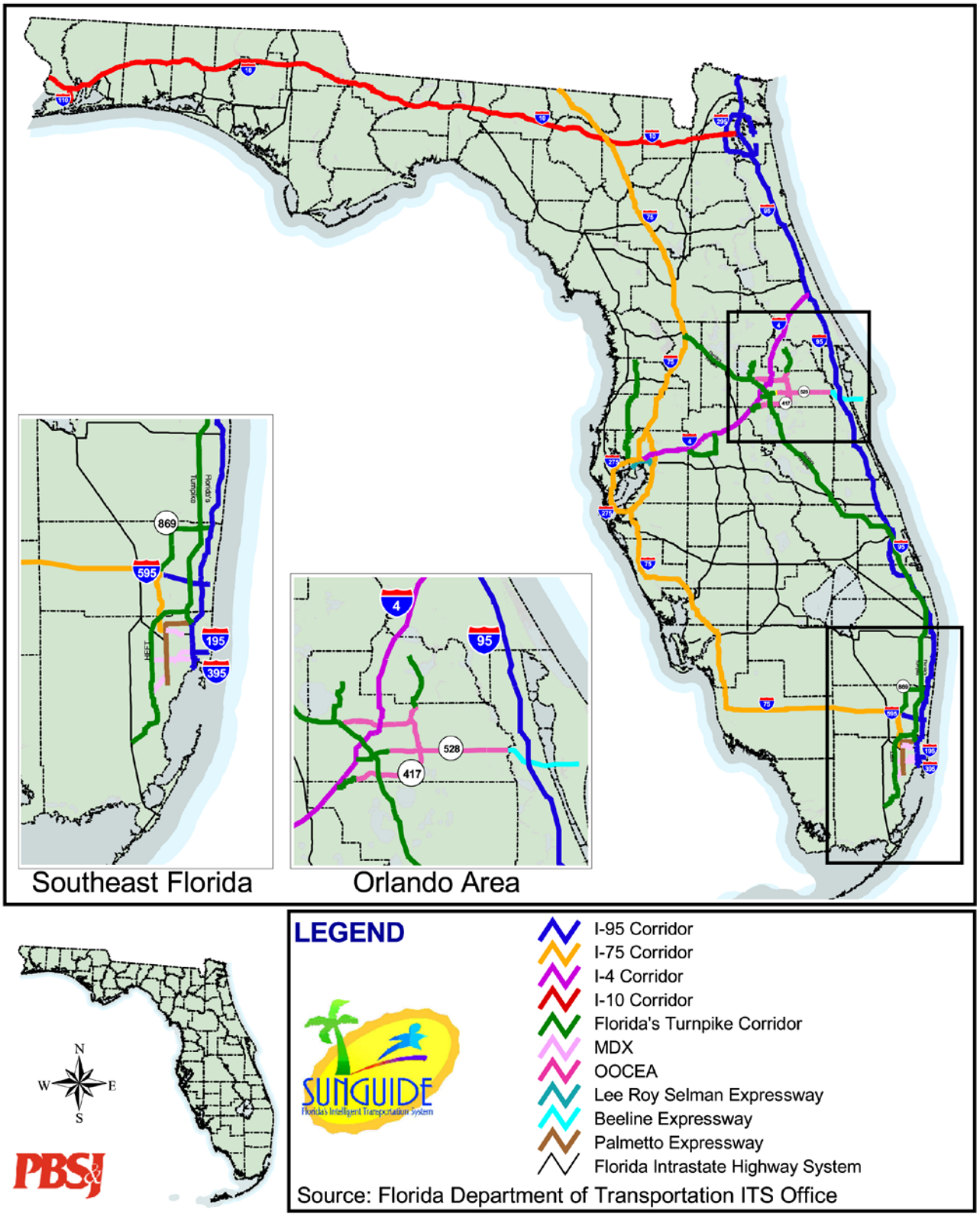


Table 1.1 – FIHS Limited-Access Facilities' Mileage by Corridor

I-10 Corridor	
I-10	362.28
I-110	6.94
	369.22
I-95 Corridor	
I-95	382.07
I-195	4.42
I-295	35.51
I-395	1.29
I-595	12.86
SR 9A	20.00
	456.16
I-75 Corridor	
I-75	470.74
I-175	1.44
I-275	60.82
I-375	1.34
	534.33
I-4 Corridor	
I-4	132.30
	132.30
Bee Line Corridor	
SR 528	17.72
	17.72
THCEA Corridor	
SR 618	13.96
	13.96

Turnpike	
SR 91	264.48
SR 417	18.42
SR 528	8.38
SR 821	47.86
SR 869	23.81
SR 429	9.80
SR 589	15.23
SR 570	24.15
Suncoast	41.43
	453.56
Palmetto Corridor	
SR 826	24.69
	24.69
MDX Corridor	
SR 112	4.62
SR 836	11.76
SR 874	7.20
SR 924	5.38
	28.95
OOCEA Corridor	
SR 408	17.03
SR 417	30.38
SR 528	27.25
	74.66

Total Corridor Mileage
2105.55

2. Current Situation

2.1 Freeway and Incident Management Services

Florida's ITS services are rapidly emerging on the FIHS limited-access facilities. However, the current coverage of existing critical services varies widely. Table 2.1 summarizes the coverage of major surveillance devices for incident detection and verification, Road Ranger (RR) Service Patrols, and traveler information technologies along the five principal FIHS limited-access corridors – I-4, I-10, I-75, I-95, and Florida's Turnpike. Figure 2.1 illustrates this coverage graphically.

Table ES-2 – Existing Freeway and Incident Management Services

Mainline Corridors[1]	Existing Coverage (Percent of Miles)[2]					
	CCTV[3]	Vehicle Detectors[4]	Road Rangers	Motorist Aid Call Boxes	DMS	HAR[5]
I-4	34.2%	28.0%	64.3%	29.0%	22.9%	0.0%
I-10	2.6%	1.6%	6.0%	99.1%	0.7%	0.0%
I-75	0.0%	0.0%	36.4%	98.1%	0.0%	0.0%
I-95	4.6%	3.0%	29.7%	70.5%	5.2%	0.0%
Florida's Turnpike[6]	0.0%	0.0%	47.8%	100%	0.2%	4.9%
TOTAL	4.5%	3.4%	32.1%	86.4%	3.3%	0.8%

Source: PBS&J

[1] Mainline only; does not include other FIHS limited-access routes.
[2] The range of influence considered is one mile in each direction for CCTV cameras, a half-mile for a vehicle detection station, one mile in each direction for motorist aid call boxes, a half-mile for DMS, and three miles in each direction for HAR.
[3] Does not include closed-circuit television cameras (CCTV) at tollbooths.
[4] Does not include telemetered traffic monitoring sites (TTMS).
[5] Does not include the Traveler Information Radio Network (TiRN).
[6] The Turnpike currently has three operational HAR stations. Six others are programmed. (Source: Turnpike District.)

Figure 2.1 – Existing ITS Services

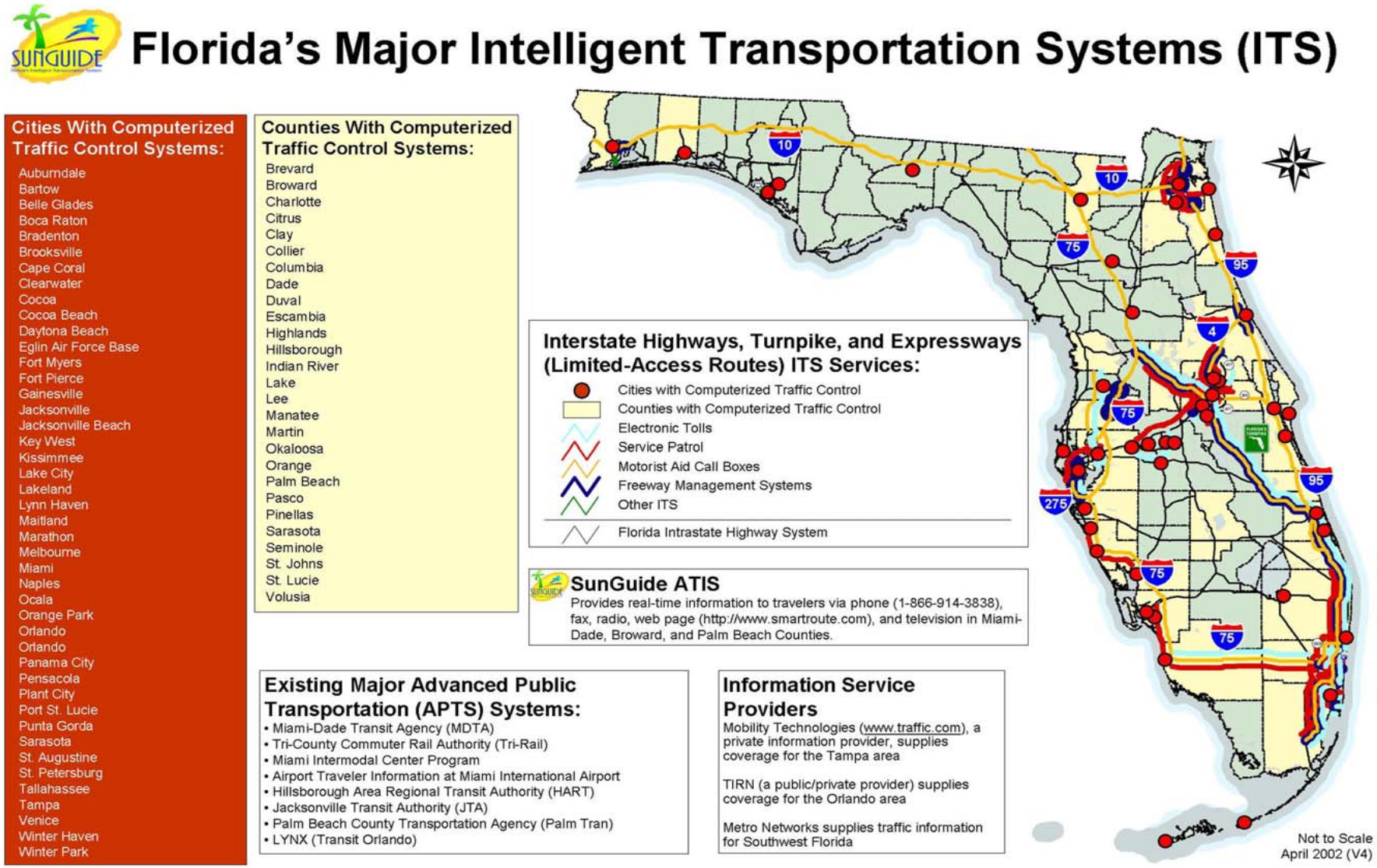
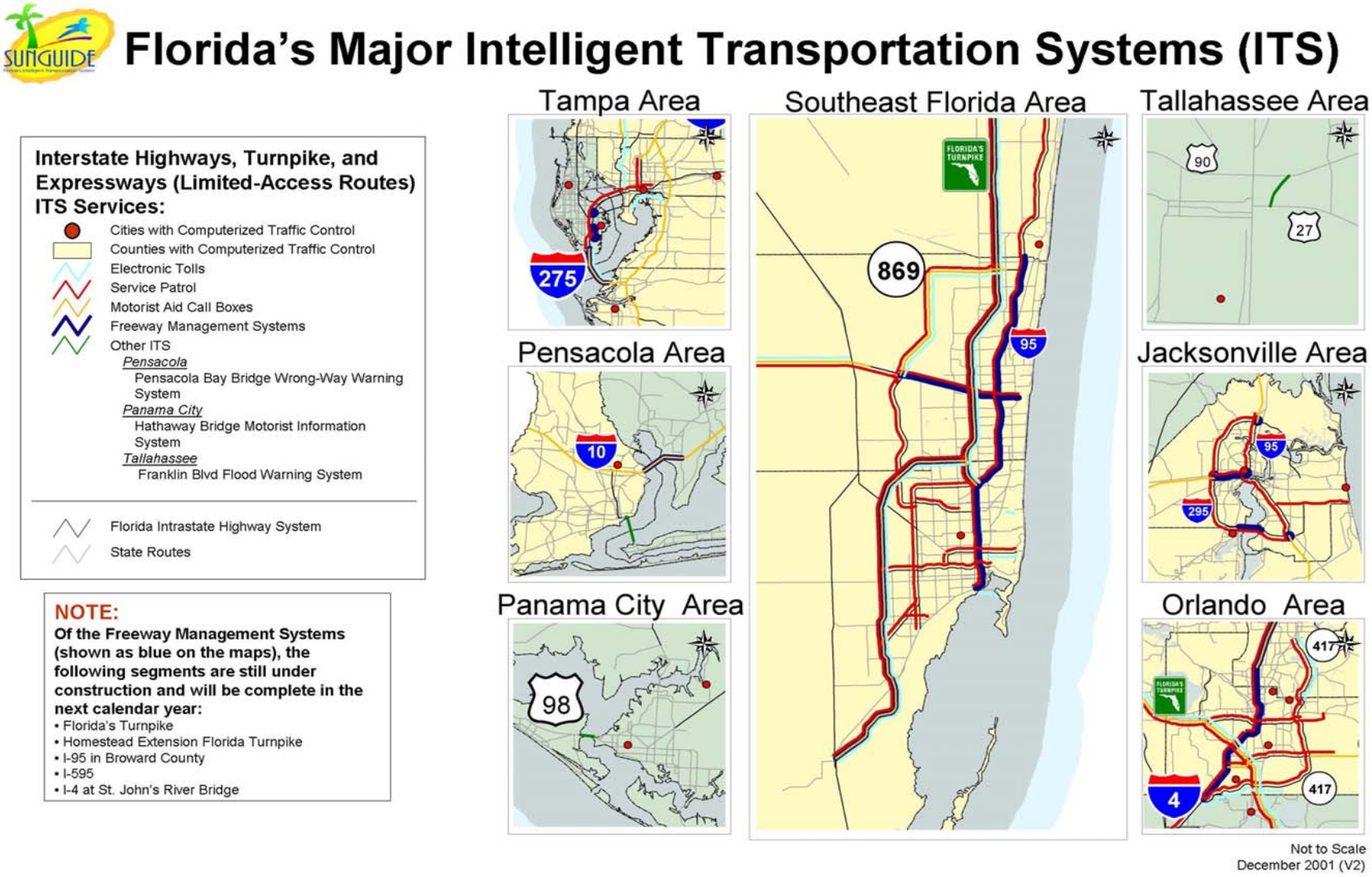


Figure 2.2 – Existing ITS Services



2.2 Advanced Traveler Information Systems (ATIS)

In addition to freeway and incident management services, FDOT plans to provide a statewide advanced traveler information system (ATIS), branded using SunGuide℠, to be implemented over the next several years. These services include the collection of traffic and traveler information, road weather information, construction work zone information, lane closure information, incident information, and evacuation coordination information. These services may be provided through a variety of media including commercial radio, television, Internet, subscriber-based customized information services, and 511 or interactive voice response (IVR) systems.

2.2.1 Southeast Florida SunGuide℠

Currently, the SunGuide℠ ATIS operates in the southeast Florida tri-county area, covering Miami-Dade, Broward, and Palm Beach counties. This ATIS is operated by a privately owned information service provider (ISP), SmartRoute Systems, a Westwood One Company, contracted by FDOT. Basic traffic, incident, and construction-related information is provided along the facilities shown in Figure ES-4. Transit and airport-related landside information is provided in the tri-county region as well. Information is disseminated through the Internet, telephone, e-mail, and fax back service.

Figure 2.3 – Southeast Florida SunGuide℠ Coverage Area

2.2.2 Traveler Information Radio Network™ (TiRN)

TiRN™ has operated since 1999 and provides traveler information on 1680 AM, WTIR, in Orange, Osceola, Seminole, and Brevard counties. TiRN™ was the nation's first 24-hour commercial radio network for traffic, weather, and tourism information. One hundred sixty one roadside signs advertise TiRN™ along I-4, I-95, and Florida's Turnpike in central Florida. Information disseminated is oriented to tourists in central Florida and other information during emergencies.

2.2.3 Highway Advisory Radio (HAR)

Florida's Turnpike currently operates nine HAR sites along the mainline. These sites are used to provide traffic and traveler information during major incidents and evacuations or severe congestion. The SunGuide[SM] ISP will operate the HAR site existing in Southeast Florida.

2.2.4 511

In July 2000, the Federal Communications Commission (FCC) designated 511 as the United States' national traveler information telephone number. The FCC ruling does not address implementation issues and schedules, but leaves these matters for state and local agencies and telecommunications carriers to resolve. In 2005, the FCC will review the progress made around the country in implementing 511.

Two 511 implementations are active in Florida. In Southeast Florida, the existing telephone information numbers are being converted to 511. All information currently available using other SunGuide[SM] media will be available to cellular and landline callers in Miami-Dade, Broward, and Palm Beach counties. An I-4 Hotline is also being planned to offer 511 service for cellular callers in Orlando for the areas where public agency data is available. In the very near term, this coverage will include I-4 from U.S. 27 in Polk County to CR 471 in Volusia County, the I-4/I-95 interchange area, and the SR 528/I-95 Interchange area. Additional partners and information is being considered through the Regional ITS Consortium in Orlando.

2.3 Electronic Toll Collection (ETC)

SunPass® is a statewide prepaid toll program being implemented by FDOT on most of Florida's toll roads. The innovative system incorporates the latest in prepaid toll programs, saving commuters time and money, while creating more efficient, less congested roadways. The transponder, which allows motorists to have tolls electronically deducted from a prepaid account, costs $25.00 (plus tax) and requires a minimum opening balance of $25.00 – a $50.00 start-up cost that has a full 45-day money back guarantee. Frequent users of the ***SunPass***® prepaid toll program will receive a ten percent rebate after 40 or more transactions are made each calendar month on Florida's Turnpike and participating non-Turnpike toll plazas. To ensure accuracy, ***SunPass***® transponders have several built-in self-tests that check key internal components such as memory and battery voltage each time the device passes through a ***SunPass***® toll lane. Transponders are warranted against manufacturing problems or defects for one year after the date of purchase. E-Pass, operated by the Orlando-Orange County Expressway Authority (OOCEA), provides a parallel service along their expressway facilities. E-Pass and ***SunPass***® have been interoperable since 2000. Together, ***SunPass***® and E-Pass have about 700,000 transponders in use in Florida and hope to reach 1,000,000 by 2005. ***SunPass***® is operated by the Office of Toll Operations, which is now an element of FDOT's Turnpike District.

Possible uses of transponders as vehicle probes to support vehicle travel times and speed for ATIS are being explored by the ITS Office.

2.4 Weigh-in-Motion (WIM)

Currently, nine weigh stations are located on interstate facilities throughout the state. Six of the nine are weigh-in-motion (WIM) stations with four more WIMs programmed for implementation within the near future. It is the Motor Carrier Compliance Office's (MCCO) goal to convert the remaining static scales along the interstate facilities to WIMs. WIMs are beneficial in decreasing travel delays, reducing queuing on the interstate, and improving truck mobility by allowing trucks to approach and go through these stations at up to 45 miles per hour (mph), where they are electronically weighed and cleared. Alternate lanes are provided for vehicles exceeding their weight limits to remove them from the main WIM lane and to prevent congestion within the station itself. These WIM upgrades are being implemented due to the increased amount of truck traffic along the roadways. Static weigh stations have several deficiencies associated with them. Operationally, trucks must stop to be weighed and cleared for travel on Florida's roads. This process creates truck queues that can be potentially hazardous to mainline interstate travel. Another area of concern with static weigh stations is the weave sections associated with the trucks merging in and out of traffic both upstream and downstream from the station. WIMs will process larger truck volumes at a higher rate while also providing safer entrances and exits to their mainline facilities. Table ES-3 identifies the location of the existing and planned WIMs along the intrastate facilities.

Table 2.2 – Weigh-in-Motion (WIM) Sites

Facility	County	Location	Status
I-10	Columbia	Ellaville	Planned (10/01)
I-10	Escambia	Pensacola	Planned (07/02)
I-10	Jackson	Sneeds	Existing
I-75	Charlotte	Punta Gorda	Existing
I-75	Hamilton	White Springs	Existing
I-75	Sumter	Wildwood	Existing
I-95	Flagler	Flagler Beach	Existing
I-95	Duval	Yulee	Existing
I-95	Martin	Martin County	Planned (12/04)
I-4	Polk	Relocating from Plant City to SR 33 in Polk County	Planned (FY 05/06)

Source: Motor Carrier Compliance Office (MCCO), 2001

3. Need for ITS and Proposed Deployment Concepts

3.1 Needs, Issues, Problems, and Objectives

The following needs, issues, problems, and objectives were identified for ITS deployment in Florida along the major corridors. The needs, issues, problems, and objectives were organized based on FDOT's Mission Statement as follows:

> Florida will provide and manage a safe transportation system that ensures the mobility of people and goods, while enhancing economic competitiveness and the quality of our environment and communities.

From this mission, FDOT derived four primary goals to carry out the mission. Associated with each goal are a number of objectives for implementation.

3.1.1 Safe Transportation – Moving People and Goods Safely

- In 1999, 2,290 people died on Florida's highways resulting in a fatal accident rate (2.1 per million vehicle-miles) higher than the national average (1.5 per million vehicle-miles). Less than one percent of these crashes were due to road-related conditions. Strategies are needed to provide a safer driving environment and to improve vehicular safety to reduce the potential for driver errors and severe accidents.

- FDOT's *FIHS Cost-Feasible Plan* will be implemented as proposed, resulting in significant capacity improvement projects, interchange modifications, and related programs on a statewide basis along each of the major corridors. These programs will result in a significant number of construction work zones along these major corridors.

- Providing safe work zones and maintaining traffic along these high-traffic volumes is a priority needed to support FDOT's mission to provide "safe" transportation services.

- The safety of commercial vehicle operators is dependent on reliable and predictable traffic flows at interchanges, weigh and inspection stations, and gates for intermodal facilities, such as rail, port, and airport cargo facilities. The formation of queues on these corridors is a safety concern for the commercial vehicle operators and other vehicles.

- Commercial vehicle operators seek safe environments at our rest and weigh stations where vehicles can be parked overnight to satisfy the rest requirements of the Interstate Commerce Commission (ICC).

- Innovative technologies are needed to enhance the coverage and accuracy of inspection and enforcement of commercial vehicle safety requirements.

- Florida has the greatest risk of landfall of hurricanes in the nation requiring residents and visitors to respond quickly to events requiring evacuation. Based on the average since 1900, a named storm is anticipated to land in Florida once per year and a storm that requires a major evacuation is likely once every three years. Services are needed that can:

    - Support pre-planning for evacuations;
    - Manage traffic during evacuation scenarios;
    - Manage demand through communications with shelters and other safe harbors;
    - Provide route guidance information and information on traffic/travel conditions and weather including winds, rainfalls, and storm surge;
    - Support remote configuration management of highways during evacuation conditions or other emergencies;
    - Provide accurate and timely traveler information regarding incidents on evacuation routes;
    - Share emergency information among local and regional traffic management centers (TMCs) and emergency management facilities; and
    - Detect, verify, respond to, and clear incidents and manage traffic around accidents, emergencies, and other incidents.

- A number of other weather and natural events affect traffic and transportation including flooding, fog, tornados, wildfires, and heavy rainfalls where unsafe driving conditions may exist or diversions of major corridors are required. Surveillance and information of when these unsafe conditions exist are needed to improve driving conditions and manage traffic.

- Improve and expand our ability to identify motorists in need and verify and respond to their needs in an efficient and cost-effective manner.

- Reduce the risk of accidents and other incidents by warning drivers of approaching congestion, inclement weather, steep downgrades, sharp curves, and other hazardous conditions.

3.1.2 System Management – Preservation and Management of Florida's Transportation System

- Four of Florida's metropolitan areas are severely congested and rank among the nation's fifty most congested areas: Miami, Orlando, Tampa, and Jacksonville. (Source: 2000 Urban Mobility Study, Texas Transportation Institute.) In Florida's seven largest urbanized counties (those with 500,000 or more in population including Miami-Dade, Broward, Palm Beach, Pinellas, Hillsborough, Orange, and Duval), the amount of traffic that is congested along these corridors doubled from 1990 to 1999. (Source: Florida's Mobility Performance Measures Program.) In order to manage the efficiency of the transportation system, the following objectives are needed:

  - Improve travel times along the corridors;
  - Improve predictability and reliability of travel times;
  - Reduce accidents and other incidents during normal flows that result from congestion and delays that result from "rubber-necking" during incidents;
  - Reduce congestion-related delays by reducing queues and spillback from other facilities;
  - Reduce delays caused by congestion in construction work zones;
  - Manage traffic accessing these major corridors at interchanges to improve through-put and traffic flow;
  - Reduce unnecessary delays at tolls booths; and
  - Reduce unnecessary delays at the gates of intermodal facilities.

- In addition to managing traffic flows, additional alternatives are needed to enable coordinated regional transportation operations by sharing information among regional traffic operations centers and agencies to maximize efficiency of the system and demand between modes. Information to support and promote transit and other multi-modal use and manage transit vehicles or fleets has the potential to reduce congestion on highways and increase mobility.

- Commercial vehicles present a considerable load on our roadway infrastructure and proper enforcement is needed to eliminate illegally over-weight vehicles that cause damage to pavement and bridges.

- Improve our abilities to detect, verify, respond to, and clear incidents to minimize the impacts on traffic flow.

- Improve traveler information to better manage traffic and inform travelers of delays and breakdowns in our largest metropolitan areas, even when no alternative can be offered to divert or re-route travelers to other modes or roadways exists.. Traveler information services are valuable communications tools that can help us manage our system more efficiently by modifying driver behavior and increasing awareness of traffic conditions.

- Technologies are needed to support the operations and management of alternate highway configurations such as special-use lanes (SULs) that serve high occupancy vehicles (HOVs), operate as express toll lanes, provide preferences to commercial vehicles or transit vehicles, open road tolling (ORT), and other alternative configurations and management plans to promote the efficiency and effectiveness of our infrastructure.

- During the course of ITS corridor and program deployments nationally and in Florida, there is an increasing need for data and information sharing to better manage and operate the system by:

    - Supporting system evaluation and alternative analysis of future ITS deployments to ensure we are deploying resources efficiently and effectively;
    - Supporting and supplementing other data collection programs such as the 200-highest hour report, highway performance monitoring system (HPMS), and design traffic factors for geometric and pavement design;
    - Supporting highway operational performance reporting, modeling simulation, and other techniques for the operations and management of the system; and
    - Providing before and after studies for ITS deployments. Many current programs are unable to assess their benefits or effectiveness because no data was collected on conditions and performance prior to installation of ITS.

3.1.3 Economic Competitiveness – A Transportation System that Enhances Florida's Economic Competitiveness

- Commercial vehicles form the backbone of the state's freight transportation network. All aspects of the economy rely on commercial vehicles to meet their transportation needs. The trucking industry is an active participant in all of Florida's economy. Motor carriers haul 77 percent of all shipments originating in Florida (by weight), have a combined value of $154 billion, and provide the landside link to all of our intermodal facilities. The following objectives are needed to support Florida's economic competitiveness:

    - Ensure efficient landside access to intermodal, port, airport, and truck terminal facilities;
    - Ensure efficient intermodal transfer of people and goods;
    - Promote safe and efficient access of vehicles to markets; and
    - Expedite permitting and clearance of commercial vehicles at weigh and agricultural inspection sites to keep commerce moving.

- Tourism is one of Florida's top industries and providing a safe, efficient, and easily navigable transportation network to support more than 60 million visitors each year is essential to Florida's long-term economic prosperity. The following objectives are needed to support Florida's economic competitiveness:

    - Ensure efficient access to major activity centers such as tourist attractions, state parks, and other areas of interest; and

  - Provide safe and efficient tourist travel and reduce vehicle-miles traveled (VMT) through the provision of accurate and timely traveler information.

- FDOT, along with its partners, is currently considering the designation of the strategic intermodal system (SIS). Each of the five principal transportation corridors will likely be part of this SIS because of their roles in regional, statewide, and national transportation linkages.

3.1.4 Quality of Life – Increasing Mobility Options for a More Livable Florida

- To ensure we provide more livable communities in Florida, the planning and design of transportation systems should support communities' visions and be compatible with corridors of statewide and regional significance. To support this objective:

  - Provide efficient statewide ITS services with autonomy for decision-making to support local needs and regional cooperation to promote efficiency and regional and statewide goals;

  - Improve interoperability of ITS services through the development of statewide uniform device standards and specifications;

  - Support integration of ITS into local planning processes, programs, and capacity projects;

  - Provide name recognition of key ITS-related services through branding that will instill trust and confidence in traveler information services, roadside assistance, electronic payment services, and other strategic services;

  - Provide easy access and central data warehousing capabilities for transportation planning and design for all partners to support decision-making; and

  - Provide accurate real-time data to technology, business, and operational users for effective and responsive transportation operations.

- Improve the quality of the environment by reducing air quality impacts of mobile source emissions through a more efficient and reliable transportation system.

- Reduce impacts of hazardous materials' (HAZMAT) incidents by providing response systems that provide first responders with access to information on the content of vehicles and vehicle locations so they can quickly respond and clear areas.

- Improve the availability of weather, traveler, and shelter information during natural and man-made disasters.

- Provide safe and efficient travel routes for freight carriers to reduce potential HAZMAT incidents in densely populated areas.

3.2 Mission and Vision

The ITS Mission and Vision statements were developed for the *ITS Corridor Master Plans* and *ITS Program Plan* to assist in defining the ultimate twenty-year ITS for the interstate corridors and to guide the selection of appropriate solutions to fulfill the ultimate ITS vision.

3.2.1 Mission

Provide effective ITS services for the five principal FIHS corridors that enhance the safety and mobility of people and goods, economic competitiveness, and the quality of our environment and communities.

3.2.2 Vision

Two decades into the 21st century, travelers and shippers of goods along Florida's limited-access transportation corridors are benefiting from infrastructure, and information and communications technologies that improve the safety, mobility, economic competitiveness, and livability of communities in Florida. Information is available that assists travelers and shippers in route planning, predicting travel times, and scheduling their trips/shipments to reduce delays and arrive at scheduled times. When congestion is severe along specific facilities, alternate routes and modes of travel will be suggested that may be more reliable or cost-effective. During their trip, information of travel conditions is provided in real-time so that scheduling and diversions can be planned if needed as a result of an incident. If an incident occurs, automated information technologies are capable of verifying the location and assessing the appropriate response to incidents. If necessary, emergency personnel or roadside assistance is dispatched, arriving in a short period of time. Traffic flow is restored quickly and delays minimized.

During normal operations, traffic flow is managed within the corridor to keep traffic moving. Information on weather conditions is provided to an in-vehicle information service that alerts the driver when visibilities are compromised and advises a safe travel speed. If a natural disaster is impending, information is provided on appropriate local shelter locations, routes for travelers choosing to drive to another area, and other modes of travel that are available instead of driving.

The economy is thriving as a result of world-class access to international markets at ports, airports, and railheads from our agricultural, mining, and manufacturing industries and efficient deliveries of goods and services at the local level. Decisions on the operations, management, and future improvements to the corridors are made through a number of key partners. These decisions are based on measured benefits and a record of the performance of various technologies and elements are customized for communities to reflect their unique values and priorities. However, similar services are available statewide and on related arterial systems and are easily recognized by elderly drivers or visitors since strong name recognition exists for

traveler information, roadside assistance, electronic tolls, and other essential services. FDOT is viewed as an ITS powerhouse and a model for how to cost-effectively deploy ITS services and partner with other public agencies and the private sector to create win-win agreements for the benefit of the citizens of Florida.

3.3 Initial Concept of Operations

During the December 2001 ITS Working Group Meeting, a concept of operations was proposed for statewide deployments. This proposed concept became the basis for the development of this *Concept of Operations* the five principal FIHS limited-access corridors.

3.3.1 Concept

ITS should, to the greatest extent possible, be developed and deployed to function statewide as a seamless system, recognizing separate but coordinated management and operations within local areas and within each region of the state.

Such a system shall be consistent with the *National ITS Architecture (NITSA)*, as applied in the *Statewide ITS Architecture* (*SITSA*) and derivative regional ITS architectures. Development of the system shall include a transitional period for any disparate local or regional subsystems to become consistent, as necessary, within the system.

Teams of transportation professionals, working with public safety agencies, will operate and communicate in real-time to jointly perform coordinated operations, active travel management, and central data warehousing.

3.3.2 Coordinated Operations

Coordinated operations will provide information sharing via communications links that connect TMCs located in separate regions of the state. Within each region, these centers will also link to and coordinate operations with local TMCs and ISPs. Finally, coordinated operations will link each county's emergency management center with the State Emergency Operations Center (SEOC). The information sharing will occur in real-time to benefit transportation system users, to help mitigate the impact of incidents, and to assist with emergency evacuations when they occur.

3.3.3 Active Travel Management

Active travel management includes transportation facility monitoring, traffic control, and information delivery functions to support transportation system users, incident response, clearance, emergency management, and transit operations. It also supports the efficient functioning of advanced signal control and SULs on expressways and other arterial highways.

3.3.4 Central Data Warehousing

Central data warehousing is a process to coordinate the measurement and collection of transportation data statewide, to assure data accuracy and timeliness, to process data as necessary to make it useful, to make it available to transportation system users and to transportation professionals on a current basis in useful formats, and to maintain an archive of such data for transportation planning, design, and operations in accordance with a statewide data plan.

3.4 Themes and Strategies for Deployment

The following themes and strategies summarize the desired outcomes of the ITS deployments along the FIHS limited-access corridors and were derived from the initial concept of operations identified in Section 3.3.

3.4.1 Coordinated Operations

- Facilitate, support, and enhance the coordination and implementation of interagency efforts in response to the needs of intercity travel, major incidents or special events of regional significance along the corridor, and the security of the transportation infrastructure.

- Promote coordination and cooperation among all organizations involved in incident management including state, county, and local transportation departments, toll road authorities, law enforcement agencies, emergency service providers, and other operating agencies within the corridor.

- Foster and facilitate continued development and implementation of regional incident management initiatives and educate the public and responders to the benefits of incident management.

- Encourage technology and resource sharing by coordinating the development of training programs to support member agencies' incident management programs and activities.

- Demonstrate and evaluate the application of innovative procedures and technologies to enhance incident management activities.

- Provide regional solutions for serving intercity travel by promoting the through movement of vehicles.

- Provide procedures and coordination during evacuation and other emergency situations to make the best use of system resources.

- Promote coordination among agencies in the notification and implementation of maintenance and construction.

3.4.2 Active Facilities Management

- Support traffic management along all facilities in a coordinated way.

- Support incident management for the detection of, response to, and clearance of accidents and other major incidents such as freeway service patrols and Mayday/E-9-1-1 support, development of incident response scenarios and traffic diversion plans, incident response centers or command posts, and traffic surveillance technologies.

- Provide transit management, including bus, commuter rail, and park-and-ride facilities, as well as other transit-related activities and manage SULs, such as high-occupancy toll or other value pricing, reversible lane control for high occupancy vehicle (HOV) facilities, and transit or emergency vehicle signal preemption systems.

- Improve the ability to monitor, schedule, and dispatch maintenance, construction, special services, or other public/community transportation fleets.

- Manage traffic flow and safety during evacuations related to hurricanes, fires, and other emergencies.

- Serve commercial vehicle operations (CVO), such as electronic screening systems, to verify the compliance of motor carriers with size, weight, safety and credentials regulations, and emergency response systems.

- Promote the use of electronic toll collection (ETC) and electronic payment systems (EPS) to improve traffic flow efficiencies and reduce infrastructure requirements.

- Implement procedures and systems that cost-effectively manage work zone activities.

- Manage lane closure prediction and scheduling.

- Collect/Maintain data on work zone locations and delay and alternate routing for mainlines and standard diversion or evacuation routes.

- Automate speed enforcement and variable speed limits in work zones.

- Support advanced traveler information systems (ATIS).

- Provide evacuation guidance that includes basic information to assist potential evacuees in determining whether evacuation is necessary. Once the decision is made to evacuate, the services will also assist evacuees in determining destination routes to shelters and other lodging options. This function will also provide guidance for returning to evacuated areas, information regarding clean up, and other pertinent information to be distributed from federal, state, and local agencies.

- Provide evacuation travel information that will benefit evacuees in planning their evacuation trip once that decision has been made. This function will also allow travelers to change course during the trip based on route and destination conditions.

- Provide evacuation traffic management to assist evacuation coordination personnel in the management of evacuation operations on the transportation network.

- Provide evacuation planning to support the evacuation process by providing information, current and historical, to emergency management planning personnel.

- Promote evacuation resource sharing to allow information and resource sharing between agencies involved in the evacuation including transportation, emergency management, law enforcement and other emergency service agencies.

- Improve the coordination of construction activity and other roadway activities with maintenance.

- Provide infrastructure security against terrorist attacks.

3.4.3 Information Sharing

- Coordinate data collection and information processing, management, and distribution.

- Coordinate data collection programs and sensor installation/operations.

- Inform and exchange data through coordinated operations.

- Centralize information processing, management, and storage.

- Open access to information delivery and use.

- Coordinate information report development.

- Coordinate transportation management strategy development.

3.5 Ideal Solutions

To achieve these goals and objectives and fulfill the themes and strategies for implementation, the following major types of deployments are anticipated as the ideal solution for ultimate deployment:

- Deployment of full scale freeway management systems (FMS) and incident management systems (IMS) on the five principal FIHS limited-access corridors –
  - Coordinated ITS interregional operations;
  - Full scale FMS and IMS in urbanized areas;
  - IMS at a minimum in rural areas including RR Service Patrols; and
  - E-911 services.

- Statewide ATIS and 511 services –
  - ATIS and 511 in the urbanized/transitioning counties; and
  - Statewide ATIS and 511 along each corridor for emergency management and evacuation coordination.

- Statewide central data warehousing of traffic and incident data to support ATIS and 511 services and to support highway performance monitoring and evaluation.

- Full scale deployment of the *CVO/Commercial Vehicle Information Systems and Networks (CVISN) Business Plan*.

- Smart work zones for all sites where capacity improvements and maintenance and construction operations on the FIHS corridors are located.

- Systems and operational integration of FMS with arterial management systems (AMS).

3.6 Need for Working Policies

Working policies are needed to support each of the themes and strategies. However, the development of these working policies is outside the scope of work for this operational concept effort. These policies should address more specifically how each theme and strategy should be implemented and what the responsibilities for the stakeholders in each will be.

4. Deployment Issues

Through the deployment of these existing ITS, a number of critical ongoing issues have emerged that should be addressed in order to achieve successful ITS deployment along the FIHS limited-access corridors.

4.1 Incorporating Legacy and Sunk Investments

The ITS program must take full account of the need to preserve legacy systems and make maximum use of sunk investments in existing infrastructure and organizational arrangements. For example, if TMC software is being used successfully, plans for future TMC software should build on this deployment and migration to new statewide TMC software should occur over time to manage risk and leverage existing investments. Similarly, field equipment that does not meet current standards should only be replaced in accordance with normal maintenance schedules unless the existing element can not be fully integrated into new software or comply with other standards migration.

4.2 Partnering with Local Operational Management to Achieve Synergy

There is a huge opportunity to boost the effectiveness and efficiency of the proposed ITS deployment through the exploitation of synergy and the development of suitable regional partnering arrangements. The full exploitation of opportunities to share infrastructures such as sensors, information delivery systems, command and control, and communications systems will ensure cost effectiveness, minimize risk, and maximize the delivery of real benefits to Florida's transportation customers. This infrastructure and information sharing will also enable the delivery of innovative services and additional value to the customer. For maximum effect, such collaboration should span the full range of activities from research and development, planning and deployment, through funding, procurement, and evaluation, to commissioning and operational management. This cooperation should span the primary operational agencies involved, such as the respective FDOT districts along the corridors, but should also encompass other transportation partners such as metropolitan planning organizations (MPOs), law enforcement agencies, emergency services, and local governments in full support of successful planning and implementation of ITS on an integrated regional basis.

4.3 Promoting Efficient Operations and Management

Operations and management have become a critical part of the overall application of ITS since the use of information and communications technologies have the greatest impact in this part of the transportation system management process. Due to the complex nature of ITS, the need to support data sharing, and the application of complementary management strategies and procedures, care must be taken when developing and defining operations and management approaches. The development of common procedures for similar tasks in different partner organizations and the agreement to apply pre-defined, coordinated management strategies will be important elements in meeting this challenge. These coordinated management strategies will support cooperation and sharing of work efforts in the definition of such procedures, staff training, and implementation support.

4.4 Integrating Software to Promote Statewide Coordination and Communications

Early ITS deployment activities in the state have resulted in a set of legacy software platforms that must be integrated to support the data and information sharing required to achieve statewide objectives. Bringing the software to a common base of functionality in support of agreed operations and management strategies is an important step in meeting this challenge.

The ITS Office recently completed a *TMC Software Study* with the Michigan Department of Transportation that looked at synergies and reducing costs for TMC software. The study recommended the following:

- Do not abandon the current efforts underway at TMCs within the state. Continue those development efforts over the short-term.

- Begin development of a statewide operational concept to define what capabilities are required for both statewide and district-by-district operations. Buying software systems to satisfy non-codified requirements is inefficient. This effort has begun under the direction of the ITS Office as part of developing functional requirements to support procurement of a statewide TMC software.

- Based on the statewide definition of requirements, begin development of a statewide library of functional components. These will form the basis of new deployments and eventually replace components of existing systems. Seek to inform multi-state coalitions for software expenditures.

- Use a currently deployed, commercially available system already licensed to Florida (PB Farradyne's MIST$^{TM)}$ for short-term implementation needs. Pay careful attention to system network design to assure that transition to statewide components can be accomplished efficiently as they become available.

- Utilize statewide buying power (for quantities) to acquire national standards-compliant hardware.

The integrated statewide TMC software system will provide a unifying platform to ensure that technologies can work together smoothly and efficiently. The statewide TMC software system will allow unified function of TMCs, toll collection, freeway and incident management, traveler information over wireless, microwave, copper, and fiber optic communications.

4.5 Developing Statewide Standards, Specifications, Procurement Guidelines, and Performance Measures

To support the effective and complete implementation of the desired end-state as defined by the corridor-wide ITS architecture, standards will be required. These standards will need to address the major interfaces between subsystems and can be derived from standards development work at international, national, or local levels. Subsystems will also need to be addressed through the development of standard specifications for devices and components to be integrated and the specification of equipment packages for procurement. In support of effective procurement of the ITS hardware and software required, procurement guidelines and bulk purchase arrangements will be required.

4.6 Balancing the Need for Local Autonomy and Control with Centralized Coordination and Cost Efficiency

The need and desire for increased service coordination has been clearly identified in the course of the architecture development work. The preservation of local management and control in support of the independent pursuit of transportation policy objectives has also been identified as a primary requirement. In order to support the attainment of both objectives, the technical and organizational elements of the systems will need to be carefully balanced. Subsystems and interfaces must be designed to support the balanced application of data and information sharing, with the implementation of locally directed strategies and procedures. Operating and management procedures and approaches are defined in this technical memorandum.

4.7 Implementing Services to Provide Coordinated Operations, Active Facilities Management, and Information Sharing

The primary elements of the desired future ITS state have been captured and defined from a systems perspective in terms of logical and physical architectures and directly mapped to a range of desired ITS User Services that will be supported by the architectures. This end-state has been defined in terms of three major themes or service groups – coordinated operations, active facilities management, and information sharing. The effective implementation of these services will require the definition of technical and organizational strategies and tactics that fully support their development and introduction in a logical, financially viable manner.

4.8 Supporting the Needs of the Full Range of ITS Users Including Commuters, Tourists, Commercial Vehicles, and Evacuees

It is recognized that the intended user group for the services to be provided by the corridor-wide ITS deployment is composed of several different sub-groups, the most important of which include commuters, tourists, commercial vehicle operators, and evacuees from natural or man-made disasters. The strategies and tactics devised to support the development and subsequent operations and management of the ITS deployments must take full account of the varying needs of each of these sub-groups. For example, users in the commuters' sub-group will have a focus on access to traveler information and traffic management from a number of different information delivery channels. Strategies and tactics to leverage existing and planned information delivery systems, operated by both public and private organizations, will need to be developed to address this need. Users in the tourists' sub-group may well be interested in information regarding access to recreational and resort areas or specific tourist attractions. In this case, there may be a need to strike partnership arrangements with tourism and leisure industry operators for the provision and collection of traveler information. In the case of the commercial vehicle operators, the need may revolve around the estimation of travel times and the improvement of travel time prediction accuracy and travel time reliability. This may require strategies that make use of public sector roadside infrastructures for travel time data collection and that harness private sector CVO information and fleet management services to deliver the required information in a cost-effective manner. For evacuees, links to shelter management personnel, travel time, and weather information are critical.

4.9 Deploying ITS in a Coherent, Structured Manner that Provides a Complete Backbone of ITS Services along the Five Principal FIHS Limited-Access Corridors at an Early Stage

This overall *ITS Business Plan* must support a logical deployment sequence that fully supports the effective and efficient deployment of the corridor-wide ITS in an optimum sequence over time and geographical coverage areas. This must take into account past and current public sector deployments and planned private sector initiatives.

4.10 Developing Efficient and Rapid Deployment Based on Practical Experience and Lessons Learned Throughout Florida and Nationally

The deployment sequence identified and supported in this *ITS Business Plan* must also address the need to support efficient and rapid deployment of several "early winner" projects and initiatives. These should be selected on the basis of lessons learned and experiences gained in the course of prior deployments in Florida and nationally. Early elements of the deployment sequence ideally should be robust, low risk, high confidence projects that make use of proven technologies.

4.11 Supporting the Effective Development and Deployment of the Communications Infrastructure Required to Support ITS, Including the Florida Fiber Network (FFN)

The plan must also provide support for the effective planning and deployment of the communications infrastructure required to support the level of data and information sharing desired. The definition of strategies and tactics that define the public sector investment program and potential public-private partnership opportunities will be essential. In particular, the FFN element of the communications infrastructure represents a key part of the communications capability required for the corridor and the state. Consequently, the overall *ITS Business Plan* activities must provide full support for the ultimate development and deployment of this infrastructure.

4.12 Supporting Continued Professional Capacity Building and Training

To support the progression from conventional transportation network deployment and management to the application of advanced technologies, improved professional capacity building education and training will be required. ITS Florida has been tasked with coordinating ITS training activities in Florida. Strategies and tactics should be defined in the *ITS Business Plan* to support the development of current capabilities, the identification of future needs, and the development of new education and training capabilities that fully support the development, deployment, and operation of the proposed ITS.

ITS Florida has also initiated a structured training program to support training needs throughout the ITS profession in Florida that will supplement training programs developed by FDOT.

4.13 Use ITS to Support Public Safety

The September 11, 2001, attacks by terrorists in New York City, Virginia[7], and Pennsylvania have resulted in a heightened awareness of public safety issues. ITS provides information that may be useful in certain situations for law enforcement to prevent similar attacks using surface transportation systems in Florida.

ITS can also play a role following man-made or other disasters. The role of ITS as a traffic management tool and the use of information systems to support disaster recovery efforts has tremendous potential to reach a large number of travelers and prevent unnecessary delays or further damages. Continued study of the potential role of ITS in these scenarios is needed.

4.14 Life-Cycle Considerations

Little attention has been given to the full funding of life-cycle costs for ITS deployments in the past. For traditional highway improvements, life cycles are planned to be twenty years for pavement structures and fifty years for bridges. However, the life cycles of ITS elements can be as short as three years for some information technology hardware and typically five to seven years for field devices such as closed-circuit television (CCTV). The replacement costs of these field devices, software upgrades, and migration to meet new standards and performance specifications should be careful considerations of any program plan. A ten-year life cycle is recommended for planning purposes.

[7] The Pentagon is located along the western banks of the Potomac River in Arlington, Virginia.

4.15 Proving Technology Through Research and Pilot Studies

ITS technology and strategies are emerging at a rapid rate. Prudent use of emerging technologies is dependent on adequate research and demonstration in pilot studies prior to a broad adoption. This approach will manage risk and ensure resources are being utilized for proven technologies.

4.16 Performance Measures and Evaluation

> ***We measure ourselves for two reasons - to make sure we are spending the taxpayers' money as efficiently as possible and to try to improve how we provide transportation to the people of Florida.***
>
> Secretary Tom Barry

Performance measures are "yardsticks" that transportation agencies use to measure their operating results and to assess investment options. Performance measures can be used by FDOT to help focus their limited resources to better serve customer needs. By defining specific measures, FDOT will be able to better define the goals and objectives and measure the effectiveness of their programs in meeting these objectives.[8] The measures will help FDOT staff to be more effective and more accountable to citizens of Florida. The ability to focus on and measure results will also assist FDOT in allocating resources more consistently with its objectives and to identify needs in a more consistent manner. Secretary Tom Barry recently stated, "We measure ourselves for two reasons – to make sure we are spending the taxpayers' money as efficiently as possible and to try to improve how we provide transportation to the people of Florida." Performance measures are becoming an important part of the way government works in Florida and by proactively approaching the development and recommendation of these measures, FDOT is ensuring its long-term sustainability by having measures that reflect their mission statement.

FDOT's mission is to:

"Provide a safe transportation system that ensures the mobility of people and goods, while enhancing economic prosperity and sustaining the quality of our environment."

FDOT establishes the goals and objectives for the state transportation system from its mission statement. The *Florida Transportation Plan* includes a long-range component that establishes goals and objectives for twenty years and a short-range component that establishes objectives for the next ten years. The long-range component is updated every three to five years and the short-range component is updated annually. Progress towards the accomplishment of FDOT's objectives is reported on an annual basis in the *Annual Performance Report*. In this context, ITS

[8] The measurement of transportation system performance is a complex problem and many externalities, such as the economy and resulting changes in driver behavior, can have profound impacts on system performance. These external factors are outside FDOT's control and, therefore, the use of performance measures only in the assessment of agency performance may not accurately reflect the full effectiveness of FDOT.

performance measures are just one type of performance measure FDOT uses to evaluate agency performance. Other performance measures used by FDOT include mobility, safety, pavement condition, bridge condition, public transportation facility asset management, and environmental concerns.

Similar to the FDOT's other major programs, ITS performance measures are needed to assess the agency's performance in supporting the *Florida Transportation Plan* through ITS deployments. The types of measures needed include mobility- and safety-related performance measures and agency oriented-measures.

4.17 Integration of ITS Data and Planning Data Systems

Data collected through the instrumentation of transportation systems provide an opportunity to improve transportation planning as a whole. However, the operational data is collected using ITS and the planning-related data is collected through Florida's telemetered traffic monitoring system (TTMS). Significant synergies and costs savings are possible through the integration of these data sources.

5. Current ITS Plans and Programs

5.1 Freeway and Incident Management Services

FDOT has been very active over the last few years in developing freeway and incident management plans for deployments in a majority of the eight districts. Each of these plans and existing deployments has been carefully inventoried and the existing and proposed locations of field devices to support these deployments have been identified. **The existing district ITS plans address most of the FIHS limited-access corridors.** Remaining geographical system gaps along these corridors include:

- I-10 – Madison, Suwannee, Columbia, Baker, and Nassau Counties, District 2;
- I-75 – Alachua, Columbia, and Hamilton Counties, District 2;
- I-75 – Broward County, District 4;
- I-95 – Martin, St. Lucie, and Indian River Counties, District 4; and
- I-95 – St. Johns and Nassau Counties, District 2.

These plans consist of freeway and incident management services involving:

- Vehicle detector systems;
- CCTV cameras;
- DMS and other types of information signs;
- Roadway weather information stations (RWIS);
- HAR;
- Communications systems to link these field devices with RTMCs;
- RTMCs and TMCs to manage and operate these facilities;
- Provisions for center-to-center communications involving the RTMCs, TMCs, other transportation, law enforcement, fire and rescue, and emergency control centers;
- HAR networks and commercial radio traveler services (TiRN™);
- ETC systems, automated vehicle identification (AVI), and automated vehicle location (AVL) systems using ETC on toll roads;
- Incident management services involving RR Service Patrols; and
- Roadside assistance using motorist aid call boxes.

The typical spacing for the primary field devices identified in these plans is summarized in Table 5.1.

Table 5.1 – Field Device Spacing for Existing or Planned Deployments by District

District	HAR (miles)	CCTV (miles)		DMS (miles)		Detectors (miles)	
		Urban	Rural	Urban	Rural	Urban	Rural
1		1	1	At interchanges	At interchanges	0.5	2.0
2		1	N/A	1	N/A	0.5	N/A
3		1	At interchanges	At interchanges	At interchanges	0.5	At interchanges
4		1	1	2	2	0.5	N/A
5		0.5	1	At interchanges	At interchanges	0.5	1
6		1	1	1	N/A	0.5	N/A
7		1	At interchanges	At interchanges	At interchanges	0.5	At interchanges
Turnpike*	3	1	1	At interchanges	At interchanges	0.5	0.5
Recommended Spacing	3	1	At interchanges	1	At interchanges	0.5	2

* The Turnpike's Communications Master Plan calls for CCTV cameras at one-mile intervals and vehicle detection stations on both sides of the Turnpike at half-mile intervals for the entire length of the Turnpike. Actual CCTV camera and vehicle detector station deployment in rural areas may be at significantly greater intervals. In the initial deployment phase, CCTV cameras are to be installed at each of the DMS sites. There are 19 DMS installations currently underway with the 20th programmed but not yet sited. Spacing of the DMS devices is dictated by the ability to effectively provide for Turnpike traffic diversion routing. Nine HAR transmitter sites on the Turnpike mainline are currently active.

N/A – Not Applicable. No plans are available to determine device spacing.

As illustrated in Table 5.2, device spacing standards for urban and rural applications should be developed and agreed upon by all districts to ensure consistent statewide device coverage.

Technical Memorandum No. 3.5.1 – Standard Specifications for ITS Devices and *Technical Memorandum No. 3.5.2 – Standards Application Plan* address the specific functional requirements and standards for each of these devices for deployment along these corridors.

5.1.1 CCTV Surveillance

For urban areas, more dense system surveillance coverage is needed to support traffic management functions and provide incident data to support traveler information. For rural areas, surveillance using CCTVs is typically needed only at major interchanges and areas where above average numbers of accidents have been documented, as well as areas where the direction of traffic has been reversed during hurricane evacuation activities. Full CCTV surveillance is typically required at one-mile intervals.

5.1.2 Vehicle Detection Systems

Vehicle detection systems are required less frequently in rural areas than urbanized areas. Typical spacing is recommended at two-mile intervals in rural areas or at major interchanges; however, half-mile spacing is required in urban areas.

5.1.3 Traveler Information (DMS/HAR)

In rural areas, traveler information needs are oriented to long-distance travel times and major incidents such as crashes, lane closures, and construction zones. Primary markets served are tourism and commercial vehicle operations. Wide-area coverage of traveler information using HAR is more cost-effective than the use of permanent DMS. However, DMS at major interchanges may be more efficient.

Traveler information needs are oriented to shorter trips and commuter market places that are most concerned with predictability and reliability of travel times. Information on incidents such as crashes, lane closures, and construction zones is needed. DMS signs should be located in advance of interchanges or at one-mile intervals (whichever is greater) in urbanized areas.

Table 5.2 identifies the functional gaps where existing services with any current plans in place would not meet the recommended deployments identified in the active facilities management and coordinated operations themes or device spacing criteria recommended in Table 5.1. Information sharing is addressed in Section 2.2.

Table 5.2 – Functional Gap Analysis for Freeway and Incident Management Services

Functional Segment	Coordinated Operations	Active Facilities Management
I-4 ITS Corridor		
I-4 District 7	✓	✓
I-4 in District 1 from District 7 to U.S. 27	✓	✓
I-4 in District 5 from U.S. 27 to I-95	✓	✓
I-10 ITS Corridor		
I-10 in District 3 from the State Line to U.S. 19	✓	✓
I-10 in District 2 from U.S. 19 to I-95		
I-75 ITS Corridor		
I-75 in District 6 from SR 826 to SR 821	✓	✓
I-75 from SR 821 in District 6 to U.S. 27 in District 4		
I-75 in District 4 from U.S. 27 to CR 833		
I-75 in District 1 from CR 833 to Alico Road	✓	✓
I-75 in District 1 from Alico Road to U.S. 301	✓	✓
I-75 from U.S. 301 in District 1 to SR 50 in District 7	✓	✓
I-75 in District 7 from SR 50 to U.S. 98 in District 5		
I-75 in District 5 from U.S. 98 to CR 318 in District 2	✓	✓
I-75 in District 2 from CR 318 to I-10 in District 2		
I-75 in District 2 from I-75 to State Line		
I-95 ITS Corridor		
I-95 in District 6 to Ives Dairy Road in District 6	✓	✓
I-95 in District 4 from Ives Dairy Road in District 6 to SR 706 Indiantown Road in District 4	✓	✓
I-95 in District 4 from SR 706 Indiantown Road to CR 512 in District 5		
I-95 in District 5 from CR 512 to U.S. 1 in District 2	✓	✓
I-95 in District 2 from U.S. 1 to I-295 South		
I-95 in District 2 from I-295 South to Airport Road	✓	✓
I-95 in District 2 from Airport Road to State Line		
Florida's Turnpike		
Mainline to I-95 (N)	✓	✓
Mainline to I-75	✓	✓
HEFT (SR 821)	✓	✓
Sawgrass (SR 869)	✓	✓
SR 528	✓	✓
SR 417	✓	✓

Notes:

(1) Plans for implementation of information sharing-related deployments include ATIS, 511, and HAR services and are discussed in Section 5.2.

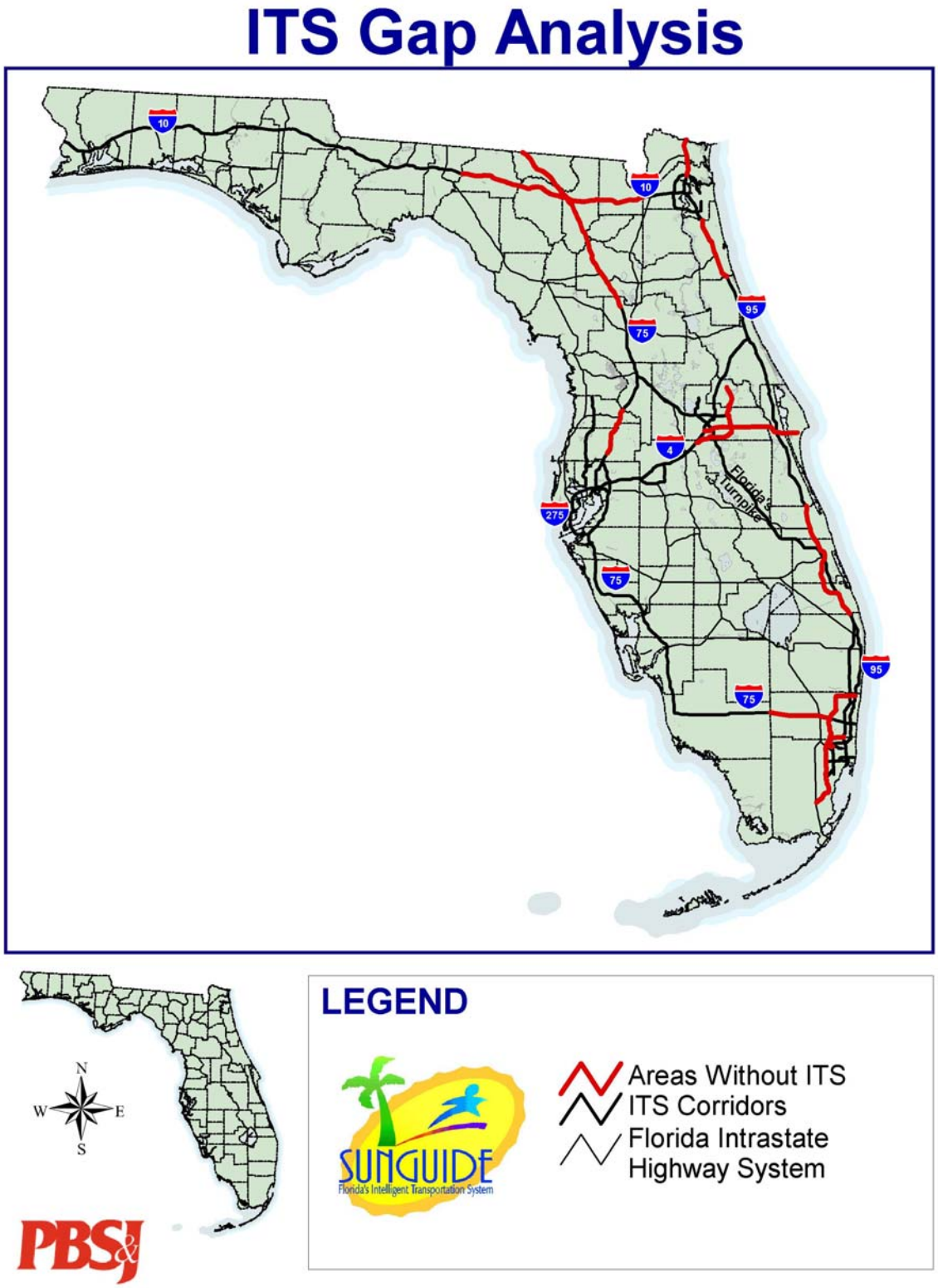
(2) ✓ **i**ndicates existing, programmed, or planned services that will satisfy the basic requirements for the implementation theme.

The segments identified in Table 5.2 as having functional gaps for active facilities management or coordinated operations are illustrated in Figure 5.1 and include:

- I-10 – Madison, Suwannee, Columbia, Baker, and Nassau Counties, District 2;
- I-75 – Alachua, Columbia, and Hamilton Counties, District 2;
- I-75 – Broward County, District 4;
- I-75 – Miami-Dade County, District 6;
- I-95 – Martin, St. Lucie, and Indian River Counties, District 4;
- I-95 – St. Johns and Nassau Counties, District 2;
- Sawgrass – Broward County, Turnpike;
- SR 528 (Bee Line Expressway) – Orange County, Turnpike; and
- SR 417 (Florida Greeneway) – Orange and Seminole Counties, Turnpike.

Along these gaps, deployments were proposed to fulfill the desired level of service (LOS) and instrumentation along the freeways in the *ITS Corridor Master Plans*. A summary of these corridor plans is provided below.

Figure 5.1


ITS Gap Analysis
10
10
95
75
4
Florida's Turnpike
275
75
95
75
N
W
E
S
PBS&J
LEGEND
SUNGUIDE
Florida's Intelligent Transportation System
Areas Without ITS
ITS Corridors
Florida Intrastate Highway System

5.2 Advanced Traveler Information Services (ATIS)

5.2.1 Regional ATIS and 511 Services

During 2002, a *Statewide 511 Implementation Plan* was developed that outlines the following vision for 511:

- By 2005, all travelers in Florida will be able to dial 511 to access travel-related information by telephone.

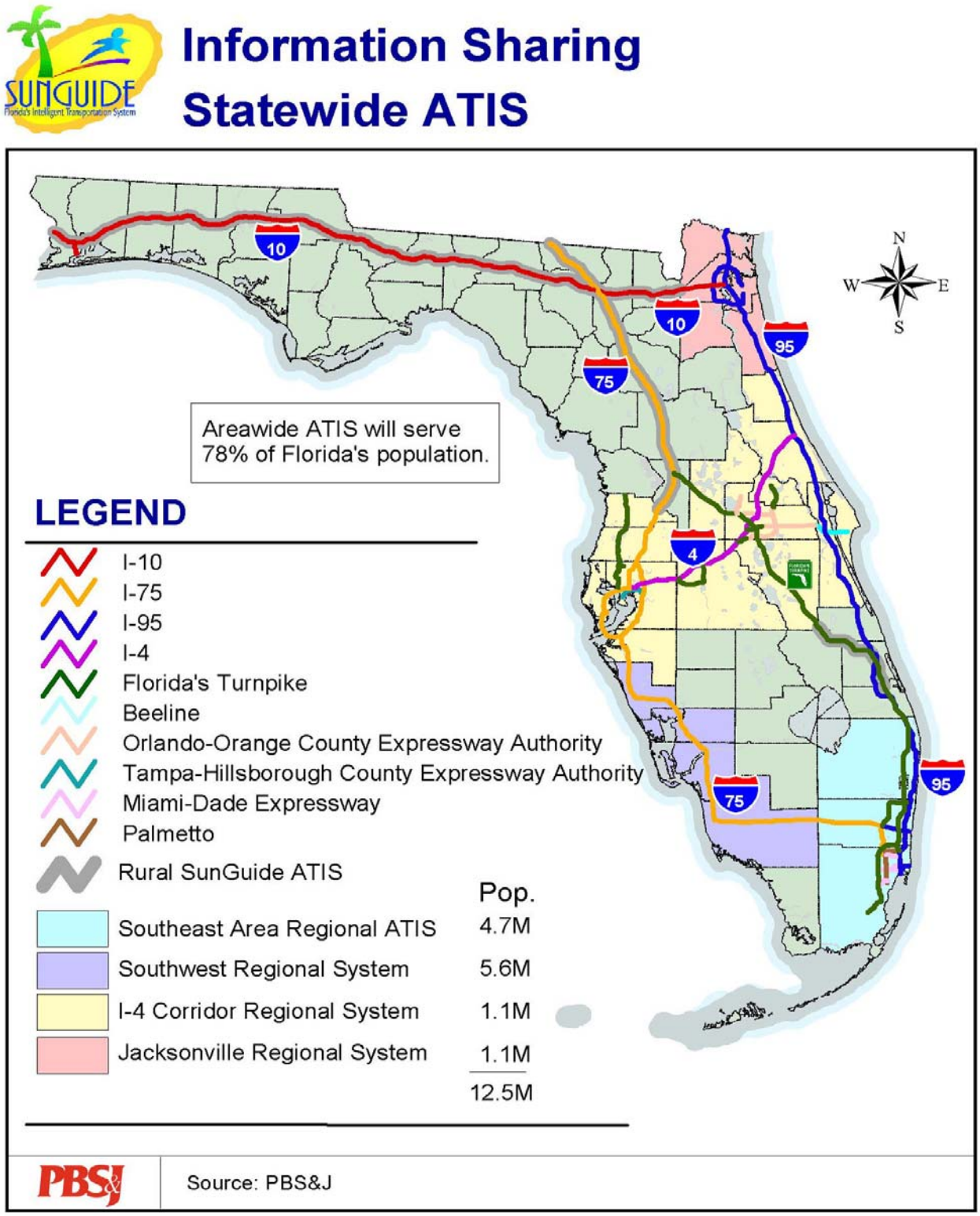
- At a minimum, information relevant to roadway and transit-based travel will be available. More detailed information will be available in urban areas where ATIS are in place.

- This basic level of information will be available at no additional charge to callers, although in some cases local telecommunications or wireless airtime charges may apply. In some cases, additional services could be provided via 511 (some for a fee) that provide further value to callers.

- 511 services will be implemented and operated in a sustainable fashion, minimizing public sector funding requirements. The 511 service will be marketed so that it will become a common term in Florida.

The vision includes the establishment of four regional ATIS systems using the 511 dialing code and an overlying system that will allow users to receive "high-level" information in areas where there is no regional system. As illustrated in Figure 5.2, the regional systems will serve 78 percent of the state's population and most of the tourist areas. The systems will also link to and between each other, both regionally and statewide. For example, a traveler in Miami may dial 511 and request information for the highways in the Miami area, then link to a system with information in Orlando, Jacksonville, or Ft. Myers. Another example would be that a traveler in Tallahassee might dial 511 and receive general highway information for the northwestern part of the state and then link to a more specific system (regional) in Miami or elsewhere. These five interconnected systems will provide seamless statewide services.

Figure 5.2 – Proposed Statewide ATIS



Florida's 511 system will leverage the extensive efforts of the 511 Deployment Coalition in defining the information – or "content" – to be made available. The Coalition's implementation guidelines provide detailed recommendations on the types of content to be provided. (See http://www.its.dot.gov/511/511_Guidelines.htm.) These content guidelines will be the basis for Florida's 511 system. The implementation guidelines establish some concepts regarding content that will be essential elements of Florida's 511 services:

- **Basic and Optional Services** – Basic content will be consistent across all regional systems and the statewide system (although in less detail). Optional content, such as additional public sector-oriented information and/or private sector support services, can be added elements to any of the five services at the discretion of the implementers.

- **Basic highway information is automated, corridor-based, and focused on FIHS.** – Callers will receive recorded/automated messages – at a minimum – for FIHS roadways. The roadways will be individually selectable and divided into logical segments.

- **More detail will be provided in urban areas.** – Due to the increased congestion and importance of information in urban areas, content will be more detailed, roadway segments will be smaller in length, and content update requirements will be more stringent for the regional systems than the statewide system. Table 5.3 illustrates the nature of basic content that will be available in the regional (urban) and statewide (non-urban) systems. In urban areas, estimated segment travel times will also be provided.

- **All major public transportation agencies in urban areas will be invited to provide information via 511.** – Regional 511 systems will work in conjunction with existing customer service centers operated by transit agencies in each region. Providing information on service disruptions, changes or additions, and the ability to offer direct transfers to customer service centers will be explored.

Table 5.3 – Basic 511 Content for Highways

Content Type	Geography		Content Detail					
	Non-Urban	Urban	Location	Direction of Travel	General Description and Impact	Days/Hours and/or Duration	Detours/ Restrictions/R outing Advice	General Forecasted Weather and Road Surface
Construction/Maintenance	✓	✓	✓	✓	✓	✓	✓	
Road Closures/Major Delays	✓	✓	✓	✓	✓	✓	✓	
Major Special Events	✓	✓	✓		✓	✓	✓	
Weather and Road Conditions	✓	✓	✓		✓			✓
Minor Incidents/Accidents *		✓	✓	✓	✓			
Congestion Information		✓	✓	✓	✓			
Emergency Interruptions		✓	✓	✓				
Transit Participation		✓						

* Major Congestion Information and Incidents/Accidents are considered part of the "Road Closures/Major Delays" content type.

To meet the needs of Florida's residents and tourists for reliable information that is easily accessible, the five systems that will collectively deliver 511 in Florida must be consistent in several key areas:

- **Voice Recognition User Interface** – Though the systems may have corresponding touch-tone interfaces, the use of voice recognition is the safest and most easily understood user interface and will be the primary interface for all systems. *(Note: This will require a change to the Southeast Florida SmartRoute service described later in this document.)*

- **Evacuation/Emergency Message Interrupt** – To facilitate quick access to important information in times of emergencies or evacuations, each IVR system will have an override capability to support "alert" messages at the start of the call or at the start of each report. For example, the caller might hear the following message immediately after connection with the 511 service and prior to being offered the options menu:

  > "The following message is being provided as a result of an emergency condition in your area. A hurricane warning is in effect for Miami-Dade, Broward, and Palm Beach counties until midnight tomorrow. The hurricane is expected to make landfall at approximately 10:00 AM tomorrow. All coastal and low-lying areas in the region are under mandatory evacuation orders at this time. Please stay on the line for menu options to access information regarding specific evacuation routes."

- **Americans with Disabilities Act (ADA) Accessible** – FDOT must consider that under Section 255 of the Telecommunications Act of 1996, carriers and equipment manufacturers must provide access to and make their services and products usable by individuals with disabilities "if readily achievable." Title II of the Americans with Disabilities Act prohibits public entities (states, local governments, and any department, agency, or other instrumentality of state or local government) from discriminating against those with disabilities in all services that they provide to the public. FDOT's 511 system will provide disabled community access through telecommunications relay services (TRS).

- **Multi-Lingual** – To offer services to an ever-increasing Spanish-speaking resident and tourist population, each system will be accessible and will provide information in Spanish as well as English. The basis for this determination is Florida's relatively high Hispanic resident population, aside from those who visit the state from Spanish-speaking nations. According to the 2000 Census, 12.5 percent of the population in the United States is people of Hispanic origin, while that in all of Florida is 16.8 percent. In Miami-Dade County, almost 60 percent of the population is of Hispanic descent. Other Florida counties with significantly high Hispanic populations are Osceola with just under 30 percent, Collier with almost 20 percent, Orange with slightly less than 19 percent, Hillsborough with 18 percent, and Broward and Monroe with about 16 percent. Although the fact that a person is of Hispanic descent does not necessarily signify that he or she is Spanish-speaking, the population figures are representative as such.

- **No Link to 911** – No direct link with 911 will be available. A thorough study of a possible linkage to 911, including a message at the beginning of a call (e.g., "If this is an emergency, please hang up and dial 911") has been done; however, the national guidelines have recommended against a direct link to 911 emergency call centers.

- **Branding/Marketing** – From the standpoint of building product recognition and customer retention, a single brand name should be used across all systems. As FDOT uses the SunGuide℠ brand name for the current traveler information projects, it is recommended that the SunGuide℠ 511 name be used to represent the telephonically delivered ATIS services across the state.

5.2.2 Highway Advisory Radio (HAR)

To support evacuation needs along interstate routes that are candidates for one-way operations during evacuations for natural or man-made disasters, a statewide system of HAR is proposed. This system will provide major incident, traffic, and emergency management-related information during these major incidents.

5.3 Commercial Vehicle Information Systems Network (CVISN) Business Plan

Florida is committed to improving the safety and operations of intrastate commercial vehicle travel and enhancing the economy through the implementation and operation of innovative ITS techniques. Florida's *CVISN Business Plan* was recently completed to identify new ITS technologies and strategies to improve CVO and to guide the state's participation in the national CVISN program.

Currently several ITS CVO deployments operate within the state of Florida including:

- WIM technology at interstate weigh stations;
- Utilization of ASPEN-equipped laptop computers;
- Participation in a national preclearance program; and
- Participation in national-level information systems for commercial drivers' licensing and safety data management.

The *CVISN Business Plan* recommends projects for incremental implementation to improve the CVO regulatory system, ensure CVO safety, guide CVISN deployment, and optimize safe and efficient travel throughout the state. The projects recommended for deployment include:

- Electronic Credentialing Software Design and Development;
- Automated Routing and Permitting Software Design and Development;
- Networked Information Systems Design and Development;
- Electronic Screening at Weigh Stations;
- Electronic Screening at Agricultural Inspection Stations;
- Compliance Help Desk/Service Representative; and
- International Fuel Tax Agreement (IFTA) Clearinghouse.

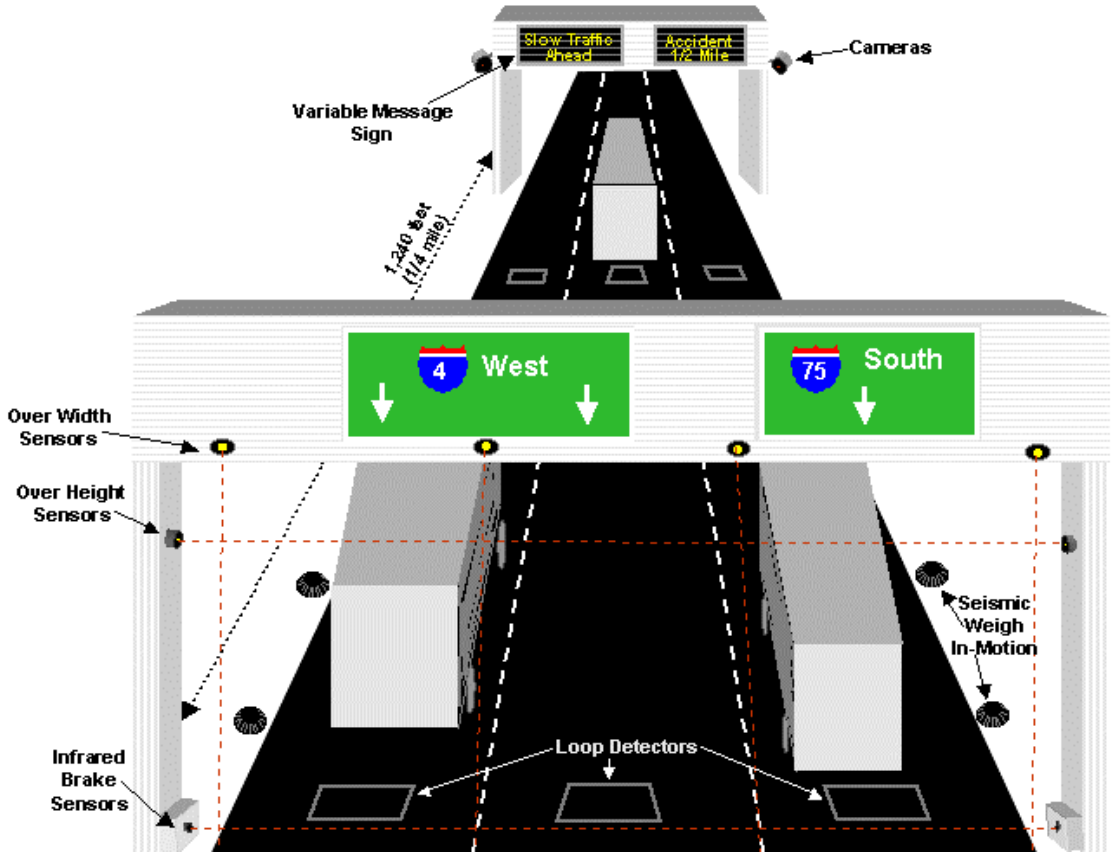
The schedule of deployment for these recommended ITS CVO systems is dependent upon statewide funding and resource allocation.

5.3.1 Virtual Weigh-in-Motion (WIM) Station

The FIHS limited-access corridors were identified as major trade and tourism routes in the FIHS Modal Plan and are critical transportation corridors for Florida's economic prosperity. The reliance on these corridors will continue to grow for carriers servicing intermodal freight and distribution centers given the planned growth in these transportation sectors. In an effort to keep transportation costs down while still maintaining commercial vehicle screening along the corridor, a pilot virtual weigh/screening station is currently being proposed for a research project. The goal of the station will be to provide a low cost and efficient means of performing CVO along the corridor.

The site being considered for application for a virtual weigh station is located in western Hillsborough County along I-4 near the Port of Tampa to screen vehicles moving on and off I-4/I-275 and I-75. The site could be constructed with minimal investment and provide portable seismic WIM scales along the roadside combined with over-height, over-width, and roadside enforcement for a test operation. Once proven successful, traditional scales and other permanent deceleration, storage, and acceleration could be provided. Figure 5.3 illustrates the concept of a virtual weigh station.

Figure 5.3 – Virtual Weigh Station Concept



5.3.2 Work Zone Management Applications

ITS work zone management applications will be implemented over the next several years as several major construction projects are programmed along the interstate facilities. These projects include the utilization of interim surveillance and portable traffic information devices as well as portable, virtual TMCs for construction engineering inspection (CEI) and maintenance of traffic (MOT). The majority of the interim devices will be leased and will not become permanent. However, some districts have instituted policies to work towards permanent placement of ITS devices.

Examples of Florida ITS work zone management applications include:

- District 1 – I-4 Portable Work Zone ITS, Polk County;
- District 4 – I-95 Interim Traffic Management System in Palm Beach County;
- District 5 – I-4 Auxiliary Lane Construction and ITS Relocation/Replacement in Orange County;
- District 7 – I-75 and I-4 Interchange Reconstruction Interim ITS, Hillsborough County; and
- District 7 – I-4 Segment 3A and 3B Reconstruction Interim ITS, Hillsborough County.

The deployment of this application will become more common as the reduction of incidents and improvement in travel times is realized along the intrastate corridors.

5.4 Evacuation Coordination Services

Florida has adopted an ITS strategy for evacuation coordination which involves the option of reversing general-use lanes (GULs) to create one-way facilities during an evacuation for a majority of the five major intrastate facilities. These plans involve reversing the southbound lanes to northbound lanes and reversing east and westbound lanes in the direction of the evacuation. Entrance ramps at the interchanges in the reverse lane direction would be closed to prohibit normal directional flow of traffic during the evacuation event. A few of the evacuation plans have been developed as shoulder use plans which convert the interstate shoulder to a travel lane in lieu of reversing major travel lanes.

These reverse lane and shoulder use plans also include deployment of DMS and HAR for traveler information, barricade and arrow board locations, aircraft surveillance, and the notification and stationing of emergency personnel and vehicles to direct the flow of traffic and provide security.

The Florida Highway Patrol (FHP) and FDOT are developing reverse lane operational plans for the five major intrastate corridors; however, currently only seven locations have been documented and completed. The evacuation facilities and the type of plans are identified below.

Table 5.4 – Major Evacuation Corridors

Facility	Type of Evacuation Plan
Florida's Turnpike from St. Lucie County to Orange County	Reverse Lane
I-75/Alligator Alley from Broward County to Charlotte County	Reverse Lane
I-4 from Tampa to Orlando	Reverse Lane
SR 528 (Bee Line Expressway) from SR 520 to SR 417	Reverse Lane
I-75/Sarasota County from Toledo Blade Boulevard to SR 681	Shoulder-Use
I-75/Hillsborough/Manatee County line to Hillsborough/Pasco County line	Shoulder-Use
I-10 from I-295 in Jacksonville to U.S. 231	Reverse Lane

Source: FDOT and FHP

Additionally, the United States Army Corps of Engineers drafted a study entitled *Southeast United States Hurricane Evacuation Traffic Study* that identifies reverse lane standards and ITS strategies for Florida's intrastate corridors. This study also makes recommendations for the implementation of additional ITS strategies to assist in the safe and efficient evacuation of Florida residents. Table 5.5 illustrates the recommendations.

Table 5.5 – Recommendations for ITS Deployment for Evacuation Coordination

Corridor	Location	Recommended ITS Devices
HEFT	I-75 to U.S. 1	CCTV
I-10	I-75 to SR 285	CCTV, HAR, VMS
I-75	SR 24 to South of U.S. 90	VMS
I-95	SR 528 to U.S. 192	CCTV, VMS
SR 528	U.S. 427	CCTV
Turnpike	SR 870 to Thomas B. Manual Bridge	CCTV

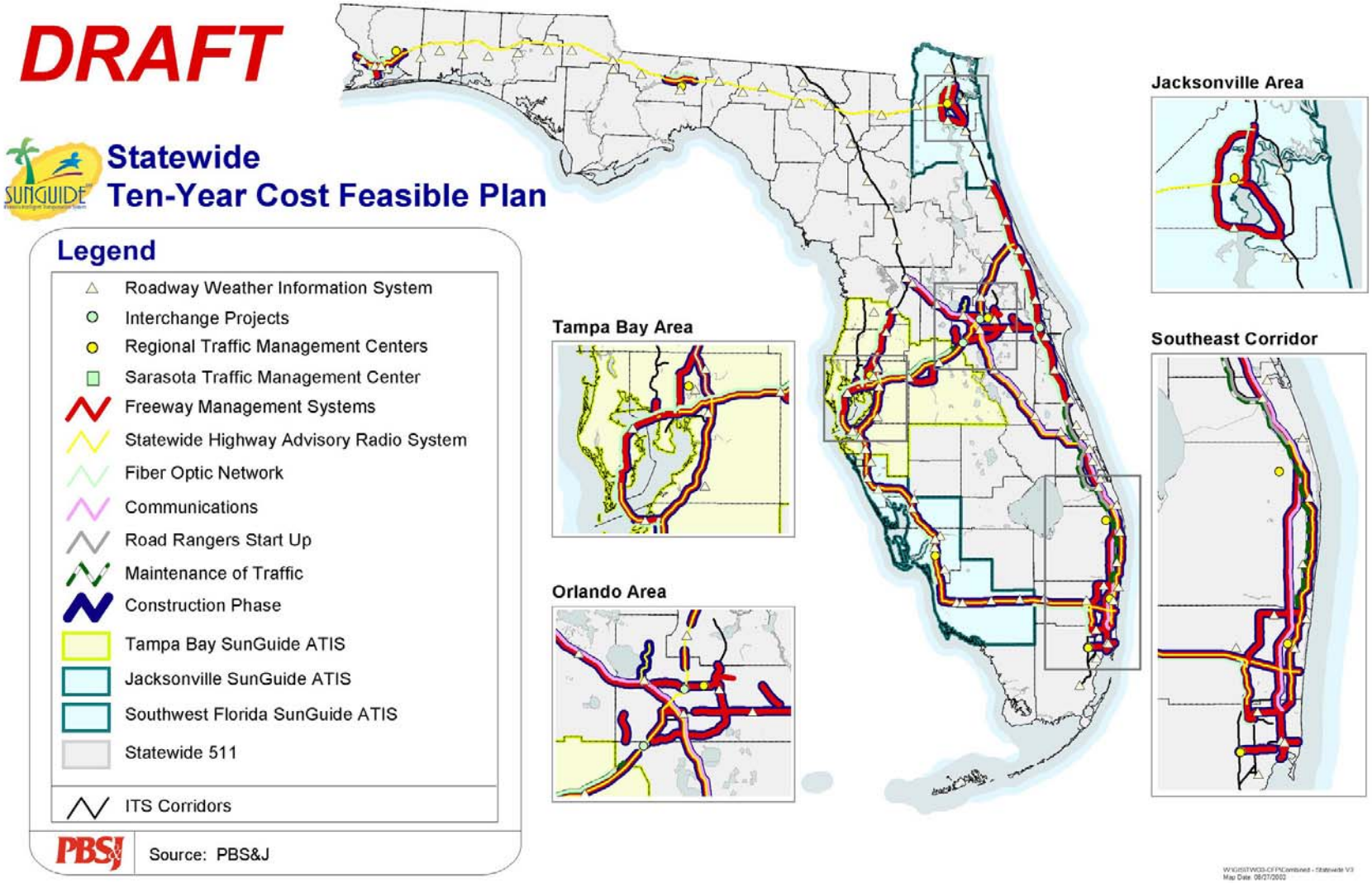
Source: *Southeast United States Hurricane Evacuation Traffic Study, Technical Memorandum 3.*

These recommendations are addressed in the corridor implementation plans through the freeway and incident management services. The primary purpose of these devices would be freeway management services and, since the potential for the landfall of a major storm event typically occurs only once every five years, deployment of ITS devices specifically for one-way operations support was not recommended.

5.5 Ten-Year ITS Cost-Feasible Plan

Figure 5.4 summarizes the ITS projects that are currently programmed for deployment along the FIHS limited-access corridors. These projects are funded using ITS Program funds, district-allocated funds, Turnpike revenue, expressway programs, and private sources and the additional projects that have been identified are funded using ITS Program funds through 2012. These projects are the basis of the concept of operations outlined in the subsequent sections.

Figure 5.4 – Statewide *ITS Ten-Year FIHS Cost-Feasible Plan*



6. Analysis of the Proposed System

6.1 Anticipated Benefits

To determine the effectiveness of the proposed ITS for the FIHS limited-access corridors, the following benefits were identified from studies around the country and were determined to be appropriate:

- A 15 percent decrease in delay is anticipated as a result of IMS based on data provided by the Maryland CHART Program.

- A 15 percent reduction in injury-related accidents and fatalities is anticipated as a result of freeway management services based on data from the Federal Highway Administration's (FHWA) Fatal Accident Reporting System experience in San Antonio.

- A 35 percent reduction in property-damage only accidents is anticipated as a result of freeway management services based on data from the FHWA Fatal Accident Reporting System experience in San Antonio.

- A 7:1 benefit to cost ratio is anticipated for the sum of the activities that will be deployed in FDOT's CVISN program and the virtual weigh station proposed for I-4 in the Tampa area based on the experiences of the Colorado Department of Transportation.

- Benefits associated with ATIS include reductions in travel time and operating costs. Additional benefits are anticipated from congestion avoidance and improvement in the quality of driver convenience. Since no quantitative data was available to support an estimate of these benefits from other areas, a generally accepted benefit to cost ratio of 1.5:1 was used to estimate these benefits.

- Benefits associated with smart work zones are anticipated to include reductions in travel time and operating costs, reductions of accident rates and the severity of accident rates in work zones saving worker and driver lives, and improvement in the quality of driver information. Based on a cost analysis of a smart work zone system on the I-496 project in Michigan, it was determined that the benefit to cost ratio of the system was 2:1.

These generalized benefits will result in significant savings in time and operating expenses for travelers and commercial vehicles operating on the FIHS limited-access corridors. A quantitative assessment of these benefits in relation to the costs of deploying these systems will be made as part of the implementation plans for these corridors.

6.2 Anticipated Impacts

No adverse direct or secondary impacts are anticipated from the deployment of these ITS services. These improvements are believed to be eligible for a programmatic categorical exclusion under the 1969 National Environmental Policy Act (NEPA) as implemented by FDOT's Project Development and Environmental (PD&E) Manual.[9] The following summarizes factors to be considered in the application that is being made for these ITS deployments:

- No adverse impacts to local traffic patterns, property access, community cohesiveness, planned community growth, or land use patterns are anticipated.
- No adverse impacts to air, noise, or water quality are anticipated.
- No wetland involvement is anticipated. There is sufficient flexibility in the siting of field devices in this program that devices can be relocated to avoid any impacts.
- No Coast Guard permits are anticipated since no new crossings of navigable waterways are proposed.
- No flood plain encroachments are anticipated.
- At most, an insignificant amount of rights-of-way is required for this project. There is sufficient flexibility in the siting of field devices in this program that devices can be relocated to avoid any impacts.
- No residential or business impacts are anticipated.
- No adverse impacts to locations registered as historic properties are anticipated.
- No contamination involvement is anticipated.
- The project does not require a public hearing or an opportunity for a public hearing.

During design and construction, the specific siting of these field devices will need to be evaluated and relocated, if necessary, to avoid or reduce any impacts. Since all of the deployments of field elements are planned to occur on FDOT-owned right-of-ways, at most insignificant adverse impacts are anticipated. Some impacts related to right-of-ways may be identified during design that include the need to accommodate construction of additional storage for queuing of vehicles along ramp segments associated with ramp metering or utility connections to field devices for power or communications. Construction of ITS field devices

[9] This eligibility has yet to be formally determined. However, an application for a programmatic categorical exclusion for this project and an issue paper documenting the relevant 23 CFR, 40 CFR, and guidance from the Council on Environmental Quality recommendations were provided to the ITS Office for coordination with FDOT's Environmental Management Office and FHWA.

and communications systems may have temporary adverse impacts such as lane closures. However, these impacts will be temporary and the added benefits when complete outweigh any short-term impacts.

Additionally, exclusion from the NEPA, as proposed in this issue, does not exempt the project from permitting requirements. Some permitting may be required in instances where ITS devices are located outside of the FDOT owned rights-of-way.

6.3 Performance Measures

To track and evaluate the success of ITS deployments, a set of performance measures were defined in *Technical Memorandum No. 3.3 – ITS Program Performance Measures.* Table 6.1 on the following page outlines the recommended performance measures.

Table 6.1 – Recommended *Ten-Year ITS Cost-Feasible Plan* Performance Measures (Goal Area 1)

Goals and Objectives		Performance Measures	Benchmark (for 2012 unless otherwise noted)
1.	**Move People and Goods Safely**		
1.1	**Reduce accident rates.**		
1.1.1	Reduce accident rates caused by driver errors and the severity of accidents.[10]	Accident rate per million vehicle-miles traveled annually.	Reduce accident rates by 15% where freeway and incident management systems are deployed and reduce the severity of accidents by 15% (a reduction of fatality and injury accident rate in proportion to the total rate)
1.1.2	Reduce accident rates and severities in construction work zones.	Accident rate per million vehicle-miles traveled annually.	Reduce accident rates by 15% where smart work zone management systems are deployed
1.1.3	Reduce accident rates at highway-rail grade crossings.	Accident rate per million vehicle-miles traveled annually.	Reduce accident rates by 15% where advanced highway-rail grade crossing systems are deployed.
1.2	**Reduce queuing on interstate mainlines.**[11]		
1.2.1	Reduce queues on limited-access roadways from highway-rail grade crossings.	Queue length (feet) on mainline and the frequency of queue formation (times per year)	Reduce queue length and frequency of queue formation by 15% where advanced highway-rail grade crossing systems are deployed.
1.2.2	Reduce queues at weigh and inspection stations along the corridors.	Queue length (feet) on mainline and the frequency of queue formation (times per year)	Reduce queue length and frequency of queue formation by 15% at weigh and inspection systems where electronic clearance and credentialing is deployed.
1.2.3	Reduce queues at intermodal facilities that impact corridor operations.	Queue length (feet) on mainline and the frequency of queue formation (times per year).	Reduce queue length and frequency of queue formation by 15% at intermodal facilities where inspection systems, electronic clearance, and credentialing are deployed.
1.3	**Improve the safety of commercial vehicle operators in rest areas.**	The number of crimes against commercial vehicle operators in rest areas.	Reduce the number of crimes committed against commercial vehicle operators where surveillance and public safety systems are deployed.
1.4	**Provide evacuation coordination services and emergency management.**		
1.4.1	Provide pre-trip planning information for evacuation coordination.	ATIS coverage.	Dissemination of pre-trip traveler information for evacuations through Information Service Providers (ISP's) to Florida coastal counties.
1.4.2	Provide traffic management during evacuation conditions.	Traffic management services coverage during evacuations.	Management of Traffic information on Florida's five principal FIHS corridors for evacuations.
1.4.3	Manage demand through communication with shelters and other safe harbors.	Communication links to county emergency management centers (EMCs) and shelter management personnel.	Provide communication links from all regional traffic management centers (RTMC') to county emergency operation centers and shelter management personnel and provide shelter information in statewide 511 services.
1.4.4	Provide route guidance information and information on traffic/travel conditions and weather including winds, rainfalls, and storm surges.	Route guidance coverage.	Provide route guidance information during evacuations on Florida's five principal FIHS corridors for evacuations.
1.4.5	Support remote configuration management of highways during evacuation conditions or other emergencies.	Remote configuration deployment coverage.	Provide remote configuration technology deployments along all candidate corridors for contra-flow operations during evacuations.
1.4.6	Provide accurate and timely traveler information regarding incidents on evacuation routes and updated weather information.	ATIS coverage.	Provide ATIS coverage along Florida's five principal FIHS corridors.
1.4.7	Share emergency information among local and regional TMCs and emergency management facilities.	Communication links to county EMCs and shelter management personnel.	Provide a communications link from all RTMCs and links to local county emergency operation centers and shelter management personnel and provide shelter information in statewide 511 services.
1.4.8	Detect, verify, respond to, and clear incidents and manage traffic around accidents, emergencies, and other incidents	Incident response and clearance times.	Minimize the incident response and clearance times during evacuation conditions.
1.4.9	Support infrastructure security through surveillance at critical structures and interchanges.	Percent of critical structures, interchanges with surveillance, and at RTMCs.	Provide coverage at 75% of critical structures on limited-access facilities and at 100% of RTMCs.

[10] The severity of accidents is commonly divided into three strata: accidents involving fatalities, accidents involving injuries (but no fatalities), and accidents involving property damage only.

[11] This objective is intended to promote measures that reduce the queuing that forms on mainlines from surface street elements formed by exiting vehicles.

Table 6.1 – Recommended *Ten-Year ITS Cost-Feasible Plan* Performance Measures (Goal Area 2)

Goals and Objectives		Performance Measures	Benchmark (for 2012 unless otherwise noted)
2.	**Preserve and Manage the System**		
2.1	**Enhance mobility and efficiency.**		
2.1.1	Improve travel times along the corridors.	Total delay in vehicle-minutes.	Reduce delays by 15% where freeway and incident management services are deployed.
2.1.2	Improve predictability and reliability of travel times.	Predictability of travel times in minutes.	Provide travel time prediction models for ATIS capable of predicting actual travel times within 5% of trip duration for 95% of all trips along the five principal FIHS corridors.
		Reliability of travel times measured as the percent of trips that are achieved less than the predicted travel time plus a 20% margin.	Operate and manage the system to provide at least 85% reliability for a 20% margin of trip travel time along the five principal FIHS corridors.
2.1.3	Reduce accidents and other incidents during normal flows that result from congestion and delays that are caused by "rubber-necking" during incidents.	Accident rate per million vehicle-miles traveled annually.	Reduce accident rates by 15% where freeway and incident management services are deployed.
2.1.4	Reduce congestion-related delays by reducing queues and spillback from other facilities.	Queue length (feet) on mainline and the frequency of queue formation (times per year).	Reduce queue length and frequency of queue formation at ramp interchanges where ramp metering and surface street control is deployed.
2.1.5	Reduce delays caused by congestion in construction work zones.	Total delay in vehicle-minutes.	Reduce delay by 15% where smart work zone management systems are deployed.
2.1.6	Manage traffic accessing these major corridors at interchanges to improve mainline throughput and traffic flow.	Total delay in vehicle-minutes	Reduce delays by 15% where freeway and incident management services are deployed.
		Throughput in passenger car equivalents per lane per hour.	Increase throughput in interchange areas by 10% where freeway and incident management services are deployed.
2.1.7	Reduce unnecessary delays at tollbooths	Total delay in vehicle-minutes.	Reduce delay at tollbooths by 10% where electronic payment services are deployed.
2.1.8	Reduce unnecessary delays at the gates of intermodal facilities.	Total delay in vehicle-minutes.	Reduce delay at intermodal terminals by 10% where electronic clearance and credentialing services are deployed.
2.1.9	Provide traveler information services with route and mode choice information.	Advanced traveler information service coverage.	Provide advanced traveler information services along Florida's five principal FIHS corridors.
2.2	**6.3.1.1.1.1.1.1 System Preservation**		
2.2.1	Improve enforcement of illegally overweight vehicles.	Overweight enforcement coverage.	Increase the use of portable overweight vehicle enforcement technologies such as seismic weigh-in-motion (WIM).
2.3	**Incident Management**		
2.3.1	Improve abilities to detect, verify, respond to, and clear incidents.	Incident management service coverage.	Provide incident management services on at least 85% of Florida's five principal FIHS corridors in urbanized areas and at high accident locations in other areas.
		Road Rangers Service Patrol coverage.	Provide incident management services on at least 85% of Florida's five principal FIHS corridors in urbanized areas and at high accident locations in other areas.
2.3.2	Improve incident-related traveler information.	Advanced traveler information service (ATIS) coverage.[12]	Provide advanced traveler information services along Florida's five principal FIHS corridors.
2.3.2.1	Predict delays and clearance times.	Predictability of travel times in minutes.	Provide travel time prediction models for ATIS capable of predicting actual travel times within 5% of trip duration of 95% of all trips along the five principal FIHS corridors.
2.4	**Manage Special-Use Lanes (SULs)**	Freeway and IMS coverage of special-use lanes.	Provide incident management services on at least 85% of special-use lanes along Florida's five principal FIHS corridors in urbanized areas and at high accident locations in other areas.
2.5	**Provide Data Archiving and Warehousing**		
2.5.1	System evaluation and alternative analysis.	Data collection system spatial coverage.	Provide data collection system coverage for all freeway and IMS's deployed.
2.5.2	Support and supplement other statewide data collection programs.	Data collection system functionality.	Document requirements and provide archived data to other statewide data collection programs.
2.5.3	Support highway operational performance reporting, modeling simulation, and other techniques for operations and management of the system.	Data collection system functionality.	Document requirements and provide archived data to highway operational performance reporting, et. al.
2.5.4	Providing before and after studies for ITS deployments	Percent of ITS deployments with before and after data.	Implement before and after studies to document benefits of statewide ITS deployments for at least 10% of all deployments.

[12] Implementation of ATIS requires instrumentation of our highways to provide accurate and reliable travel times in near real-time.

Table 6.1 – Recommended *Ten-Year ITS Cost-Feasible Plan* Performance Measures (Goal Areas 3 and 4)

Goals and Objectives		Performance Measures	Benchmark (for 2012 unless otherwise noted)
3.	**Enhance Economic Competitiveness**		
3.1	**Ensure efficient landside access to intermodal, port, airport, and truck terminal facilities.**	See items 1.1.3, 1.2.1, 1.2.2, 1.2.3, 2.1.8, and 2.2.1.	See items 1.1.3, 1.2.1, 1.2.2, 1.2.3, 1.2.8, and 2.2.1.
3.2	**Ensure efficient intermodal transfer of people and goods.**	See items 1.1.3, 1.2.1, 1.2.2, 1.2.3, 2.1.8, and 2.2.1.	See items 1.1.3, 1.2.1, 1.2.2, 1.2.3, 2.1.8, and 2.2.1
3.3	**Promote safe and efficient access of vehicles to markets.**	See all above.[13]	See all above.
3.4	**Expedite permitting and clearance of commercial vehicles at weigh and agricultural inspection sites to keep commerce moving.**	See items 1.1.3, 1.2.1, 1.2.2, 1.2.3, 2.1.8, and 2.2.1.	See items 1.1.3, 1.2.1, 1.2.2, 1.2.3, 2.1.8, and 2.2.1.
3.5	**Ensure efficient access to major activity centers such as tourist attractions, state parks, and other areas of interest.**	See all above.	See all above.
3.6	**Provide safe and efficient tourist travel and reduce VMT through the provision of accurate and timely traveler information.**	See items 1.4.1, 1.4.6, 2.1.9, and 2.3.2.	See items 1.4.1, 1.4.6, 2.1.9, and 2.3.2.
3.7	**Support designation of corridors as strategic intermodal corridors and funding for ITS deployments.**	See item 2.5.	See item 2.5.
4.	**Enhance Quality of Life and the Environment**		
4.1	**Provide efficient statewide ITS services with autonomy for decision-making to support local needs and regional cooperation to promote efficiency and support regional and statewide goals.**	See all above.	See all above.
4.2	**Improve interoperability of ITS services through the development of statewide uniform device standards and specifications.**	See Goal Area 5.	See Goal Area 5.
4.3	**Support integration of ITS into local planning processes, programs, and capacity projects.**	Publish guidelines on how to mainstream ITS in transportation planning.	Complete Rule 940 Implementation Plan by the end of 2002 and provide regular support of metropolitan planning organizations (MPO's) on ITS planning integration.
4.4	**Provide name recognition of key ITS-related services through branding that will instill trust and confidence in traveler information services, roadside assistance, electronic payment services, and other strategic services.**	Branding of major services.	Adopt statewide brands for (1) traveler information services, (2) roadside assistance and (3) electronic payment services by the end of 2001 and others as needed.
4.5	**Provide easy access and data mining capabilities for transportation planning and design for all partners to support decision-making.**	See item 2.5.	See item 2.5.
4.6	**Provide accurate real-time data to technology, business, and operational users for effective and responsive transportation operations.**	See item 2.5.	See item 2.5.
4.7	**Reduce air-quality emissions from mobile sources.**	See items 2.1.1, 2.1.5, 2.1.6, 2.1.7, 2.1.8, and 2.4.	See items 2.1.1, 2.1.5, 2.1.6, 2.1.7, 2.1.8, and 2.4.
4.8	**Reduce the potential for impacts from HAZMAT incidents.**	See items 1.1.1, 1.1.2, and 1.1.3.	See items 1.1.1, 1.1.2, and 1.1.3.
4.8.1	Improve HAZMAT response systems.	HAZMAT response system coverage.	Provide HAZMAT response coverage on 85% of Florida's principal FIHS corridors in urbanized areas and at high-accident locations in other areas.
4.8.2	Improve the availability of traveler, weather, and shelter information during man-made and natural disasters.	See items 1.4.1 and 1.4.6.	See items 1.4.1 and 1.4.6.
4.8.3	Provide safe routes for HAZMAT that avoid densely populated areas.	Designation and signing of detour routes.	Designate and sign detour routes for Florida's five principal FIHS corridors.

[13] All of the measures identified for ITS support this objective.

Table 6.1 – Recommended *Ten-Year ITS Cost-Feasible Plan* Performance Measures (Goal Area 5)

Goals and Objectives		Performance Measures	Benchmark (for 2012 unless otherwise noted)
5.	**Deploy an Integrated, Effective System**		
5.1	**Provide research and development for technologies to support deployments.**	Continue research and development at existing or greater funding levels.	Promote continued research and development of emerging technologies and activities to support deployments.
5.2	**Develop statewide standards and specifications for ITS field devices.**	Publish statewide standards and specifications for ITS field devices and implement.	Complete by end of 2001.
5.3	**Develop statewide standards for TMC software.**	Publish statewide standards for TMC software.	Complete by end of 2001.
5.4	**Develop a communications architecture and backbone for statewide deployment.**	Publish statewide communication architecture and implement.	Complete by end of 2001.
		Communication backbone coverage.	Pursue private partnerships to advance deployment of statewide communication backbone to achieve 50% coverage of the five principal FIHS corridors.
5.5	**Develop standard procedures for operations and management.**	Publish standard operation procedures.	Complete by end of 2002.
5.6	**Develop statewide information exchange network standards and criteria.**	Publish statewide information exchange network standards and criteria and implement.	Complete by end of 2002.
5.7	**Brand all critical statewide services such as traveler information, interactive voice response (IVR) systems (511 or 1-800), RR Service Patrols, *SunPass*®, Pre-Pass, etc.**	Brand all critical statewide services such as traveler information, IVR systems (511 or 1-800), Road Rangers, ***SunPass***®, Pre-Pass, etc.	Complete by end of 2001.
5.8	**Standardize performance measures and archive data to produce a history of trends and establish benchmarks.**	Publish performance measures and archive data requirements and implement.	Complete by end of 2002.
5.9	**Develop statewide procurement guidelines.**	Publish procurement guidelines and implement.	Complete by end of 2002.
5.10	**Develop a statewide systems engineering process for design, integration, and testing that includes regular updates and enhancements of statewide architecture.**	Publish SEMP.	Complete by end of 2002.
5.11	**Develop statewide procurement contracts to leverage economies of scale.**	Develop statewide procurement contracts.	Complete by end of 2002.
5.12	**Develop an ITS asset management program to track and program replacement parts, migrate legacy systems, and manage the life-cycle of deployment.**	Deploy asset management program.	Complete by end of 2002.
5.13	**Establish a statewide-managed funding program for ITS with project decision recommendations made by the ITS Office.**	Establish statewide-managed funds program.	Complete by end of 2001.
5.14	**Dedicate a percentage of all FDOT funds, statewide-managed and district-allocated, for operations, management, and ITS deployment.**	Implement ITS funding targets for FDOT.	Complete by end of 2002.
5.15	**Update work program instructions to develop traceability with the *Statewide ITS Architecture (SITSA)*.**	Publish work program instruction changes.	Complete by end of 2002.
5.16	**Increase the professional capacity of the public and private sectors in Florida to support planned deployments.**	Publish training needs assessment and implement.	Complete training needs assessment by end of 2001 and implement structured training program by 2003.
5.17	**Promote public-public partnerships to leverage financial and human resources.**	Percent of project costs funded (total cost) by other agencies through public-public partnerships.	One percent of total project costs funded through partnerships on FIHS limited-access facilities.
		Number of regions that implement regional operating organization (ROOs) partnerships.	Establishment of ROO in Orlando, Miami, Jacksonville, and Tampa.
5.18	**Promote public-private partnerships to leverage financial and human resources.**	Percent of project costs funded (total cost) through public-private partnerships.	One percent of total project costs funded through partnerships on FIHS limited-access facilities.

7. Systems Engineering Approach

A systems engineering approach for ITS deployments along the FIHS limited-access corridors was adopted by FDOT's ITS Office that identified major activities needed to ensure FDOT optimizes the resources committed to ITS projects. The approach ensures that the identified projects are driven by stakeholder requirements and that the final deployments meet these requirements. The systems engineering approach emphasizes three areas: program management, technical/project management, and professional capacity building to promote cost-efficient and effective deployments that will be fully integrated and seamless. This process includes the project development process for ITS projects.

7.1 Program Management

The program management functions support the deployment of ITS through the strategic, long-range planning of ITS, process definition, configuration management, and information management. The activities associated with this program area are intended to promote:

- Increased efficiency and cost-effectiveness through the establishment of best-management practices;
- Coordinated deployments, development, and maintenance of the *SITSA*;
- Adoption of statewide ITS standards;
- Development and maintenance of the *Systems Engineering Management Plan* (*SEMP*);
- Provision of model scopes of work and work breakdown structures;
- Support of statewide information sharing and development and adoption of statewide policies and procedures;
- Conduct risk analyses and the provision of technical assistance and support on projects; and
- Quality assurance for all processes used in deployment.

7.2 Technical/Project Management

The technical/project management functions support the technical development of the individual ITS projects deployed in Florida. The activities associated with this program area are intended to ensure that individual ITS projects are deployed in a cost-effective and efficient manner. This program area addresses the requirements of the FHWA's Rule 940 for systems engineering and fully satisfies the IEEE Standard 1220-1998, *Standard for Application and Management of the Systems Engineering Process*. This program area is the traditional emphasis of the systems engineering process for project development and includes:

- Requirements analysis and definition;
- Design;
- Validation; and
- CEI and maintenance.

The activities defined for this systems engineering application include:

- Conceptual design and master plans;
- Design criteria packages;
- Procurement documentation;
- Implementation;
- Operations and management;
- Information sharing;
- Performance evaluation;
- Conflict resolution; and
- Change order management.

7.3 Professional Capacity Building

The professional capacity building functions support the sustainable execution of the systems engineering process and align the program management and technical/project management program areas between FDOT and the ITS stakeholders. These activities are strategically oriented to improve the understanding and effectiveness of ITS deployments. The activities associated with the professional capacity building area include:

- Training for all aspects of ITS deployment;
- Research and development; and
- Mainstreaming ITS with other FDOT activities and transportation partners.

ITS Florida has also initiated a structured training program to support training needs throughout the ITS profession in Florida that will supplement training programs developed by FDOT.

7.4 Roles and Responsibilities

Table 7.1 summarizes the mapping of the requirements of the systems engineering approach proposed in this issue paper to other professionally accepted techniques including FHWA Rule 940 and the Systems Engineering Compatibility Model. The basic process was also mapped to the Florida Statutes to document the authority of FDOT to develop this systems engineering approach.

Table 7.1 also summarizes the proposed roles of the major stakeholders for ITS deployments along the FIHS limited-access corridors. The stakeholders include the FHWA, the ITS Office, the districts, and MPOs.

Recently, ITS Florida has embarked on the development of a structured training program for ITS professionals in Florida. This program will be developed in cooperation with FDOT and other agencies who participate in the ITS Advisory Council.

Table 7.1 – Roles and Responsibilities in the Systems Engineering Approach

Proposed Systems Engineering Approach For ITS Deployments Along FIHS Limited-Access Facilities		Roles and Responsibilities							
		FHWA		ITS Office		District		MPO/Local	
		Role	Resp.	Role	Resp.	Role	Resp.	Role	Resp.
ITS Architecture Conformity in Rule 940 for Regions	Initial Needs, Issues Problems & Objectives	♦	⊙	□	❍	■	●	□	⊙
	Legacy Systems and Stakeholders	♦	⊙	□	❍	■	●	□	⊙
	Stakeholders Participation	♦	⊙	□	❍	■	●	□	⊙
	Concept of Operations and Business Plan	♦	⊙	□	❍	■	●	□	⊙
	Requirements Analysis	♦	⊙	□	❍	■	●	□	⊙
	Project Architecture and System Requirements	♦	⊙	■	●	□	⊙	□	⊙
	Applicable ITS Standards	♦	⊙	■	●	□	⊙	□	⊙
	Implementation Strategy	♦	⊙	□	⊙	■	●	□	⊙
Systems Engineering in Rule 940 for Projects	Concept Designs & Master Plans	♦	❍	□	⊙	■	●		
	Concept of Operations and Business Plan	♦	❍	□	⊙	■	●		
	Design Criteria Packages	♦	❍	□	⊙	■	●		
	Performance Criteria	♦	❍	□	⊙	■	●		
	ITS Standards and Specifications	♦	❍	■	●	□	⊙		
	Analysis of Alternate System Configurations & Technologies	♦	❍	□	⊙	■	●		
	Determine Method of Procurement	♦	❍	□	⊙	■	●		
	Statewide Performance Criteria, ITS Standards and Specifications	♦	❍	■	●	□	⊙		
	Statewide Testing Requirements	♦	❍	■	●	□	⊙		
	Statewide Procedures For Management and Operations	♦	❍	■	●	□	⊙		
Additional Steps Required For Technical/Program Management Systems Engineering & Configuration Management	Risk Analysis	♦	❍	□	⊙	■	●		
	Verification of Design/Design Acceptance	□	❍	□	⊙	■	●		
	Validation/Project Acceptance	□	❍	□	⊙	■	●		
	Information Sharing	♦		□	⊙	■	●		
	Performance Evaluation	♦		■	●	□	⊙		
	Conflict Resolution	♦		□	⊙	■	●		
	Change Order Management	♦		□	⊙	■	●		
	Operations	♦		□		■	●		
	Management	♦		□		■	●		
Systems Engineering Program Management & Professional Capacity Building	ITS Program Plan	♦		■	●	□	⊙	□	
	Maintain Statewide ITS Architecture	♦		■	●	□	⊙	□	
	Systems Engineering Management Plan	♦		■	●	□	⊙		
	Statewide Rules, Policies and Procedures for ITS	♦		■	●	□	⊙		
	Model scopes of work and Work Break Down Structures	♦		■	●	□	⊙		
	Review Products for Consistency with ITS Standards & Specifications for State Contract	♦		■	●	□	⊙		
	Quality Assurance Processes and Reviews	□	⊙	■	●	□	⊙		
	Statewide Information Sharing	♦		■	●	□	⊙		
	Professional Capacity Building and Training	□	⊙	■	●	□	⊙		
	Research and Development of New Technologies	□	⊙	■	●	□	⊙		
	Statewide Technical Assistance and Support	□	⊙	■	●	□	⊙		

Legend –

Roles: ■ Lead; □ Participate; ♦ Advise

Responsibilities: ● Perform; ⊙ Review/Concurrence; O Approve

8. Operations

8.1 Traffic Management Centers (TMCs)

The heart of ITS operations is the TMC. To determine the most appropriate locations for command and control centers for the ITS deployments, a review of the existing TMCs and stakeholder agency boundaries was conducted. A future conceptual RTMC/TMC classification strategy and coverage was developed for the ITS deployments which coincides with programmed changes in the law enforcement dispatch operations and boundaries. These proposed RTMC dispatch co-locations and coverages were recommended to increase efficiency and cost-effectiveness and to coordinate deployment, development, and maintenance of the *SITSA*.

8.1.1 Functional Requirements

Traffic Management Centers – TMCs shall provide the following desirable and minimum functions:

- Desirable Requirements:
  - Incident detection along the limited-access facilities;
  - Video surveillance along the limited-access facilities;
  - Video surveillance of the interchange areas (along the mainline and crossroads);
  - Management and operations of limited-access facilities during incident management;
  - Management and operations of one-way operations during evacuations;
  - Collection and dissemination of traveler information using DMS, HAR, and ATIS services (511 telephone services, Internet, commercial radio, television, text messaging, etc.) for freeway operations and where available along other arterial routes independently or through an ISP contractor for ATIS;
  - Detection of road weather conditions that may impact operations;
  - Identification of construction work zones and activities to support operations and management of these work zones and, where smart work zone management is provided, integration of the smart work zone management into FMS and IMS;
  - Coordination with local traffic operation centers;
  - Coordination with county emergency management centers and the SEOC when appropriate;
  - Configuration management of traffic management software until the statewide TMC software is available (configuration management will then occur at a statewide level). This software should include device drivers, graphical user interfaces, operating systems, databases, and other commercial off-the-shelf software needed to operate and manage the TMC;
  - Coordination with a freeway incident management team involving major stakeholders;
  - Reporting of data needed for performance monitoring and deployment evaluation including HPMS requirements through coordination with the TranStat Office;
  - Traffic and delay prediction to support incident management and performance monitoring (including travel times and travel speeds);

  - Traffic data archiving and data warehousing including regional data sharing capabilities;
  - Center-to-center communications to support major incidents that effect multiple jurisdictions including evacuation;
  - Integration with computer aided dispatch systems for incident detection with regional communications centers (RCCs) and emergency operations centers through co-location, communications links, and software or provision of operation stations in the TMC; and
  - Support APTS – transit, port and airport.

- Minimum Requirements:
  - Video surveillance of the interchange;
  - Management and operations of limited-access facilities during peak demand periods;
  - Traffic data collection to support incident detection;
  - Real-time video display;
  - Real-time video control;
  - Video verification of messages posted on DMS;
  - Incident data archiving;
  - Coordination with all law enforcement, fire/rescue, and emergency management personnel;
  - Management, dispatch, and coordination of RR Service Patrols;
  - System maintenance and management of ITS field devices and communications infrastructure and development of a plan to ensure responsive and preventative maintenance is being carried out;
  - Support operations and management during natural or manmade disasters or evacuations;
  - Maintenance of a list of diversion routes for management of traffic during incidents and evacuations; and
  - Support of lane or road closures during natural or manmade disasters or evacuations.

The primary responsibility for these requirements is at the RTMC. Secondary and virtual TMCs should be capable of fulfilling these responsibilities when required for limited-durations when secondary control is required due to man-made or natural disasters or maintenance activities that would require the primary center to be off-line. The relationship between these centers and the coverage of RTMC responsibilities is identified in Section 8.1.2.

In the major urbanized areas, these services should be provided at LOS 5 as defined in the *ITS Strategic Plan* – 24-hour operations, 7 days a week. In other regions, LOS 4 is recommended – 16-hour operations.

Other functions or institutional agreements that may be considered and addressed in the future, but for which technology is not available to support at this time, include:

- Identification of incident locations identified through cell phones using E-911 services;
- Reverse 911 or 511 services to advise travelers of urgent advisories related to emergencies or road closures; and

- Identification of vehicle travel times and delays using probe vehicle technologies that may include ***SunPass***™ transponders or AVI technologies on transit, police, or emergency vehicles, or cell phone technologies.

Florida Highway Patrol (FHP), Other Law Enforcement, and Regional Communication Centers – The FHP has the primary responsibility for incident site management and law enforcement on the limited-access facilities. FHP's mission is to promote safe driving environments through law enforcement, education, and awareness. FHP provides responses to crashes, crimes, and natural and man-made disasters. FHP also detects, prevents, and enforces criminal laws relating to highway violence, transportation of illegal substances, auto theft, driver's license fraud, and emissions violations. FHP is in the process of consolidating their dispatch and operations centers with other law enforcement agencies throughout the state into RCCs. The location and coverage of these communication centers are discussed in greater detail in Section 8.1.2.

Along the limited-access facilities, FHP and other law enforcement agencies provide the following functions through the RCCs:

- Responds to call box actuations for law enforcement;
- Receives calls using *FHP cellular services;
- Responds to 911 or other calls for assistance;
- Performs crash investigations;
- Manages incident operations;
- Performs traffic management at incidents;
- Initiates and coordinates traffic diversions;
- Coordinates with TMCs and RCCs;
- Coordinates with RR Service Patrols;
- Responds to reports of roadway debris;
- Monitors and reports adverse roadway conditions resulting from infrastructure deficiencies and environmental conditions;
- Provides incident detection and verification to the TMC and vice versa;
- Provides vehicle tracking for emergency vehicles using automated vehicle detection technologies.

Fire and Rescue – Fire and rescue services are provided throughout the limited-access corridors usually in conjunction with emergency management services. Fire and rescue will provide the following functions:

- Response to vehicle crashes and other emergencies;
- Removal and transport of injured persons for medical care;
- Extinguishing and preventing fires related to vehicles and from adjacent lands along the corridors;
- Response and mitigation of HAZMAT spills; and
- Assistance with evacuation operations, response, and clean up of natural and man-made disasters.

Emergency Operations Centers – Each county maintains an emergency operations center in accordance with the *State Emergency Preparedness Plan*. These centers are centrally located and serve as the hub of local information communicated to the SEOC in Tallahassee that, under states of emergency, is commanded by the Governor and is responsible for the deployment and management of all state resources. FDOT, law enforcement, and emergency management agencies are represented in the SEOC. The primary roles of the emergency operations centers are:

- Emergency preparedness for natural and man-made disasters;
- Management and operations of emergency responses and evacuations associated with natural and man-made disasters;
- Recovery and mitigation following disasters;
- Compliance planning and support; and
- Policy and planning coordination among agencies affected by disasters.

8.1.2 Relationship of Traffic Management Centers (TMCs) and Their Coverage

A hierarchy of TMCs was developed to determine which TMCs would serve as the coordinated hub for control decisions, operations, and dispatch and which TMCs would serve as satellite or virtual TMCs, operating as secondary or peak hour ITS control centers for the intrastate corridors.

Three categories of TMCs were identified to distinguish primary and secondary command and control. These include:

- RTMCs;
- Satellite or Secondary Traffic Management Centers (STMCs); and
- Virtual Traffic Management Centers (VTMCs).

Regional Traffic Management Centers (RTMCs) – The RTMCs will serve as the hub for command and control decisions for operations along the intrastate corridors and will coordinate with other operational stakeholder agencies and transportation control centers as necessary. These RTMCs are designated as "regional" based on the following criteria:

- RTMCs are the regional hub for command and control for operations along major limited-access corridors and link to other TMCs and transportation, law enforcement, fire and rescue, and emergency management control centers within a region.
- RTMCs are the hub for data collection and data warehousing within the districts.
- RTMCs provide dispatch for the RR Service Patrols for the intrastate corridors.
- RTMCs are co-located with FHP/Florida Department of Law Enforcement (FDLE) joint communications dispatch centers where possible.
- RTMCs may provide space for other agencies to operate in the RTMC to support coordinated operations and serve as the institutional hub for coordinated operations.

- RTMCs are not necessarily defined by city, county, or district boundaries but by functional requirements for the operations and management of the limited-access facilities.
- RTMCs may provide command and control of arterial traffic management systems as well, where feasible.

This premise requires the designation of as few RTMCs as necessary to maintain efficient and effective ITS operations for each district and the division of corridors for command and control operations.

Existing RTMC Coverage – Currently, only three FDOT RTMCs are operational. These include:

- Miami RTMC located at the FDOT District 6 Office and co-located with the FHP Miami RCC (under construction – interim center located within District 6 headquarters);
- Orlando RTMC co-located with the FHP Orlando RCC at the District 5 Urban Office; and
- Jacksonville RTMC located at the District 2 Urban Office.

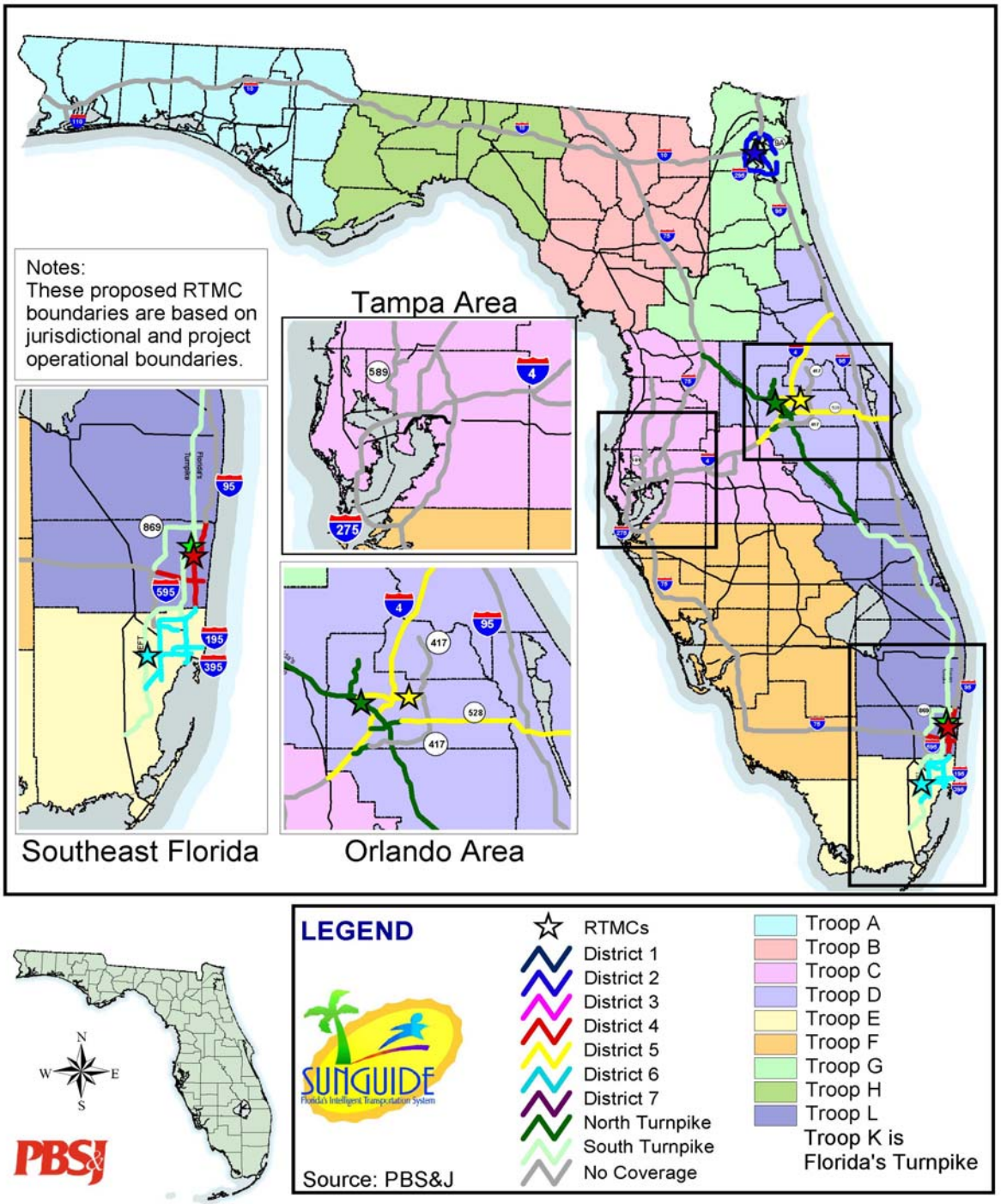
The Miami and Orlando RTMCs are currently co-located with new centralized FHP dispatch centers and the Jacksonville RTMC coordinates closely with the existing FHP Troop G dispatch center. In fact, the FHP Troop G dispatch center serves as secondary control of the I-10 ITS devices when the RTMC is not in operation during evening and weekend hours.

Existing RCC Coverage – Currently, the FHP operates several independent communications centers for each troop throughout their individual districts. However, the current communications centers will be consolidated as the RCC plan is implemented. FHP's personnel will be dispatched from one centralized communications center established for their district, in coordination with other law enforcement agencies. The existing FHP headquarters are currently located at:

- Troop A – West U.S. 98, Panama City;
- Troop B – U.S. 90 West, Lake City;
- Troop C – Adjacent to District 7 Headquarters, McKinley Drive, Tampa;
- Troop D – District 5 RTMC, Semoran Boulevard, Orlando;
- Troop E – District 6 RTMC, NW 111th Avenue, Miami;
- Troop F – 53rd Avenue East, Bradenton;
- Troop G – Normandy Boulevard, Jacksonville;
- Troop H – Mahan Drive, Tallahassee;
- Troop K – Florida's Turnpike, West Palm Beach; and
- Troop L – West Lantana Road, Lantana.

Figure 8.1 illustrates the existing RTMCs, their coverages, and the FHP troop boundaries.

Figure 8.1 – Existing RTMC Coverage



Future RTMC Coverage – As mentioned previously, FHP is implementing a program to establish RCCs for the dispatch of FHP, FDLE, Motor Carrier Compliance Office (MCCO), Alcohol, Beverage and Tobacco (ABT) agency personnel, and resources from each FHP district. A phased implementation plan has been developed for RCCs to ensure that state law enforcement agencies receive efficient, prompt, and coordinated dispatch services and that the appropriate personnel are notified of a critical or unusual incident involving their agency.

Seven RCCs will be established in major metropolitan areas throughout the state and individual communications centers for existing FHP troops will be consolidated with these regional dispatch centers. Currently, three of the seven RCCs exist and the remaining four centers will be implemented over the next several years. Table 8.1 identifies the new RCC locations, the FHP troops dispatched from the RCC, and the RCC implementation dates. A copy of the FHP's RCC Plan is included in Appendix A of this report.

Table 8.1 – Implementation of FHP RCCs

RCC	FHP Troops dispatched from RCC	Scheduled Implementation
Miami	Troop E	Existing
Orlando	Troop D	Existing
Lake Worth	Troops L and K	Existing
Ft. Myers	Troop F	July 2002
Tampa	Troop C	June 2002
Jacksonville	Troops B and G	October 2002
Tallahassee	Troops A and H	February 2002

Additionally, FDOT has entered into a Memorandum of Understanding (MOU) with the FDLE Joint Task Force (JTF) Oversight Committee which states that both agencies will work towards the co-location of state law enforcement agencies' dispatch and the TMCs in Miami, Tampa, Jacksonville, and in other areas of the state where the centers are established and where it is feasible for both agencies to co-locate. A copy of the MOU is included in *Technical Memorandum No. 1 – ITS Legacy* and the *ITS Program Plan.*

With this in mind, future RTMCs and their operational coverages for the intrastate corridors were developed to be coincidental with the RCCs and their dispatch boundaries. In most cases, these boundaries will parallel the district boundaries. However, alternate boundaries were considered where reasonable based on: (1) FHP RCC dispatch boundaries, (2) functional application of RR Service Patrols, and (3) other ITS operational characteristics.

The following existing or planned RTMCs have been identified through the district plans for command and control of the intrastate ITS deployments (from south to north):

- District 6 RTMC located at the FDOT District 6 Office and co-located with FHP Miami RCC (under construction – interim center located within District 6 headquarters);
- Broward County ITS Operations Facility (RTMC) co-located with Broward County traffic management (in final design);
- Palm Beach County ITS Operations Facility planned for location near the I-95/PGA Boulevard Interchange and co-located with Palm Beach County traffic management;
- District 5 RTMC co-located with the FHP Orlando RCC at the District 5 Urban Office;
- District 1 RTMC in Ft. Myers co-located with the FHP Ft. Myers RCC (planned);
- District 7 RTMC co-located with the FHP Tampa RCC located at the District 7 Office (planned);
- Turkey Lake Turnpike RTMC (under development)[14];
- Pompano Beach RTMC (under development)[7];
- Jacksonville RTMC located at the District 2 Urban Office; and
- Tallahassee RTMC to be co-located with the City of Tallahassee and linked to the SEOC and the Troop A and H RCC (planned)[15].

Although FHP and FDOT are working together to coordinate dispatch and control of the intrastate facilities, in some instances it may be infeasible to co-locate. For example, the Lake Worth RCC is currently operational. Space within the existing facility is limited, thus minimizing the potential for co-location with the planned Palm Beach County ITS Operations Facility. However, in the future, as the Palm Beach County ITS Operations Facility is developed, potential relocation of the Lake Worth RCC may be considered. Similarly, the RCC in Jacksonville is currently not housed in the Jacksonville RTMC; however, co-location in the future may be considered. (This concept has been discussed between FDOT and FDLE/FHP but no formal agreements are in place.) In Tallahassee, the location for the RTMC and RCC is currently being reviewed.

Satellite or Secondary Traffic Management Centers (STMCs) – STMCs or operational centers and statewide centers of interest include:

- District 1 STMC in Sarasota (planned);
- ***SunPass***® Toll Operations Center in Boca Raton (electronic payment processing center);
- SunGuide℠ Smart Route TMC (ATIS only) for Districts 4, 6, and the Turnpike;
- Miami-Dade Expressway (MDX) TMC (under construction) that operates SR 836, SR 112, SR 878, SR 874, and SR 924;
- District 5 Headquarters STMC in Deland (planned);
- Pensacola Traffic Operations Facility co-located with FHP Troop A (planned); and
- SEOC (Tallahassee).

[14]The Turkey Lake RTMC and Pompano Beach RTMC will be interoperable and capable of assuming full operational control of the Turnpike facilities.

[15]When the Tallahassee RTMC is constructed, it could serve as a primary hub for traffic and incident information during states of emergency and provide a direct link to the SEOC. This concept will require additional refinement and consideration when construction is more imminent.

Virtual Traffic Management Centers (VMTCs) – VTMCs (or remote access terminals with limited physical capital investments) to the RTMCs are also proposed as follows:

- District 1 VTMC in Bartow (planned); and
- District 2 Headquarters VTMC in Lake City (planned).

Portable Traffic Management Centers (PTMCs) – Portable TMCs may be used to support work zone management or special traffic management scenarios on an as-needed basis. Examples of these traffic management systems could be as simple as a laptop computer and software that is connected to DMS in a work zone using wireless communications to provide traffic and traveler advisories.

The proposed RTMCs, their corridor coverage, and the relationship to the FHP RCC boundaries are identified in Figure 8.2.

Table 8.2 summarizes these responsibilities and the secondary control centers for limited-access facilities. Table 8.3 summarizes the mileage of limited-access facilities each RTMC will operate under this scenario for the full system build out and based on the *Ten-Year ITS Cost-Feasible Plan*.

Figures 8.3 through 8.11 illustrate the conceptual operational approach and connections between the RTMCs, the STMCs, the VMTCs, local TMCs, and state and local emergency response agencies.

Table 8.2 – Summary of Roles and Responsibilities along ITS Corridors

Corridor/Segment	Deployment	Primary Operational Command	Secondary DOT Operational Command(1)	Costs of Maintenance
I-4 ITS Corridor				
I-4 District 7	District 7	Tampa RTMC	District 1 VTMC (Bartow)	District 7
I-4 in District 1 from District 7 to U.S. 27	District 7	Tampa RTMC	District 1 VTMC (Bartow)	District 7
I-4 in District 1 from U.S. 27 to District 5	District 5	Orlando RTMC	District 1 VTMC (Bartow)	District 5
I-4 in District 5 to I-95	District 5	Orlando RTMC	District 5 STMC (Deland)	District 5
I-10 ITS Corridor				
I-10 in District 3 to U.S. 90 in Suwannee County	District 3	Tallahassee RTMC	District 3 VTMC (Pensacola)	District 3
I-10 in District 2 from U.S. 90 in Suwannee to I-95	District 2	Jacksonville RTMC	District 2 VTMC (Lake City)	District 2
I-75 ITS Corridor				
I-75 from SR 826 in District 6 to SR 858 in District 4	District 6	Miami RTMC	Broward County RTMC	District 6
I-75 from SR 858 to U.S. 27 in District 6	District 4	District 4 Broward County RTMC	District 6 RTMC (Miami)	District 4
I-75 in District 4 from U.S. 27 to CR 833	District 4	Ft. Myers RTMC	Broward County RTMC	District 4
I-75 in District 4 from CR 833 to Alico Road in District 1	District 1	Ft. Myers RTMC	Sarasota STMC	District 1
I-75 Alico Road in District 1 to SR 70 in District 1	District 1	Ft. Myers RTMC	District 1 VTMC (Bartow)	District 1
I-75 from SR 70 in District 1 to U.S. 98 in District 7	District 7	Tampa RTMC	District 1 VTMC (Bartow)	District 7
I-75 from U.S. 98 in District 7 to CR 484 in District 5	District 5	Tampa RTMC	District 5 STMC (Deland)	District 5
I-75 in District 5 from CR 484 to CR 318	District 5	Jacksonville RTMC	District 5 VTMC (Deland)	District 5
I-75 in District 5 from CR 318 to State Line	District 2	Jacksonville RTMC	District 2 VTMC (Lake City)	District 2
I-95 ITS Corridor				
District 6 to Ives Dairy Road	District 6	District 6 RTMC	Broward County RTMC	District 6
District 4 from Ives Dairy Road in District 6 to CR 512	District 4	Broward County RTMC	Palm Beach RTMC	District 4
District 5 from CR 512 to U.S. 1	District 5	Orlando RTMC	District 5 STMC (Deland)	District 5
District 2 from U.S. 1 to State Line	District 2	Jacksonville RTMC	District 2 VTMC (Lake City)	District 2

Table 8.2 (Continued)

Florida's Turnpike				
Mainline to I-95 (North)	Turnpike District	Pompano Beach RTMC	Turkey Lake RTMC	Turnpike District
HEFT (SR 821)	Turnpike District	Pompano Beach RTMC	Turkey Lake RTMC	Turnpike District
Sawgrass (SR 869)	Turnpike District	Pompano Beach RTMC	Turkey Lake RTMC	Turnpike District
SR 528	Turnpike District	Turkey Lake RTMC	Pompano Beach RTMC	Turnpike District
SR 417[(2)]	Turnpike District	Orlando RTMC	Turkey Lake RTMC	Turnpike District
Western Beltway	Turnpike District	Orlando RTMC	Turkey Lake RTMC	Turnpike District
Veterans/Suncoast Parkway[(2)]	District 7	District 7 RTMC	Turkey Lake RTMC	District 7
Polk County Parkway[(2)]	District 7	District 7 RTMC	Turkey Lake RTMC	District 7

Notes:

(1) Secondary command and control of some operations currently occurs in partnership with FHP and FDLE where joint dispatch and traffic management do not occur in the same location. For example, District 2's existing secondary center is the FHP/FDLE dispatch center (Normandy Boulevard), which operates and manages the facilities when the FDOT center is not occupied (off-hours). As more centers come "on-line" with co-locations for joint dispatch and traffic management, alternate sites for secondary command and control will be needed. If needed, an additional column can be added to relate these traffic management functions with FHP/FDLE dispatch coverage.

(2) This division of responsibilities is based on a tentative agreement between the Turnpike, District 5 and District 7. An operational plan and protocols are needed before the agreement can be formalized. This agreement should address funding, design, construction, operation and maintenance issues.

Figure 8.2 – Future RTMC Coverage

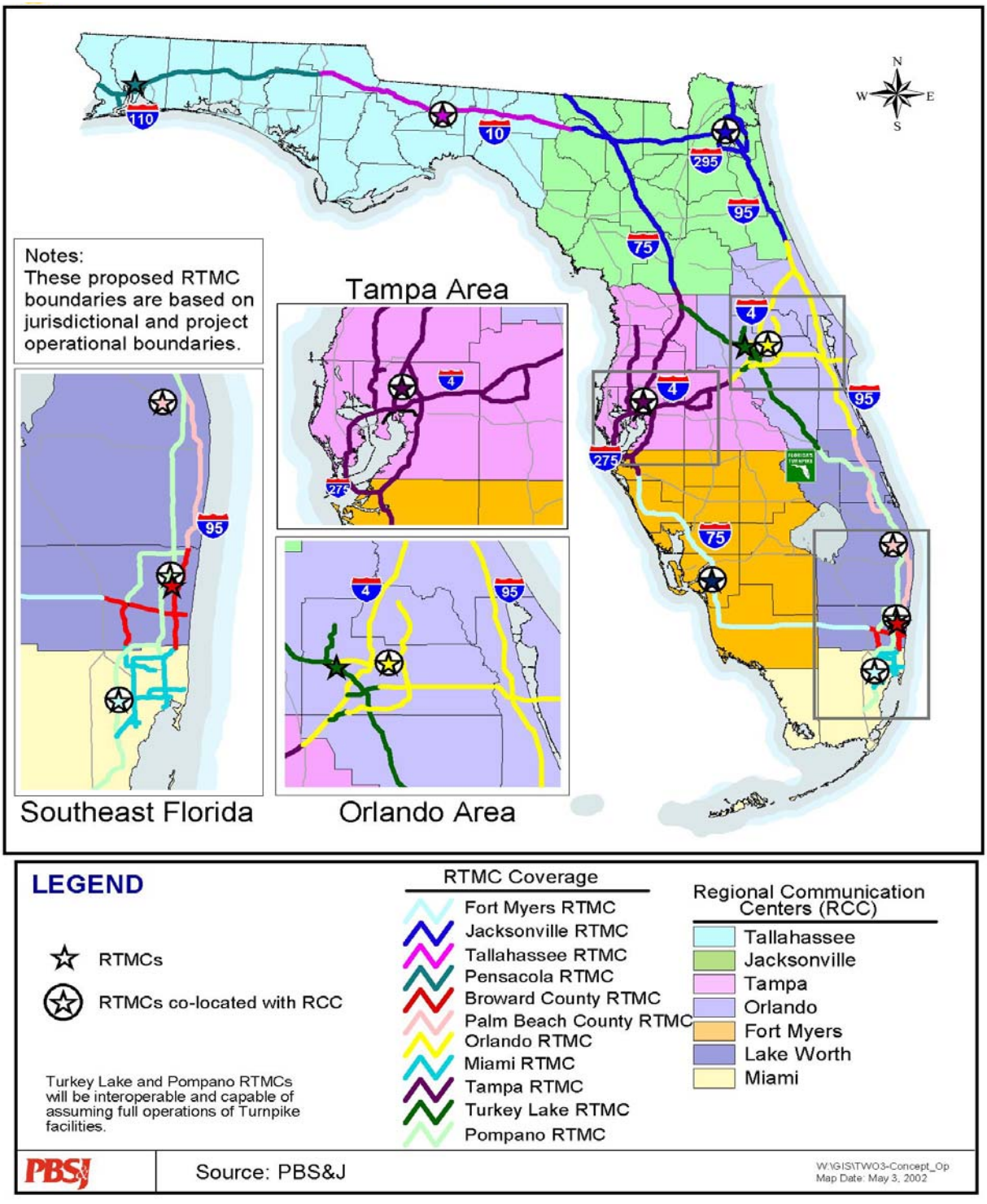
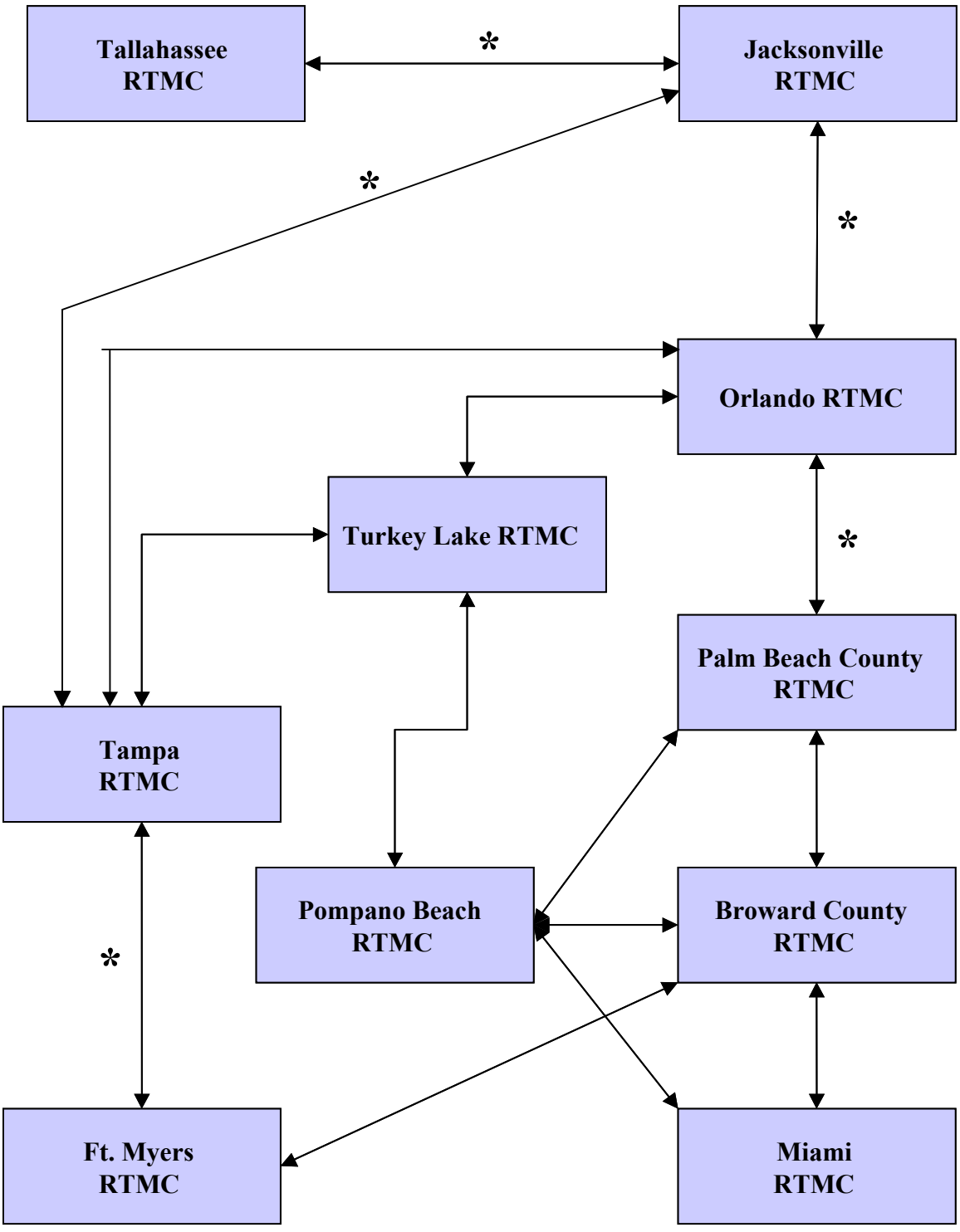


Table 8.3 – Summary of Miles of Operations along ITS Corridors for Each RTMC Under the Proposed Concept of Operations

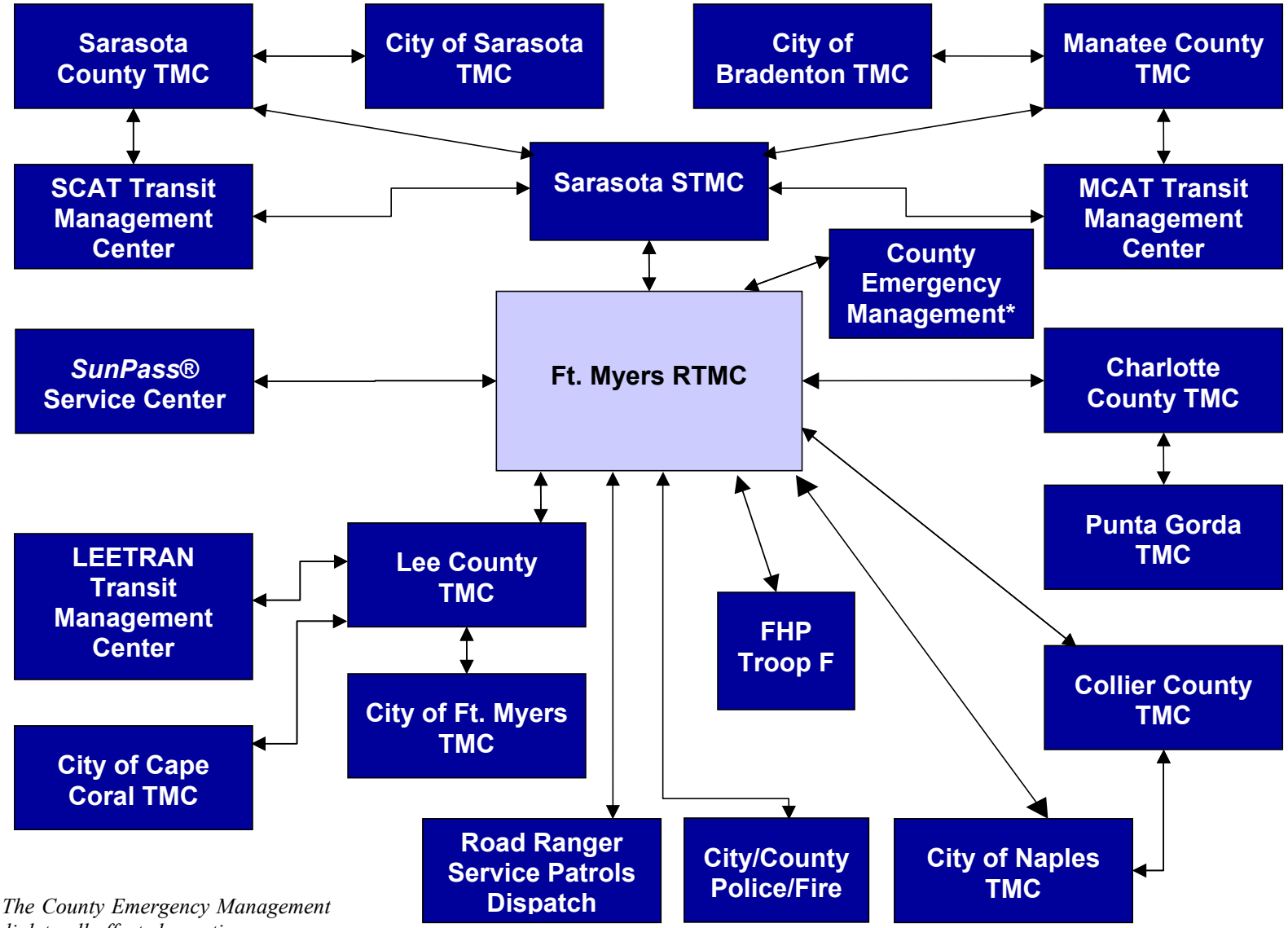
District	Miles
1	205.14
2	378.13
3	281.58
4	169.36
5	315.27
6	85.63
7	307.34
Turnpike	359.43
TOTAL	**2,101.88**

Figure 8.3 – Center-to-Center RTMC Coordination



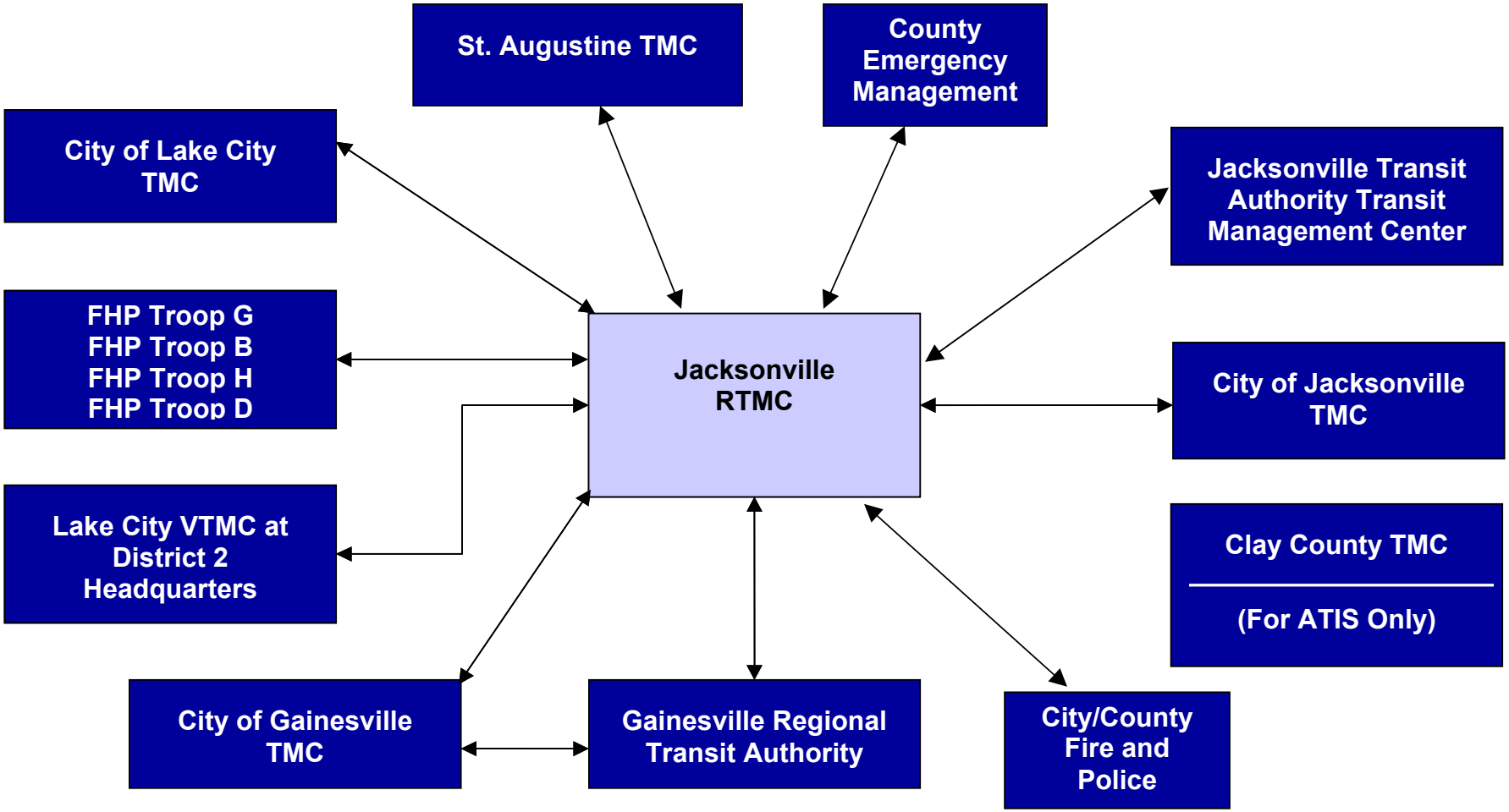
* Direct communications infrastructure links between these RTMCs will be limited to the microwave backbone until the FFN is completed through public/private partnership or the FDOT Fiber Optic Network is completed. Telephone systems should also be considered for these connections.

Figure 8.4 – District 1 RTMC Operational Approach



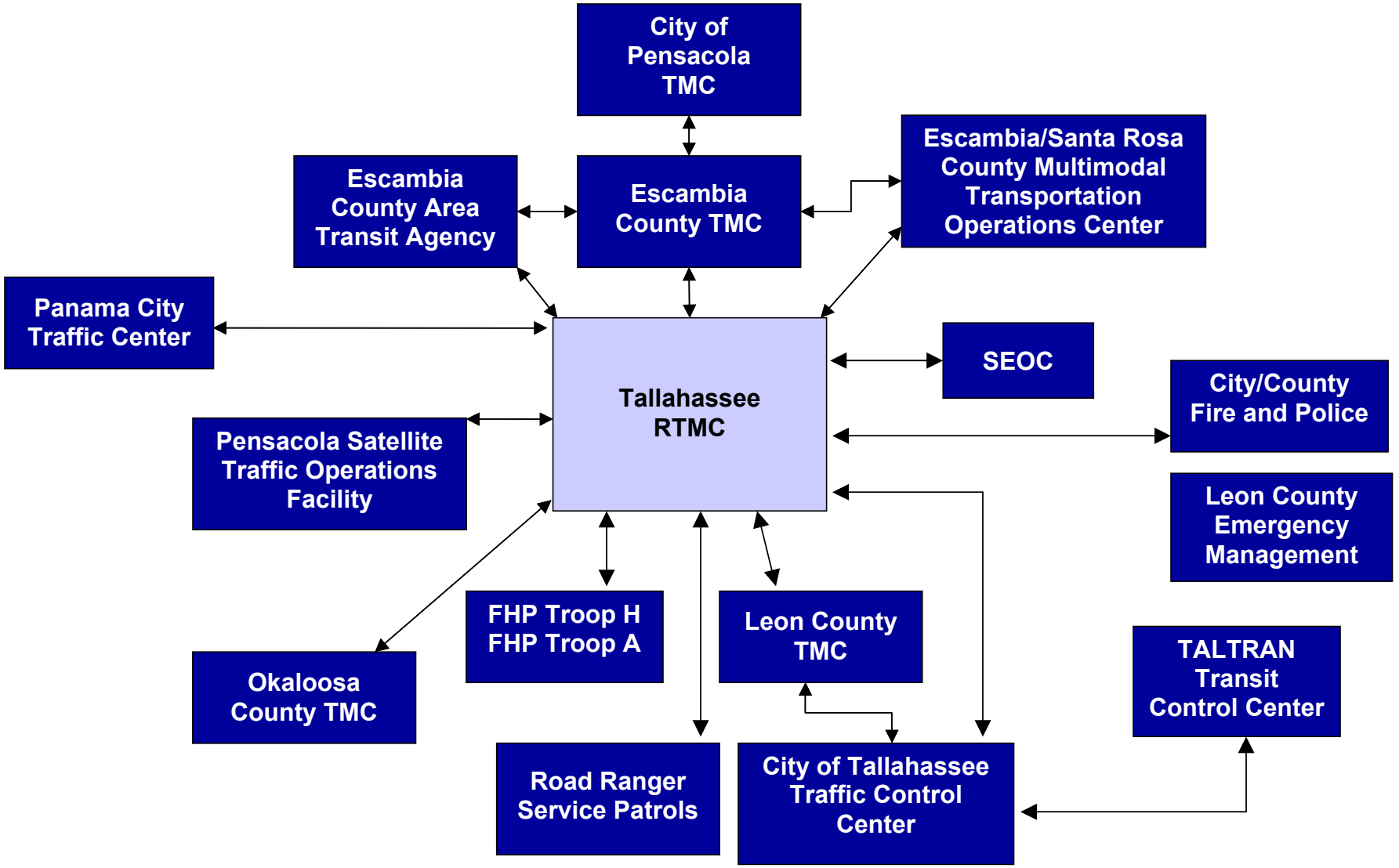
NOTE: The County Emergency Management Centers link to all affected counties.

Figure 8.5 – District 2 RTMC Operational Approach



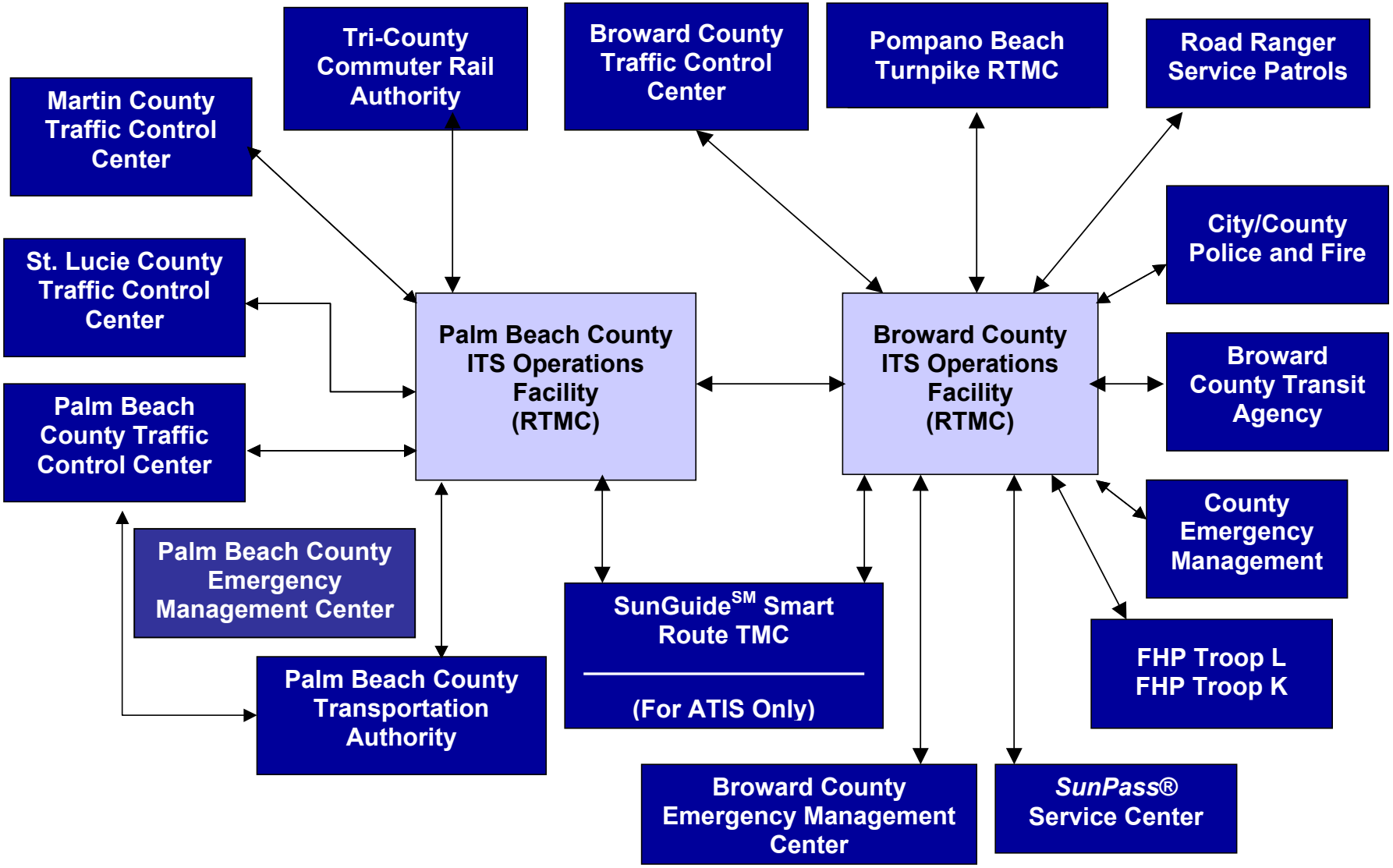
NOTE: The County Emergency Management Centers link to all affected counties.

Figure 8.6 – District 3 RTMC Operational Approach



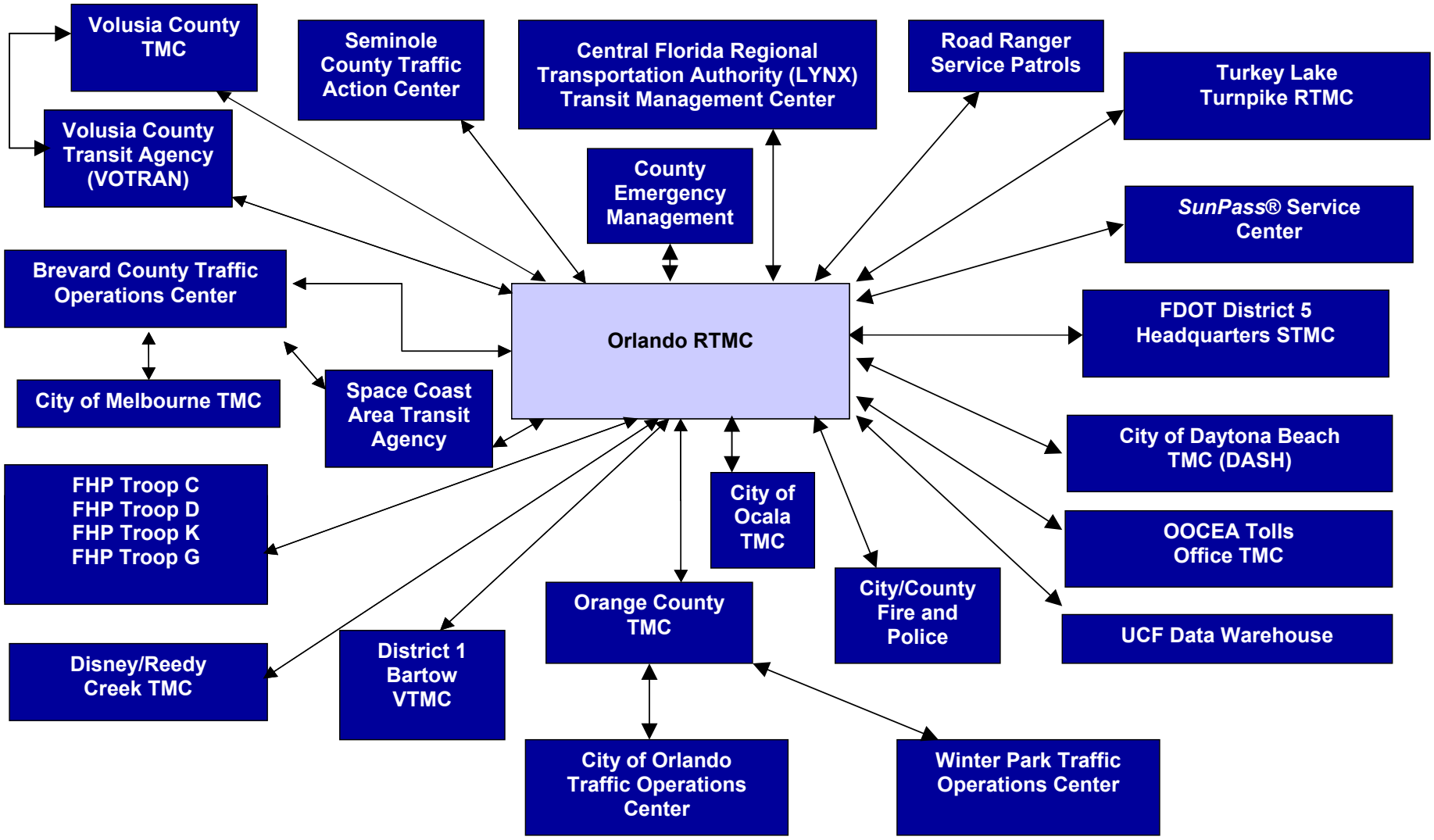
NOTE: Co-location of the City of Tallahassee, FDOT Tallahassee RTMC, and the RCC (Dispatch) is currently being explored by these stakeholders.

Figure 8.7 – District 4 RTMC Operational Approach



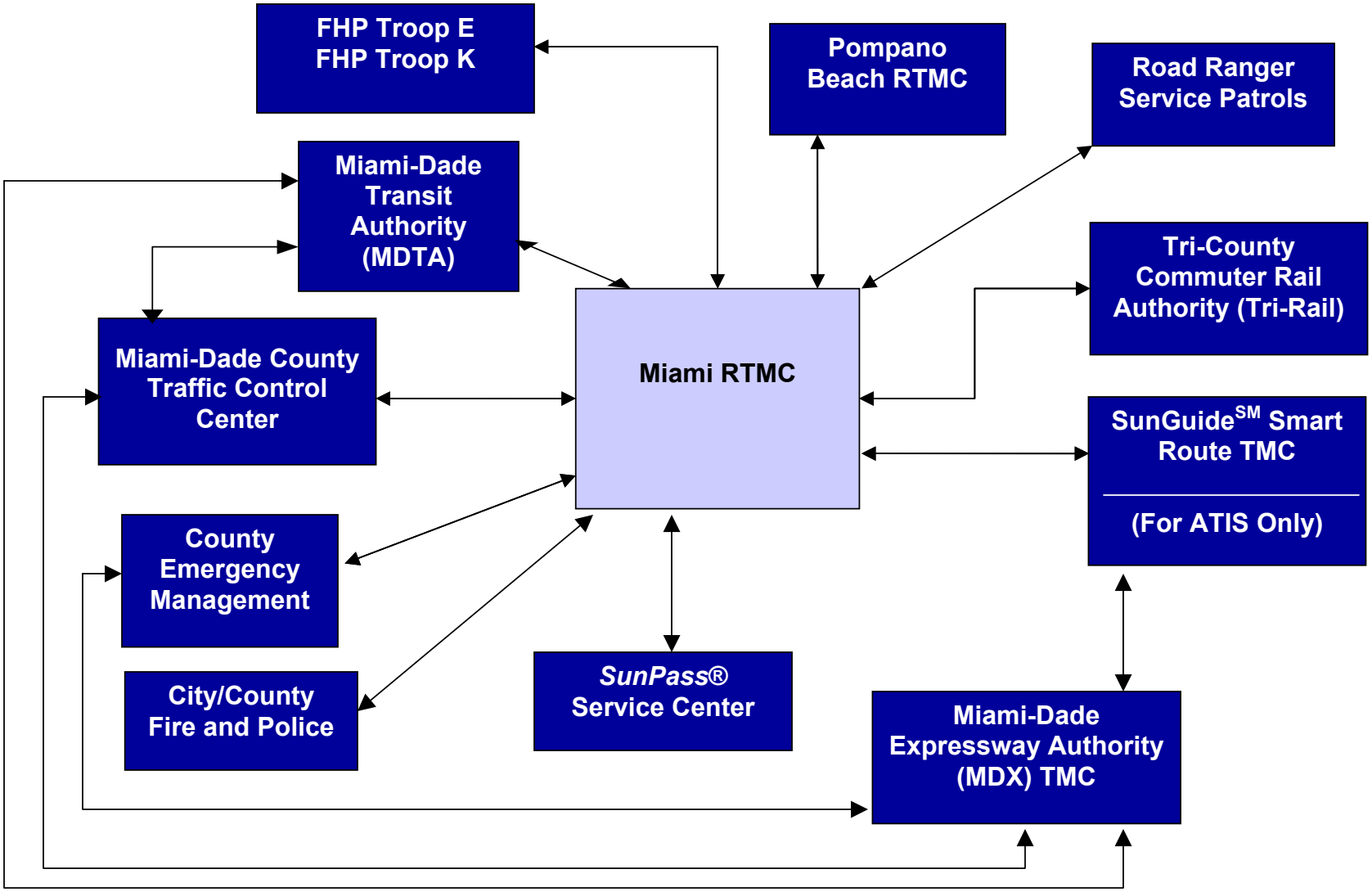
NOTE: The County Emergency Management Centers link to all affected counties.

Figure 8.8 – District 5 RTMC Operational Approach



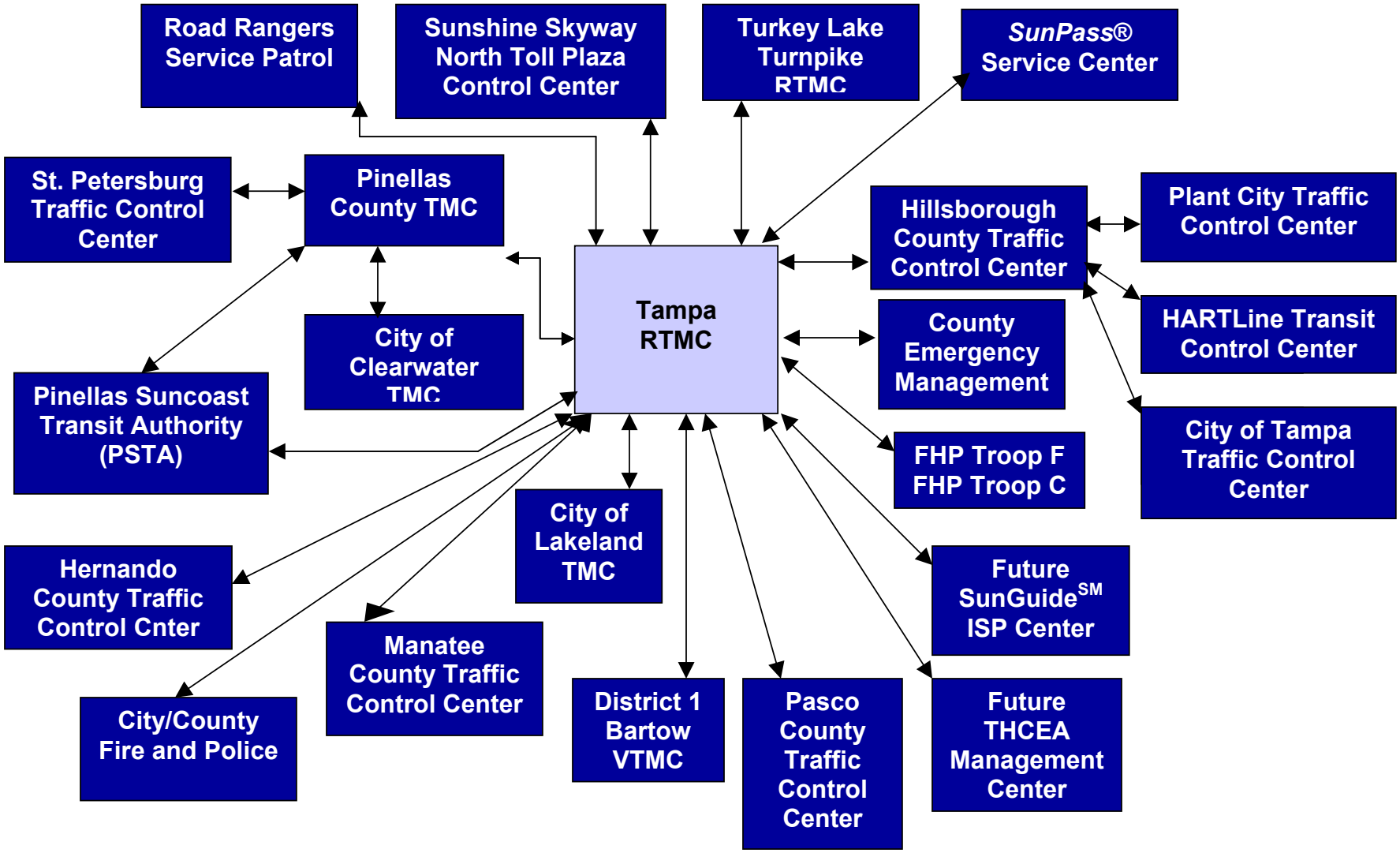
NOTE: The County Emergency Management Centers link to all affected counties.

Figure 8.9 – District 6 RTMC Operational Approach



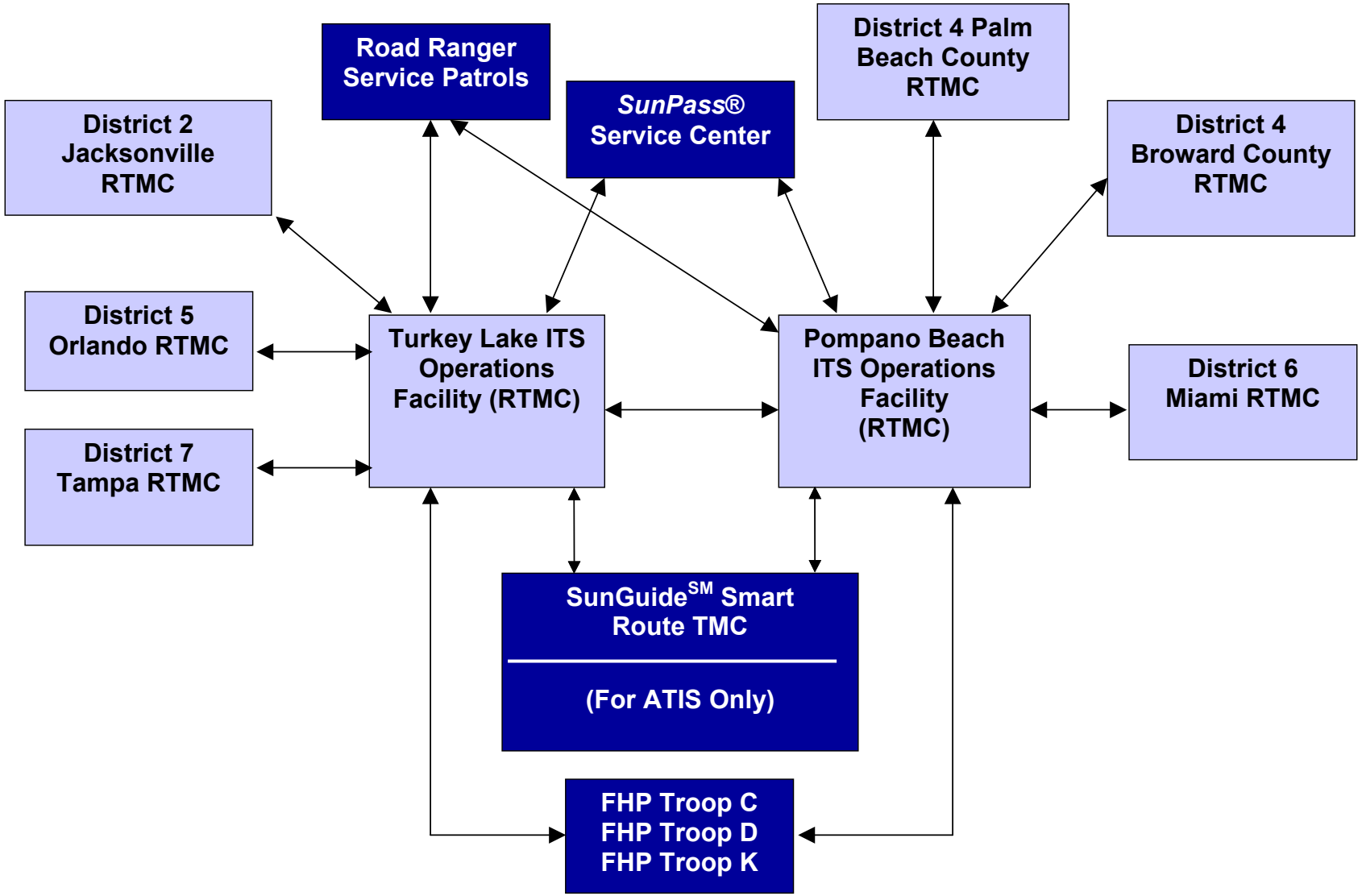
NOTE: The County Emergency Management Centers link to all affected counties.

Figure 8.10 – District 7 RTMC Operational Approach



NOTE: The County Emergency Management Centers link to all affected counties.

Figure 8.11 – Turnpike District RTMC Operational Approach



The following text discusses the conceptual ITS management and operations along the study corridors.

8.1.3 I-4 ITS Corridor

I-4 ITS Corridor Defined – The limits of the I-4 corridor are from I-275 in Hillsborough County to I-95 in Volusia County.

Roles and Responsibilities – The division of roles and responsibilities for the management and operations of I-4 is both functional and geographic. The functional division of responsibilities for I-4 occurs with the Evacuation Coordination User Service. During evacuation conditions, the SEOC is responsible for command and control of all state resources as outlined in the general approach to operations. The district offices are responsible for the command and control of the corridor and for the application of all other operational functions. Agreements have been developed between the districts that delegate responsibility for command and control and operations of the I-4 corridor as follows:

- District 7 is fully responsible for the I-275 segments of the corridor, command and control and operations and maintenance in Hillsborough County, and command and control of I-4 from I-275 to U.S. 27 in Polk County (District 1).

- District 1 will provide the maintenance of I-4 through Polk County; however, District 7 will be responsible for operations through command and control of the ITS from U.S. 27 west and District 5 from U.S. 27 east. District 1 will develop a VTMC (to provide a communications link to the TMCs in Districts 7, 5, and Florida's Turnpike) in Bartow at the District Headquarters. During local emergencies, District 1 will provide command and control (when the VTMC is complete). Specific protocols for operations during these conditions will be required.

- District 5 is responsible for the command and control of I-4 from U.S. 27 east in Polk County (in District 1) and command and control and operations and maintenance from the Polk County Line to I-95 (in District 5). The control of I-4 near I-95 will be integrated with the DASH system.

- The Turnpike District is responsible for the command and control of the Turnpike mainline. A communications link will be provided between the Turnpike District and other districts as needed.

- District 7 will be responsible for the traffic management of Turnpike facilities located in District 7 such as the Veterans/Suncoast Parkway and Polk County Parkway. The Turkey Lake RTMC will serve as the secondary control center for these facilities.

Two RTMCs are anticipated to be the primary parties responsible for the I-4 corridor: the Tampa RTMC (proposed) and the Orlando RTMC, currently operational. Each district will determine the need for linkages to the RTMCs.

- The Tampa RTMC will be responsible for the east-west segments of I-275 and I-4 from I-275 to U.S. 27 in Polk County.
- The District 1 VTMC in Bartow will serve as the secondary operational command for the Tampa RTMC.
- The Orlando RTMC will be responsible for I-4 from U.S. 27 in Polk County to I-95.
- The District 1 VTMC in Bartow will serve as the secondary operational command for the Orlando RTMC.

8.1.4 I-10 ITS Corridor

I-10 ITS Corridor Defined – The limits of the I-10 corridor are from the Alabama state line to I-95 in Jacksonville. This corridor will also include I-110 in Escambia County.

Roles and Responsibilities – The division of roles and responsibilities for the management and operations of I-10 is both functional and geographic. The functional division of responsibilities for I-10 occurs with the Evacuation Coordination User Service. During evacuation conditions, the SEOC is responsible for command and control of all state resources as outlined in the general approach to operations. The District 2 and District 3 offices are responsible for the command and control of the corridor for the application of all other operational functions. Command and control of operations of the I-10 corridor will be as follows:

- District 3 is fully responsible for the I-10 corridor in District 3 from the Alabama State Line to U.S. 90 in Suwannee County from the Tallahassee RTMC (planned).
- District 3 is fully responsible for the full extent of the I-110 corridor in Escambia County.
- District 2 is fully responsible for the I-10 corridor in District 3 from U.S. 90 in Suwannee County to I-95 in District 2 from the Jacksonville RTMC.

Based on an analysis of the division boundaries and RCC boundaries, it may be reasonable for District 2 to consider abrogating command and control decisions for I-10 in accordance with the RCC boundaries. This approach would create a more efficient dispatch and operational response to incidents occurring along this largely rural corridor. However, this proposal is conceptual and no discussion of this concept has occurred between the districts at this time.

In addition to the primary command and control responsibilities for the corridor:

- The Pensacola STMC (planned) will serve as the secondary control center for the Tallahassee RTMC.
- The Lake City VTMC (planned) will serve as the secondary control center for the Jacksonville RTMC.

8.1.5 I-75 ITS Corridor

I-75 ITS Corridor Defined – The limits of the I-75 corridor are from the Palmetto Expressway in Miami-Dade County to the Georgia State Line. This corridor will also include I-275 from I-75 in Manatee County to I-75 in north Hillsborough County.

Roles and Responsibilities – The I-75 corridor is one of the most operationally complex corridors along the FIHS limited-access facilities. This corridor travels through Districts 6, 4, 1, 7, 5, and 2. The range of travel conditions along this corridor vary from intense urbanized areas to rural operations with low-density interchanges and high-density rural segments with high truck volumes. The segment of I-75 known as Alligator Alley, which travels from Naples to Ft. Lauderdale, is one of only two tolled interstate facilities in the state. The segment of I-275 known as the Sunshine Skyway Bridge, which spans Tampa Bay from Manatee County to Pinellas County, is the second tolled interstate facility.

The division of roles and responsibilities for the management and operations of I-75 is both functional and geographic. The functional division of responsibilities for I-75 occurs with the Evacuation Coordination User Service. During evacuation conditions, the SEOC is responsible for command and control of all state resources as outlined in the general approach to operations. The district offices are responsible for the command and control of the corridor for the application of all other operational functions. Command and control of operations of the I-75 corridor will be as follows:

- It is proposed that District 6 abrogate command and control of the portion of I-75 that travels through Dade County to District 4. District 6 will maintain responsibility for the costs of field element deployments and maintenance along the corridor.

- District 1 currently operates I-75 along the rural segments of I-75 from Alico Road to U.S. 27 to provide a single RR Service Patrol contract and consistent operations across the corridor. This approach is anticipated to continue through deployment of freeway and incident management services.

- District 1 is fully responsible for I-75 from CR 833 along Alligator Alley to the CR 683/Moccasin Wallow Road limits of the District 7 Interstate Plan in Manatee County. The remaining section of I-75 in Manatee County will be operated by District 7 as part of the Sunshine Skyway Bridge and I-275 corridors in the District 7 Interstate ITS Plan. District 1 will be responsible for the costs of field deployments and maintenance along the corridor in this section. The facility will be operated from the Sarasota STMC (planned) but all data will be linked to the Ft. Myers RTMC (planned) that is District 1's RTMC.

- District 7 is responsible for the operations of I-75 in Manatee County from CR 683/Moccasin Wallow and fully responsible for I-75 and I-275 within District 7. This facility will be operated from the Tampa RTMC.

- For consistency with RCC dispatch boundaries, it is proposed that District 7's operational control for I-75 extend through Sumter County, abrogating control from District 5 to the Tampa RTMC.

- District 2 is fully responsible for I-75 within its district. The facility will be operated from the Jacksonville RTMC.

- For consistency with RCC dispatch boundaries, District 2's operational control of I-75 would extend through Marion County, abrogated from District 5 to the Jacksonville RTMC.

Secondary controls for the I-75 facilities would be as follows:

- The District 5 VTMC in Deland would have secondary control of the portion of I-75 extending through District 5 in Sumter and Marion Counties.

- The Miami RTMC would have secondary control of the portion of I-75 in District 4.

- The Broward RTMC would have secondary control of I-75 in District 6.

- The Sarasota STMC would have secondary control for I-75 in District 1.

- The Lake City VTMC would have secondary control of I-75 in District 2.

- Secondary control of I-75 and I-275 in District 7 shall be the District 1 VTMC in Bartow.

8.1.6 I-95 ITS Corridor

I-95 ITS Corridor Defined – The limits of the I-95 corridor are from the southern terminus of U.S. 1 in Miami-Dade County to the Georgia State Line. This corridor will also include I-195 and I-395 in Miami-Dade County, I-595 in Broward County, and I-295/9A around Jacksonville in Duval County.

Roles and Responsibilities – The I-95 corridor, like the I-75 corridor, is one of the most operationally complex corridors along the FIHS limited-access facilities. This corridor is contained in Districts 6, 4, 5, and 2. The range of travel conditions along this corridor varies from intense urbanized areas to rural operations with a low density of interchanges and high-density rural segments with high truck volumes. However, due to the more direct north-south alignment of the corridor and the fact that district boundaries coincide with the RCC coverage boundaries, the division of responsibilities for I-95 is more easily defined.

The division of roles and responsibilities for the management and operations of I-95 is both functional and geographic. The functional division of responsibilities for I-95 occurs with the Evacuation Coordination User Service. During evacuation conditions, the SEOC is responsible for command and control of all state resources as outlined in the general approach to operations. The district offices are responsible for the command and control of the corridor for the

application of all other operational functions. Command and control of operations for the I-95 corridor will be as follows:

- District 6 is fully responsible for I-95 within its district. This facility will be operated from the Miami RTMC (under construction).
- District 4 is fully responsible for I-95 within its district. This facility will be operated from the Broward County RTMC (planned).
- District 5 is fully responsible for I-95 within its district. This facility will be operated from the Orlando RTMC.
- District 2 is fully responsible for I-95 within its district. This facility will be operated from the Jacksonville RTMC.

In addition to the primary command and control responsibilities for the corridor:

- The Broward County RTMC (planned) will serve as the secondary control center for the District 6 RTMC in District 6.
- The Palm Beach County RTMC (planned) will serve as the secondary control center for the Broward County RTMC in District 4.
- The Deland VTMC (planned) will serve as the secondary control center for the Orlando RTMC.
- The Lake City VTMC (planned) will serve as the secondary control center for the Jacksonville RTMC.

8.1.7 Florida's Turnpike ITS Corridor

Florida's Turnpike Corridor Defined – The limits of Florida's Turnpike corridor include the Homestead Extension of Florida's Turnpike (HEFT) and the Turnpike mainline to milepost 0X[16] The corridor will also include the Sawgrass Expressway, the Seminole Expressway, and FDOT-controlled sections of SR 417 (the Florida Greeneway), and SR 528 (the Bee Line Expressway).

The division of roles and responsibilities for the management and operations of the Turnpike facilities is both functional and geographic. The functional division of responsibilities for the Turnpike facilities occurs with the Evacuation Coordination User Service. During evacuation conditions, the SEOC is responsible for command and control of all state resources as outlined in the general approach to operations.

Because the Turnpike facilities are located in various urban areas throughout the state, the command and control of the corridors will have to be closely coordinated between the Turnpike and the surrounding districts. All toll operations and ETC along the facilities will be coordinated and conducted through the ***SunPass®*** Service Center. The Turnpike offices are responsible for the command and control of the Turnpike mainline corridor for the application of all other operational functions. Command and control of operations for the Turnpike corridors will be as follows:

[16] This section connects the Turnpike to I-95 at the Golden Glades interchange.

Roles and Responsibilities

- The Turnpike District is responsible for the command and control of the Turnpike mainline. Communications links will be provided between the Turnpike District and other districts as needed.

- The southern portion of the Turnpike mainline from Miami-Dade County to Yeehaw Junction in Okeechobee County will be controlled from the Pompano Beach RTMC. The northern portion of the Turnpike mainline from Yeehaw Junction to I-75 will be controlled by the Turkey Lake RTMC.

- The command and control for the Turnpike portions of the expressways in Orlando, SR 528 (Bee Line Expressway), SR 417 (Florida Greeneway), and SR 408 (East-West Expressway) will be the Turkey Lake RTMC.

- The HEFT and SR 869/Sawgrass Expressway in Miami-Dade and Broward counties will be controlled by the Pompano Beach RTMC.

- Tentatively, District 7 will be responsible for the traffic management of Turnpike facilities located in Districts 7 and 1 such as the Veterans/Suncoast Parkway and Polk County Parkway. Operational plans and protocols are needed before the agreement can be formalized.

In addition to the primary command and control responsibilities for the corridors:

- The Turkey Lake RTMC will tentatively serve as the secondary control center for the Veterans Expressway/Suncoast Parkway and Polk County Parkway.

- Secondary control for SR 528 and SR 417 will be from the Pompano Beach RTMC.

- Secondary control for the HEFT and SR 869/Sawgrass Expressway in Miami-Dade and Broward counties will be from the Pompano Beach RTMC.

8.2 Operations During Evacuations and Other States of Emergency

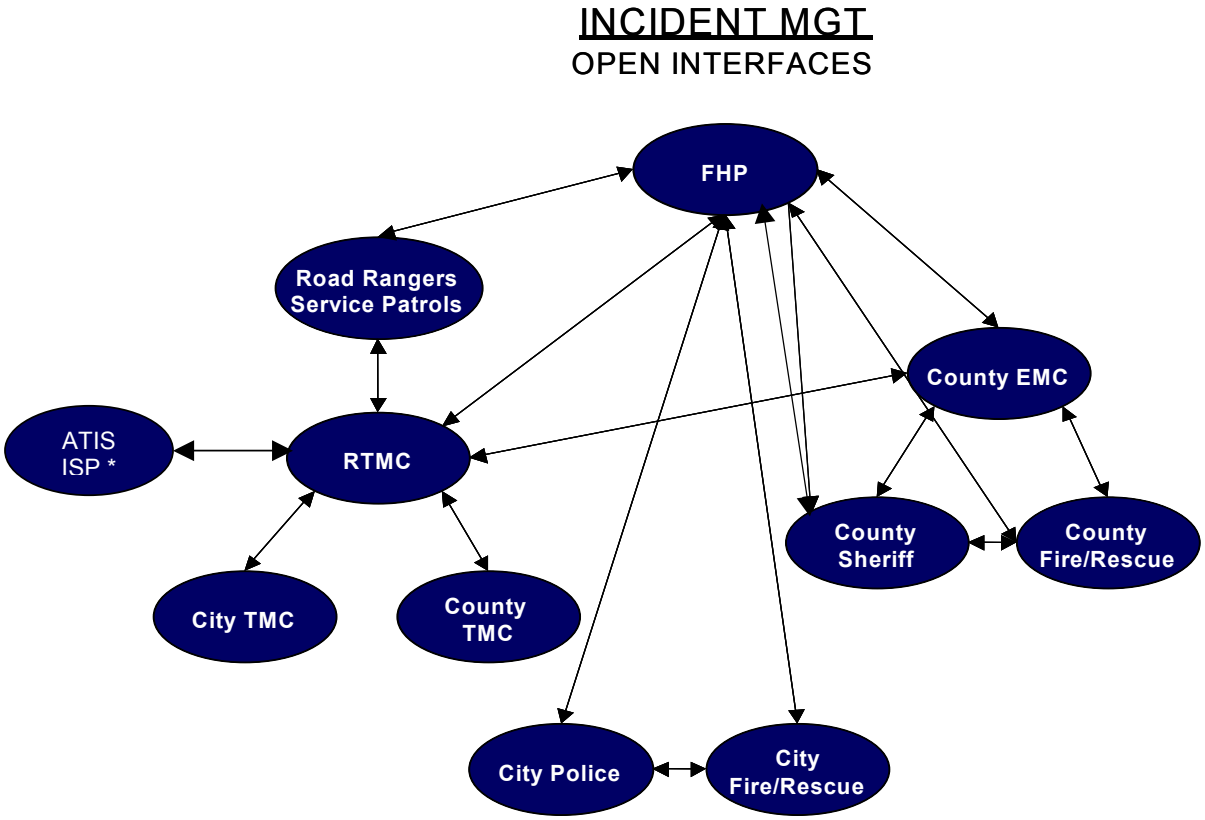
During evacuations and other situations where a state of emergency is declared, command and control decisions, particularly for deployment of state resources such as FHP, will be delegated to the SEOC in Tallahassee.

Figures 8.12 and 8.13 illustrate the differences between emergency management during a state of emergency and normal operations for incident management.

8.3 Management

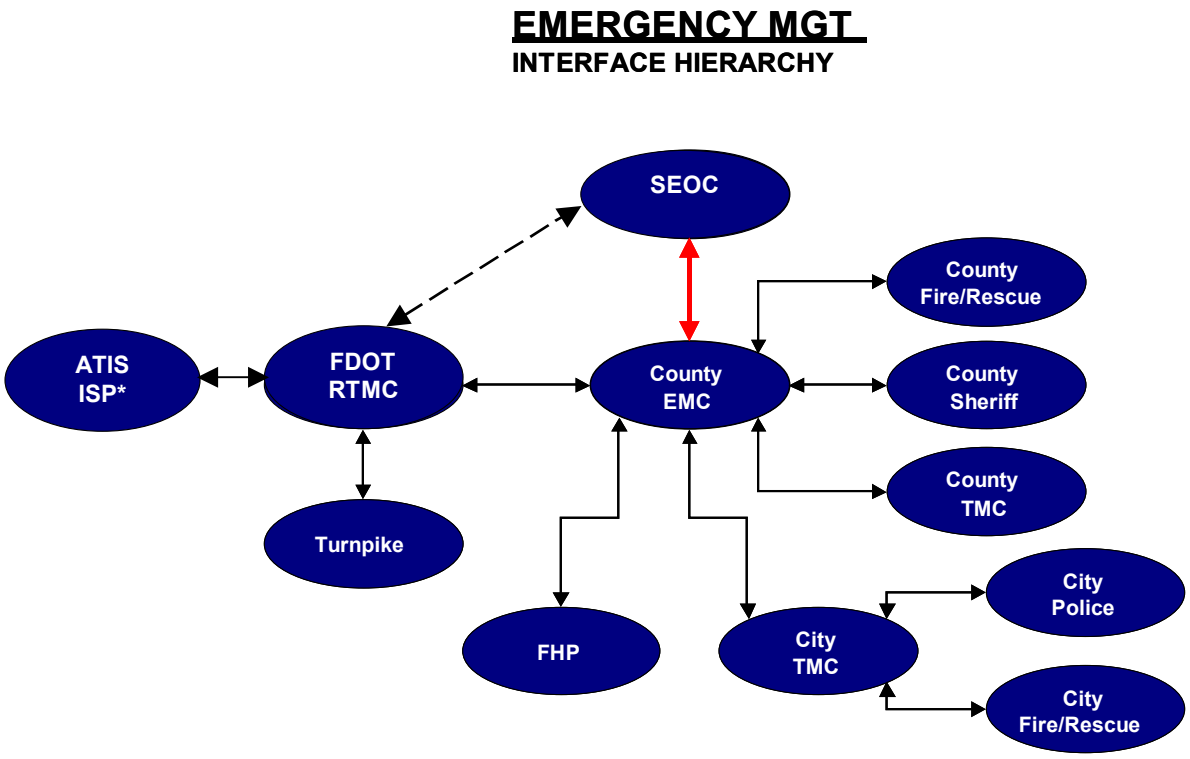
Each district will be responsible for the costs of operating and maintaining the ITS deployments within its district. In some cases, where the district defers operational control of a portion of a facility to another district, e.g., I-4 in District 1, the costs of this operation may also be shared based on an agreement between the districts.

Figure 8.12 – Operational Command and Control for Incidents on the Intrastate Corridors



* Where appropriate.

Figure 8.13 – Operational Command and Control for Emergencies on the Intrastate Corridors



* Where appropriate.
_ _ _ _ _ = An informal line of communications may occur during these operations.

8.4 Center-to-Center Communications and Secondary Control Considerations

Table 8.2 identified the need for center-to-center communications and secondary control of field devices between TMCs. This concept is proposed to provide redundancy in our ability to operate and manage field devices remotely.

The scenarios under which the transfer of command and control to a secondary center may be needed include:

- Natural or man-made disasters;
- Software/Hardware failures; and
- Availability of staff.

To implement remote or secondary command control requirements, the following must be provided to some extent:

- Traffic flow data;
- Incident information;
- Road construction information;
- Traffic camera video images;
- Field device control including DMS and lane configuration management; and
- Traveler information dissemination.

In order to implement secondary control, predefined procedures for operations and management of the systems are needed in each of the TMC operational plans that will address:

- What data (traffic, video, etc.) is needed in the secondary control center from the primary center's jurisdiction?
- How will this data be used (operational decisions)?
- How will the data be provided (communications system)?
- How will the data be stored?
- How will stakeholders be informed of the change in command and control decisions?
- How are requests for incident responses to be handled?
- What decisions are permitted by the secondary center?
- How will field devices be controlled?
- What messages can be disseminated through roadside traveler information (DMS or HAR)?
- Will data be stored?
- How will data be stored?
- What standards are needed?
- What periods must secondary control be provided?
- What security measures are needed to prevent unauthorized use?
- How will these additional responsibilities affect performance of systems in the secondary control center?
- What records of the operations under this scenario are needed to evaluate performance and make recommendations for future scenarios?
- Are technologies and staff interoperable from center to center?

A major effort is now underway to define functional requirements for statewide traffic management software based on the results of the *TMC Software Study* discussed in Section 4.4.

Public Safety and Evacuation Coordination

As mentioned previously, in the case of an evacuation, the SEOC will assume primary command and control of the ITS deployments along the FIHS limited-access corridors.

The SEOC will collect, disseminate, and coordinate information for evacuees during an event. These evacuation services will include:

- Evacuation guidance;
- Evacuation travel information;
- Evacuation traffic management;
- Evacuation planning support; and
- Resource sharing.

The SEOC will control devices pertaining to the FIHS limited-access corridors as required by the evacuation management plan, including traffic signals at interchanges, DMS, ramp meters, reversible lane signs, turning restriction signs, road closure devices, lane closure devices, HAR, TiRN, and shoulder use signs. The SEOC will also coordinate and dispatch law enforcement and emergency management personnel to the appropriate locations as needed. A new user service for evacuation coordination was developed as part of the physical architecture for this project. More detailed definitions of the requirements associated with these activities are contained in the appendices of *Technical Memorandum No. 3.4 – ITS Physical Architecture*.

Although addressed on a very high-level in this concept of operations, a coordinated approach to address homeland security and public safety issues related to ITS is needed. The following outlines some of the major issues that need to be addressed in defining this approach.

I. Introduction – Everything changed on September 11, 2001.
   A. The world in general;
   B. Transportation;
   C. Emphasis on homeland security –
      1. To date, has been first with responders;
      2. Transportation roles are significant, however –
         - The goal is a transportation system that is well protected against attacks and that responds effectively to natural and manmade threats and disasters, enabling the continued movement of people and goods even in times of crisis.
   D. ITS and operations especially suited to have a role:
      1. Investments in transportation surveillance and response for homeland security will also yield substantial benefits in transportation management day-to-day and for other major incidents; the converse is true also.

II. ITS use and lessons learned related to 9/11:
   A. New York City – Transcom and Virginia/Washington, D.C./Pentagon;
   B. Hurricane evacuation, response, and recover;

III. Components of homeland security:
   A. Preparedness –
      1. Starts with understanding the problem – scope, magnitude, capacity, and redundancy; and
      2. Needs to engage the relevant stakeholders.
   B. Prevention and protection –
      1. What are the vulnerabilities?
      2. Where can existing technologies be applied? What are the gaps?
      3. What are the costs/downsides (legal, social, etc.)? What's the right trade-off?
      4. Types of situations that need prevention –
         - Threats to the infrastructure; and
         - Physical infrastructure information.
      5. Use of the transportation system/vehicles to deliver attacks –
         - Understanding what the sensors are saying; and
         - Getting reports to the right place.
      6. Response –
         - Advance arrangements;
         - Communications/Coordination among responders;
         - Rescue; and
         - Evacuation.
      7. Recovery –
         - Disseminating information to the public;
         - Providing alternatives; and
         - Returning the system to "normal".

IV. Role of ITS in homeland security:
   A. ITS provides tools to safeguard the transportation system against threats, both natural and manmade, and to help react in case of disruptions –
      1. Providing surveillance of key infrastructure and system activity.
      2. Providing logistical and communications tools to enhance existing capabilities for swift, appropriate, and coordinated responses to system disruptions by law enforcement defense, emergency response and security organizations, rescue and treat the injured, clear guideways, smoothly reroute travel to available alternatives, restore services as promptly as possible, and provide the public with prompt and accurate information

on transportation alternatives in case of disruptions to portions of the system or when quarantine or evacuation is necessary.

3. Providing surveillance and analysis for freight and intermodal operations: monitoring and maintaining the security of containers and various other mobile assets, matching cargo against bills of lading, matching actual travel against intended route and destination, and assuring the identity of commercial operators.
4. Providing surveillance and analysis for public transit, including identification of threatening or high-risk passenger behavior, matching actual travel against planned routes and schedules, assuring the identity of transit vehicle operators, and providing surveillance and analysis at major transportation centers.
5. Providing tools for the analysis of raw transportation system operation data (either real-time or archived) to detect and prevent potential threats, as well as assist in investigating incidents that may have occurred and identifying and assessing breakdowns or bottlenecks in the system, whatever their cause.
6. Safeguarding ITS services and data (as well as other transportation-related computer controlled systems) against inadvertent or deliberate incursions.
7. Helping to assure that vehicles' and drivers' licenses, particularly commercial licenses, are issued and used appropriately.

B. Technologies in use today can be adapted to make infrastructure and travelers more secure –

1. Smart cards;
2. Biometrics identifiers;
3. AVL;
4. Map databases;
5. Video surveillance;
6. Vehicle classification sensors;
7. WIM technology;
8. Geolocation and routing technologies to track the movements and behavior of vehicles, particularly trucks and transit vehicles. Technologies exist to detect vehicle contents, particularly hazardous substances, explosives, and drugs without opening the vehicle.
9. Technology is available to match a specific commercial vehicle with a specific operator and a specific cargo and to prevent or halt travel in case of a mismatch; and
10. Simply doing better surveillance has deterrence value.

C. If an attack does occur, sensor, communications, and analysis technologies used today to better manage travel and transportation can be adapted to assess damage and facilitate recovery logistics, evacuation, or quarantine –
   1. Automated signal systems;
   2. Signal priority systems;
   3. Moveable lane barriers;
   4. DMS;
   5. Incident detection systems;
   6. Mayday systems;
   7. Public safety response systems; and
   8. TMCs, fleet dispatch centers, and telematics services perform portions of this function today.

V. Areas for Action:

A. Role for FDOT –
   1. Participate in threat assessment analysis for areas of jurisdiction and cooperate with adjoining jurisdictions;
   2. Deploy and operate systems for threat detection, prevention, and response;
   3. Establish active interagency and inter-jurisdictional cooperation for threat detection and emergency response;
   4. Plan escape routes and evacuation procedures under various scenarios;
   5. Deploy systems to implement emergency rerouting and evacuation;
   6. Harden key communications systems from physical threats and hacking and provide redundancy using alternate technologies (e.g., wired and wireless); and
   7. Deploy mechanisms for emergency information dissemination to the public, including direct communications via HAR and DMS, plus links to media, telematics providers, etc.

B. Programmatic activity –
   1. Monitor and participate in the development of national homeland security/transportation leadership and initiatives of Congress; agencies such as the Office of Homeland Security, FEMA, Transportation Security Administration, FHWA, FTA; programs such as the National Threat Alert System; and associations such as AASHTO, ITS America, APTA, etc.;
   2. Determine the institutional structure for guiding the deployment of surface transportation security on a consistent statewide basis to address funding, accountability, and leadership;

3. Provide for enhanced coordination of traffic control centers, emergency response centers, traveler information services to respond to emergencies, and keep the public informed;
4. Expand plans for evacuations and quarantining;
5. Deploy sensors (and associated networks and processing capabilities) to identify suspicious vehicles and detect disruptions;
6. Harden emergency communications and provide redundancy;
7. Deploy systems to track and automatically halt CVO and public transit vehicles that violate security profiles;
8. Expand traffic control systems to handle emergency traffic redirection and evacuations, including reversal of lanes;
9. Provide for better mechanisms for information dissemination to the public;
10. Coordinate emergency services with telematics suppliers and in-vehicle systems to facilitate rerouting and escape;
11. Work with mainstream information technology and transportation infrastructure interests to establish requirements for hardening sensors, communications, processing centers, and databases against hacking, fraudulent messages, etc. Focus on authentication, verification, integrity assurance, etc. Implement technology to respond to the requirements;
12. Archive data and responses; and
13. Evaluate appropriate tradeoffs between security and civil rights; work toward appropriate legislation and education.

C. Funding –
1. Homeland security acts –
   - FEMA;
   - Supplemental appropriations; and
   - New federal legislation.
2. TEA-21 earmarks;
3. Reauthorization;
4. Leveraging existing state programs; and
5. New state legislation.

Potential project activity

9. Staffing[17]

Staffing is important to ITS in order to achieve the full potential of the system. In essence, a good system plus good people equals good operations. To attain full system potential, agencies should consider the operations staff as much a part of the system as the hardware and software itself. They should also consider using MOUs to document interagency operations and management issues and agreements. This is commonly done by many agencies and has proved to be a successful tool in facilitating operations and management functions.

Staffing needs associated with FMS and IMS are divided into two areas: field staff and operations center staff.

9.1 Field Personnel

Field Technician – This person is responsible for maintaining ITS field devices and identifying failures of surveillance and control devices. He/She should also be capable of assisting an electronics technician in troubleshooting and testing incoming equipment.

Electronics Technician – This person is responsible for diagnostic maintenance to a predetermined level. They should be capable of diagnosing a failure and initiating corrective action as well as performing or monitoring preventative maintenance on ITS field devices.

Field Administrator – In addition to being capable of performing the field and electronics technicians' duties, the field administrator would be responsible for scheduling and monitoring the work performance of the group, equipment inventory and replenishment, cost estimates, and the annual budget.

9.2 Operations Center Staff

Program Manager / Ops Center Manager – These positions refer to the overall manager of the program or operations center. As a senior level manager, this position can most easily assume the additional responsibilities of a combined center.

Shift Manager / Supervisor / Project Manager – As mid-level managers, these positions are responsible for shift operations and projects. Therefore, some sharing of responsibilities is possible.

System Operator / Dispatcher / Liaison – These positions were used in different contexts with the individual ITS functions identified in previous tables. In this table, these positions are assumed to be less specialized and can perform multiple functions, but are listed separately for clarity. The system operator is responsible for confirming incidents, initiating response and disseminating traveler information. The dispatcher is primarily responsible for dispatching and

[17] Major elements of this section were adapted from the *ITS Strategic Plan*.

communicating with the service patrol drivers, but can also assist in incident response by communicating with public safety providers. The liaison position can be a "catch-all", providing general interface with local agencies and the public, including (in the case of the ATIS function) help desk functions for the ISPs.

Computer / Network Support – These positions are similar in all of the individual function scenarios; therefore some responsibility of sharing is possible in a combined center.

Administrative Support – This position is very easily shared in the combined operations center. This position can also pick up some of the liaison's responsibilities.

The staffing needs for the RTMC are a function of the market packages, services provided and hours of operations. To support the deployments outlined in this *Concept of Operations*, three basic scenarios exist. The existing and planned RTMCs are identified with the applicable scenario in the following table.

Table 9.1 – Identification of Long-Term Staffing Needs Scenarios in RTMCs

District	RTMC	Independent of Law Enforcement Dispatch	Co-located with Law Enforcement Dispatch	Regional ATIS Will Be Services Provided
1	Ft. Myers		✓	✓
2	Jacksonville		✓	✓
3	Tallahassee		✓	
3	Pensacola	✓		
4	Broward	✓		✓
4	Palm Beach		✓	✓
5	Orlando		✓	✓
6	Miami		✓	✓
7	Tampa		✓	✓
T	Pompano Beach		✓	✓
T	Turkey Lake	✓		✓

To estimate the staffing requirements, a LOS 5 (24 hours a day, 7 days a week) operation was assumed in the largest metropolitan areas (Miami, Broward, Palm Beach, Tampa, Orlando and Jacksonville) and the Pompano Beach RTMC. A LOS 4 (16 hours a day) operation was assumed for the remaining centers. Table 9.2 summarizes the staffing needed to support these operations in full-time equivalents by the year 2012 based on the staffing guidelines provided in the *ITS Strategic Plan*. Each RTMC is anticipated to develop their own unique detailed operational plan that will more specifically address the phasing of these staffing requirements over time and whether positions are filled using FDOT personnel or consultant staff.

Table 9.2 – Summary of Operational Criteria and Staffing Required at Each RTMC

District	RTMC	LOS	Number of Centerline Miles of Freeway with RR Service Patrols (1)	Program Center Manager		Shift Manager, Supervisor, Operations Engineer, Senior Operator, or Maintenance Engineer		System Operator		RR Service Patrols Dispatcher		RR Service Patrols Field Personnel/ Drivers		Public Safety Operations Center Liaison		Computer Network Support		Administrative Support		Total
				FDOT Min	Others	FDOT Min	Others	FDOT Min	Others	FDOT Min	Others	FDOT Min	Others	FDOT Min	Others	FDOT Min	Others	FDOT Min	Others	
1	Ft. Myers	4	205	0.5		4			4		3		68				1		0.5	81
2	Jacksonville	5	85	1		4			6		5		26	3			4	1		50
3	Tallahassee	4	33	1		2	1	2	3		3		11	3			3		2	31
3	Pensacola	4	21	1		2	1	2	3		3		7	3			3		2	27
4	Broward	5	55	1		3	2	3	6		5		52				4		2	78
4	Palm Beach	5	46	1		3	2	3	6		*		*				4		2	21
5	Orlando	5	130	1			2		9		3		15	0			2		1	33
6	Miami	5	85	1		2	1	1	11		**		50	0		1	2		1	70
7	Tampa	5	70	1	1		5		8		4		35			1	2		2	59
T	Pompano Beach	5	70	1			3		6		5		23				1			39
T	Turkey Lake	4	140	1			3		6		3		47				1			61
	Total		940	10.5	1	20	20	11	68	0	34	0	334	9	0	2	27	1	12.5	550

Total FDOT Positions Needed:	53.5
Total Consultant Positions Needed:	496.5
TOTAL:	**550.0**

(1) Assumes existing RR Service Patrols plus the following additional coverage:

District	Facility	Segments
1	I-75	Remainder of I-75 in District 1
2	SR 9A	Entire Corridor
3	I-10	Tallahassee FMS
3	I-10	Pensacola FMS
3	I-110	Pensacola FMS
*	District 4 proposes centralized dispatching for the RR Service Patrols from the Broward County TMC.	
**	Systems operators will handle these duties.	
	Indicates information provided by the districts. In all other instances, information is based on guidelines in the *ITS Strategic Plan*.	

(2) Sources:

Based on information received as of June 26, 2002.	
Ft. Myers	I-75 Master Plan
Jacksonville	Memo from Peter Vega 5/23/02
Tallahassee	Memo from Elizabeth McCrary 6/6/02
Pensacola	Memo from Elizabeth McCrary 6/6/02
Broward	Email from Valerie Tofexis 6/10/02, No specific numbers provided; best estimate made from information received.
Palm Beach	Email from Valerie Tofexis 6/10/02, No specific numbers provided; best estimate made from information received.
Orlando	Provided by Anne Brewer at May 9 Meeting. Additional comments were provided by Fred Ferrell on 6/24 but not included. (See the attached.)
Miami	Email from Jesus Martinez 6/25/02.
Tampa	Email from Bill Wilshire 6/3/02
Pompano Beach	Turnpike District Concept of Operations
Turkey Lake	Turnpike District Concept of Operations

(3) Additional comments:

Possibly some overlap in Public Safety Officer and Shift Manager needs.
Possibly some overlap in Dispatch and Operator needs.

10. Maintenance[18]

ITS requires an appropriate level of maintenance. Good maintenance will assure reliability and proper operation will protect the investment and enable adjustment to changing conditions. The maintenance of ITS is important in that malfunctions can critically affect the ability of the system to perform its intended functions. Failure to function as intended could negatively impact traffic safety, public acceptance and transportation network capacity. Failure of the system also has the potential to cause measurable economic loss and increase congestion, fuel consumption, pollutants, and traffic accidents.

Unlike traditional capacity improvement projects, providing the operations and maintenance costs to fully support the deployment of ITS is critical. Therefore, the total life-cycle costs for all projects evaluated in this *Concept of Operations* were estimated. ITS operations and management considerations should be evaluated before implementing any technology. Operations and management of ITS technologies and systems extend beyond simply keeping the equipment working. Reacting to emergency failure conditions, maintaining accurate maintenance logs, and conducting preventative maintenance programs all require highly skilled staff that is motivated and fully trained. A maintenance program can also be used to track failures and decrease the time needed to fix the failures.

Most, if not all, public agencies provide maintenance in response to alarms or identified problems. Response maintenance is defined as the repair of failed equipment and its restoration to safe, normal operation. It requires action based on the priority of the subsystem that has failed and takes precedence over preventative maintenance activities for the duration of the emergency. Response maintenance is a critical element of a comprehensive ITS maintenance plan. The importance stems from agencies' responsibility to keep traffic systems operating safely at all times.

The safety of the traveling public and minimizing the agency's exposure to liability represent the two strongest reasons for establishing a sound approach to response maintenance. Typically, response maintenance requires that a qualified technician be on-call to receive notice of any and all problems that arise with field equipment.

[18] Major elements of this section were adopted from the *ITS Strategic Plan*.

Table 10.1 – Response Maintenance Priorities and Guidelines

Priority	Time to Respond	Problem	Time to Repair
High	4 hours	Critical	Next rush hour
		Non-critical	5 working days
Medium	8 hours	Critical	2 working days
		Non-critical	10 working days
Low	Next working day	Critical	5 working days
		Non-critical	20 working days

Response maintenance may involve both field and shop maintenance procedures to fully repair a failed component. Frequently, spares are kept in a ready state in the shop so that they can be used to switch-out the failed device in the field. This provides a means to affect a full and rapid repair in the field and permit the failed device to be completely repaired in the shop where comprehensive diagnostic tools are available and weather elements can be avoided. Spare components suitable to the maintenance demand should be kept on hand for repairs to equipment.

The following guidelines are provided to support response maintenance preparation and need:

- Electronic spare components should be kept in sufficient quantities to repair board failures. It is also advisable to keep some full spare printed circuit boards.
- Spare components are not interchangeable with those of different generations of equipment. It is advisable to note the differences and stock each component.
- Normally, a percentage of components relating to the total existing pieces of equipment in the field are required. Currently, no guidelines exist for inventorying these items; however, this information should be included in the operational plan associated with each RTMC.
- Where failures of certain components become common, it is advisable to stock more than the recommended percentage.
- It may not be appropriate to stock large expensive items such as DMS sign cases, complete with the internal equipment, for the eventuality of a catastrophe, because such items may be too expensive to carry on the books.

While most, if not all, public agencies provide response maintenance, few provide preventative maintenance on a regular, routinely scheduled basis. Preventative maintenance, or routine maintenance as it is sometimes referred to, is defined as a set of checks and procedures to be performed at regularly scheduled intervals for the upkeep of equipment. It includes checking, testing, inspection, record keeping, cleaning, and replacement based on the function and rated service life of the device and its components. Preventative maintenance is intended to ensure reliable mechanical and electrical functioning and operation of equipment, thereby reducing equipment failures, response maintenance, road user costs, and liability exposure. The emphasis in preventative maintenance is checking for proper operation and taking proactive steps to repair or replace defective equipment, thus ensuring that problems are not left until failure occurs.

Lack of staffing and funds is often cited as primary reasons why preventative maintenance is not carried out. Furthermore, most ITS field devices are comprised of solid-state components that have become much more reliable in quality in over the past five years. As such, most agencies simply replace these components when they fail.

FMS have been planned, designed, and deployed throughout Florida to manage the roadway network in a proactive manner. These systems typically consist of various subsystems, i.e., detectors that monitor roadway conditions, CCTV cameras that verify roadway conditions, variable message signs (VMS) that provide en-route traveler information to motorists, and ramp metering systems that increase capacity at major interstate ramp junctures. Operations and control of these various devices typically occur from a traffic control center.

The ability to obtain and communicate real-time information about roadway conditions is essential to the successful operation of FMS and the traveling public's trust in using the relayed information. As such, a proactive maintenance program is essential to the continued successful operation of FMS.

The following table provides guidelines on the suggested preventative maintenance in support of FMS.

Table 10.2 – Preventative Maintenance Guidelines

Subsystem	Minor Maintenance	Major Maintenance	Major Rehabilitation	Life Expectancy
Field Systems				
Cabinets		Twice per year	10 years	20 years
Power Supply	Twice per year	5 years	10 years	20 years
Grounding	Annually	5 years	10 years	25 years
Vehicle Detection Systems				
Loop Detectors and Cables	Twice per year	Annually	5 years	10 years
Controllers		Twice per year	2 years	7 years
Closed-Circuit Television (CCTV) Camera Systems				
Poles	Twice per year	5 years	15 years	50 years
Silicon Intensified Target Cameras		Twice per year	1.5 years	6 years
Charged Coupled Device Cameras		Twice per year	2 years	10 years
Pan-Tilt-Zoom Cameras	Twice per year	Annually	3 years	10 years
Receivers		Twice per year	3 years	10 years
Monitors	Twice per year	5 years		5 years
Dynamic Message Signs (DMS)				
Signcase		Twice per year	1.5 years	10 years
Protective Devices	Twice per year	1 year	2 years	10 years
Pixels, Modules and Drivers		Twice per year	3 years	6 years
Controllers		Twice per year	3 years	6 years
Ramp Metering Systems				
Signal Wiring	Quarterly	5 years		15 years
Signal Heads and Hardware	Quarterly	Annually	Annually	10 years
Poles and Footings	Annually	5 years	10 years	25 years
Loops and Cables	Quarterly	Twice per year	5 years	10 years
Sensor Units		Quarterly		7 years
Controllers		Quarterly	2 years	7 years
Communications Infrastructure				
Fiber Optic Cable Plant	Annually	5 years	25 years	25 years
Fiber Optic Plant Video and Data Equipment		Twice a year	3 years	10 years
Twisted Pair Cable	2 years	8 years	30 years	40 years
Coaxial Cable	Annually	6 years	20 years	30 years
Spread Spectrum	Twice a year	4 years	10 years	20 years

Notes:

(1) *Minor* Maintenance – Minor maintenance is that which can be carried out without large scale testing or the use of heavy equipment. It includes visual inspection and checking of many items, elementary testing, cleaning, lubricating, and minor repairs that can be carried out with hand tools or portable instruments.

(2) *Major Maintenance* – As well as all items normally done under minor maintenance, major maintenance also includes extensive testing, overhauling, and replacement of components that require a scheduled power outage, use of bucket trucks and other heavy equipment.

(3) *Major Rehabilitation* – Major rehabilitation, or complete replacement, is contemplated for devices that experience frequent malfunction or failures.

(4) *Life Expectancy* – Period before total replacement is needed.

A statewide ITS asset management system is currently being considered that will track each device location, type, manufacturer, and maintenance/operations issues. This asset management system will provide a better source of information for the planning of preventative maintenance, inventories to support response maintenance, and planning and budgeting for ITS maintenance needs. This proposed system will be built on the ITS Deployment Tracking Database prepared for the *ITS Program Plan* and *ITS Corridor Master Plans*.

Within the TMC, software is one the critical elements of the ITS services. As discussed in Section 4.4, Deployment Issues, FDOT is migrating to a component-based statewide TMC software that should minimize the total dollars spent on the maintenance of TMC at the district level. Since statewide configuration management is proposed, technical and management support for the TMC software will need to be maintained for the full life cycle of the deployment. A more detailed concept of operations and functional requirements for the TMC software is currently being prepared under a separate document. Staffing and funding of configuration management activities for the statewide TMC software is currently funded through the *Ten-Year ITS Cost-Feasible Plan*.

Estimates of the maintenance costs to support the projects identified in the *Ten-Year ITS Cost-Feasible Plan* are summarized in Table 10.3. These costs are based on unit costs provided by the Maintenance Program or the FHWA Unit Cost Database where unit costs were not available from the Maintenance Program.

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Table 10.3 - Operations and Maintenance Costs for the Ten-Year ITS Cost-Feasible Plan

FIN / MapID	District	Facility	Project Limits	Description	Type	Phase	Project Opening Yr	End of Life Cycle	FY 03	FY 04	FY 05	FY 06	FY 07	FY 08	FY 09	FY 10	FY 11	FY 12	Thru 2012 Total	Funding Source
102502	1	I-75	From Collier/Lee County Line to Lee/Charlotte County Line	Freeway and Incident Management System	FMS	CONST	2006	2015				$0.40	$0.42	$0.43	$0.45	$0.46	$0.48	$0.49	$3.13	Statewide
102702	1	I-75	From Sarasota/Manatee County Line to I-275 (Manatee)	Freeway Management System	FMS	CONST	2013	2022											$0.00	Statewide
102802	1	I-75	From Charlotte/ Sarasota County Line to Sarasota/ /Manatee County Line	Freeway Incident Management System	FMS	CONST	2012	2021										$0.60	$0.60	Statewide
104202	1	I-75	From Broward/Collier County Line to Collier/Lee County Line	Freeway Incident Management System	FMS	CONST	2006	2015				$0.55	$0.57	$0.59	$0.61	$0.63	$0.65	$0.67	$4.25	Statewide
137302	1	I-75	From Collier/Lee Co. Line to Lee/Charlotte Co. Line	Fiber Optic Network	FON	CONST	2006	2015				$0.04	$0.04	$0.04	$0.04	$0.04	$0.05	$0.05	$0.30	Statewide
137402	1	I-75	From Lee/ Charlotte Co. Line to Charlotte/Sarasota Co. Line	Fiber Optic Network	FON	CONST	2010	2019								$0.03	$0.03	$0.03	$0.09	Statewide
137502	1	I-75	From Sarasota/Manatee Co. Line to I-275 (Manatee County)	Fiber Optic Network	FON	CONST	2013	2022											$0.00	Statewide
138202	1	I-75	From Charlotte/Sarasota Co. Line to Sarasota/Manatee Co. Line	Fiber Optic Network	FON	CONST	2011	2020									$0.06	$0.06	$0.12	Statewide
138502	1	I-75	From Lee/Charlotte Co. Line to Charlotte/Sarasota Co. Line	Freeway and Incident Management System	FMS	CONST	2010	2019								$0.33	$0.34	$0.35	$1.03	Statewide
204402	2	I-295	From I-10 to I-95 N	Incident Management System, Traveler Information, Management Center and Fiber Optics	FMS	CONST	2013	2022											$0.00	Statewide
204502	2	I-295	From I-95 S to I-10	Incident Management System, Traveler Information, Management Center and Fiber Optics	FMS	CONST	2012	2021										$0.15	$0.15	Statewide
237002	2	I-295	From I-10 to I-95N	Fiber Optic Network	FON	CONST	2012	2021										$0.02	$0.02	Statewide
237102	2	I-295	From I-95S to I-10	Fiber Optic Network	FON	CONST	2012	2021										$0.03	$0.03	Statewide
203902	2	I-95	From I-10 to Airport Road	Fiber Optic Network	FON	CONST	2005	2014			$0.01	$0.01	$0.01	$0.01	$0.01	$0.02	$0.02	$0.02	$0.12	Statewide
204002	2	I-95	From I-10 to Trout River	I-95 North ITS Improvements - Incident Management - cctvs, vehicle detection units, DMSS	FMS	CONST	2005	2014			$0.03	$0.03	$0.03	$0.03	$0.03	$0.04	$0.04	$0.04	$0.27	Statewide
204102	2	I-95	From Trout River to Airport/Duval Road	I-95 North ITS Improvements - Incident Management - cctvs, vehicle detection units, DMSS	FMS	CONST	2006	2015				$0.07	$0.07	$0.07	$0.07	$0.08	$0.08	$0.08	$0.52	Statewide
321502	3	I-10	From Welcome Center to East of SR 87	Pensacola Area Freeway Management System	FMS	CONST	2009	2018							$0.37	$0.39	$0.40	$0.41	$1.58	Statewide
321702	3	I-10	From West of US 90 (Gadsden County) to East of US 90 (Leon County)	Tallahassee Area Freeway Management System	FMS	CONST	2010	2019								$0.28	$0.29	$0.30	$0.88	Statewide
336702	3	I-10	From US 90 West to US 90 East	Fiber Optic Network	FON	CONST	2009	2018							$0.02	$0.02	$0.02	$0.02	$0.09	Statewide
336802	3	I-10	From Alabama State Line/I-10 Welcome Center to SR 87	Fiber Optic Network	FON	CONST	2009	2018							$0.04	$0.04	$0.04	$0.04	$0.17	Statewide
307902	3	I-110	From I-10 to Pensacola Bay Bridge	I-110 Pensacola Area Freeway Management System	FMS	CONST	2009	2018							$0.13	$0.13	$0.14	$0.14	$0.54	Statewide
336902	3	I-110	From Pensacola Bay Bridge to I-10	Fiber Optic Network	FON	CONST	2009	2018							$0.01	$0.01	$0.01	$0.01	$0.03	Statewide
401402	4	I-75	From Sawgrass Expressway to Broward/Collier Co Line	DMSS, ATIS, ARTS, CCTV at Interchanges, OVCS	FMS	CONST	2009	2018							$0.34	$0.35	$0.36	$0.37	$1.41	Statewide
423302	4	I-75	From Southern Terminus to Sawgrass Expressway	DMSS, ATIS, ARTS, CCTV at Interchanges, OVCS	FMS	CONST	2009	2018							$0.62	$0.64	$0.66	$0.68	$2.60	Statewide
438302	4	I-75	From Sawgrass Expressway to Broward/Collier Co. Line	Fiber Optic Network	FON	CONST	2008	2017						$0.04	$0.04	$0.04	$0.05	$0.05	$0.22	Statewide
438402	4	I-75	From Southern Terminus to Sawgrass Expressway	Fiber Optic Network	FON	CONST	2008	2017						$0.04	$0.04	$0.04	$0.04	$0.04	$0.21	Statewide
2317391	4	I-95	From Miami-Dade/Broward Co. Line to Broward/Palm Beach Co Line	I-95/I-595 Video Monitoring System Cameras Broward County	FMS	CONST	2006	2015				$0.10	$0.10	$0.11	$0.11	$0.11	$0.12	$0.12	$0.77	District
503802	5	I-4	From SR 44 to I-95	I-4 Surveillance Motorist Information System Phase 5	FMS	CONST	2005	2014			$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.01	Statewide
2425231	5	I-4	From World Drive to US 27	I-4 SMIS (7 Miles) Phase 4 / 6- Lane Reconstruction Project	FMS	CONST	2004	2013		$0.10	$0.10	$0.10	$0.11	$0.11	$0.11	$0.12	$0.12	$0.13	$0.99	District

Programmed Projects

FIN / MapID	District	Facility	Project Limits	Description	Type	Phase	Project Opening Yr	End of Life Cycle	FY 03	FY 04	FY 05	FY 06	FY 07	FY 08	FY 09	FY 10	FY 11	FY 12	Thru 2012 Total	Funding Source
2427021	5	I-4	From Lake Mary Blvd to SR 472	I-4 SMIS (22 Miles) Phase 3 - St. Johns River Bridge Replacement / Reconstruction	FMS	CONST	2003	2012	$0.14	$0.15	$0.15	$0.16	$0.16	$0.17	$0.18	$0.18	$0.19	$0.19	$1.68	District
512702	5	I-95	From US 1 (Volusia County) to US 1 at the Flagler County Line	Surveillance Motorist Information System/Daytona Area Smart Highways Phase IV	FMS	CONST	2007	2016					$0.31	$0.32	$0.33	$0.34	$0.35	$0.36	$1.99	Statewide
512802	5	I-95	From SR 44 to US 1 (Volusia County)	Surveillance Motorist Information System/Daytona Area Smart Highways PhaseIII	FMS	CONST	2007	2016					$0.10	$0.10	$0.10	$0.10	$0.11	$0.11	$0.62	Statewide
523902	5	I-95	From Indian River/Brevard Co. Line to SR44	Surveillance Motorist Information System/Daytona Area Smart Highway Phase IV	FMS	CONST	2009	2018							$0.68	$0.70	$0.72	$0.75	$2.85	Statewide
540302	5	I-95	From US 1 (Volusia County) to US 1 at the Flagler/St. Johns Co. Line	Fiber Optic Network	FON	CONST	2006	2015				$0.03	$0.03	$0.03	$0.03	$0.03	$0.03	$0.03	$0.20	Statewide
540402	5	I-95	From Indian River/Brevard Co. Line to SR 44	Fiber Optic Network	FON	CONST	2007	2016					$0.11	$0.11	$0.11	$0.12	$0.12	$0.12	$0.69	Statewide
540502	5	I-95	From SR 44 to US 1 (Volusia County)	Fiber Optic Network	FON	CONST	2006	2015				$0.03	$0.03	$0.03	$0.03	$0.03	$0.03	$0.03	$0.22	Statewide
4702	5	Various	From Kirkman Road to SR 417 West	ITS-01:OOCEA's SR 408 & SR 417	FMS	CONST	2003	2012	$0.07	$0.08	$0.08	$0.08	$0.08	$0.09	$0.09	$0.09	$0.09	$0.10	$0.85	Expwy Auth
4902	5	Various		ITS-02: OOCEA's SR 408, SR 417, & SR 528	FMS	CONST	2004	2013		$0.08	$0.08	$0.08	$0.08	$0.09	$0.09	$0.09	$0.09	$0.10	$0.78	Expwy Auth
5602	5	Various		ITS-04: OOCEA's SR 408, SR 417, & SR 528	FMS	CONST	2004	2013		$0.14	$0.14	$0.15	$0.15	$0.16	$0.16	$0.17	$0.17	$0.18	$1.41	Expwy Auth
5801	5	Various		ITS-05: OOCEA's SR 408, SR 417, SR 528, SR 520, & SR 50	FMS	CONST	2005	2014			$0.13	$0.13	$0.14	$0.14	$0.15	$0.15	$0.16	$0.16	$1.15	Expwy Auth
2516821	6	I-95	From US 1 to Ives Dairy Road	I-95 Intelligent Corridor System Package B	FMS	CONST	2003	2012	$0.55	$0.57	$0.58	$0.60	$0.62	$0.64	$0.67	$0.69	$0.71	$0.73	$6.37	District
1001802	6	SR 836	From SR 821 to NW 27th Ave	ITS - 002	FMS	CONST	2003	2012	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.01	Expwy Auth
140602	7	I-275	From I-75 South to Sunshine Skyway Bridge	Fiber Optic Network	FON	CONST	2012	2021										$0.01	$0.01	Statewide
702002	7	I-275	From Bearss Ave to I-75	Freeway and Incident Management System	FMS	CONST	2007	2016					$0.10	$0.10	$0.11	$0.11	$0.11	$0.12	$0.65	Statewide
737802	7	I-275	From South of Sunshine Skyway Bridge to McKinley Drive	Communication Link for Sunshine Skyway Bridge to FHP	FON	CONST	2005	2014			$0.05	$0.05	$0.05	$0.05	$0.05	$0.06	$0.06	$0.06	$0.42	Statewide
737902	7	I-275	From Fowler Ave to Bearss Ave	Fiber Optic Network	FON	CONST	2005	2014			$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.02	Statewide
743302	7	I-275	From Howard Frankland Bridge to Hillsborough River	Links II/III	FMS	CONST	2011	2020									$0.24	$0.25	$0.50	Statewide
743402	7	I-275	From Bearss Ave to I-75	Fiber Optic Network	FON	CONST	2007	2016					$0.01	$0.01	$0.01	$0.01	$0.01	$0.01	$0.05	Statewide
2583991	7	I-275	From Himes Ave. to Hillsborough River	Links Stage III	FON	CONST	2008	2017						$0.00	$0.00	$0.00	$0.00	$0.00	$0.02	Statewide
2586432	7	I-275	From Hillsborough River to I-4	I-275/I-4 Freeway Management System	FMS	CONST	2006	2015				$0.05	$0.06	$0.06	$0.06	$0.06	$0.06	$0.07	$0.42	Statewide
4072331	7	I-275	From MLK Blvd to Bearss Ave	I-275 Freeway Management System	FMS	CONST	2006	2015				$0.12	$0.13	$0.13	$0.14	$0.14	$0.15	$0.15	$0.96	Statewide
4072332	7	I-275	From 54th Ave N to Howard Frankland	I-275 Freeway Management System	FMS	CONST	2006	2015				$0.06	$0.06	$0.07	$0.07	$0.07	$0.07	$0.07	$0.47	Statewide
4072333	7	I-275	From Howard Frankland to Kennedy Blvd	I-275 Freeway Management System	FMS	CONST	2006	2015				$0.07	$0.07	$0.07	$0.07	$0.07	$0.08	$0.08	$0.51	Statewide
4072334	7	I-275	From 54th Ave S to 54th Ave N	I-275 Freeway Management System	FMS	CONST	2008	2017						$0.32	$0.33	$0.34	$0.35	$0.36	$1.70	Statewide
740202	7	I-4	From I-275 to US 27 (Polk County)	Fiber Optic Network	FON	CONST	2005	2014			$0.06	$0.06	$0.06	$0.07	$0.07	$0.07	$0.07	$0.08	$0.54	Statewide
2584012	7	I-4	From 14th St to 50th St	I-4 Freeway Management System	FMS	CONST	2006	2015				$0.05	$0.05	$0.05	$0.05	$0.05	$0.05	$0.05	$0.35	Statewide
4093661	7	I-4	From 50th Street to CR 579	I-4 Freeway Management System	FMS	CONST	2006	2015				$0.12	$0.12	$0.13	$0.13	$0.14	$0.14	$0.15	$0.93	Statewide
4093662	7	I-4	From CR 579 to Park Road	I-4 Freeway Management System	FMS	CONST	2007	2016					$0.23	$0.24	$0.25	$0.25	$0.26	$0.27	$1.51	Statewide
4093663	7	I-4	From Park Road to Hillsborough/Polk Co. Line	I-4 Freeway Management System	FMS	CONST	2008	2017						$0.08	$0.09	$0.09	$0.09	$0.10	$0.45	District
4093664	7	I-4	From Hillsborough/Polk Co. Line to US 27	I-4 Freeway Management System	FMS	CONST	2008	2017						$0.16	$0.16	$0.17	$0.17	$0.18	$0.84	Statewide
743702	7	I-75	From US 301 (Brandon) to SR 54	Fiber Optic Network	FON	CONST	2010	2019								$0.07	$0.07	$0.08	$0.22	Statewide
4109091	7	I-75	From US 301 to Fowler Ave	I-75 Freeway Management System	FMS	CONST	2007	2016					$0.18	$0.19	$0.20	$0.20	$0.21	$0.22	$1.20	Statewide

Programmed Projects

FIN / MapID	District	Facility	Project Limits	Description	Type	Phase	Project Opening Yr	End of Life Cycle	FY 03	FY 04	FY 05	FY 06	FY 07	FY 08	FY 09	FY 10	FY 11	FY 12	Thru 2012 Total	Funding Source
4109095	7	I-75	From Pasco Co. Line to SR 50	I-75 Freeway Management System	FMS	CONST	2012	2021										$0.08	$0.08	Statewide
2558441	7	SR 589	From I-275 to Hillsborough River	Links Stage I	FMS	CONST	2005	2014			$0.07	$0.07	$0.08	$0.08	$0.08	$0.08	$0.09	$0.09	$0.64	Statewide
843802	8	SR 91	From MP 263 to MP 267	Ocoee Video System and Fiber Optics	FMS	CONST	2003	2012	$0.01	$0.01	$0.01	$0.02	$0.02	$0.02	$0.02	$0.02	$0.02	$0.02	$0.16	
1907501	8	SR 91	From MP4 to MP 75	SunNav Phase 1 Fiber Project	FMS	CONST	2004	2013		$0.09	$0.09	$0.09	$0.10	$0.10	$0.10	$0.11	$0.11	$0.11	$0.91	District
4061231	8	SR 91	From Turnpike Mainline to	Intelligent Transportation System (ITS) Incident Detection	FMS	CONST	2008	2017						$0.24	$0.24	$0.25	$0.26	$0.27	$1.26	District
1907171	8	Various	From I-95 to I-75	Advanced Traveler Information System DMS, HAR , TMC's	FMS	CONST	2003	2012	$0.24	$0.25	$0.26	$0.27	$0.27	$0.28	$0.29	$0.30	$0.31	$0.32	$2.80	District
								Yearly Totals:	$1.02	$1.45	$1.85	$3.60	$4.75	$5.79	$8.18	$9.17	$9.77	$10.98	$56.55	

Programmed Projects

Table 10.4 – Estimated Unit Maintenance Costs

Device	Unit	Construction	O&M Cost
Closed-Circuit Television	each	$48,000.00	$2,350.00
Detector Area	each	$1,850.00	$162.50
Dynamic Message Signs	each	$272,500.00	$11,600.00
Dynamic Trail Blazer	each	$75,000.00	$4,000.00
Emergency Stopping Site		$20,000.00	$1,000.00
Fiber	each	$116,000.00	$1,000.00
Highway Advisory Radio	each	$32,000.00	$1,000.00
Highway Advisory Radio Beacon	each	$75,000.00	$4,000.00
Communications HUB	each	$107,500.00	$1,000.00
Inductive Loop Detectors	each	$1,850.00	$162.50
Ramp Metering Station	each	$56,000.00	$3,500.00
RTMS	each	$6,000.00	$400.00
Road Weather Information System	each	$52,000.00	$3,500.00
Vehicle Identification Detection System	each	$30,000.00	$400.00

11. Guidelines for TMC Operational Plans

This *Concept of Operations* considers from a high-level the basic concepts and requirements for operations of the *Ten-Year ITS Cost-Feasible Plan*. Because of the range and scope of these deployments and the desire to promote local autonomy at the district level with statewide coordination, the concepts presented are principles that will be refined though the development of operational plans/concepts of operations for each of the RTMCs. Each existing RTMC maintains an operational plan. All proposed RTMCs will require the development of a more detailed concept of operations to support design, procurement, implementation, and operations and management of the TMC to reflect the specific needs for that center.

During the development of these concepts of operations and maintenance of the operational plans at existing TMCs, the following issues needed to be addressed based on guidance from the FHWA in *Traffic Management Center Concept of Operations: Implementation Guide* (1997).

The purpose of the TMC concepts of operation is to define the functions (what is accomplished) and processes (how they are accomplished) applicable to the center. Based on the *Guide* and experiences throughout a review of the concepts of operations for deployments in Florida, the concept of operations should include:

- Purpose;
- Legacy Systems;
- Deployment Issues;
- Need for ITS;
- Proposed Deployment Concepts;
- Gap Analysis;
- Anticipated Impacts and Benefits;
- Systems Engineering Management Plan (SEMP) –
  - Program Management;
  - Technical/Project Management; and
  - Professional Capacity Building.

- Operations –
  - Functional Requirements;
  - Relationship to Other Centers;
  - Roles and Responsibilities;
  - Workload and Performance;
  - Organization/Staffing; and
  - Nonstandard Operations;

- Maintenance –
  - Responsive Maintenance and Inventory;
  - Preventative Maintenance; and
  - Replacement and Disposal;

- Operational Facility Needs;

- Training and Documentation; and

- Procurement and Contracting.

Additional guidance on the level of detail each of these sections should include and how to prepare the concept of operations is provided in the *Guide* referenced above.

12. Summary

The purpose of this *Concept of Operations* is to present a summary of major issues, approaches, roles, and responsibilities in the deployment, operations, and management of ITS strategies along the FIHS limited-access facilities. These approaches and concepts were developed consistent with current ITS practices and programs developed by stakeholder agencies and the districts. These issues will continue to be resolved through the involvement and interaction with the ITS Steering Committee which includes the district ITS engineers responsible for the ITS deployments and the ITS Central Office, whose charge is to ensure the development of a successful, interoperable, statewide ITS. Operational plans are recommended for the further refinement and development of these concepts in each of the TMCs and regional ITS deployments that build on this initial concept but establish the operational requirements specific for each district.

Existing, programmed, and planned ITS deployments along the intrastate facilities were identified to determine physical gaps in the ITS services which will be the focus of the ITS implementation strategies to be developed for the corridors. Minimum spacing standards were recommended for deployment in the rural and urban areas and to serve as a guidelines for future ITS deployments developed by the districts.

Technical Memorandum No. 2 – ITS Needs Model presented the goals, objectives, mission, and vision of the statewide ITS program that creates an ideal approach to the deployment of ITS strategies along the FIHS limited-access corridors. These concepts illustrate the need for the ITS deployments and are the standard for which the ITS program aims.

The anticipated benefits and impacts of the proposed ITS deployments were identified and the roles and responsibilities of the major stakeholders were defined in the systems engineering approach to the statewide ITS program.

Recommendations for the operation and management of the proposed statewide ITS program were presented utilizing the RTMC aligned with planned law enforcement RCCs. The primary and secondary command and control of these facilities were based on functional criteria and through coordination with the ITS Steering Committee. A detailed description of the ITS corridor operations was included in addition to the minimum connections for each RTMC. Operations and communications for the ITS deployments during incidents and emergencies was also defined for the FIHS limited-access corridors.

Additional discussions were provided that address the potential operational and maintenance needs to support the ITS deployments outlined in the *Ten-Year ITS Cost-Feasible Plan*. Estimates of the staffing requirements were made based on assumed LOS and operational jurisdiction. These concepts will be refined in the development of center specific concepts of operations.

An outline of the maintenance needs and costs to support the projects and programs identified in the *ITS Program Plan* is provided. These needs will support the long-range planning of operations and maintenance resources needed to ensure the ITS are effectively supported and the greatest possible benefit is achieved.

This *Concept of Operations* is intentionally high-level because of the range and scope of deployment considered. A summary of the FHWA guide on *Traffic Management Center Concepts of Operations: Implementation Guide* is provided. This guide is intended for the development of TMC-specific operations.

Appendix A

Florida Highway Patrol's Regional Communications Center (RCC) Plan

DRAFT

DIVISION OF FLORIDA HIGHWAY PATROL

OFFICE OF DEPUTY DIRECTOR – FIELD OPERATIONS

October 7, 1999

TO: Colonel Charles C. Hall

FROM: Lieutenant Colonel Billy Dickson

SUBJECT: Joint Communications Centers Implementation Plan

As the Florida State Law Enforcement Community enters the next century, communications as we currently know them will be a thing of the past. The success of the Joint Communications venture in Miami has proven that it should continue throughout the state. The only feasible way to accomplish this is to implement joint communications along with 800 MHz implementation phases.

To accomplish Joint Communications, we must envision where we want to be five-ten years from now, and how to get there. We now know that we cannot continue to operate as we always have in the past; however, we must also carefully graph our future if we want to reach our intended goals with any success.

Below is our vision in how to accomplish the task of reducing our communications centers from 23 autonomous district operations to seven regional communications centers that will serve the Florida Highway Patrol, Florida Department of Law Enforcement, Motor Carrier Compliance, and the Bureau of Alcohol Beverage and Tobacco. Additionally, we will have two satellites offices that will serve FHP personnel along the I-10 and I-75 corridors. To be successful we must, as stated earlier, implement this plan in accordance with the implementation of the 800 MHz Radio System;

Phase I

The first phase of the 800-MHz began in Miami-Dade and Monroe Counties; therefore, it was a logical place to begin joint communications, where several state agencies could, under one roof, provide emergency dispatch services to their officers, and citizens and visitors of this state as well. Currently, we are conducting co-located dispatch in Miami. This communications center is responsible for dispatching; FHP, FDLE, MCC, and

ABT. January 1, 2000, will be the beginning of true joint communications within state law enforcement. Assuming the pilot program continues to progress as expected, FHP will assume all responsibilities for dispatch services for all the agencies included in our MOU with FDLE.

The FHP is committed to ensuring that all state law enforcement agencies receive efficient, prompt and professional dispatch services. In order to ensure this, shift commanders will oversee the operations within the communications center and will ensure that dispatching services are prompt and professional. They will also ensure that appropriate agency personnel are notified of any critical or unusual incident concerning members from their agency. A recent staff study concluded that the FHP could easily handle this task with an additional eleven duty officers and one duty officer supervisor in the Miami Station.

We also plan to transfer all communications personnel consigned to the joint communications center in Miami from FDLE to FHP, effective July 1, 2000. The transfer of FDLE positions will provide the Miami Communications Center with seven additional duty officers and one additional duty officer supervisor. This will result in the FHP accepting the sole responsibility of providing professional, efficient and courteous dispatch services to the other law enforcement agencies outlined in the MOU.

PHASE II - 800 MHz Radio System Implementation

Phase II of the 800 MHz Radio System includes; Troops D, L, and K from Broward County to Sumter County. This phase currently contains six communications centers:

Davie -	Troop L
Lake Worth -	Troop L
Lake Worth -	Troop K
Cocoa -	Troop D
Orlando -	Troop D
Deland -	Troop D

It is recommended that we reduce the communications centers in this phase from its current six to two:

① Lake Worth - Troops K and L

Regional Communications
Page 3

(2) Orlando – Troop D

This consolidation will require relocating the following communications centers:

Troop	Current Location	New Location	Miles to new Station	Deadline
L	Davie	Lake Worth	50	06/30/2000
D	Cocoa	Orlando	48	03/31/2000
D	Deland	Orlando	34	12/31/2000

Currently, the existing six communications centers have 90 duty officers to handle dispatching troopers to emergency and non-emergency calls, answer in-coming telephones, conduct criminal history and warrant checks, etc. Additionally, the FDLE has eight duty officers assigned to its Orlando Communications Center, seven duty officers and one duty officer supervisor. The current staffing does not provide sufficient communications personnel to handle all those duties in an efficient manner. In the consolidated communications centers; it will require 92 duty officers to effectively handle these duties, and to provide dispatch services for the other state law enforcement agencies in the MOU.

PHASE III

Phase III of the 800 MHz Radio System consists of Troops C and F, in Region II. This phase of the 800 MHz Radio System will be implemented by June 30, 2001. We currently have seven communications centers in this phase:

Brooksville - Troop C
Lakeland - Troop C
Tampa - Troop C
Arcadia - Troop F
Bradenton - Troop F
Fort Myers - Troop F
Venice - Troop F

It is recommended that these seven (3) communications centers be consolidated into two communications centers in Fort Myers and Tampa (4). This consolidation will require relocating the following communications centers:

Regional Communications
Page 4

Troop	Current Location	New Location	Miles to new Station	Deadline
C	Brooksville	Tampa	45	12/31/2000
C	Lakeland	Tampa	32	12/31/2000
F	Arcadia	Fort Myers	46	12/31/2000
F	Bradenton	Fort Myers	94	03/31/2001
F	Venice	Fort Myers	53	03/31/2001

Currently, the existing seven communications centers have 69 duty officers to handle dispatching troopers to emergency and non-emergency calls, answer in-coming telephones, conduct criminal history and warrant checks, etc. Additionally, the FDLE has eight duty officers assigned to their Tampa Communications Center, one duty officer supervisor and seven duty officers. The current staffing does not provide sufficient communications personnel to handle all those duties in an efficient manner. In the consolidated communications centers, it will require 86 duty officers to effectively handle these duties, and to provide dispatch services for the other state law enforcement agencies in the MOU.

Phase IV

Phase IV of the 800 MHz Radio System consists of Troops B, G, and Madison and Taylor Counties in Troop H. We currently have six communications centers in this phase; however, one of the communications centers, Madison, will be implemented with Phase V rather than Phase IV, for the purpose of Regional Communication Centers. Therefore, we will only be consolidating five communications centers during this phase:

Gainesville - Troop B
Lake City - Troop B
Jacksonville - Troop G
Ocala - Troop G
Palatka - Troop G

It is recommended that these five communications centers be consolidated into two communications centers in Gainesville and Jacksonville. Jacksonville will be a Regional Communications Center, and Gainesville will be a Satellite Communications Center that will serve FHP along the I-75 corridor.

Regional Communications
Page 5

This consolidation will require relocating the following communications centers:

Troop	Current Location	New Location	Miles to new Station	Deadline
B	Lake City	Gainesville	45	12/31/2002
G	Ocala	Gainesville	37	12/31/2002
G	Palatka	Jacksonville	53	12/31/2001

Currently, the existing five communications centers have 46 duty officers to handle dispatching troopers to emergency and non-emergency calls, answer in-coming telephones, conduct criminal history and warrant checks, etc. Additionally, the FDLE has eight duty officers assigned to their Jacksonville Communications Center, one duty officer supervisor and seven duty officers. The current staffing does not provide sufficient communications personnel to handle all those duties in an efficient manner. In the consolidated communications centers, it will require 53 duty officers to effectively handle these duties, and to provide dispatch service to the other state law enforcement agencies in the MOU.

Phase V

Phase IV of the 800 MHz Radio System consists of Troops H. We currently have four communications centers in this phase:

Madison - Troop H
Tallahassee - Troop H
Panama City - Troop A
Pensacola - Troop A

It is recommended that these four communications centers be consolidated into two communications centers in Pensacola and Tallahassee. Tallahassee will be a Regional Communications Center, and Pensacola will be a Satellite Communications Center that will serve FHP along the I-10 corridor. This consolidation will require relocating the following communications centers:

Regional Communications
Page 6

Troop	Current Location	New Location	Miles to new Station	Deadline
H	Madison	Tallahassee	55	12/31/2004
A	Panama City	Pensacola	144	12/31/2004

Currently, the existing four communications centers have 44 duty officers to handle dispatching troopers to emergency and non-emergency calls, answer in-coming telephones, conduct criminal history and warrant checks, etc. Additionally, the FDLE has nine duty officers assigned to its Tallahassee Communications Center, one duty officer supervisor and seven duty officers. The current staffing does not provide sufficient communications personnel to handle all those duties in an efficient manner. In the consolidated communications centers, it will require 58 duty officers to effectively handle these duties, and to provide dispatch services to the other agencies in the MOU.

It is recommended that the communications centers be consolidated before the implementation of 800 MHz. This will allow:

- Sufficient training for the duty officers,
- Cost of remodeling to accommodate the 800 MHz radio system will be paid by the Department of Management Services,
- Cost of workstation furniture will be paid by the Department of Management Services,
- Installation of the radio system will be paid by Department of Management Services,

The costs that are involved in this venture that are not paid by the Department of Management Services are:

- Telephone lines to remote radio equipment,
- Remoting telephone lines,
- Cost of lines and moving of the computer aided dispatch equipment and servers,
- Cost of moving criminal justice information computer terminals,
- Cost of moving and connecting recording equipment,

Regional Communications
Page 7

- In some locations, it may be necessary to purchase new telephone systems to handle the additional workload,
- Cost of modifying Federal Communications Commission (FCC) Radio Licenses.

The Division has operated for many years with insufficient staffing in the communications centers. The implementation of joint dispatching within consolidated communications centers will help eliminate staffing problems and be more cost effective for the State of Florida.

The partnerships we have established with the other affected state law enforcement agencies indicate our ability to work as a team. With their support, and the tireless efforts of our field personnel, especially those consigned to the communications centers, we will a professional and efficient service for all concerned parties.

Finally, to create a smooth transition from the existing communications centers to the regional communications centers, it is recommended that each communications centers begin reassigning positions as they become available to the regional communications center for their respective jurisdiction. As these positions are transferred, we will begin remoting beginning with the midnight shift, then the evening shift. When there are not sufficient personnel to staff the day shift – the remaining positions will be transferred to the respective regional or satellite communications centers.

It is expected that the process of transferring positions to regional and satellite communications centers will take approximately three years, which will allow our personnel ample time to prepare for the impending move.

DISPATCH CENTERS APPLYING MAS
NEW DISPATCH CONFIGURATION

REGIONAL CENTERS
① LAKE WORTH
② ORLANDO
③ FT MYERS
④ TAMPA
⑤ JACKSONVILLE
⑥ TALLAHASSEE

SATELLITE CENTERS
Ⓐ GAINESVILLE
Ⓑ PENSACOLA. > 24 HOUR DISPATCH

Florida Department of Transportation

JEB BUSH
GOVERNOR

605 Suwannee Street
Tallahassee, Florida 32399-0450

THOMAS F. BARRY, JR.
SECRETARY

March 1, 2000

Lieutenant Colonel Mike Boles
Florida Highway Patrol
Neil Kirkman Building
Tallahassee, Florida 23299-0500

Re: Florida Highway Patrol Station Closures

Dear Lieutenant Colonel Boles:

The Department of Transportation is in the process of finalizing the design phase of a project that will upgrade our microwave system and provide a permanent reconfiguration of our motorist aid call box system to conform with your regional dispatching plan. However, the upgrade of our system has not started and we do not anticipate, once construction starts, to be complete until the fall of 2001.

To keep the call boxes operational for those stations that will be losing dispatching capabilities, the Department has developed the following interim plan.

Fort Lauderdale

Route the Alligator Alley call box traffic to Lake Worth. Because of a project we now have going at the Miccosukee Indian reservation and at the Broward County toll plaza we will have to split the call box traffic at the Broward/Collier County line. The Collier County traffic will be routed to Lake Worth using the microwave via I-75, I-10 and I-95. The Broward County traffic will be routed to Lake Worth utilizing leased lines. Two four wire E&M lines will be necessary.

Cocoa, Deland, Brooksville, Bradenton & Venice

We will utilize the backup capabilities provided as part of the design of the motorist aid call box system to switch call box traffic to an adjacent station as follows:

- Switch Cocoa traffic to Lake Worth
- Switch Deland traffic to Palatka
- Switch Brooksville traffic to Tampa
- Switch Bradenton traffic to Tampa
- Switch Venice traffic to Fort Myers

The other stations that dispatch for the motorist aid call box system will not be impacted. The dates these stations will transfer dispatching duties will be outside our construction window. The permanent reconfiguration will be in place and the dispatching function for the motorist aid call box system will be routed to an appropriate station as designated in your regional plan.

The Department will cover the costs for any equipment that will be necessary to be install to make the interim plan functional. The estimated equipment and installation cost will be approximately $250,000. We are asking the Highway Patrol to pickup the installation and recurring cost for the temporary phone lines between Andytown (I-75 toll plaza in Broward County) and Lake Worth.

Once the interim plan is in place, the backup capabilities designed into the system will be diminished. There may be some instances when a station goes down (dispatch console goes down), a portion of the system will be without call boxes until the stations goes back on line. During this time increased patrols may be necessary to make up for the temporary loss of the call boxes.

If you have any questions, please give me a call at (850) 414-7620.

Sincerely,

Gene Glotzbach, P.E.
Deputy State Traffic Operations Engineer

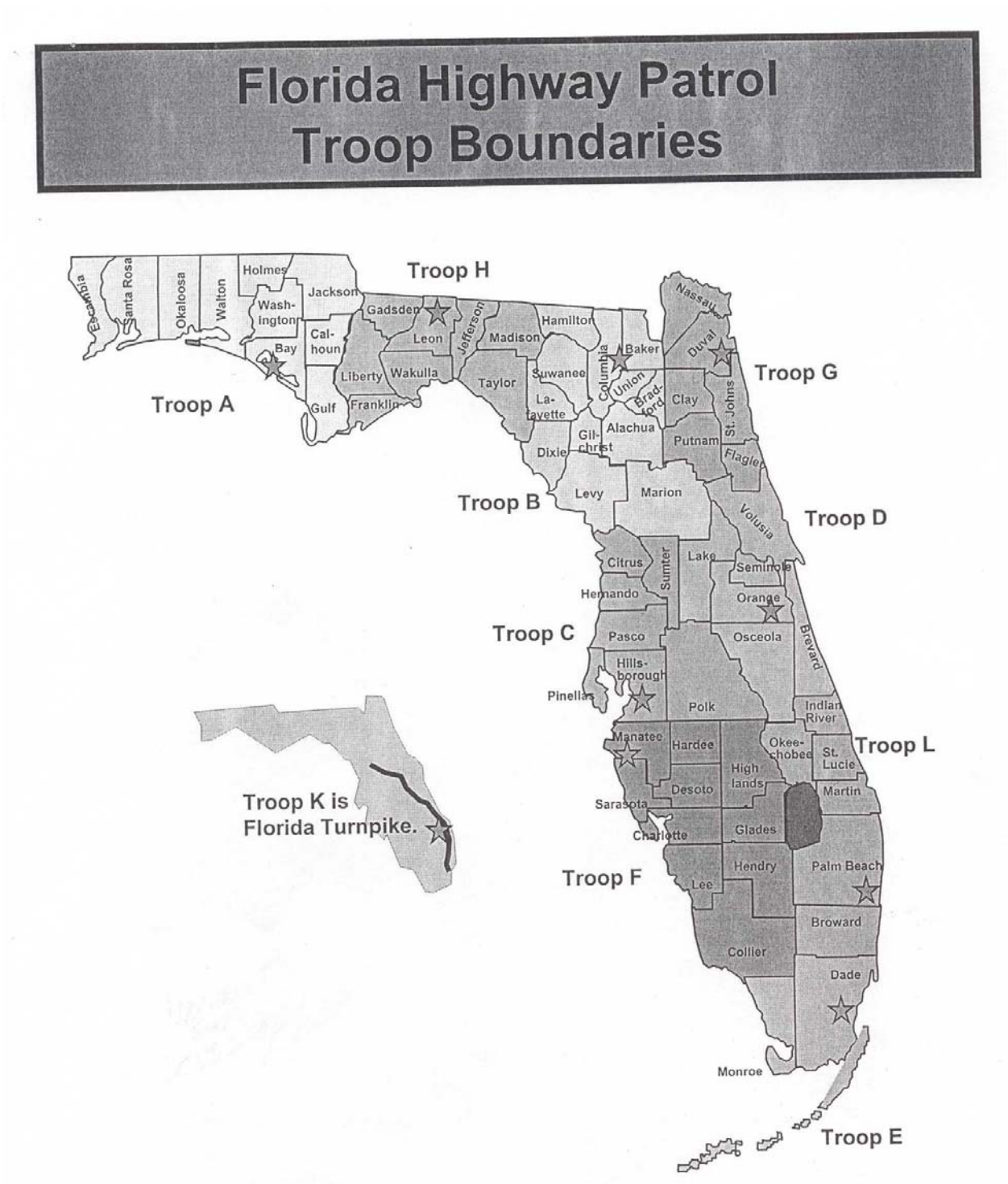
Concur with interim dispatching plan:

_____

LTC Mike Boles
Florida Highway Patrol

GAG:is

cc: Don Fox
Robert Gottschalk
John Hogan


Florida Highway Patrol
Troop Boundaries
Troop H
Troop A
Troop G
Troop B
Troop D
Troop C
Troop L
Troop F
Troop E
Troop K is
Florida Turnpike.
Escambia
Santa Rosa
Okaloosa
Walton
Holmes
Jackson
Wash-
ington
Bay
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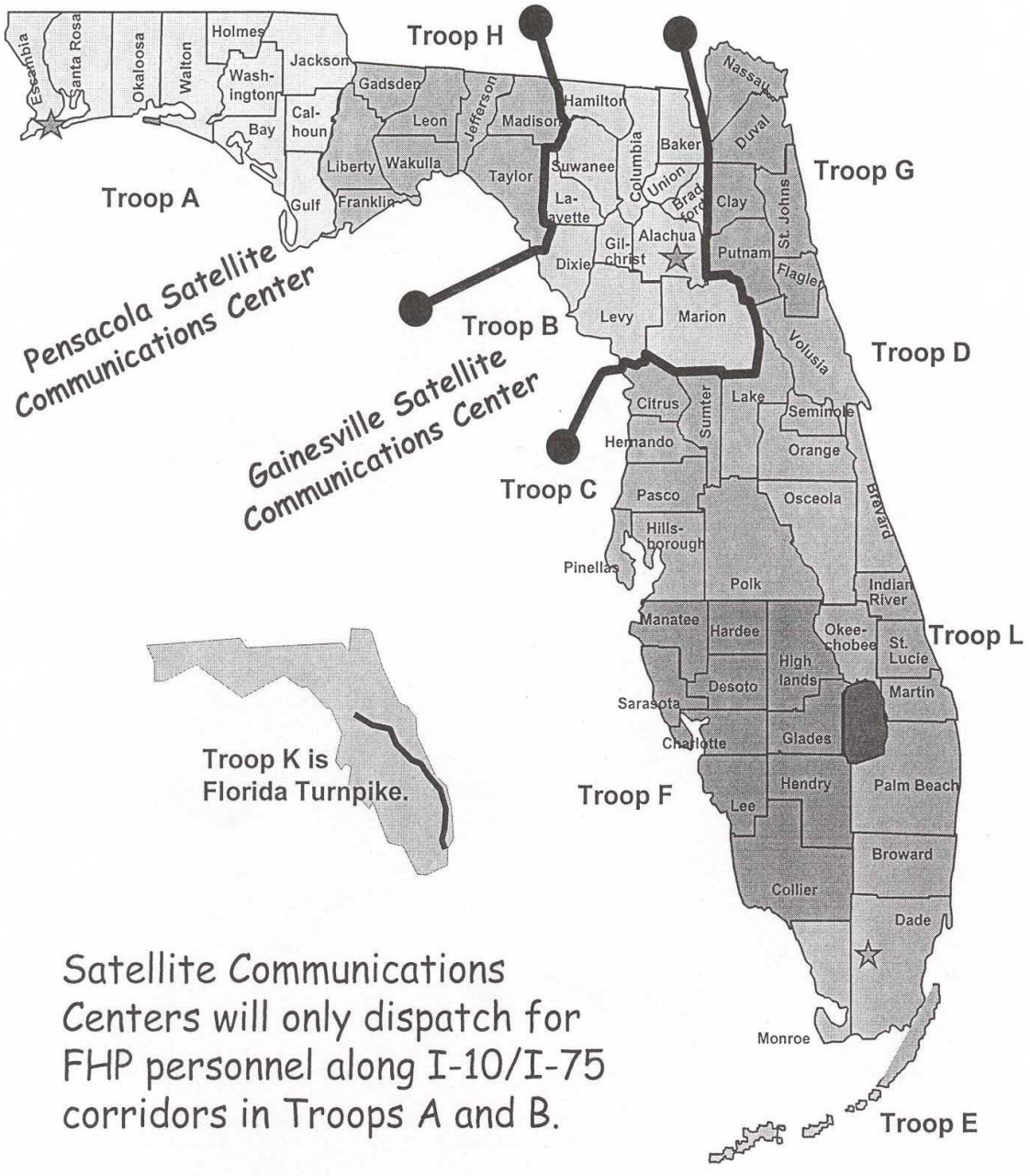
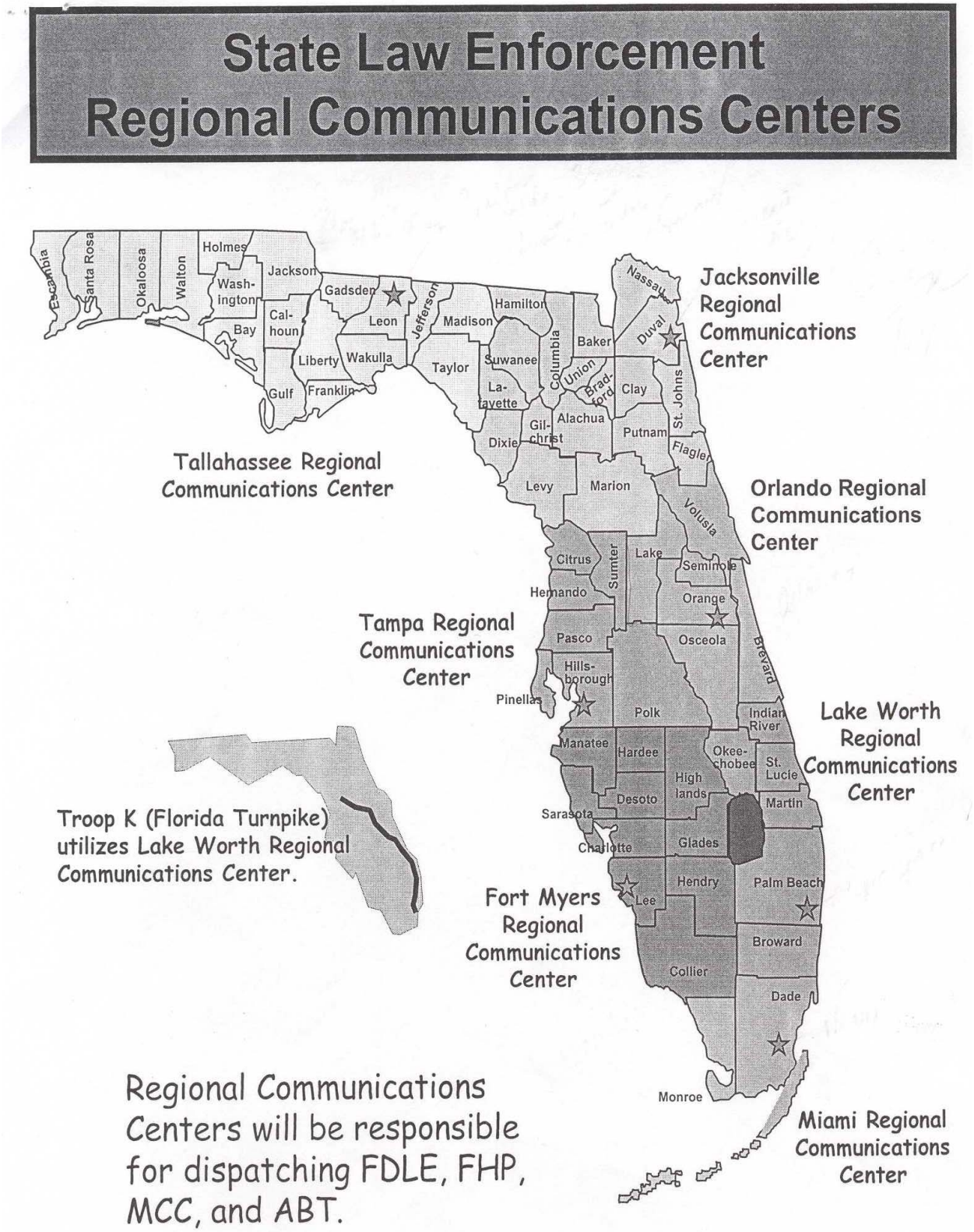
houn
Gulf
Liberty
Franklin
Gadsden
Leon
Wakulla
Jefferson
Taylor
Madison
Hamilton
Suwanee
La-
fayette
Columbia
Baker
Union
Brad-
ford
Nassau
Duval
Clay
St. Johns
Putnam
Flagler
Alachua
Gil-
christ
Dixie
Levy
Marion
Volusia
Citrus
Sumter
Lake
Seminole
Hernando
Orange
Pasco
Osceola
Brevard
Hills-
borough
Pinellas
Polk
Indian
River
Manatee
Hardee
Okee-
chobee
St.
Lucie
High
lands
Martin
Desoto
Sarasota
Charlotte
Glades
Hendry
Palm Beach
Lee
Broward
Collier
Dade
Monroe

Florida Highway Patrol Satellite Communications Centers




State Law Enforcement
Regional Communications Centers
Escambia
Santa Rosa
Okaloosa
Walton
Holmes
Wash-ington
Jackson
Cal-houn
Bay
Gadsden
Leon
Jefferson
Madison
Hamilton
Liberty
Wakulla
Taylor
Suwanee
Columbia
Baker
Nassau
Duval
Union
Brad-ford
Clay
St. Johns
Gulf
Franklin
La-fayette
Alachua
Gil-christ
Putnam
Flagler
Dixie
Levy
Marion
Volusia
Citrus
Sumter
Lake
Seminole
Hernando
Orange
Pasco
Osceola
Brevard
Hills-borough
Pinellas
Polk
Indian River
Manatee
Hardee
Okee-chobee
St. Lucie
High lands
Desoto
Martin
Sarasota
Charlotte
Glades
Hendry
Palm Beach
Lee
Broward
Collier
Dade
Monroe
Jacksonville Regional Communications Center
Tallahassee Regional Communications Center
Orlando Regional Communications Center
Tampa Regional Communications Center
Lake Worth Regional Communications Center
Troop K (Florida Turnpike) utilizes Lake Worth Regional Communications Center.
Fort Myers Regional Communications Center
Miami Regional Communications Center
Regional Communications Centers will be responsible for dispatching FDLE, FHP, MCC, and ABT.