Rural/Inter-Urban ITS Applications Issue Paper

1. Purpose

The purpose of this paper is to *"define rural ITS needs including but not be limited to communication, information services, emergency services, commercial vehicle operations, paratransit, and rail-grade crossing safety"*. The paper shall also *"discuss how rural ITS needs and plans can be integrated with urban and regional ITS needs and plans leading to a total integrated statewide ITS plan"*. Finally, it is the intention of this paper to also determine rural ITS priorities and geographical areas of focus in Florida based on the extent of documented problems and existing development strategies in rural areas.

2. Background

More Floridians live in rural Florida today than ever in the state's history. According to the 1997 Florida Statistical Abstract, rural Florida is home to more than two million residents, however, almost seven million (49 percent) of the state's total population live within unincorporated areas. Rural designated land constitutes nearly 80 percent of the state's total land area, and serves more than 12 million "eco-tourists" each year (or about 30 percent of the total annual volume of tourists to Florida) that visit parks, preserves, and historic sites scattered throughout the rural areas of the state.

Economic redevelopment in rural Florida is also fast becoming a top priority because rural community growth has been much slower than in metropolitan areas. *Senate Bill 1754,* passed in the 1997 legislative session, requires that *Enterprise Florida* develop a statewide rural development plan *("A Blueprint for Rural Florida")* and marketing strategy *("Crossroads Florida").* The objective of this legislation is intended to increase job creation and continue to attract business and industry to rural Florida while still maintaining it's attractive quality of life. According to this development plan for rural Florida, the fundamental issues in any rural community are "what will bring dollars into the community?" and "what will keep dollars from leaving these communities?" Therefore, the fundamental objective of rural ITS deployment should also address these concerns.

For clarity and consistency, the "*Blueprint for Rural Florida"* included several recommended definitions as follows:

- ***Rural County*** = county with less than 75,000 population, or less than 100,000 if contiguous to a county with less than 75,000. "Inter-urban" (undefined in *"Blueprint for Rural Florida"*) can be considered as those additional unincorporated transitional areas between defined urbanized centers.

- ***Rural City in a Rural County*** = incorporated city in a rural county.

- ***Rural City in a Non-Rural County*** = an incorporated city with a population of 25,000 or less, located in a county not defined as rural, with an employment base focused on traditional agriculture industries.

- ***Rural Area of Critical Concern*** = a rural county, city, or region that has been adversely affected by extraordinary circumstances (e.g., loss of major employer, military base closure, natural disaster, etc.), or lacking employment opportunities for WAGES (the state's welfare to work program) participants which the Governor designates.

In accordance with the definitions above for rural county and rural city, Table 1 lists those counties (and cities in parentheses) that fall within the definitions. This table indicates that half of the counties in the state (34) are "rural", with 101 cities in these counties defined as "rural" cities. The majority of these rural counties are located in the "panhandle" of Florida and along the western side of Lake Okeechobee.

Table 1 – Rural Counties (and Number of Rural Cities) in Florida

County	
Baker (2)	Holmes (5)
Bradford (4)	Jackson (11)
Calhoun (2)	Jefferson (1)
Citrus (2)	Lafayette (1)
Columbia (2)	Levy (8)
DeSoto (1)	Liberty (1)
Dixie (2)	Madison (3)
Flagler (4)	Nassau (3)
Franklin (2)	Okeechobee (1)
Gadsden (6)	Putnam (5)
Gilchrist (3)	Sumter (5)
Glades (1)	Suwannee (2)
Gulf (2)	Taylor (1)
Hamilton (3)	Union (3)
Hardee (3)	Wakulla (2)
Hendry (2)	Walton (3)
Highlands (3)	Washington (5)

Source: 1998 Florida Statistical Abstract

Table 1 identifies counties that satisfy Enterprise Florida's definition of "rural", but portions of other counties certainly could be included as well. Another way to define the extent of "rural" and "inter-urban" area within Florida is to compare the rural proportion of the state highway system mileage within each county. "Rural" in this case is defined by the roadway cross-section. Accordingly, the December 1998 State Highway System report reveals that besides the 34 counties previously defined in Table 1, an additional 18 counties have more than 50 percent of their state roadway mileage defined as "rural". Consequently, any way "rural" and "inter-urban" is defined, a significant portion of Florida will be included.

The Florida Office of Tourism, Trade and Economic Development, under the Executive Office of the Governor, has developed the Florida Enterprise Zone Program. There are ten Florida rural communities (see Table 2 below) that have recently applied for the federal status of "enterprise community/empowerment zone", enabling these areas to receive a

variety of resources to achieve their development goals.

The aforementioned demographics and recent legislation indicate that rural residents and visitors should not be overlooked when it comes to preserving mobility and safety. The overall economic vitality of Florida also requires that safe and efficient movement of people and goods be maintained within and through the rural and inter-urban areas of Florida. However, unlike most urban areas, rural mobility and safety needs are relatively isolated or dispersed. ITS applications in rural and inter-urban areas can therefore be viewed as a tool for providing contiguous traffic monitoring and traveler information only if specific problem areas can be identified, and cost-sharing and real-time information-sharing can be maximized. Rural ITS deployment in Florida should be driven by several factors. First, it makes sense that as a means to leverage and inter-connect urban investments in ITS, proximity to early urban Florida ITS "winners" (e.g., Daytona, Orlando, Jacksonville) will serve to identify potential rural and inter-urban corridors where urban ITS applications could be evaluated for extension. Second, as mentioned previously, the 10 rural enterprise communities, listed in Table 2, can further target rural ITS investment toward emerging areas of economic redevelopment. It should be noted that half of the applicants are located within the FDOT District 1 area.

Table 2- Enterprise Community Applicants

County	FDOT District
Collier/Hendry	1
DeSoto	1
Gadsden	3
Hamilton	2
Hardee	1
Highlands	1
Madison	2
Okeechobee	1, 8
Palm Beach	4, 8
Putnam	2

Source: Florida Office of Tourism, Trade and Economic Development

User-specific ITS needs in rural and inter-urban locations can be focused on the needs and priorities currently being identified by the Community Traffic Safety Teams (CTSTs), and transit providers serving rural areas of Florida. For example, reducing high-speed crashes at unsignalized intersections, heavy vehicle and/or hazardous material crash response, and non-passive control at rail at-grade crossings are of the greatest concern to rural CTSTs at this time. Other potential needs could include detection of single-vehicle crashes on low volume roadways, improving response to crashes involving hazardous materials, and "safety readiness" or "accident prevention" through the use of isolated motorist warning systems (e.g., wet pavement or reduced visibility warning systems.) General characteristics and demands of rural transit/paratransit providers have been highlighted later in Section 3.3, and counties with the greatest demand for rural tripmaking are noted.

Additionally, location-specific needs for rural ITS deployment can also be focused on rural high-crash roadways and major attractions in rural areas. Coordination and sharing of video

feedback from existing/planned traffic monitoring cameras in rural and inter-urban locations (as a foundation for emergency evacuation monitoring infrastructure) has already been recommended. These characteristics are further discussed below.

2.1 Rural Crash Facts

Nationally, according to the United States Department of Transportation (USDOT) Traffic Safety Facts 1996 Report, about 58 percent of total U.S. fatal crashes occurred in rural areas. In Florida, during the same year, just over 32 percent of fatal crashes were located in rural ("open country") locations. Crashes in rural locations tend to be more severe because they occur at higher speeds, with 70 percent exceeding 55 miles per hour as recorded by the officer at the scene of the crash. In Florida, the highest percent of fatal crashes to total crashes also occurs in rural counties. The top five counties, in descending order, are Glades, Jefferson, Calhoun, Lafayette, and Sumter according to the 1996 Florida Traffic Crash Facts Report.

An examination of the "High Crash Roadway Spot and High Crash Roadway Segment" computer printouts from the FDOT Safety Office for the last three years also reveals significant rural crash facts on state roadways. Each location on these printouts is listed in descending order of "safety ratio". Only those spots or segments with a safety ratio equal to or greater than 1.0 are considered high crash locations. For purposes of this issue paper, only those roadway spots and segments defined as rural were included. For each year (1995, 1996, and 1997) there were 1,436, 1,488, and 1,503 rural high crash locations statewide, respectively. Also, over the three-year period, the individual safety ratios for these rural high crash locations varied from 1 to 901, with about 100 locations each year that exceed a 10.0 safety ratio and 10 locations in each year exceeding a safety ratio of 50.

Further examination reveals that 11 counties in particular have rural locations (not necessarily the same locations) that exceed a safety ratio of 50 in at least two of the three years, and these have been highlighted in Table 3 below. Specific milepost designations for high crash spots and segments have not been included in the table, but they are available from the computer printouts. Most importantly, as can be noted from the table, five rural state roadways have recurring high crash locations (SR 43, SR 44, SR 54, SR 64, and SR 100). Until contributing causes from these crash locations can be identified from the individual crash reports and Emergency Management Services (EMS) response logs, selection of the most appropriate ITS application can not be made. However, if recurring crashes along some of these roadways tend to be concentrated, an automatic incident detection/verification system may be warranted. In any case, some way to automatically capture and monitor response performance will likely be needed.

Table 3 - Rural High Crash Roadways

Year	County	Roadway(s)	Safety Ratio(s)
1995	Escambia	SR 10	567

1995	Volusia	SR 44	358
1995	Manatee	SR 43, SR 64	203, 63
1995	Hillsborough	SR 43, SR 674	168, 136
1995	Lee	SR 884	110
1995	Union	SR 100	63
1996	Hillsborough	SR 43, SR 600	622, 128
1996	Marion	SR 200, SR 40	136, 111
1996	Santa Rosa	SR 87, SR 4	111,63
1996	Volusia	SR 44	98
1996	Union	SR 100	83
1996	Manatee	SR 62	73
1996	Pasco	SR 54	69
1996	Jackson	SR 2	66
1996	Putnam	SR 15	60
1997	Santa Rosa	SR 89	379
1997	Marion	SR 326, SR 25	369, 229
1997	Hillsborough	SR 43	214
1997	Manatee	SR 64, SR 43	194, 82
1997	Escambia	SR 292	136
1997	Pasco	SR 54	107
1997	Putnam	SR 100	84
1997	Union	SR 100	77
1997	Lee	SR 82	68
1997	Jackson	SR 77	59

Source: FDOT Safety Office

2.2 Major Attractions in Rural Areas

Florida is blessed with a wonderfully diverse landscape, which to a large extent has remained untouched for tens of thousands of years. The state and national park system within the state continues to attract a growing number of residents and tourists. Many of these parks are located in proximity to major metropolitan areas. For example, 121 state parks are within 60 miles of urbanized areas in Florida. Annual attendance is significant at state parks, national parks/monuments, and major attractions in rural Florida. Table 4 highlights top ten attendances for state and national parks in Florida.

Roadways leading to these high-tourist attractions provide the venue for potential application of advanced recreational information systems, especially if they are located in remote areas (e.g., Gasparilla Island). Static and real-time traveler information on directions to the attraction, schedules, amenities, special events, etc. can be disseminated via roadside variable message signs and kiosks at nearby rest areas, Turnpike service plazas, or new rural welcome centers. For those attractions not so isolated, consideration could be given to exclusive highway advisory radio as a means to disseminate attraction information to travelers (perhaps just in peak season).

Table 4 - Major Attractions of Rural Florida

State Park	County (City)	1997 Attendance	Connecting Roadway(s)
Coral Reef	Monroe (Key Largo)	991,937	US 1
Lloyd Beach	Broward (Dania)	611,397	A1A
Honeymoon Island	Pinellas (Dunedin)	542,185	SR 586, west end
Gasparilla Island	Lee (Boca Grande)	517,951	Boca Grande Causeway @CR 775
Delnor-Wiggins Pass	Collier (Naples)	515,071	US 41(CR 901)
Sebastian Inlet	Brevard, Indian River (Melbourne Beach)	504,406	A1A
Bahia Honda	Monroe (Big Pine Key)	383,091	US 1, south of Marathon
Anastasia	St. Johns (St. Augustine)	381,707	A1A @ SR 3
Blue Springs	Volusia (Orange City)	251,584	I-4, US 92/17
St. George Island	Franklin (St. George Island)	169,468	US 98

Source: 1998 Florida Statistical Abstract

Table 4 (continued) - Major Attractions of Rural Florida

National Park/Monument	County (City)	1997 Attendance	Connecting Roadway(s)
Gulf Islands Seashore	Escambia, Okaloosa, Santa Rosa (Pensacola, Navarre, Ft. Walton Beach)	4,679,100	I-10, I-110, US 98, SR 292, SR 295, SR 399, US 87, SR 85
Fort Jefferson	Monroe (Key West)	3,420,100	US 1
Canaveral Seashore	Brevard, Volusia (Daytona Beach, Melbourne, New Smyrna Beach, Titusville)	1,368,600	US 1, I-95, SR 528, A1A
Everglades Park	Dade (Homestead)	989,500	US 41, SR 29, US 1, SR 997
Castillo de San Marcos Monument	St. Johns (St. Augustine)	582,700	I-10, I-295, I-95, US 1, A1A
Ft. Matanzas Monument	St. Johns (St. Augustine)	537,600	I-95, SR 206, A1A
Big Cypress Preserve	Collier (Ochopee)	462,600	US 41, SR 29
Biscayne Park	Dade (Homestead)	392,100	US 1, Turnpike
DeSoto Memorial	Manatee (Bradenton)	221,600	I-75, SR 64, I-275, US 19
Ft. Caroline Memorial	Duval (Jacksonville)	130,400	SR 10, I-95, SR 9A

Source: The Orlando Sentinel Advertiser Marketing Division

Table 4 (continued) - Major Attractions of Rural Florida

Private Attractions	County (City)	1994 Estimated Attendance	Connecting Roadway(s)
Walt Disney World	Orange (Orlando)	30,016,000	I-4, Turnpike, SR 192, SR 417

Universal Studios Florida	Orange (Orlando)	7,700,000	I-4, Turnpike, SR 528
Sea World	Orange (Orlando)	4,600,000	I-4, Turnpike, SR 528
Busch Gardens	Hillsborough (Tampa)	3,700,000	I-4, I-75, I-275
Church Street Station	Orange (Orlando)	2,600,000	I-4, Turnpike, SR 528
Kennedy Space Center	Brevard (Titusville, Melbourne)	2,058,000	US 1, A1A, I-95, SR 50, SR 528, SR 520
Wet 'n Wild	Orange (Orlando)	1,290,000	I-4, Turnpike, SR 528, SR 482
Silver Springs	Marion (Ocala)	850,000	I-75, SR 40
Cypress Gardens	Polk (Winter Haven)	750,000	I-4, US 27
Gatorland Zoo	Orange (Orlando)	750,000	Turnpike, I-4, SR 417, US 441

Source: The Orlando Sentinel Advertiser Marketing Division

2.3 Emergency Evacuation

During an evacuation, it would be desirable for statewide and county emergency management officials to be able to obtain traffic information from a wide range of sources. Special focus on live video feed of traffic conditions is especially critical, as concluded in a March 1998 CUTR report for the FDOT. In fact, the initial infrastructure for a fairly wide-coverage (but autonomous) system of CCTV devices currently exists, primarily in coastal county areas. Unfortunately, the individual video feeds from these cameras (used by various agencies to gather traffic information) are not being transmitted to a centralized emergency management center. In the March 1998 report, CUTR recommended that the video feed should be shared with both local traffic management centers, county shelters, and the State and County Emergency Management Operations Centers.

To the greatest extent possible, the future Florida Fiber Network (projected to be completed in 2007) should be utilized as the primary communications linkage system for these devices because of its greater bandwidth features to accommodate full-motion, real-time video. In addition to the statewide fiber network currently being planned, the FDOT has a 92-tower microwave backbone system in place today located on Interstate and Turnpike right-of-way. This network would be capable of supporting transmission of slow scan video images, or full-motion video if the number of channels needed are limited to a few. However, in order to bring these video images to a centralized location, an additional tower (perhaps at the FDOT Burns building in Tallahassee) would be required.

Figure 1 depicts this statewide coverage (within 20 counties) of 146 existing and 145 planned cameras identified in the March 1998 report previously mentioned. One-third of the existing cameras are located along I-4 in Orange, Osceola, and Seminole counties. The other existing cameras are generally located at several major Interstate interchanges (mostly I-95), Interstate or State Road bridges, and at intersection approaches along principal arterials. The Turnpike system also has extensive camera coverage at the immediate toll plaza areas only, although this video is used primarily for toll plaza security. For the most part, with the exception of the 50 I-4 cameras, the existing cameras serve to monitor special

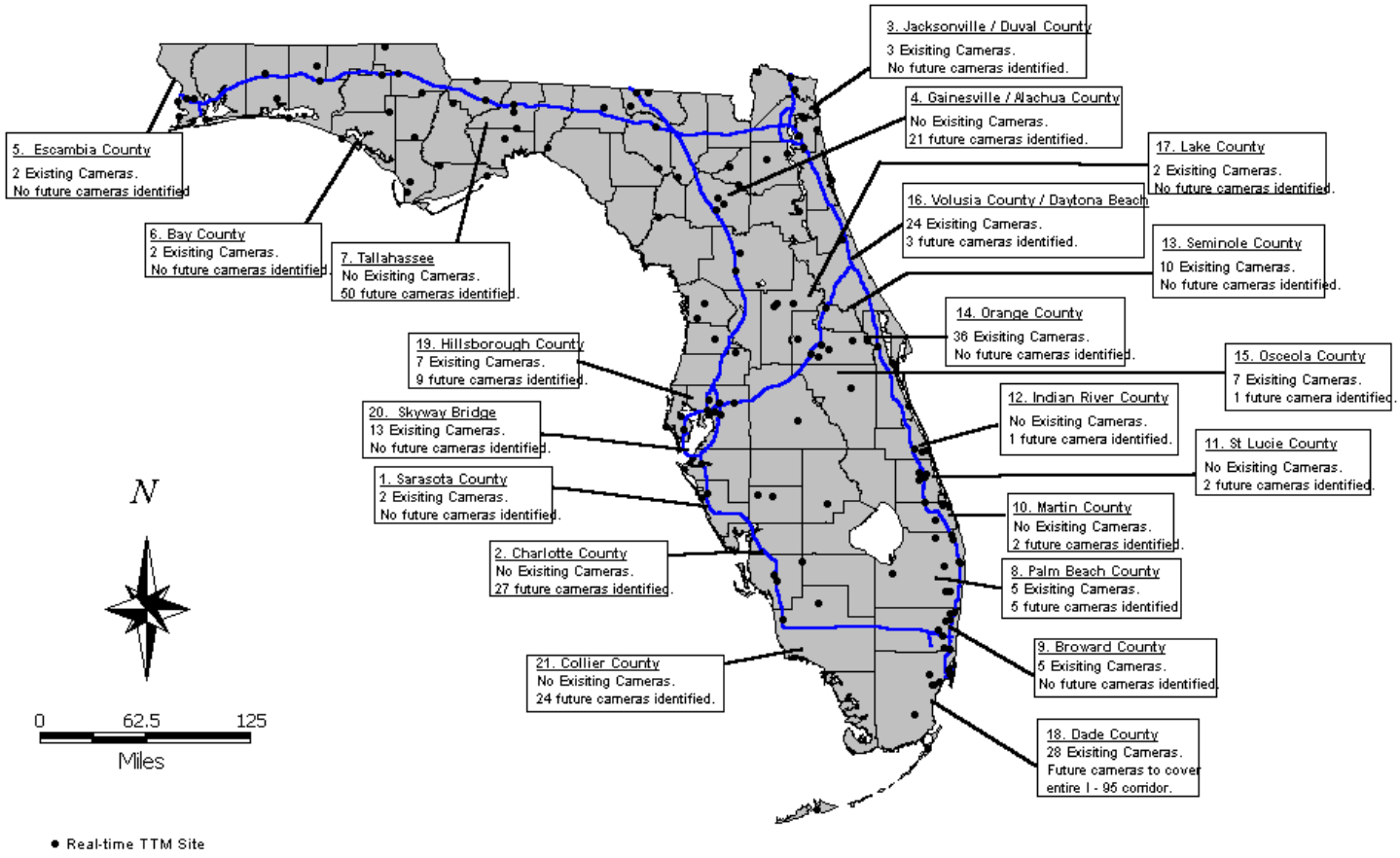
event traffic and traffic signal system coordination. Future cameras are generally intended to continue to enhance traffic signal coordination, provide incident verification, and monitor special events, but emergency evacuation application is also being added.

Additional cameras would be needed to be able to properly monitor and manage a statewide evacuation should an emergency arise. The central (predominantly rural) corridor is obviously the evacuation mainline, and thus warrants strategically placed CCTV cameras. Consideration of additional camera locations (coinciding with the major statewide evacuation route network and upgraded real-time telemetered traffic monitoring sites) should include:

- I-75 (along Alligator Alley and north of Hillsborough County to state line)
- I-95 (between Palm Beach and Daytona, and between Daytona and Jacksonville)
- US 19, US 41, US 27, US 301, US 441, US 17, US 1, and A1A (at major bottlenecks and junctions)
- Florida Turnpike (between mainline plazas at major junctions)
- US 231, US 331, and US 29 (at the state line)
- I-10 (major junctions between Escambia Bay Bridge and Buckman Bridge (Duval County))
- SR 70, SR 60 (east of Hillsborough County), SR 50, SR 40, US 90 and SR 100 (at major bottlenecks and junctions)

Figure 1 also illustrates 135 real-time polling telemetered traffic monitoring (TTM) sites. These sites, which include some new and some retro-fitted TTM locations, have been recently upgraded to include speed and occupancy data collection capabilitities. These sites cover all eight FDOT districts, 58 counties, and four weigh-in-motion stations. The designation of these sites was developed by emergency management experts working with the FDOT Transportation Statistics Office. The sites are located along Interstates (21), US Highways (28), State Roads (78), Turnpike (6) and county roads (2). They compliment camera coverage and can provide a source of existing data for monitoring emergency evacuations if the information is shared. In addition to these 135 TTM sites, real-time vehicle detection stations also exist on several freeway management systems and numerous computerized traffic signal systems located throughout both rural and urban Florida.

Figure 1
Traffic Surveillance Camera Locations and Real-Time Polling TTM Sites



2.4 Inter-Urban and Intra-Urban Travel Demand

Visit Florida's *1997 Florida Visitor Study* (which relies exclusively on FDOT telemetered count station data at the state line) estimated that about 20.5 million vehicles crossed the state line at I-95 (8.2 million), I-75 (5.9 million), I-10 (4.4 million), and US 231 (2 million) in 1997. Visit Florida's sampling of auto traffic crossing the state line at these roadways further concluded that about 15 million, or 73 percent, are classified as "visitors" (i.e., origins/destinations greater than 50 miles from the state line). In 1997, I-95 lead the way with the greatest number of estimated auto "visitors" at 6.8 million, followed by I-75 (4.3 million), I-10 (2.5 million), and US 231 (1.4 million). Another 5.3 million "visitors" during 1997 were estimated to have crossed the state line at other roadways. Based on interviews conducted by Visit Florida, the top five states/provinces of origin were Georgia, Ohio, North Carolina, Tennessee, and New York. The top five destination counties were Orange-Osceola, Bay, Volusia, Okaloosa, and Duval.

The *1998 SYSTRA/KPMG Peat Marwick Ridership Study for the Florida High Speed Rail Project* (now eliminated by Governor Bush) included one of the most extensive surveys of intrastate highway and airport travelers ever undertaken in the United States, and remains a source of estimated intrastate trips. The expanded auto and air traveler surveys from the study estimated a large intercity travel market, with a total of over 67 million one-way trips in 1997. Ninety-five percent of these trips were determined to be auto travelers, with 65 percent of the auto trips defined as short-distance trips (less than 100 miles). Inter-urban auto trips between Palm Beach and southeast Florida comprised the largest proportion of short-distance auto trips (24.4 million). For long-distance (100 miles or more) auto trips, the highest demand inter-urban travel corridor is between central Florida and southeast Florida, with just over 6 million trips. Four out of every 5 inter-urban trips in 1997 were estimated to be non-business related trips.

The *1996 Florida Long-Term Economic Forecast*, published by the Bureau of Economic and Business Research, has estimated a substantial growth in intercity travel volumes. Even with the fairly conservative assumption of an annual growth rate of 3.3 percent, about 104 million one-way trips are forecasted in Year 2010. This increase in the intercity travel market is primarily attributed to expected growth in resident and visitor population over the same time period. Tripmaking efficiency through ITS will certainly be paramount. Providing real-time traveler information to residents and visitors could affect the time of day, mode choice, or even the necessity of individual tripmaking, thereby reducing or eliminating unnecessary delay and congestion. Future intercity travel demand can be better managed by extending ITS deployment into the inter-urban travel corridors of Florida, particularly along I-4 and between major urban areas and traffic generators along the other Interstate and US Highway corridors.

3.0 Summary of Potential Rural/Inter-Urban ITS Applications

Prior to rural/inter-urban ITS deployment, there is a need to first conduct a comprehensive statewide inventory of ITS elements already implemented (or planned) in the rural/inter-urban portions of the state. This paper has noted some of these elements, but most likely

not all of them.

The Advanced Rural Transportation Systems (ARTS) Strategic Plan, developed in August 1997 by the ITS Joint Program Office and ITS America, has been formally included in the development of the national ITS systems architecture. All planning studies in rural areas are also being encouraged to study the applicability of ARTS. The ARTS Strategic Plan has identified seven critical program areas or general areas of need which include:

1. traveler safety and security,
2. emergency services,
3. tourism and traveler information services,
4. public traveler services,
5. infrastructure operations and management,
6. fleet operations, and
7. commercial vehicle operations

Additionally, the 2020 Florida Transportation Plan stipulates four primary goals for Florida, that when compared with the ARTS Strategic Plan areas of need, should be used to identify the most appropriate types of ITS applications for rural and inter-urban Florida. The four primary goals of the 2020 Florida Transportation Plan are as follows:

1. *Safe Transportation*

2. *Protection of Transportation Investment*

3. *Statewide Interconnection of Transportation System*

4. *Provision of Travel Choices*

Based on background data previously described in this issue paper and priorities of the ARTS Strategic Plan and the 2020 Florida Transportation Plan, the following rural/inter-urban ITS applications in Table 5 are recommended as most appropriate for rural/inter-urban Florida. Each one of these application areas is further detailed in sections 3.1-3.4 (following Table 5).

Table 5 – Rationale for Rural/Inter-Urban ITS Applications

Application Area	Critical ARTS Program Areas	2020 Florida Transportation Plan Goals	ITS Statewide Strategic Plan Goals
Improve response times to incidents along high-crash rural roadways (see Table 3)	• Traveler safety and security • Emergency services	• Safe transportation	• Improve emergency mgt. communications • Improve security for travelers • Reduce vehicular delay from incidents
Enhance eco-tourism market with pre-trip and en-route information to visitors (see Table 4)	• Tourism and traveler information services	• Statewide Interconnection of transportation system (economic vitality concerns)	• Improve tourist access and convenience
Improve cost-efficiency of rural paratransit trip making (see Table 6)	• Public traveler services • Fleet operations	• Provisions of travel choices	• Improve service for special traveler needs • Improve mobility choices
Maximize commercial fleet monitoring capabilities and inter-modal transfer efficiency (see Table 7)	• Commercial vehicle operations	• Protection of transportation investment (inter-modal facilities) • Statewide interconnection of transportation system	• Improve efficiency of fleet operations • Reduce cost and delay of inter-modal connections • Minimize shipping and delivery delays
Enhance statewide emergency evacuation/management capabilities (see Figure 1)	• Traveler safety and security • Emergency services	• Safe transportation	• Improve emergency management communications
Improve efficiency of maintenance of traffic communications	• Infrastructure operations and management	• Protection of transportation investment	• Assist in providing safe and efficient MOT during project construction

3.1 Safety and Emergency Management Services

As mentioned previously, the top rural safety issues involve improving response times to incidents (particularly those involving heavy vehicle crashes), reducing high-speed crashes at unsignalized intersections, implementation of non-passive control at rail at-grade crossings, and construction work zone safety and control. Statewide, providing for emergency evacuation (previously discussed) and tourist safety are critical issues. ITS applications for tourist safety in remote areas of the state have been embraced by the rental car industry. AVIS currently provides a "mayday" option where emergency dispatch services can be activated by an in-vehicle-locating device (similar to Lojack®).

Emergency call boxes have now been installed by FDOT throughout the entire Florida Interstate and Turnpike System. These existing call boxes are the push-button type that send a coded signal to a FHP dispatch center (motorist cannot speak). Just recently, "voice" call boxes have been installed along the Bee Line Expressway between Orlando and I-95. This type of call box allows the motorist to speak directly to a dispatcher so as to realize the urgency of the call, and most likely will save lives in emergency medical situations with greater response capabilities. Long-term statewide retrofit from push-button to "voice" call boxes is now being planned by FDOT.

Response times to crashes in rural areas are at least twice that in urban areas, primarily due

to greater distances from response teams and medical centers. In particular, the timeframe from arrival at the crash scene to hospital arrival (typically more than half of the total response time) is the most critical. Also, getting the proper medical attention to the scene and having that same coordination when the crash victims arrive at the hospital can reduce the number of fatalities. Equipping EMS vehicles with AVL technology coupled with computer-aided dispatch can better track all portions of response. Partnerships with cellular providers (rural 911 centers) could also provide added efficiency and improved response in rural areas with incentives provided for added wireless coverage. For crash response involving heavy vehicles, the FDOT Motor Carrier Compliance Office must be summoned to investigate the crash. In rural areas, staffing is limited so timely notification is mandatory. The application of centralized dispatching and communications, as with the occurrence of statewide evacuation, should also be investigated for FDOT response to heavy vehicle crashes (particularly in rural and inter-urban areas).

The high crash roadways previously identified should be further investigated for proximity of unsignalized intersections and rail at-grade crossings. If these types of crossings are located along these roadways, advance warning sign sub-systems could be installed to detect oncoming trains/vehicles and provide real-time warning (visible and audible) to unsuspecting motorists.

Work zones have always posed safety and traffic (speed) control problems to highway engineers. Portable CCTV surveillance cameras and speed sensors can be used to activate enforcement and incident response activities. For rural maintenance of traffic, available portable signage may not be sufficient to provide warning of closure outside the immediate area (e.g., US 301 was recently closed for one week at Starke for railroad crossing replacement with no means to warn motorists on outlying portions of US 301 with junctions to other major highways). In this case, the Florida Traveler Information Radio Network (TIRN) and upstream fixed variable message signs that may exist can be notified of such a construction condition to more effectively alert motorists in advance to avoid unnecessary delays.

3.2 Tourist Information Services

As indicated previously, the volume of Florida tourism in rural areas contributes substantially to the state's economy. Consequently, these visitors (and residents) should be provided with reliable pre-trip and en-route information on construction, incidents, weather, and service accommodations. According to the Florida Tourism Industry Marketing Corporation, approximately 45 percent of the visitors to Florida in 1996 arrived by auto. Pre-trip information can be provided via the Internet, commercial radio/TV, or kiosks provided at the attraction, hotel, or at major public gathering locations (airport, cruise port, train/bus terminals). En-route, real-time traveler information could be provided by strategically placed variable message signs, highway advisory radio, and the Traveler Information Radio Network (TIRN) being implemented in Florida. TIRN is scheduled to begin broadcasting on its first station in Orlando during March 1999. The FDOT will get one minute of every 10 for public service messages, and can take over the network as necessary to warn motorists of widespread real-time driving impacts such as last summer's wildfires. This privately funded program will also include the placement of "Traveler Info Radio" billboards on the state's

highways so motorists can be instructed to tune to a nearby TIRN affiliate commercial radio station as they travel through Florida. The key to this ITS application is to assure that information is provided throughout all of Florida, including along corridors within counties serving the major attractions in rural areas.

3.3 Paratransit Productivity

Paratransit is basically defined as the component of public transit that provides service between specific origins and destinations selected by the individual user. This service is provided (by sedans, vans, buses, and other vehicles) at a time that is agreed upon between the user and the provider. In rural areas, paratransit service generally addresses the particular needs of the transportation disadvantaged who (by State of Florida definition) are unable to transport themselves or have no other form of transportation available. Since 1989, the Florida Commission for the Transportation Disadvantaged (FCTD) is responsible for coordinating transportation services to the transportation disadvantaged. Community Transportation Coordinators, approved by the FCTD, serve the transportation disadvantaged in 53 designated service areas statewide in all 67 counties.

According to the 1997 FCTD Annual Performance Report, over 32 million paratransit passenger-trips were provided logging over 105 million vehicle-miles of travel (about half of the estimated daily VMT on the entire state highway system). Forty-six percent of these passenger-trips were fixed-route, 35 percent were advance reservation, and most of the remaining trips were demand-responsive. Thirty-nine of the 53 designated service areas (74 percent) are defined as predominantly rural. The estimated transportation disadvantaged population in these 39 rural counties is just under 672,000, and about 2.3 million passenger-trips and 17 percent of the total statewide paratransit VMT were logged serving these rural counties during the past year.

There are three counties that have recorded over one million vehicle-miles of travel of paratransit service within rural areas. Another 12 counties have exceeded one-half million vehicle-miles of rural paratransit service during the last year. Table 6 summarizes the paratransit tripmaking for these 15 Florida counties in 1997. Nine of these counties are located either within the District 2 or 3 (Panhandle) area.

Table 6 - Paratransit Tripmaking
(Counties over ½ million vehicle-miles of rural travel)

VMT Rank	County	FDOT District	VMT	Passenger-Trips
1	Gadsden	3	1,377,756	170,499
2	Lake	5	1,329,872	249,974
3	Jackson	3	1,208,113	95,795
4	Highlands	1	908,297	99,919
5	Okaloosa	3	802,237	140,931
6	Citrus	7	750,517	132,195
7	Putnam	2	750,297	96,472
8	Columbia	2	698,852	106,317
9	Sumter	5	675,182	62,534
10	Levy	2	565,704	44,725
11	Walton	3	552,746	61,390
12	St. Johns	2	544,126	103,319
13	Flagler	5	526,956	76,609
14	DeSoto	1	526,741	38,587
15	Washington	3	512,673	67,025

Source: Florida Commission for the Transportation Disadvantaged, 1997 Annual Performance Report

The FCTD focuses on improving cost-efficiency, documenting accountability, and encouraging coordination of intercounty paratransit trip performance. The application of ITS technologies certainly can be used as a tool to achieve these objectives. Just this year, a $200,000 FTA grant was awarded (one of five awarded nationally by the USDOT for rural ITS applications) to the Commission to increase awareness and utilization of ITS in rural areas. Putnam, St. Johns, and Flagler counties (also listed above in Table 6) were chosen as the sites to evaluate an application of automatic vehicle location technology for fleet monitoring and *Route Logic*™ software to better plan and coordinate real-time performance monitoring of intercounty trips, and trips with destinations outside of the contiguous three-county area. Additionally, it is the current intention of the FCTD to apply for another $200,000 FTA grant (in different rural counties) to evaluate and demonstrate how ITS can be applied to improve the efficiency of providing rural work trips to major employment centers. The state's welfare-to-work program, known as WAGES, can be enhanced with better coordination of inter-county work related trips through multiple paratransit service areas.

3.4 Intermodal Connectivity

Rural ITS applications must improve the ease at which people and freight can move throughout the entire state. Many intermodal facilities exist throughout Florida, and a number of them are located in predominantly rural or isolated areas. For example, Amtrak directly serves ten cities under 10,000 in population. Sixty of the state's 103 public airports are general aviation airports in predominantly rural areas. Four cargo-based only seaports are located in smaller populated areas of the state and handle substantially less throughput (less than one million tons of shipping per year) than the other seaports. Table 7 summarizes the general inventory of these facilities.

Table 7 - Florida Intermodal Facilities

Facility Type	Statewide Total
Park-n-Ride Lots	135
Public Airports	103 (20 commercial)
Intercity Bus Stations	81
Local Bus Terminals	43
Bulk Cargo Transfer Facilities	39
Amtrak Stations	36
Metro-Rail Stations	21
Tri-Rail Stations	15
Seaports	14 (8 cruise ports)
Rail-Highway Terminals	10

Sources: 2020 Florida Transportation Plan and 1998 CUTR Florida Transportation Almanac

According to *Crossroads Florida,* more than 60 percent of the continental U.S. is accessible from Florida by overnight motor freight. The 1998 USDOT Transportation Statistics Annual Report ranked Florida 12th among all states in value ($172 million) of all commodity shipments and 8th among all states in tonnage (346 million tons), based on 1993 data. Almost 78 percent of these shipments are made by truck, but only three other states have a lower proportion of in-state shipments. The 1990 Census indicated that Florida Intrastate freight movement by for-hire and private truck accounted for just over 65 percent (165 million tons) of the total tonnage movement. Comparatively, total Florida Interstate freight movement by for-hire and private truck was 32 percent of the total tonnage 45 million tons) movement by all modes. Marion and Polk counties have the greatest motor freight activity in rural Florida.

The *ADVANTAGE CVO* project is the only commercial fleet monitoring program in Florida, covering only the immediate Interstate 75 corridor at weigh stations for a very limited number of participating trucking companies (mostly time-sensitive delivery companies). To maximize the benefits of statewide commercial fleet monitoring, this very limited ITS electronic credentialing and weigh-in-motion system should be extended at least along the other Interstate highways that serve the ports, airports, bulk cargo terminals, and rail-highway terminals. Obviously, more trucking companies would have to be willing to participate to attain meaningful benefits. Perhaps fuel taxes for participants could be reduced to compensate for the reduced pavement maintenance costs expected with greater monitoring coverage of overweight vehicles and incident management involving heavy vehicles. In the long run, consumer prices could be reduced with the improvement of trucking and shipping efficiency through automatic vehicle location (AVL) and computer-aided dispatching also linked to areawide and regional traffic management centers.

One of the objectives of the Governor's Intermodal Transportation summit held in June 1998 was the creation of a private/public task force (Florida Freight Stakeholders Task Force) to address the needs of Florida's intermodal system, and assist in developing Florida's Intermodal System Plan (including specific freight intermodal needs and projects, and development of meaningful performance measures for reporting freight accessibility and connectivity). The Task Force has been broken down into five subcommittees; four of the subcommittees will represent the interests of four modes of freight transportation (highway, air, ocean, and rail), and the fifth subcommittee will represent legislative and policy issues. Existing and planned freight project inventory (public and private) is just beginning, and the

Final Intermodal System Plan is to be completed by February 1, 2000. Once needs and site-specific project priorities are identified, appropriate ITS applications can be considered. However, ITS applications for monitoring freight accessibility in relatively remote areas of the state, should be put forth for consideration at this time.

From the perspective of improving intermodal connectivity for public transportation systems, ITS applications are certainly appropriate and beneficial. At least several municipal urban transit providers in Florida (e.g., Miami, Ft. Lauderdale, Jacksonville, West Palm Beach, and Tampa) are also utilizing some type of AVL technology for improving operating efficiency. Information currently being provided to agency dispatchers should be shared with areawide and regional traffic management centers. This same "next arrival" information should also be fed via multimedia kiosks into public airports, sea cruise ports (which served 8.3 million passengers in 1997), Amtrak stations (which currently serve 47 Florida cities), intercity bus terminals, local bus terminals, and park-n-ride lots to perhaps reduce the dependency on single-occupant vehicle trips and make public transportation more attractive to the "choice rider".

4. The "Virtual" Transportation Management Center

Unless there becomes a very isolated, site-specific application, the immediate benefits to rural/inter-urban ITS investment are not always apparent and easy to measure. First of all, rural/inter-urban mobility and safety needs are generally dispersed. Secondly, because of this need dispersion, the ability to readily detect, send, receive, and share real-time traffic/traveler information is limited. If real-time information can not be easily obtained and shared, the benefit will dissipate. The heavy capital investment usually associated with a centralized (i.e., equipment and personnel in a single building) traffic management center in urban areas is prohibitive for most rural/inter-urban environments. Thirdly, ITS deployment funding for rural areas is generally limited and directed more toward the urban areas where the perception is that more will benefit. One way to overcome these constraints is to find a cost-efficient approach to integrate rural and urban ITS deployments into a single coordinated statewide system to maximize rural investment.

The "virtual" transportation management center approach could enhance and maximize rural/inter-urban ITS investment. As deployment of Advanced Transportation Management Systems (ATMS) matures in urban areas throughout Florida, there will be greater opportunity for rural communities to advance their transportation management capabilities. Although funding to support large scale ITS deployment efforts in rural areas would be limited (due to competition with urban areas), rural communities could link to these extensive urban ATMS through an emerging concept known as the "virtual" transportation management center (TMC).

The virtual TMC is based on the provision of a single seamless transportation system perceived by the traveler, not impacted by jurisdictional or agency boundaries. Linking and sharing of two-way transportation information between urban areas and adjacent rural communities can be accomplished without a large additional cost. Through a system of database servers, remote workstations, and real-time messaging, the need for a physical traffic management center could be eliminated. The server for the virtual TMC could be located anywhere, not necessarily within the rural area it may be serving. Further, the actual

management and operation of the virtual TMC is that it will be defined by its memorandum(s) of understanding between agencies sharing the information.

The technical issues associated with such a concept are not impossible to overcome. Even across disparate hardware and software platforms, information sharing and control strategies can be developed with proper planning and software design. Medium to low communication bandwidth is required, and the telecommunication requirements are generally low enough to be satisfied with a regular telephone line or the Internet. The toughest issue to overcome is associated with determining how the urban and rural agencies will work together to accomplish the mutual goal of effective transportation management. Also, there may be a problem in re-training of personnel to operate efficiently in this type of "virtual" environment.

Most importantly though, deployment of the virtual TMC concept can help assure a compatible, interoperable statewide ITS architecture by requiring that all urban areas establish a set of common communication interfaces and protocols between their urban ITS management center(s) and the adjacent rural/inter-urban virtual TMCs.

5. Identification of Rural ITS Operational Tests

The Advanced Rural Transportation Systems (ARTS) Committee was established by ITS America in January 1993 to provide a focus for rural interest in ITS. Compared to urban ITS investment, limited Federal funding for rural ITS applications have been committed. However, a number of fairly high-profile projects are noted below in Table 8 for future reference.

Upon review of Table 8, one should take note of several factors. First, many of the example projects highlighted include some type of public-private or public-public partnership always critical in attracting federal funding. Second, the example projects for rural public transportation systems follow closely with the scope of the Florida FTA paratransit grant for Putnam, St. Johns, and Flagler counties. Third, FDOT should specifically track results of the advanced rural tourist information system applications and advanced rural public transportation systems because they match Florida objectives for rural ITS applications. Lastly, these project examples can be used as guidance for future Florida attempts to apply for federal ITS grants for rural implementation. The era of operational tests has passed, and future federal funding will be geared toward deployment, as evidenced by the example projects noted in Table 8.

Table 8 - Rural ITS Project Facts

Advanced Rural Tourist/Recreational Information Systems

Project	*Purpose*	*Contact*
Arizona's Rural Advanced Traveler Information System	Develop prototype kiosk @ Painted Cliffs Tourist Welcome Center on I-40	Arizona Department of Transportation

Yosemite Area Traveler Information System	Real-time traveler information within 5-county area surrounding Yosemite National Park	Caltrans
Cuerno Verde Rest Area ATIS	Implement the first "intelligent rest area"	DeLeuw, Cather & Company
Branson Ozark Highroad Missouri	HAR, VMS, and traveler information center	Missouri Department of Transportation
TraveLink	130 kiosk locations throughout Atlanta	Georgia Department of Transportation
Touch and Go System	Driving instructions at rural welcome centers	Touch Information, Inc. (North Carolina and Tennessee)
Cape Cod Recreational Travel	Integrated travel and tourism system	PB Farradyne/Massachusetts Highway Department/Cape Cod Commission
Tally-Ho Michigan	Weather and construction detours via kiosks	Michigan Department of Transportation

Advanced Rural Public Transportation Systems

Project	*Purpose*	*Contact*
Beaver County Mobility Manager	Specialized database and advanced communication and vehicle location system	Beaver County (PA) Transit Authority
Smart Flexroute Integrated Real-time Enhancement System	AVL, real-time scheduling, mode integration	Potomac and Rappahannock (VA) Transportation Commission
"Status Flash" Ferry System	ATMS at ferry docks on ferry boats	Washington State Department of Transportation
The RIDES System	On-board Medicare card reader with GPS/AVL interface	ARC Transit (Palatka, FL)
Advanced Rural Transportation Information and Coordination	Networked workstations, vehicle location and mapping, scheduling software	Minnesota Department of Transportation (Virginia, MN)
ATHENA	Real-time trip matching and portable communications	L.D. King, Inc. (Ontario, CA)
Urban/Rural Corridor Application	Paratransit real-time tracking and scheduling	Sandia National Laboratories (Albuquerque, NM)

Road Weather Information Systems

Project	*Purpose*	*Contact*
I-81 Road/Weather Advisory System	Real-time short range storm forecast system	New York State Department of Transportation
Sierra Project- "Snow Wars"	Weather radar and CMS with snow management control center along I-80	California Department of Transportation
Idaho Storm Warning System	VMS with visibility and environmental sensors	Idaho Transportation Department
I-75 Fog Detection/Warning System	VMS, HAR, fixed warning signs with activated flashers	Tennessee Department of Transportation
Road Weather Information System	Real-time roadside weather and pavement condition system for Lake Tahoe Basin	Nevada Department of Transportation
Colorado Road & Weather Information System	Various weather and pavement sensors linked to maintenance office	Colorado Department of Transportation
SMART Call Box	Uses call boxes system as controllers for weather sensors with CHP	California Department of Transportation
Travel-Aid, I-90 through Snoqualmie Pass	Weather monitoring, traveler information and advisories	PB Farradyne/Washington State Department of Transportation
Advanced Transportation Weather Information System for Rural Interstate Highways	Site-specific weather forecasts to enroute travelers	North Dakota DOT, South Dakota DOT, CommNet Cellular, Inc. and U.S. West Communications

Table 8 (continued) - Rural ITS Project Facts

Mayday and Collision Notification Systems

Project	*Purpose*	*Contact*
Colorado Mayday System	GPS for location and cellular phones for two-way communications	FHWA/Colorado Department of Transportation
Puget Sound Mayday Systems	Differential GPS, cellular, and advanced mapping and response software	Washington State Department of Transportation
Ford RESCU System	Personal security system for 1996 Lincoln Continental	Ford Motor Company
Minnesota Mayday Plus	Emergency detection and response infrastructure for Rochester, MN	Minnesota Department of Transportation
TransCal	In-vehicle notification, low-earth orbit satellite communication, and ground-based tracking	Caltrans
GM/Cadillac	OnStar advanced vehicle electronics for location assistance for 1997 Cadillac models	GM NOA Communications

Advanced Highway-Rail Crossing Warning Systems

Project	*Purpose*	*Contact*
Los Angeles Metro Blue Line Grade Crossing Improvement	100 at-grade crossings with photo enforcement and intelligent warning signs	PB Farradyne/Los Angeles County Metropolitan Transportation Authority
In-Vehicle Signing System for School Buses at Rail-Highway Crossings	In-vehicle display using train detector system	Minnesota DOT/3M/Hughes Transportation/Delco Electronics
Positive Train Separation	Train control system integrated with traffic management center	Union Pacific/Burlington Northern/TTI
Low Volume Grade Crossing Treatments for the Oregon High-Speed Rail Corridor	Safety and warning system where trains will operate up to 200 mph	Oregon State University Transportation Research Institute

Source: ITS America

6. Quantifying the Benefits of Rural/Inter-Urban ITS Deployment

In order to maximize benefits, ITS deployment in rural areas has to be leveraged against adjacent urban ITS system cost, and be located in counties and along roadways previously indicated. The expected tangible benefits will be directly related to *reduced fatalities* (from unsignalized and rail-grade crossing advance warning, speed sensors to assist in enforcement, work zone monitoring, and improved incident response and monitoring technologies). Enhancement to paratransit operations and pre-trip/enroute traveler information approaching rural attractions can be measured indirectly by *increased transit ridership and visitor attendance.* Emergency evacuation management through CCTV monitoring and intermodal connectivity with the provision of real-time transportation information can be measured in *reduced total travel time and delay for goods and passenger movement,* with both services being provided through the cost-effective technique of virtual traffic management centers.

It is also important to note that in many applications, the ITS technology being applied can itself be designed and programmed to automatically capture these performance measures.

7. Outreach/Education Program Needs for Rural Florida

The rural elements of the statewide ITS Strategic Plan has to address public involvement (awareness) and education. Based on the information provided in this paper, the main constituency groups to both understand and deliver the rural ITS message would be Enterprise Florida, the Community Traffic Safety Teams, the paratransit Community Transportation Coordinators, Safety and Traffic Management System Coordinators at the

FDOT District and MPO levels, the Department of Commerce, local chambers of commerce, and the Florida Tourism Industry Marketing Corporation (i.e., Visit Florida).

The most appropriate medium for education and awareness would most likely be brochures/posters, small group meetings, community newspapers/newsletters, local Rotary, town hall meetings, and VIP briefings. Local colleges, universities, high schools, and even grade schools (e.g., technical fairs) should be involved in the "grass roots" education process within the rural communities. Public agencies (mentioned above) need a coordinated effort, methods for disseminating information must be flexible and targeted to the specific rural and inter-urban population groups, and the private sector could be a deployment partner if free advertising is offered as an incentive.

8. Recommendations for Florida Rural/Inter-Urban ITS Program Element

This issue paper for rural/inter-urban ITS applications has provided background information sufficient to define the needs, and determine the most appropriate ITS applications and general deployment locations best suited for these particular applications. In summary, the recommendations for the Florida rural ITS program element are to:

- Connect to urban ITS (cost leveraging). Provide for natural extensions into rural and inter urban areas in proximity to ITS currently being deployed in Miami/Ft. Lauderdale, Jacksonville, and Orlando/Daytona Beach.

- Assure adequate coverage for emergency evacuation, major attractions, and high-crash locations through rural ITS applications in prescribed locations, corridors, and counties noted previously.

- Enhance economic redevelopment and provide for more efficient rural tripmaking in federally-designated rural enterprise communities with the greatest overall need (Gadsden, Putnam, DeSoto, Highlands, and Collier counties in particular).

- Identify specific high activity intermodal areas for both passenger and freight real-time information kiosks.

- Develop a virtual transportation management center for rural Florida (in close proximity to Miami, Jacksonville, or Orlando) to be jointly operated by all involved Districts and the State Office of Emergency Management. This particular rural ITS application would also be a strong candidate project for Florida seeking a federal ITS deployment grant.

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