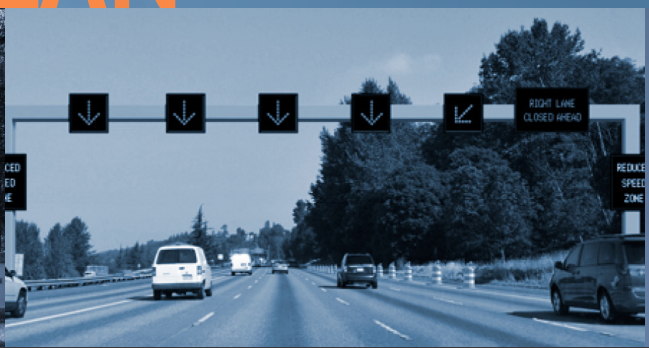
FINAL

INTELLIGENT TRANSPORTATION SYSTEMS (ITS) MASTER PLAN



Florida Department of Transportation
District 5

October 31st, 2016

Florida Department of Transportation, District 5

Intelligent Transportation Systems Master Plan

October 31, 2016
Version 1.3

Prepared for:

Florida Department of Transportation, District Five
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List of Acronyms

AAA.......Authentication, Authorization, and Accounting
AAM .... Active Arterial Management
AASHTO .... American Association of State Highway and Transportation Officials
ACL .... Access Control List
ADMS .... Arterial Dynamic Message Signs
AEB .... Automatic Emergency Braking
AERIS .... Applications for the Environment Real-Time Information Synthesis
AID....... Agency Independent Domain
ANSI....... American National Standards Institute
APC .... Automated Passenger Counter
APTA....... American Public Transportation Association
ASN....... Autonomous System Numbers
ASTM .... American Society for Testing and Materials
ATDM .... Active Transportation and Demand Management
ATMS .... Advanced Traffic Management Systems
AV .... Automated Vehicles
AVI .... Automatic Vehicle Identification
AVL .... Automated Vehicle Locator
AVSS .... Advanced Vehicle Safety System
BGP....... Border Gateway Protocol
BSM .... Basic Safety Messages
BtU .... I-4 Beyond the Ultimate
CAC....... Citizen's Advisory Committee
CAD .... Computer Aided Dispatch
CAMP....... Crash Avoidance Metrics Partnership
CAR....... Center for Automotive Research
CCTV .... Closed Circuit Television
CECI .... China Engineering Consultants Inc.
CES....... Carrier Ethernet Switch
CFI .... Continuous Flow Intersection
CFX .... Central Florida Expressway Authority
CMM .... Capability Maturity Model
CO....... FDOT Central Office
CV .... Connected Vehicle
CVRIA....... Connected Vehicle Reference Implementation Architecture
CVSP .... Connected Vehicle Safety Pilot
DBIA .... Daytona Beach International Airport
DMS....... Dynamic Message Sign
DOD....... Department of Defense
D-RIDE .... Dynamic Ridesharing

DSRC .... Dedicated Short Range Communications
DSS .... Decision Support System
EVAC .... Emergency Communications and Evacuation
FAV .... Florida Automated Vehicles
FDLE .... Florida Department of Law Enforcement
FDOT .... Florida Department of Transportation
FHWA .... Federal Highway Administration
FMS .... Freeway Management System
FOC .... Fiber Optic Cable
FRATIS .... Freight Advanced Traveler Information Systems
FTE .... Florida's Turnpike Enterprise
FTE .... Full Time Equivalents
GHGs .... Greenhouse Gases
GIS .... Geographic Information System
GOAA .... Greater Orlando Aviation Authority
GPS .... Global Positioning System
HART .... Hillsborough Area Regional Transit Authority
HMIRS .... Hazardous Materials Information Resource System
HOT .... High-Occupancy Toll
HOV .... High Occupancy Vehicle
I2M .... Infrastructure to Mobile
I2V .... Infrastructure-to-Vehicle
ICM .... Integrated Corridor Management
IEEE .... Institute of Electrical and Electronics Engineers
IETF .... Internet Engineering Task Force
IMC .... Intersection Movement Counts
IMSA .... International Municipal Signal Association
INC-ZONE .... Incident Scene Work Zone Alerts for Drivers and Workers
IP .... Internet Protocol
I-SIG .... Intelligent Traffic Signal System
ISO .... International Organization for Standardization
ITS .... Intelligent Transportation Systems
ITS JPO .... ITS Joint Program Office
ITS SIQA .... ITS System Input Quality and Analysis
LAN .... Local Area Network
LRTP .... Long Range Transportation Plan
MAN .... Metro-Area Network
MDSS .... Maintenance Decision Support System
MDT .... Mobile Data Terminal
MIMS .... Maintenance Inventory Management System
MMU .... Malfunction Monitoring Unit

MOT .... Maintenance of Traffic
MOU .... Memorandum of Understanding
MPLS .... Multiprotocol Label Switching
MPO .... Metropolitan Planning Organization
MSDP .... Multicast Source Discovery Protocol
MSDS .... Material Safety Data Sheets
MVDS .... Microwave Vehicle Detection System
NAT .... Network Address Translation
NEMA .... National Electrical Manufacturers Association
NHTSA .... National Highway Safety Transportation Administration
NMS .... Network Management Software
O&M .... Operations and Maintenance
OBE .... On-Board Equipment
OEM .... Original Equipment Manufacturers
PED-SIG .... Pedestrian Signal System
PIM .... Protocol Independent Multicast
PM .... Performance Measurement
PMP .... Preventive Maintenance Plan
PREEMPT .... Emergency Vehicle Preemption
PRT .... Personal Rapid Transit
Q-WARN .... Queue Warning
R2CTPO .... River to Sea Transportation Planning Organization
RADIUS .... Remote Authentication Dial-In User Service
RESP-STG .... Incident Scene Pre-Arrival Staging Guidance for Emergency Responders
RITA .... Research and Innovative Technology Administration
RITIS .... Regional Integrated Transportation Information System
ROI .... Return on Investment
RSU .... Roadside Unit
RTMC .... Regional Traffic Management Centers
SAE .... Society of Automotive Engineers
SCAT .... Space Coast Area Transit
SCTPO .... Space Coast Transportation Planning Organization
SIs .... Slot-based Intersections
SKM .... Sinclair Knight-Merz
SLA .... Service Level Agreements
SOG .... Standard Operating Guidelines
SOP .... Standard Operating Procedure
SPaT .... Signal Phasing and Timing
SPUI .... Single-Point Urban Interchange

TAC .... Technical Advisory Committee
TACACS+ .... Terminal Access Controller Access-Control System Plus
TCI .... Town Center Intersection
T-DISP .... Dynamic Transit Operations
TERL .... Traffic Engineering Research Lab
THEA .... Tampa - Hillsborough Expressway Authority
TIGER .... Transportation Investment Generating Economic Recovery
TIP .... Transportation Improvement Program
TMC .... Traffic Management Center
TPO .... Transportation Planning Organization
TSM&O .... Transportation System Management & Operations
TSP .... Transit Signal Priority
UCF .... University of Central Florida
UF .... University of Florida
UPS .... Uninterruptible Power Supply
USF/CUTR .... University of South Florida's Center for Urban Transportation Research
UPWP .... Unified Planning Work Program
V2I .... Vehicle-to-Infrastructure
V2V .... Vehicle-to-Vehicle
VII .... Vehicle Infrastructure Integration
VMT .... Vehicle-Miles-Traveled
W3C .... World Wide Web Consortium
WAVE .... Wireless Access in Vehicular Environments
WYDOT .... Wyoming Department of Transportation

1. Executive Summary

1.1. Background

According to the Florida Department of Transportation (FDOT) public information office, District 5 is one of the fastest growing areas of the state. It covers nine counties, nearly 9,000 square miles, and is home to nearly 4,000,000 residents who log more than 55.6 million (estimated) vehicle miles traveled daily. The purpose of this ITS Master Plan is to create an overarching Districtwide ITS Master Plan for this rapidly growing area, that creates a consensus on what items are to be integrated, what ITS Strategies are to be implemented, and what standards need to be met (security, maintenance, staffing, etc.) to facilitate the future ITS goals of the region. With the FDOT planning for the deployment of connected vehicles technologies on public roadways and with the establishment of the Connected Vehicle (CV) initiative as a part of the Transportation Systems Management and Operations (TSM&O) program, the District 5 Districtwide ITS Master Plan will be an important step in identifying the needed framework to support this.[1]

1.2. Stakeholder Coordination

In the past, ITS technologies have been segregated between arterial and freeway applications, but with the initiation of the TSM&O program and its goal of intertwining operations between the arterials and freeways, ITS technologies are starting to blend together their fields of application. The seamless blending of these technologies will be important for the CV initiative. For this reason, ITS Master Plan primary stakeholders were identified as any local agency, Metropolitan Planning Organization (MPO) or Transportation Planning Organization (TPO) that operates and/or maintains existing or future ITS or signalization technologies within the District 5 region. These stakeholders are identified in Section 2.

1.3. Existing Infrastructure

An important initial step in creating an overarching Districtwide ITS Master Plan is to understand and document existing conditions and infrastructure to form a foundation from which to build upon. By compiling information pertinent to the ITS vision, objectives, and goals from all involved agencies and municipalities, it allows the plan to take shape and provide the magnitude of the plan for a direction most beneficial to those involved. As a part of each individual stakeholder meeting, each stakeholder was asked to complete a data request and information form.

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[1] Traffic Engineering and Operations Office, Divisions, TSMO, Management and Deployments, Connected Vehicle http://www.dot.state.fl.us/trafficoperations/ITS/Projects_Deploy/CV/Connected_Vehicles.shtm

The information collected from each stakeholder included the following:

- Existing ITS/ Advanced Traffic Management Systems (ATMS) Master Plans
- As-Built plan sets
- GIS files
- Miles of Fiber Optic Cable
- ITS End Devices
- Number of Signals
- Number of Signals that are Interconnected
- Number of Signals that Belong to Coordinated Signal Corridors
- Number of Adaptive Traffic Signals

1.4. Staffing Guidance

ITS solutions can have tremendous benefits for mobility as a whole; however, it is important to remember that operations and maintenance are essential to ensure the success of the transportation system. Adequate maintenance staffing ensures reliability, and proper operations staffing protects the technology investment and enables adjustment capabilities to changing traffic conditions. Without proper staffing and training, agencies will be hard pressed to exploit the additional capabilities gained through a successful ITS deployment. A primary lesson learned from Federal Highway Administration (FHWA) Successful Traffic Signal Systems Procurement Techniques is the importance of retaining properly trained staff to deploy, operate, and maintain systems.[2] As part of the overall ITS Master Plan, it is important to establish guidelines for staffing needs anticipated by different programs. The first step in establishing those needs is to look at current existing staffing levels relative to recommended staffing levels. The following is a summary of the ITS Staffing Needs by MPO/TPO as established in this Master Plan.

[2] Federal Highway Administration, *Successful Traffic Signal System Procurement Techniques*, Washington, DC: January 2002. ITS Lessons Learned Knowledge Resource: www.itslessons.its.dot.gov/its/benecost.nsf/Lesson?OpenForm&78E81A40197E84A4852570A60055F16B

Lake-Sumter MPO Region			
Position	Existing Staff*	Current Needed - Recommended Staff	Current Needed - Additional Staff
Traffic Engineering Operations Manager	1.0	1.0	0.0
Traffic Signal/ITS Engineer	0.0	0.5	0.5
Traffic Signal Analysts/Technician	1.0	1.5	0.5
Traffic Signal Maintenance/ITS Fiber Technician	5.5	7.0	1.5
Network Specialist	1.0	1.0	0.0
Electronics Specialist (L2 Network Tech)	1.0	1.5	0.5
TMC Manager	0.0	0.0	0.0
Supervisor	0.0	0.0	0.0
TMC Operators	0.0	0.0	0.0

*Not required until Lake County TMC is built.

MetroPlan Orlando MPO Region			
Position	Existing Staff	Current Needed - Recommended Staff	Current Needed - Additional Staff
Traffic Engineering Operations Manager	3.0	3.0	0.0
Traffic Signal/ITS Engineer	8.75	12.5	3.75
Traffic Signal Analysts/Technician	12.0	15.5	3.5
Traffic Signal Maintenance/ITS Fiber Technician	54.5	67.0	12.5
Network Specialist	4.0	5.0	1.0
Electronics Specialist (L2 Network Tech)	3.0	9.0	6.0
TMC Manager	1.5	3.0	1.5
Supervisor	1.0	6.0	5.0
TMC Operators	10.0	11.0	1.0

Ocala-Marion TPO Region			
Position	Existing Staff	Current Needed - Recommended Staff	Current Needed - Additional Staff
Traffic Engineering Operations Manager	1.0	1.0	0.0
Traffic Signal/ITS Engineer	1.0	1.0	0.0
Traffic Signal Analysts/Technician	1.5	2.0	0.5
Traffic Signal Maintenance/ITS Fiber Technician	8.0	8.0	0.0
Network Specialist	0.5	1.0	0.5
Electronics Specialist (L2 Network Tech)	1.0	1.5	0.5
TMC Manager	1.0	1.0	0.0
Supervisor	0.0	0.0	0.0
TMC Operators	0.0	1.0	1.0

River to Sea TPO Region			
Position	Existing Staff	Current Needed - Recommended Staff	Current Needed - Additional Staff
Traffic Engineering Operations Manager	3.0	3.0	0.0
Traffic Signal/ITS Engineer	1.0	2.0	1.0
Traffic Signal Analysts/Technician	0.75	3.1	2.35
Traffic Signal Maintenance/ITS Fiber Technician	12.5	18.25	5.75
Network Specialist	1.0	1.5	0.5
Electronics Specialist (L2 Network Tech)	0.5	2.0	1.5
TMC Manager	0.5	2.0	1.5
Supervisor	1.0	2.0	1.0
TMC Operators	0.75	2.0	1.25

Space Coast TPO Region			
Position	Existing Staff	Current Needed - Recommended Staff	Current Needed - Additional Staff
Traffic Engineering Operations Manager	3.0	3.0	0.0
Traffic Signal/ITS Engineer	0.0	2.5	2.5
Traffic Signal Analysts/Technician	1.0	4.5	3.5
Traffic Signal Maintenance/ITS Fiber Technician	14.5	20.0	5.5
Network Specialist	0.5	1.0	0.5
Electronics Specialist (L2 Network Tech)	0.5	3.5	3.0
TMC Manager	0.0	1.0	1.0
Supervisor	0.0	1.0	1.0
TMC Operators	0.5	2.0	1.5

In addition, the staffing for the region's FMS system was evaluated as follows:

FDOT District 5 FMS Staffing			
Position	Existing Staff	Current Needed - Recommended Staff	Current Needed - Additional Staff
Regional TSM&O Engineer (Freeways)	1	1	0
Regional ITS Project Manager/Supervisor	3	3	0
Sunguide Software Developer	0.5	0.5	0
Sunguide Database Administrator	0.5	0.5	0
Sunguide Software Analyst	0.5	2	1.5
Network Engineer	1	1	0
Network Server Administrator	1	2	1
Network Security Administrator	1	2	1
Computer Technician	0.5	1	0.5
TSM&O Operations Manager	1	1	0
TMC Manager	1	1	0
Supervisor	2	3	1
Lead TMC Operator	5	5	0
TMC Operators	11	12	1

1.5. ITS Strategies

A significant part of this ITS Master Plan entails sorting through the various options that are available that can better serve the transportation system. Emerging technologies, tried and true safety applications, along with up-and-coming initiatives, bring together a melting pot of viable and attainable strategies to implement within the region. These strategies touch on all facets of a transportation system, and when implemented in concert, will further the flow of goods, safety of travelers and keep the public informed. ITS technologies can vary in different types of applications, including different types of traffic signal controllers, variable message signs, vehicle speed detections and road weather information, to more complex applications, which integrate real time data to actively manage the traffic. ITS Strategies presented in this Master Plan cover a wide range of technology solutions; and each solution serves as a “tool” within a toolbox. It must be understood that one strategy is not always an “end-all” solution and that some of these tactics have multiple applications, while a few may only be warranted for unique situations.

Over thirty stakeholders were met with individually to discuss over 70 ITS strategies. In order to document whether a stakeholder generally approved or was interested in a strategy, it was noted as a “Yes”, “No” or “Maybe.” A general rule of thumb utilized as the intention of all stakeholder responses is the following:

- “Yes” - An agreeable option where they would have direct or indirect involvement;
- “No” - An option that may not apply to that stakeholders, or the region’s needs, or the organization has no foreseeable role;
- “Maybe” – An option with no definitive side (positive or negative) but with the notion that it could be a viable choice in the future.

An ITS Strategies Matrix tracked the answers from each of these stakeholders in order to identify trends or synergies between certain agencies or planning organizations. The Matrix follows:

ITS STRATEGY	FDOT Districts	FDOT District 5	Florida's Turnpike Enterprise	Lake-Sumter MPO	Lake County	Sumter County	MetroPlan Orlando	Central Florida Expressway Authority	Orange County	Osceola County	Seminole County	City of Kissimmee	City of Maitland	City of Orlando	City of Winter Park	GOAA	LYNX	SunRail	I-4 Ultimate Team	Ocala-Marion MPO	Marion County	City of Ocala	SUNTRAN	River To Sea	Flagler County	Volusia County	City of Daytona Beach	City of Palm Coast	Daytona Beach Int'l Airport	VOTRAN	Space Coast TPO	Brevard County	City of Melbourne	City of Palm Bay	City of Titusville	Port Canaveral	Melbourne Airport Authority	SCAT
	STAKEHOLDER																																					
ACTIVE TRAFFIC MANAGEMENT																																						
Active Arterial Management		Y	Y	M	Y	M	Y	N	Y	Y	Y	Y	Y	Y	Y	NA	Y	NA	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Dynamic Junction Control		Y	Y	M	M	M	Y	M	M	M	Y	M	M	M	M	NA	M	NA	M	M	N	M	N	Y	Y	M	Y	M	N	N	M	M	M	Y	M	Y	N	N
Dynamic HOV & Managed Lanes		Y	N	M	N	N	Y	M	N	N	N	N	N	M	N	NA	N	NA	M	M	N	M	N	Y	M	M	N	N	N	N	N	N	N	N	N	N	N	N
Dynamic Lane Reversal		Y	Y	M	N	N	Y	M	N	Y	M	N	N	M	Y	NA	N	NA	N	M	N	M	N	M	N	M	N	N	N	N	N	N	N	M	Y	N	N	N
Dynamic Lane Use Control		Y	M	M	N	N	Y	M	M	M	N	M	M	M	N	NA	N	NA	N		N	M	N	Y	Y	Y	N	N	N	N	Y	Y	Y	N	N	N	N	N
Adaptive Ramp Metering		Y	Y	M	N	N	Y	M	M	Y	M	N	Y	M	N	NA	N	NA	Y	N	M	N	N	Y	Y	M	N	M	N	N	N	N	N	Y	M	M	N	N
Dynamic Merge Control		Y	Y	Y	M	M	Y	Y	N	Y	N	Y	M	M	N	NA	N	NA	M	N	Y	Y	N	Y	N	Y	M	N	M	N	N	N	N	N	N	M	N	N
Dynamic Shoulder Lanes, or "Hard Shoulder Running"		Y	Y	Y	N	N	Y	M	N	M	N	N	N	N	N	NA	Y	NA	M	N	Y	M	M	Y	N	M	M	N	N	N	M	M	M	N	N	M	N	Y
Dynamic Routing		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	Y	NA	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Queue Warning		Y	Y	Y	M	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	NA	M	NA	Y	M	Y	Y	N	Y	M	Y	Y	Y	N	N	Y	Y	Y	M	N	Y	N	Y
ADVANCED PARKING MANAGEMENT																																						
Dynamic Parking Guidance and Reservation		Y	N	N	N	N	Y	N	Y	Y	N	Y	Y	Y	Y	NA	M	NA	N	Y	Y	Y	N	Y	Y	Y	Y	M	Y	N	Y	Y	Y	N	Y	Y	Y	N
Dynamic Overflow Transit Parking		Y	N	M	M	M	Y	N	Y	Y	N	NA	M	M	Y	NA	Y	NA	N	Y	M	Y	M	Y	Y	Y	M	N	Y	Y	M	M	M	N	N	N	M	M
Dynamic Priced Parking		Y	M	N	N	N	Y	N	M	Y	N	M	N	Y	M	NA	M	NA	N	N	Y	Y	N	Y	Y	M	M	N	Y	N	M	M	M	N	M	N	N	N
Freight Parking		Y	Y	Y	Y	N	Y	M	N	M	N	N	N	M	N	NA	N	NA	Y	M	Y	M	N	Y	N	M	Y	Y	N	N	Y	Y	Y	M	Y	Y	N	N
INTEGRATED CORRIDOR MANAGEMENT		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	Y	NA	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	M	Y	Y	Y	Y	M	Y	N	Y	Y
TRAVELER INFORMATION																																						
Predictive Traveler Information		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	Y	NA	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	M	Y	Y	Y	Y	Y	Y	Y	Y	M
Pre-trip Travel Information		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	Y	NA	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y
En-route Driver Information		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	Y	NA	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	M	Y	Y	Y	Y	Y	Y	Y	N	Y
Route Guidance		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	Y	NA	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	N	Y
Traveler Services Information		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	Y	NA	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y
DYNAMIC RIDESHARING		Y	Y	Y	Y	N	Y	M	M	Y	Y	Y	Y	M	Y	NA	Y	NA	M	Y	Y	Y	Y	Y	Y	M	M	Y	Y	M	Y	Y	Y	N	Y	N	Y	Y
DYNAMIC WAYFINDING		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	Y	NA	M	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	M	Y	Y	Y
TRAFFIC CONTROL																																						

ITS STRATEGY	FDOT Districts	FDOT District 5	Florida's Turnpike Enterprise	Lake-Sumter MPO	Lake County	Sumter County	MetroPlan Orlando	Central Florida Expressway Authority	Orange County	Osceola County	Seminole County	City of Kissimmee	City of Maitland	City of Orlando	City of Winter Park	GOAA	LYNX	SunRail	I-4 Ultimate Team	Ocala-Marion MPO	Marion County	City of Ocala	SUNTRAN	River To Sea	Flagler County	Volusia County	City of Daytona Beach	City of Palm Coast	Daytona Beach Int'l Airport	VOTRAN	Space Coast TPO	Brevard County	City of Melbourne	City of Palm Bay	City of Titusville	Port Canaveral	Melbourne Airport Authority	SCAT
	STAKEHOLDER																																					
Adaptive Signal Control		Y	N	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	NA	M	NA	N	Y	Y	Y	M	Y	Y	Y	M	M	N	M	Y	Y	Y	Y	Y	Y	N	M
Transit Signal Priority		Y	N	Y	M	N	Y	N	Y	Y	Y	Y	Y	Y	Y	NA	Y	NA	N	Y	Y	Y	Y	Y	Y	Y	M	M	N	Y	Y	Y	Y	Y	Y	Y	N	Y
INCIDENT MANAGEMENT		Y	Y	Y	Y	Y	Y	Y	M	Y	Y	Y	Y	Y	Y	NA	Y	NA	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
TRAVEL DEMAND MANAGEMENT		Y	Y	M	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	Y	NA	Y	Y	Y	Y	Y	Y	Y	M	Y	Y	Y	Y	Y	Y	Y	M	Y	N	M	Y
EMISSIONS TESTING AND MITIGATION		Y	N	M	M	N	Y	N	N	N	Y	M	N	N	M	NA	M	NA	N	M	M	M	N	M	Y	N	Y	M	N	N	M	M	M	N	M	N	N	N
HIGHWAY RAIL INTERSECTION		Y	N	Y	Y	Y	Y	M	Y	Y	Y	Y	Y	Y	Y	NA	Y	NA	N	M	Y	Y	M	Y	Y	Y	Y	N	M	M	Y	Y	Y	Y	Y	Y	M	Y
PUBLIC TRANSPORTATION MANAGEMENT																																						
Dynamic Transit Capacity Assignment		Y	M	M	Y	N	Y	M	M	Y	Y	Y	Y	Y	Y	NA	Y	NA	M	M	M	M	Y	Y	Y	Y	Y	M	N	Y	Y	Y	Y	N	M	N	N	Y
Dynamic Fare Reduction		Y	N	M	Y	N	Y	M	M	M	Y	Y	Y	M	Y	NA	Y	NA	Y	M	M	Y	M	Y	Y	M	Y	Y	N	Y	M	M	M	N	Y	N	N	M
Transfer Connection Protection		Y	N	M	Y	N	Y	M	M	M	Y	M	Y	M	N	NA	Y	NA	N	M	Y	M	N	Y	Y	M	N	M	N	N	M	M	M	N	M	N	N	Y
Transit Traveler Information		Y	M	Y	Y	N	Y	M	M	Y	Y	Y	Y	Y	Y	NA	Y	NA	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	N	Y	M	N	Y
PERSONALIZED PUBLIC TRANSIT		Y	N	Y	Y	Y	Y	N	M	Y	M	Y	Y	Y	Y	NA	Y	NA	M	Y	Y	Y	Y	Y	Y	Y	M	Y	M	Y	Y	Y	Y	N	Y	Y	N	Y
PUBLIC TRAVEL SECURITY		Y	Y	M	M	N	Y	Y	Y	Y	Y	M	Y	Y	Y	NA	Y	NA	Y	M	Y	Y	M	Y	Y	M	Y	Y	Y	Y	N	N	N	M	Y	Y	Y	Y
ELECTRONIC PAYMENT SERVICES																																						
Regional Payment System		Y	Y	Y	Y	Y	Y	Y	M	Y	Y	Y	Y	Y	Y	NA	Y	NA	Y	M	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Electronic Transit Ticketing		Y	N	Y	Y	N	Y	M	Y	Y	Y	Y	Y	Y	Y	NA	Y	NA	M	M	Y	Y	Y	Y	Y	Y	Y	M	N	Y	Y	Y	Y	N	Y	N	N	Y
ELECTRONIC TOLL COLLECTION		Y	Y	Y	Y	Y	Y	Y	M	Y	N	Y	Y	N	Y	NA	M	NA	Y	M	M	Y	N	Y	N	M	Y	Y	Y	N	Y	Y	Y	N	Y	Y	N	N
Dynamic Pricing		Y	Y	Y	M	N	Y	N	M	Y	N	N	N	N	N	NA	N	NA	Y	M	M	M	Y	Y	N	M	Y	N	N	Y	M	M	M	N	N	N	N	N
Demand Pricing		Y	M	N	N	N	Y	N	M	M	N	N	M	N	M	NA	Y	NA	M	M	M	N	Y	M	Y	M	Y	M	N	Y	N	N	N	N	M	N	N	N
Corridor Pricing		Y	M	Y	Y	N	Y	N	M	M	N	N	N	N	N	NA	Y	NA	Y	M	M	M	Y	Y	N	M	Y	M	N	Y	M	M	M	N	N	N	N	Y
COMMERCIAL VEHICLE OPERATIONS																																						
Automated Roadside Safety Inspection		Y	Y	Y	Y	Y	Y	N	M	N	N	M	N	N	M	NA	N	NA	M	M	Y	M	N	Y	M	N	Y	Y	N	N	M	M	M	N	N	N	N	N
Commercial Vehicle Administration Process		Y	Y	Y	Y	Y	Y	N	M	N	N	M	M	N	M	NA	N	NA	Y	M	Y	Y	N	Y	M	N	Y	Y	N	N	M	M	M	N	N	N	N	N
Commercial Vehicle Electronic Clearance		Y	Y	Y	Y	Y	Y	M	M	N	N	M	N	M	M	NA	N	NA	M	M	Y	M	N	Y	M	M	Y	Y	N	N	M	M	M	N	N	N	N	N
Freight Mobility		Y	Y	Y	M	Y	Y	N	M	Y	N	M	M	N	Y	NA	N	NA	M	Y	Y	M	N	Y	Y	M	M	Y	N	N	M	M	M	N	N	M	N	N

ITS STRATEGY	FDOT Districts	FDOT District 5	Florida's Turnpike Enterprise	Lake-Sumter MPO	Lake County	Sumter County	MetroPlan Orlando	Central Florida Expressway Authority	Orange County	Osceola County	Seminole County	City of Kissimmee	City of Maitland	City of Orlando	City of Winter Park	GOAA	LYNX	SunRail	I-4 Ultimate Team	Ocala-Marion MPO	Marion County	City of Ocala	SUNTRAN	River To Sea	Flagler County	Volusia County	City of Daytona Beach	City of Palm Coast	Daytona Beach Int'l Airport	VOTRAN	Space Coast TPO	Brevard County	City of Melbourne	City of Palm Bay	City of Titusville	Port Canaveral	Melbourne Airport Authority	SCAT
	STAKEHOLDER																																					
Hazardous Materials Security & Incident Response		Y	Y	Y	Y	Y	Y	N	M	Y	N	Y	Y	Y	Y	NA	Y	NA	Y	M	Y	Y	N	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	N
On-Board Safety and Security Monitoring		Y	Y	Y	Y	Y	Y	M	M	Y	N	Y	M	N	Y	NA	Y	NA	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	M	Y	Y	Y	Y	M	Y	N	Y
EMERGENCY MANAGEMENT																																						
Emergency Notification & Personal Security		Y	Y	Y	Y	Y	Y	Y	M	Y	Y	Y	Y	Y	N	NA	Y	NA	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N
Emergency Vehicle Management		Y	N	Y	Y	Y	Y	N	M	Y	M	Y	Y	Y	Y	NA	N	NA	N	Y	Y	Y	N	Y	Y	N	Y	Y	Y	N	Y	Y	Y	Y	Y	N	M	Y
Disaster Response and Evacuation		Y	Y	Y	Y	Y	Y	Y	M	Y	Y	Y	Y	Y	Y	NA	Y	NA	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
ADVANCED VEHICLE SAFETY SYSTEMS *																																						
Connected Vehicles - In-vehicle Information		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	Y	NA	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Connected Vehicles - Probe Vehicle Data		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	Y	NA	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Longitudinal Collision Avoidance		Y	N	N	N	N	Y	N	Y	N	N	N	N	Y	N	NA	Y	NA	N	N	N	N	Y	N	N	N	N	N	N	Y	N	N	N	N	N	N	Y	Y
Lateral Collision Avoidance		Y	N	N	N	N	Y	N	Y	N	N	N	N	Y	N	NA	Y	NA	N	N	N	N	Y	N	N	N	N	N	N	Y	N	N	N	N	N	N	Y	Y
Intersection Collision Avoidance		Y	M	Y	Y	Y	Y	M	Y	Y	N	Y	Y	Y	Y	NA	Y	NA	N	Y	Y	Y	Y	M	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	M	M	Y
Vision Enhancement for Crash Avoidance		Y	N	N	N	N	Y	N	Y	N	N	N	N	Y	N	NA	Y	NA	N	N	N	N	N	N	N	N	N	N	N	Y	N	N	N	N	N	N	M	N
Pre-crash restraint deployment		Y	N	N	N	N	Y	N	Y	N	N	N	N	Y	N	NA	Y	NA	N	N	N	N	N	N	N	N	N	N	N	M	N	N	N	N	N	N	M	Y
Automated Vehicle Operation		Y	N	N	N	N	Y	N	Y	N	N	N	N	Y	N	NA	Y	NA	N	N	N	N	M	N	N	N	N	N	N	N	N	N	N	N	N	N	M	Y
INFORMATION MANAGEMENT																																						
Archived Data		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	Y	NA	Y	Y	Y	Y	Y	Y	Y	Y	M	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Data Management - Big Data		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	Y	NA	Y	Y	Y	Y	Y	Y	Y	Y	M	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Data Management - Transportation Data Analytics		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	Y	NA	Y	Y	Y	Y	Y	Y	Y	Y	M	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Performance Management (or Measurement)		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	Y	NA	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	M	Y	Y	Y	Y	Y	Y	Y	Y	Y
EVENT MANAGEMENT		Y	Y	Y	Y	Y	Y	Y	Y	Y	M	Y	Y	Y	Y	NA	Y	NA	Y	Y	Y	Y	M	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	M	Y	M
WRONG WAY DRIVING COUNTERMEASURES		Y	Y	Y	Y	Y	Y	NA	NA	Y	NA	Y	M	NA	Y	NA	N	NA	Y	M	Y	Y	M	Y	Y	M	Y	Y	M	N	NA	NA	NA	N	Y	N	Y	N
ASSET MANAGEMENT		Y	Y	Y	Y	Y	Y	NA	NA	Y	NA	Y	Y	NA	Y	NA	Y	NA	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	NA	NA	Y	Y	Y	Y	Y

ITS STRATEGY	STAKEHOLDER																																				
	FDOT Districts	FDOT District 5	Florida's Turnpike Enterprise	**Lake-Sumter MPO**	Lake County	Sumter County	**MetroPlan Orlando**	Central Florida Expressway Authority	Orange County	Osceola County	Seminole County	City of Kissimmee	City of Maitland	City of Orlando	City of Winter Park	GOAA	LYNX	SunRail	I-4 Ultimate Team	**Ocala-Marion MPO**	Marion County	City of Ocala	SUNTRAN	**River To Sea**	Flagler County	Volusia County	City of Daytona Beach	City of Palm Coast	Daytona Beach Int'l Airport	VOTRAN	**Space Coast TPO**	Brevard County	City of Melbourne	City of Palm Bay	City of Titusville	Port Canaveral	Melbourne Airport Authority	SCAT
BIKE & PEDESTRIAN INNOVATIVE ITS SOLUTIONS																																						
Pedestrian Safety Systems		Y	Y	Y	Y	Y	Y	NA	NA	Y	NA	Y	Y	NA	Y	NA	Y	NA	M	Y	Y	Y	N	Y	Y	M	M	Y	Y	N	NA	NA	NA	Y	Y	Y	Y	Y
Bicycle Warning Systems		Y	N	Y	Y	Y	Y	NA	NA	Y	NA	Y	Y	NA	Y	NA	N	NA	M	Y	Y	Y	N	Y	Y	M	Y	Y	Y	N	NA	NA	NA	Y	Y	N	Y	Y
INNOVATIVE INTERSECTION DESIGNS		Y	Y	Y	Y	Y	Y	NA	NA	Y	NA	Y	Y	NA	Y	NA	N	NA	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	M	Y	NA	NA	NA	Y	Y	Y	M	Y

** Contingent on manufacturer's development and when infrastructure is in place to support these systems*

The following strategies were identified as Districtwide ITS strategies since they involve operations on the SHS or require a consensus on standards throughout the District to be implementable.

- Active Traffic Management/Traffic Control
  - Active Arterial Management (AAM)
  - Dynamically High Occupancy Vehicle (HOV) & Managed Lanes
  - Dynamic Routing
  - Adaptive Ramp Metering
  - Transit Signal Priority
- Integrated Corridor Management (ICM)
- Traveler Information
  - Predictive Traveler Information
  - Pre-trip Traveler Information
  - En-route Driver Information
  - Route Guidance
  - Traveler Services Information
- Travel Demand Management
- Public Transportation Management
  - Dynamic Transit Capacity Assignment
  - Dynamic Fare Reduction
  - Transfer Connection Protection
  - Transit Traveler Information
  - Personalized Public Transit
- Incident Management
- Dynamic Wayfinding
- Dynamic Ridesharing
- Electronic Payment Services
  - Regional Payment System
  - Electronic Toll Collection
- Emergency Management
  - Emergency Notification & Personal Security
  - Emergency Vehicle Management
  - Disaster Response and Evacuation

- Information Management
  - Archived Data
  - Big Data/Analytics
  - Performance Management/Measurement
- Wrong Way Driving Countermeasures
- Asset Management
- Public Travel Security

The following ITS strategies were identified as regional strategies on the MPO/TPO level within the District 5 region. These strategies are classified as such because they involve cooperation between multiple stakeholders within an MPO/TPO region; although not necessarily all stakeholders within the District. They are identified by the related MPO/TPO organizations.

MetroPlan, River to Sea, Ocala/Marion, Space Coast

- Advanced Parking Management
  - Dynamic Parking Guidance and Reservation
  - Dynamic Overflow Transit Parking

MetroPlan, River to Sea, Ocala/Marion, Space Coast

- Commercial Vehicle Operations
  - Automated Roadside Safety Inspection
  - Hazardous Materials Security & Incident Response
  - On-Board Safety and Security Monitoring
  - Freight Parking

The following ITS strategies were identified as local strategies within the District 5 region. These strategies were classified as local because they did not necessarily require regional cooperation, involve specific intersections or corridors on arterial roadways, or are specifically applicable to only certain stakeholder types. For example, many of the advanced vehicle safety systems only apply to those stakeholders that physically operate and maintain a fleet of vehicles for public services such as transit agencies.

- ❖ Active Traffic Management
  - Dynamic Merge Control
  - Queue Warning
- ❖ Advanced Parking Management
  - Dynamic Priced Parking
  - Freight Parking
- ❖ Traffic Control
  - Adaptive Signal Control
- ❖ Highway Rail Intersection
- ❖ Electronic Payment Systems
  - Electronic Transit Ticketing
- ❖ Advanced Vehicle Safety Systems
  - Longitudinal Collision Avoidance
  - Lateral Collision Avoidance
  - Intersection Collision Avoidance
  - Vision Enhancement for Crash Avoidance
  - Automated Vehicle Operations
- ❖ Bike & Pedestrian Innovative ITS Solutions
  - Pedestrian Safety Systems
  - Bicycle Warning Systems
- ❖ Innovative Intersection Designs

1.6. Connected Vehicles

The Connected Vehicle Initiative uses cutting edge technologies to quickly identify roadway hazards, speed optimization, weather advisories, basic safety messages (BSM) and provide drivers with vehicle analyses. These technologies have the potential to revolutionize the transportation system – a huge shift in travel that has not been seen for decades. Just as we have seen the far reaches of the Internet's potential; once CV is applied to the movement of goods, services and people, the possibilities are limitless. In-depth research is being performed nationwide; however, there is still a large amount work ahead to make this "connected" dream a reality. District 5's ITS Master Plan is striving to prepare the region through unified networks, security protocols, data labeling/sharing/storing, etc. However, it's imperative to know what is being done within the industry in order to shed light on some of the steps that Central Florida can be taking now to organize the region's transportation system for this technology and be a frontrunner in the development of connected vehicles.

The levels at which this technology impacts the driving experience are defined as follows:

- Connected Vehicle
- Automated Vehicle
- Autonomous Vehicle

This Master Plan provides an overview of Connected Vehicles and reviews past and present pilot programs. In addition, Connected Vehicle Strategies are reviewed. The Connected Vehicle Strategies that appear to be appropriate for District 5 at this time include:

- Vehicle-to-Infrastructure (V2I) Safety
  - Red Light Violation Running*
  - Curve Speed Warning
  - Stop Sign Gap Assist*
  - Spot Weather Impact Warning
  - Reduced Speed/Work Zone Warning*
  - Pedestrian in Signalized Crosswalk
  - Warning (Transit)
- Road Weather
  - Motorist Advisories and Warnings
  - Enhanced Maintenance Decision Support System (MDSS)
  - Weather Response Traffic Information
- Agency Data
  - Probe-Based Pavement Maintenance
  - Probe-Enabled Traffic Monitoring*
  - Vehicle Classification-Based Traffic Studies*
  - CV-Enabled Turning Movement & Intersection Analysis*
  - CV-Enabled Origin-Destination Studies*
  - Work Zone Traveler Information
- Mobility/Environment
  - Advanced Traveler Information System – Eco*
  - Intelligent Traffic Signal System (I-SIG) – Eco*
  - Signal Priority (Transit, Freight) – Eco*
  - Eco-Approach and Departure at Signalized Intersections*
  - Mobile Accessible Pedestrian Signal System (PED-SIG)

  - Emergency Vehicle Preemption (PREEMPT)
  - Queue Warning (Q-WARN)*
  - Incident Scene Pre-Arrival Staging Guidance for Emergency Responders (RESP-STG)*
  - Incident Scene Work Zone Alerts for Drivers and Workers (INC-ZONE)*
  - Eco-Ramp Metering*
  - Emergency Communications and Evacuation (EVAC)
  - Dynamic Transit Operations (T-DISP) - Eco
  - Dynamic Ridesharing (D-RIDE)*
  - Freight-Specific Dynamic Travel Planning and Performance - Eco
  - AFV Charging/Fueling Information
  - Eco-Smart Parking*
  - Eco-ICM Decision Support System*
- Smart Roadside
  - Wireless Inspection
  - Smart Truck Parking

* Strategies that would require a substantial number of On-Board Units (Vehicular) to be cost effective. This would delay implementation, since it is dependent upon automobile manufacturers. Note that informational strategies that are not dependent upon V2V are not included, since these strategies would provide value to vehicles with OBU's regardless of the saturation of other vehicles.

1.7. ITS Standards

In the past, ITS technologies have been segregated by application and jurisdiction with each agencies' ITS system working within its own "silo". However, with the initiation of the TSM&O program and rapidly progressing technology, there are many benefits to be gained by taking a collaborative approach to ITS regionally, both as a MPO/TPO region and Districtwide. This allows each local agency stakeholder to leverage their existing independent system investments to form a greater whole in combination with other regional partners. It will also create regional cost saving opportunities through resource sharing of device data, sharing software licensing and combined regional network contract staffing options. This ITS Master Plan documents ITS standards that either need to be implemented regionally or should at least be considered in order to facilitate the connectivity of stakeholders Districtwide and the overall regional success of the TSM&O program. The fundamental goal is to allow for connectivity and resource sharing while also allowing each stakeholder to maintain control over their specific systems.

The following ITS Standards were identified:

- ITS Network, Data and Security Standards
- ITS Maintenance Standards
- ITS Operations Standards
- ITS Training Standards
- Software Licensing
- Asset Management
- Regional Operations and Maintenance w/ Federal Language
- Standard Testing and System Acceptance
- Creation of System Engineering Document Services
- Network/Re-IP Addressing (Existing Contract)
- Active Arterial Management (Existing Contracts)
- No More #2 Keys in cabinets that have communications
- Common Clock for all Network and Signalization Applications

1.8. Configuration Assessment and Functions

This Master Plan identified strategies which will aid in the linking of planning and operations as well as the rest of the FDOT project development process. This involves configuration assessment and functions for TSM&O as a part of the overall project development process. Generally, TSM&O has taken on a more prominent role within FDOT over the past few years. However, the use of TSM&O principles has just begun to be considered as having a role throughout the entire project development process.

This Master Plan completed a Capability Maturity Model for Central Florida. There are 18 core strategies defined in the Capability Maturity Model for Transportation in Central Florida and each of these is used as a yardstick to indicate progress made in the Central Florida region.

In addition, as a part of the Master Planning effort, a planning workshop was conducted in which information was gathered and insights were gained into how the FDOT project development process could be modified to optimized using transportation systems management and operations. In particular, the goal was to map the existing process and provide guidance and a level of accountability as to where in the process additional steps were needed. The following primary project development phases were reviewed:

- Planning
- PD&E
- Design
- Construction
- Operations and Maintenance

Within these areas, the following summarizes where the overall process may change.

PLANNING PROCESS

Cost Feasible Transportation Plans

MPO LRTP

Operational Strategies – Consideration should be given to operational strategies as a means of resolving transportation issues. This should include operations and maintenance as possible.

Operations Involvement – Operations should be consulted regarding data and their observations regarding the feasibility of an operational strategy as a means of resolving transportation issues. They should also be consulted regarding operations and maintenance requirements.

Note that Planning should be authoring System Engineering Documents as appropriate.

Programming Screen

Qualifying Priority Projects

Operational Strategies – Consideration should be given to operational strategies as a means of resolving transportation issues. This should include operations and maintenance as possible.

Operations Involvement – Operations should be consulted regarding data and their observations regarding the feasibility of an operational strategy as a means of resolving transportation issues. They should also be consulted regarding operations and maintenance requirements.

Local Involvement – Locals should be notified regarding any operational strategies that will affect them from an operations and maintenance perspective.

Note that Planning should be authoring System Engineering Documents as appropriate.

Project Level Planning

<u>Less Complex/Moderate/Complex</u>

Operational Strategies – Consideration should be given to operational strategies as a means of resolving transportation issues. This should include operations and maintenance as possible.

Operations Involvement – Operations should be consulted regarding data and their observations regarding the feasibility of an operational strategy as a means of resolving transportation issues. They should also be consulted regarding operations and maintenance requirements.

Local Involvement – Locals should be notified regarding any operational strategies that will affect them from an operations and maintenance perspective.

Note that Planning should be authoring System Engineering Documents as appropriate.

PD&E PROCESS

Preliminary Concept Analysis

<u>Needs Analysis</u>

Operational Strategies – Consideration should be given to operational strategies as a means of resolving transportation issues. This should include operations and maintenance as possible.

Operations Involvement – Operations should be consulted regarding data and their observations regarding the feasibility of an operational strategy as a means of resolving transportation issues. They should also be consulted regarding operations and maintenance requirements.

Local Involvement – Locals should be notified regarding any operational strategies that will affect them from an operations and maintenance perspective.

Planning Involvement – Planning should be maintaining and updating the system engineering documentation and confirming that the intent of the project remains intact.

<u>Initial Concept Development</u>

Operational Strategies – Operational strategies should be conceptualized and a Return on Investment (ROI) determined. The ROI should include operations and maintenance.

Operations Involvement – Operations should be consulted regarding data and their observations regarding the conceptualized operational strategy. They should also be consulted regarding operations and maintenance requirements.

Local Involvement – Locals should be provided the opportunity to review the Operational Strategy concept(s) that will affect them from an operations and maintenance perspective.

Planning Involvement – Planning should be maintaining and updating the system engineering documentation and confirming that the intent of the project remains intact.

<u>Preliminary Concept Screening</u>

Operational Strategies – Operational strategies should be compared against each other and also traditional "brick and mortar" solutions with a comparison of Return on Investment (ROI). The ROI should include operations and maintenance.

Operations Involvement – Operations should be consulted regarding data and their observations regarding the conceptualized operational strategy as well as any other solutions that are being considered. They should also be consulted regarding operations and maintenance requirements.

Local Involvement – Locals should be provided the opportunity to review the Operational Strategy concept(s) that will affect them from an operations and maintenance perspective as compared to other "brick and mortar" solutions.

Planning Involvement – Planning should be maintaining and updating the system engineering documentation and confirming that the intent of the project remains intact.

Engineering Analysis and Design

<u>Engineering Analysis/Engineering Design</u>

Operational Strategies – If an operational strategy is selected as the preferred alternative, the engineering analysis/design should be used to confirm the results of the Concept Analysis.

Operations Involvement – Operations should be consulted regarding data and their observations regarding the operational strategy. They should also be consulted regarding operations and maintenance requirements.

Local Involvement – Locals should be provided the opportunity to review the Operational Strategy design that will affect them from an operations and maintenance perspective.

Planning Involvement – Planning should be maintaining and updating the system engineering documentation and confirming that the intent of the project remains intact.

Final Documents

Engineering Final Reports

Operational Strategies – If an operational strategy is selected as the preferred alternative, the engineering analysis/design should be used to confirm the results of the Concept Analysis.

Operations Involvement – Operations should be consulted regarding data and their observations regarding the operational strategy. They should also be consulted regarding operations and maintenance requirements.

Local Involvement – Locals should be provided the opportunity to review the Operational Strategy design that will affect them from an operations and maintenance perspective.

Planning Involvement – Planning should be maintaining and updating the system engineering documentation and confirming that the intent of the project remains intact.

FDOT Review

Operations Involvement – Operations should be consulted regarding the operational strategy. They should also be consulted regarding operations and maintenance requirements.

Planning Involvement – Planning should be maintaining and updating the system engineering documentation and confirming that the intent of the project remains intact.

DESIGN PROCESS

30% Plans

Activities

Operations Involvement – Operations should be consulted regarding the operational strategy and any initial design requirements. They should also be consulted regarding operations and maintenance requirements.

Planning Involvement – Planning should be maintaining and updating the system engineering documentation and confirming that the intent of the project remains intact.

60%/90%/100%/Final Plans/Plans Update

Activities

Operational Strategies – The operational strategy should be designed to meet the overall requirements identified in the planning and PD&E process.

Operations Involvement – Operations should be consulted regarding the operational strategy and any initial design requirements. They should also be consulted regarding operations and maintenance requirements.

Local Involvement – Locals should be provided the opportunity to review the design(s) that will affect them from an operations and maintenance perspective.

Planning Involvement – Planning should be maintaining and updating the system engineering documentation and confirming that the intent of the project remains intact.

CONSTRUCTION PROCESS
Construction

Construction Activities

Operations Involvement – Operations should be consulted regarding the construction of an operational strategy; particularly as it relates to vendors, final construction and system acceptance.

Local Involvement – Locals should be provided the opportunity to participate in the final acceptance process, when they are involved in final operations or maintenance.

Planning Involvement – Planning should be maintaining and updating the system engineering documentation and confirming that the intent of the project remains intact.

OPERATIONS AND MAINTENANCE PROCESS
Operations

Activities

Operational Strategies – The operational strategy should be utilized and evaluated based upon the identified goals originating with the planning and PD&E process.

Local Involvement – Locals should operate and maintain the operational strategy as identified as a part of the planning and PD&E process.

Planning Involvement – Planning should be maintaining and updating the system engineering documentation and evaluating the project to determine if goals were reached. In addition, lessons learned should be identified for future projects.

1.9. Commitments

Throughout the development of this ITS Master Plan, various ITS strategies were identified as desirable for implementation regionally. However, various elements are required to be standardized within the region in order to make the implementation of these ITS Strategies feasible.

Therefore, the Master Plan has identified ITS Standards that are needed throughout the region. These ITS Standards are noted as being either mandatory and being provided as guidance.

The Mandatory ITS Standards are as follows:

- Communications
  - Hub and Spoke Topology
  - Static Routing for Now; gradually Migrate Border Gateway Protocol (BGP) with Unique Autonomous System Numbers (ASN) Numbers
  - Fiber Connection Between Agency Router and D5 Carrier Ethernet Switch (Master Hubs)
  - Use of Multiprotocol Label Switching (MPLS)
  - Unique Assigned IP Address Ranges – An existing contract is currently underway to re-IP the region
  - Use of Multicast Source Discover Protocol (MSDP)
- Security
  - Firewall at the D5 Carrier Ethernet Switch (Master Hub)
  - Each Stakeholder to Centrally Manage User Account Database (i.e. Microsoft Active Directory)
  - Authentication, Authorization and Accounting (AAA) - Remote Authentication Dial-In User Service (RADIUS) or TACACS+ (Terminal Access Controller Access-Control System Plus)
- Common Clock
- Discontinuing the Use of #2 Keys at Cabinets with Network Communications

In addition, as a part of regional coordination, it is necessary to determine a method in which the region can benefit from 3rd party data, by providing real-time data as a part of a data sharing agreement. This will require a legal interpretation of the Sunshine Law requirements as it relates to data as well as regional consensus.

The following data standards are offered as possible solutions pending additional regional deliberation. Please note that these data standards must ultimately be adopted by the regional stakeholders as a part of further regional coordination efforts:

- Format - JSON or XML
- District 5 will be the sole source of regional data
- Access to a partner's data to be read only
- For 3rd party - Data would be published through the Department

The ITS Standards that are offered as guidance are as follows. Please note that the below does not change the responsible agency:

- Local Agency Security – Firewall
- ITS Maintenance Standards
- ITS Operations Standards
- ITS Training Standards
- Standard ITS Testing and System Acceptance
- Software Licensing
- Asset Management
- Regional Operations and/or Maintenance Contract (w/USDOT Language)
- System Engineering Document Services Contract
- Active Arterial Management Contract

2. Stakeholder Coordination

2.1. Introduction

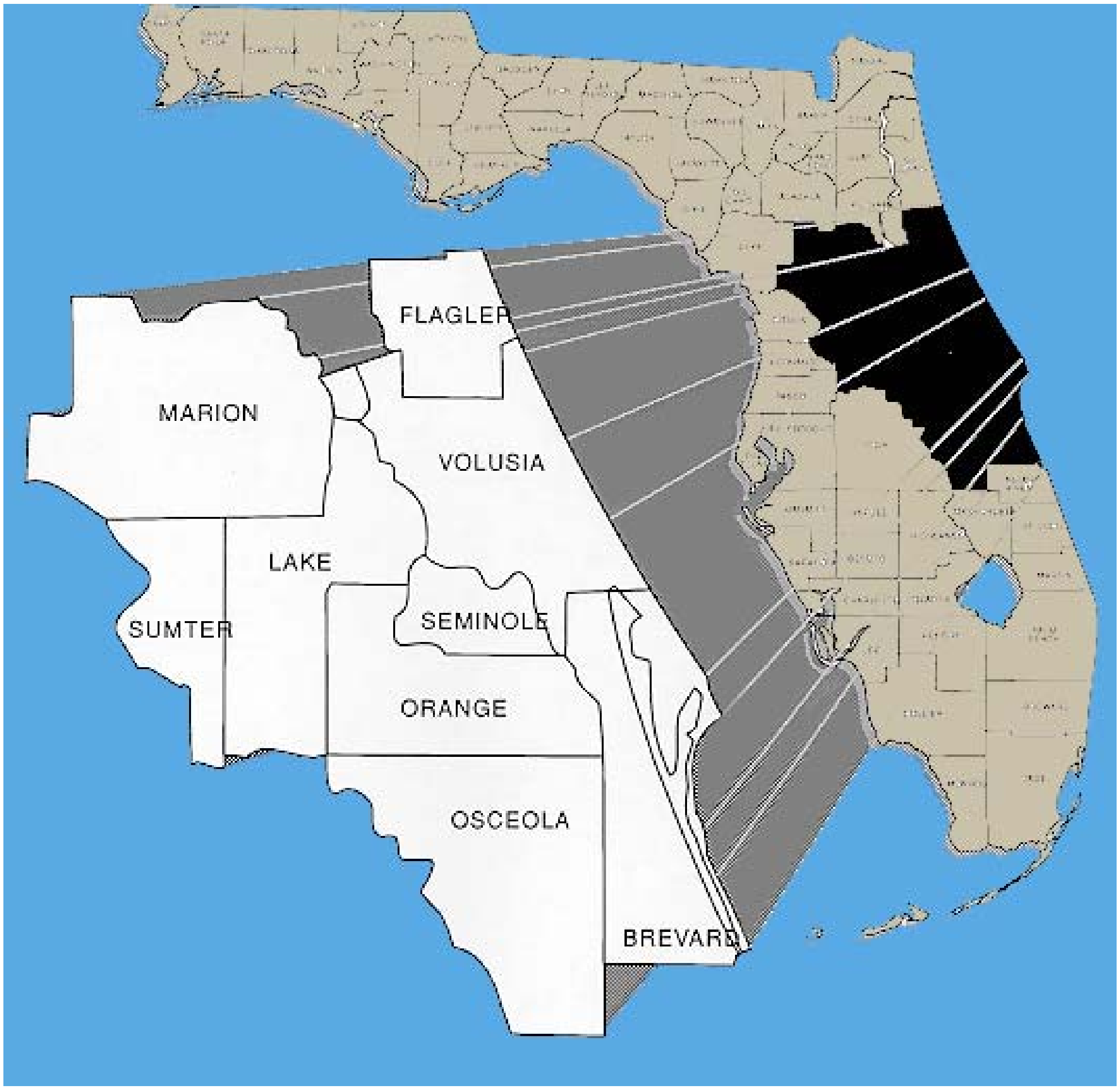
According to the FDOT public information office, District 5 is one of the fastest growing areas of the state. It covers nine counties, nearly 9,000 square miles, and is home to nearly 4,000,000 residents who log more than 55.6 million (estimated) vehicle miles traveled daily. The purpose of this ITS Master Plan is to create an overarching Districtwide ITS Master Plan for this rapidly growing area, that creates a consensus on what items are to be integrated, what ITS Strategies are to be implemented, and what standards need to be met (security, maintenance, staffing, etc.) to facilitate the future ITS goals of the region. With the FDOT planning for the deployment of connected vehicles technologies on public roadways with the establishment of the CV initiative as a part of the Transportation Systems Management and Operations (TSM&O) program, the District 5 Districtwide ITS Master Plan will be an important step in identifying the needed framework to support this[3]. The first step in creating a creating a consensus on future ITS strategies, standards, and goals is to identify the project stakeholders and begin the discussion. This section serves to identify stakeholders within the region and the coordination process.

2.2. Project Stakeholders

In the past, ITS technologies have been segregated between arterial and freeway application, but with the initiation of the TSM&O program and its goal of intertwining operations between the arterials and freeways, ITS technologies are starting to blend together their fields of application. The seamless blending of these technologies will be important for the CV initiative. For this reason, ITS Master Plan primary stakeholders were identified as any local agency, MPO or TPO that operates and/or maintains existing or future ITS or signalization technologies within the District 5 region (See **Figure 1**). In addition, please see **Figure 2** for the MPO/TPO regions.

[3] Traffic Engineering and Operations Office, Divisions, TSMO, Management and Deployments, Connected Vehicle http://www.dot.state.fl.us/trafficoperations/ITS/Projects_Deploy/CV/Connected_Vehicles.shtm

Figure 1 - FDOT District 5 Map

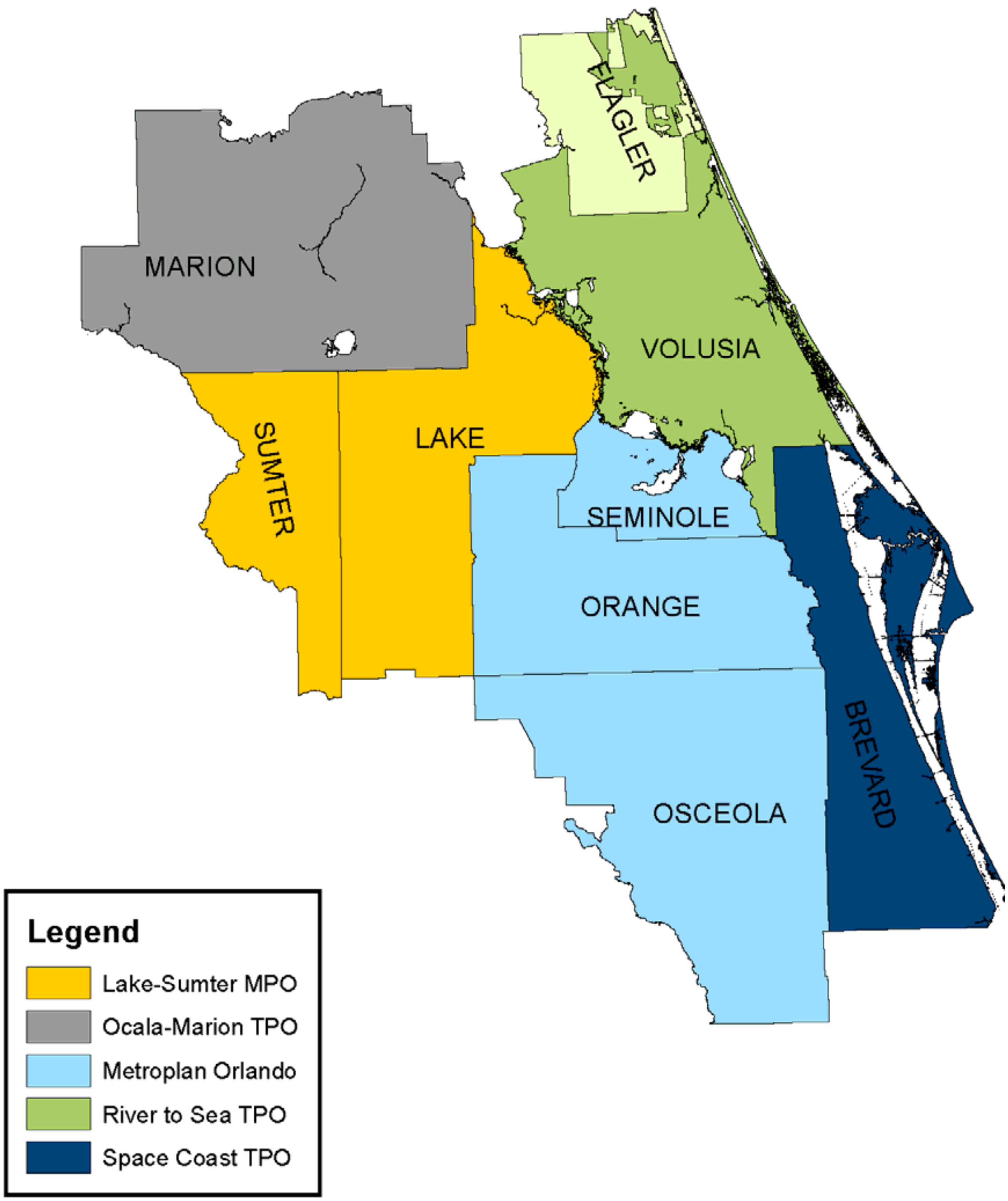


The primary stakeholders identified for the project are as follows:

- FDOT District 5,
- Florida's Turnpike Enterprise (FTE),
- Lake-Sumter MPO,
- MetroPlan Orlando,
- Ocala-Marion TPO,
- River to Sea TPO (R2CTPO),
- Space Coast TPO (SCTPO),
- Central Florida Expressway Authority (CFX),
- Brevard County,
- Flagler County,
- Lake County,
- Marion County,
- Orange County,
- Osceola County,
- Seminole County,
- Sumter County,
- Volusia County,
- City of Daytona Beach,
- City of Kissimmee,
- City of Maitland,
- City of Melbourne,
- City of Ocala,
- City of Orlando,
- City of Palm Bay,
- City of Palm Coast,
- City of Titusville,
- City of Winter Park,
- Daytona Beach International Airport (DBIA),
- Greater Orlando Aviation Authority (GOAA),
- LYNX,
- Melbourne Airport,
- Port Canaveral,
- Space Coast Area Transit (SCAT),
- SunRail,
- SUNTRAN,
- VOTRAN, and

- I-4 Mobility Partners.

Figure 2 – MPO/TPO Boundaries within FDOT District 5



2.3. Coordination Methodology

Once stakeholders were established, an individual one on one meeting with each was held to discuss the overall scope of the project and to request documentation on their current systems and deployments. Each individual one on one meeting was between one to two hours in length discussing the rapid advancement in technology with the advent of smart phones and tablets. Each meeting discussed how society in general is becoming increasingly connected as a whole and this advancement is beginning to fuel changes in the private sector of transportation. With car companies and technology companies coming together, the transportation sector has the potential to change rapidly in the near future. Since long range transportation planning is forecasting 25-40 years from today, now is the time to start considering what impacts these technology advances may have on the public sector. In particular, the impacts that CV and eventually Automated Vehicles (AV) could have on safety and planning; and how these technologies have the potential to greatly alter the way that roadway improvements are planned, designed, and constructed. In addition to going over the general scope, each meeting discussed over 70 ITS strategies and the interest level of each strategy, and the outcome of each is covered in depth in **Section 5 - ITS Strategies** (later in this report). A copy of the meeting handout of ITS strategies discussed can be found attached in **Appendix A**. Meeting minutes from the individual stakeholder meetings can be found attached in **Appendix B**. Information on the current systems and deployments of each stakeholder can be found in **Section 3 – Existing Conditions**, of the Master Plan.

3. Existing Infrastructure

An important initial step in creating an overarching Districtwide ITS Master Plan is to understand and document existing conditions and infrastructure to form a foundation from which to build upon. By compiling information pertinent to the ITS vision, objectives, and goals from all involved agencies and municipalities, it allows the plan to take shape and provide the magnitude of the plan for a direction most beneficial to those involved. As a part of each individual stakeholder meeting previously discussed in Section 2, each stakeholder was asked to complete a data request and information form. A copy of the data information request form completed by each stakeholder can be found in **Appendix C**. This section details existing and funded ITS Deployments within District 5 to be considered in the development of the ITS Master Plan. This documentation includes end devices and signal system data for FDOT, local agencies, and MPO/TPO organizations.

3.1. Data Collection Methodology

As mentioned above, each agency was asked to fill out a data and information request form during the one on one stakeholder coordination meetings. As a part of the overall information request, each agency was asked to provide any documentation available on their current systems and deployments, including any existing ITS/ ATMS master plans, As-Built plan sets and GIS files. Additionally, future plans that have already been funded, if available, were also requested. Based upon the stakeholder provided data, **Table 1** on the following page summarizes the information provided by each stakeholder regarding existing device plans, existing signal system information, future ITS or signal deployment plans, and GIS data files.

Table 1 – Existing and Future Planning and Deployment Documents

EXISTING AND FUTURE PLANNING AND DEPLOYMENT DOCUMENTS Y= Yes Document Provided, N = Document Not Available or Does not Exist, SN = Still Needed, (XXXX) = Year						
STAKEHOLDER	ITS/ATMS Master Plan	Priority List	FDOT District 5 ITS Master Plan Data and Information Request Form	Other Planning Documents	As-Builts, Existing Deployment Documents, and Future Deployment Documents	Existing GIS Shape Files
FTE	N	N	N	N	01_Pinellas_Bayway_System.pdf, 02_Everglades(Alligator_Alley).pdf, 03_Mid-Bay_Bridge.pdf, 04_Garcon_Point_Bridge.pdf, 05_Sunshine_Skyway_Bridge.pdf, 06_Dolphin_Center(Southern_Coin).pdf, 427146 HEFT ML Final ITS Plans.pdf, 25841515201-As-Built Plans Complete.pdf, 40609085201rev6.pdf, 41546225202-As-Built Plans.pdf, ACS_Typical_Details.pdf, AET_Phase_IVA_S&S_ITS_Plans.pdf, ITS Plans_41548815201r6.pdf, Okeechobee ITS section PD&E.pdf, Project_ITS_41546265201.pdf, SEGAB_E4N84_CP_IT_90_ITSPlans_2015-07-1.pdf	N
Lake-Sumter MPO	N	Y (2015)	N	2035 Long Range Transportation Plan (LRTP)(2010), Unified Planning Work Program (UPWP) (FY 2015/2016) Transportation Improvement Program (TIP) (FY 15/16-19/20)	N	N
MetroPlan Orlando	Y (1998)	Y (2015)	N	2040 LRTP (2014) TIP (FY 15/16-19/20) UPWP (FY 2015/2016)	N	N
Ocala-Marion MPO	N	Y (2015)	N	UPWP (FY 2015/2016), TIP (FY 15/16-19/20), 2035 LRTP (2010)	N	N

EXISTING AND FUTURE PLANNING AND DEPLOYMENT DOCUMENTS Y= Yes Document Provided, N = Document Not Available or Does not Exist, SN = Still Needed, (XXXX) = Year						
STAKEHOLDER	ITS/ATMS Master Plan	Priority List	FDOT District 5 ITS Master Plan Data and Information Request Form	Other Planning Documents	As-Builts, Existing Deployment Documents, and Future Deployment Documents	Existing GIS Shape Files
R2CTPO	N	Y	Y (2015)	UPWP (FY 2015/2016) , TIP (FY 15/16-19/20) 2035 LRTP (2015)	N	N
SCTPO	Y (2015)	Y (2015)	N	UPWP (FY 2015/2016)	N	N
CFX	Y (1998)	Y	Y (2015)	N	253E.pdf, 408-615A Final As-Built Plans.pdf, 414-510 Final As-Built Plans.pdf, 599-503.pdf, 599-511 Final As-Built.pdf, and SYS 719A Final As Built Plans.pdf	Y
Brevard County	Y (2015)	Y (2015)	Y (2016)	N	2013 Fiber Optic Network Depiction.pdf, 237592-2-52-01 Signalization.pdf, 423352-1-52-01 SR 3 from Richland to SR 528 redlined plans.pdf, Brevard Review Checklist.xlsx, Countywide ATMS p1-75.pdf, Countywide ATMS p76-136.pdf, Countywide ATMS p137-195.pdf, DASH III.pdf, Government Ctr to I-95.pdf, I FLORIDA Central Florida Field Components Brevard ITS Plan.pdf, ITS Plan SR 520.pdf, SR 520 @ Townsend final plans.pdf, US 192 – I-95 to John Rhodes Blvd.pdf, US 192 Mark-up.pdf, US192 24-12 FOC Minton to I95 asbuilt.pdf, Wickham ITS 2.pdf, WICKHAM ITS As-built Rev 4.pdf, Wickham Road ITS 2008.pdf, and wickham_rd_South_final_plans_7-22-11.pdf	Y
Flagler County	N	N	N	N	N	N

EXISTING AND FUTURE PLANNING AND DEPLOYMENT DOCUMENTS Y= Yes Document Provided, N = Document Not Available or Does not Exist, SN = Still Needed, (XXXX) = Year						
STAKEHOLDER	ITS/ATMS Master Plan	Priority List	FDOT District 5 ITS Master Plan Data and Information Request Form	Other Planning Documents	As-Builts, Existing Deployment Documents, and Future Deployment Documents	Existing GIS Shape Files
Lake County	Y (2015)	Y	Y (2015)	Current Project List.docx, TIP and LRTP Capacity Projects_Lake County.xlsx, and LC_ITS_Stakeholders.docx	CoordinatedCorridors.xlsx, FiberFourCornersSection.pdf, FiberLocationsSpreadSheet.xlsx, FiberSR50.pdf, FiberUS27.pdf, FiberVillagesSection.pdf, LadyLakeFiberAerial1.pdf, LakeCountyFiberRtClermont.pdf, SignalsOnline_8-25-15.xlsx,TavaresFiberAerial.pdf, and WolfBranchCountryClubInterconnect.pdf	N
Marion County	N	N	Y (2016)	N	Adaptive_new.xlsm, ATMS Exhibit.pdf, ATMS Phase II 7-2-2014b.pdf, Marion I75-2007.pdf, Marion SR 40 - 2007.pdf, Phase_II Sched_20150319.xlsx	N
Orange County	Y (2002)	Y	Y (2015)	N	ATMS 3 Final Scope.pdf and Scope of Service 434917-1-54-01.pdf	Y
Osceola County	N	ATMS IV (FY 2016/ 2017)	Y (2015)	N	1 Signed and Sealed As-Builts.pdf, 417257-3_Osceola ATMS Phase III_As-Built.pdf, Osceola ATMS Phase 2_As-Builts.pdf, Osceola County Advanced Traffic Management Center Phase I - As Builts Phase I.pdf, and SBTBSG_ITS and Signal Maint Contract.xlsx	Y
Seminole County	Y (2000)	Y	Y (2016)	Seminole County ATMS Phase II - Systems Engineering Document (2012) and Draft 5 Year CIP Traffic Projects revised.xlsx	Fiber Expansion Project.xlsx, MetroPlan ATMS Phase II Project revised 7 28 15.xlsx, Seminole County BlueTOAD Locations.xlsx, Seminole County VMS.pdf, Traffic Capital Projects FY 11 12.xlsx, Traffic Capital Projects FY 12 13.xlsx, Traffic Projects FY 14 15.xlsx, and Traffic Projects FY 15 16 revised 9 21 15.xlsx	Y

EXISTING AND FUTURE PLANNING AND DEPLOYMENT DOCUMENTS Y= Yes Document Provided, N = Document Not Available or Does not Exist, SN = Still Needed, (XXXX) = Year						
STAKEHOLDER	**ITS/ATMS Master Plan**	**Priority List**	**FDOT District 5 ITS Master Plan Data and Information Request Form**	**Other Planning Documents**	**As-Builts, Existing Deployment Documents, and Future Deployment Documents**	**Existing GIS Shape Files**
Sumter County	Y (2014)	N	Y (2015)	ITS Architecture Planned Data Flow Connections (2014)	FDOT Sumter County controllers.pdf	N
Volusia County	N	Y	Y (2016)	Traffic Engineering Division Plan Part 1 Missions and Duties.pdf and Traffic Engineering Division Plan Part 2 Personnel Needs.pdf	2014 Traffic Controller Replacement Plan.pdf, 2016 Application for Project Prioritization Traffic Adaptive Network Contracted Service.pdf, 2016 Project Prioritization Application LPGA Adaptive.pdf, 2016 Project Prioritization Application Saxon Blvd Adaptive.pdf, 2016 Project Prioritization Application SR 44 Adaptive.pdf, 2016 Project Prioritization Application SR 421 Adaptive.pdf, Countywide Signal Database.pdf, FY 16 17 Traffic Budget.pdf, OandM.pdf, Volusia County ITS Information Signals.pdf, and Volusia County Public Works Traffic Engineering Division Presentation.pdf	N
City of Daytona Beach	N	Y	Y (2015)	N	433622-3-52-01_Addendum 1 Revised Sheets_02.05.14_rf.pdf and 4336223-2-58-01_FINAL_11.12.13_rf.pdf	N
City of Kissimmee	N	Y	Y (2016)	N	CABINET INFO - Grant Rev3 w Type VI.xlsx and INT_KIS RPL.xls	N
City of Maitland	N	N	Y (2015)	N	N	N
City of Melbourne	Y (2015)	Y (2015)	N	N	Communication System.docx (Note: City of Melbourne ATMS installed device installed in the Brevard Countywide ATMS project plans can be found in Brevard County deployment documents.)	N
City of Ocala	N	Y	Y (2015)	N	PDF Intersection Files Folder (This folder contains individual PDF as-built plan sheet of 132 signals in the City of Ocala)	SN

EXISTING AND FUTURE PLANNING AND DEPLOYMENT DOCUMENTS Y= Yes Document Provided, N = Document Not Available or Does not Exist, SN = Still Needed, (XXXX) = Year						
STAKEHOLDER	ITS/ATMS Master Plan	Priority List	FDOT District 5 ITS Master Plan Data and Information Request Form	Other Planning Documents	As-Builts, Existing Deployment Documents, and Future Deployment Documents	Existing GIS Shape Files
City of Orlando	Y (2007)	N	Y (2015)	N	426341-1-58-01 Final As-Builts.pdf, 428986-1-58-01 Final As-Builts.pdf, and 430201-1-58-01 Final As-Built.pdf	Y
City of Palm Bay	Y (2015)	Y (2015)	N	N	N	N
City of Palm Coast	N	Y	Y (2016)	Palm Coast Traffic Detection Hardware and Software Study Concept of Operations (2015)	N	N
City of Titusville	Y (2015)	Y (2015)	N	N	N	N
City of Winter Park	N	N	Y (2015)	Comprehensive Plan	N	N
LYNX	Y (2011)	Y	Y (2015)	2012 GIS Strategic Plan	N	Y
SCAT	Y (2015)	Y (2015)	N	N	N	N
SunRail	N	N	N	N	N	N
SUNTRAN	N	Y	Y (2016)	N	N	N
VOTRAN	N	Y	Y (2016)	Transit Development Plan (2011)	N	N
I-4 Mobility Partners	N	N	Y (2015)	N	_RFC Submittals (Directory)	N

3.2. ITS Device Summary

Based on the information provided by each agency in the region, this section shows a snapshot of the miles of fiber optic cable (FOC) and ITS end devices maintained by each stakeholder. This summary was split into two groups: one for agencies that operate and maintain roadway facilities and the other for transit agencies. The ITS end devices shown and totaled for stakeholders that operate and maintain roadway facilities are the physical roadside devices that are not with the device cabinet. This includes closed-circuit television (CCTV) cameras, dynamic message signs (DMS), microwave vehicle detectors (MVDS), Automated Vehicle Identification (AVI) readers and Bluetooth devices for stakeholders that operate and maintain roadway facilities. This summary does not include in-cabinet ITS devices such as switches, malfunction monitoring units (MMU), or uninterruptible power supplies (UPS). Also, the ITS end device summary does not include cameras or MVDSs that are used for detection instead of loops at traffic signal locations. It should be noted that FTE has facilities statewide. The summary information shown for FTE lists only the fiber and ITS end devices located within the District 5 region. The summary of ITS end devices for stakeholders that operate and maintain roadway facilities are shown in **Table 2**.

The ITS end devices summarized for transit agencies are devices that are located primarily onboard the transit vehicles. These include computer aided dispatch (CAD) or mobile data terminals, CCTVs, automated passenger counters (APC), automated vehicle locators (AVL) and transit signal priority devices (TSP). It should also be noted for transit ITS devices that some CCTVs are located within the physical bus stop and those have been included in the number of CCTVs shown per transit agency. **Table 3** provides a summary of ITS end devices for the transit agencies within the District 5 region. In addition, **Figures 3 - 11** show the location of ITS end devices.

Table 2 – ITS End Device Summary by Stakeholder

Summary of ITS End Devices Maintained						
LEGEND CCTV = Closed-Circuit Television Camera, DMS = Dynamic Message Sign, MVDS = Microwave Vehicle Detectors, and AVI = Automated Vehicle Identification						
STAKEHOLDER	**Miles of Fiber Optic Cable**	**Total ITS Devices**	**CCTV**	**DMS**	**MVDS / AVI**	**Bluetooth**
FDOT Districts						
FDOT District 5	239	763	271	80	322	90
FTE	168	684	202	31	451	0
Lake-Sumter MPO						
Lake County	43	14	14	0	0	0
Sumter County	0	0	0	0	0	0
MetroPlan Orlando						
CFX	200	833	178	93	562	0
Orange County	218	306	107	13	158	28
Osceola County	75	75	64	6	0	5
Seminole County	400	291	180	29	0	82
City of Kissimmee	0	6	6	0	0	0
City of Maitland	0	0	0	0	0	0
City of Orlando	55	192	101	11	0	80
City of Winter Park	0	0	0	0	0	0
I-4 Mobility Partners	100	465	130	150	185	0
Ocala-Marion MPO						
Marion County	2*	110	58	0	0	52
City of Ocala	0**	44	37	7	0	0
River to Sea TPO						
Flagler County	0	0	0	0	0	0
Volusia County	27	35	35	0	0	0
City of Daytona Beach	8	60	60	0	0	0
City of Palm Coast	40	0	7	0	0	0
Space Coast TPO						
Brevard County	71	179	80	49	0	50
City of Melbourne	3.2	9	9	0	0	0
City of Palm Bay	0	1	1	0	0	0
City of Titusville	0	0	0	0	0	0

*Marion County has some fiber optic cable connecting devices or signals however, all information is sent to the TMC via wireless communication.

**The City of Ocala uses fiber from the city owned telecommunications utility company to communicate with their ITS end devices.

Figure 3 – Brevard County ITS End Devices

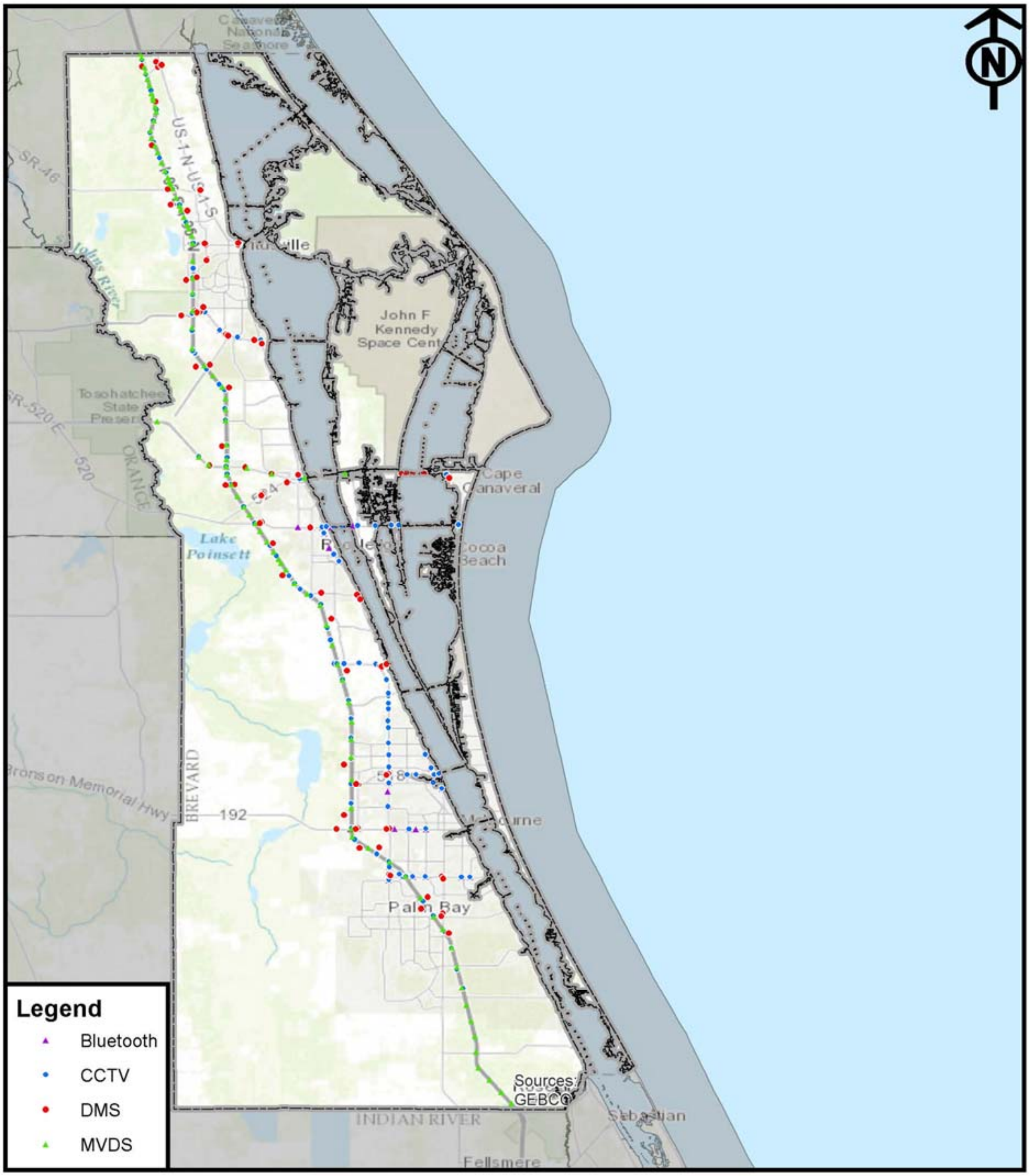


Figure 4 – Flagler County ITS End Devices

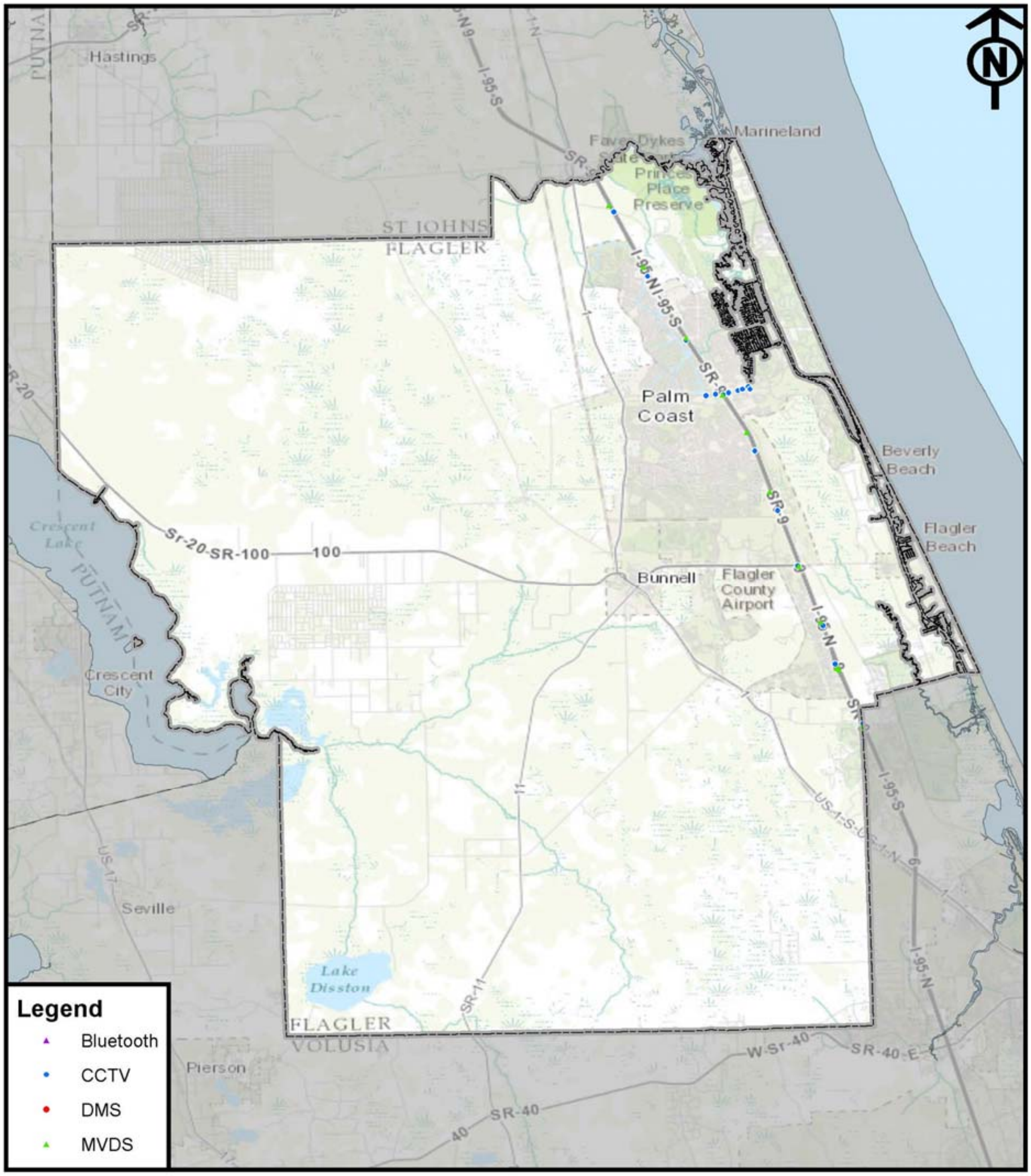


Figure 5 – Lake County ITS End Devices

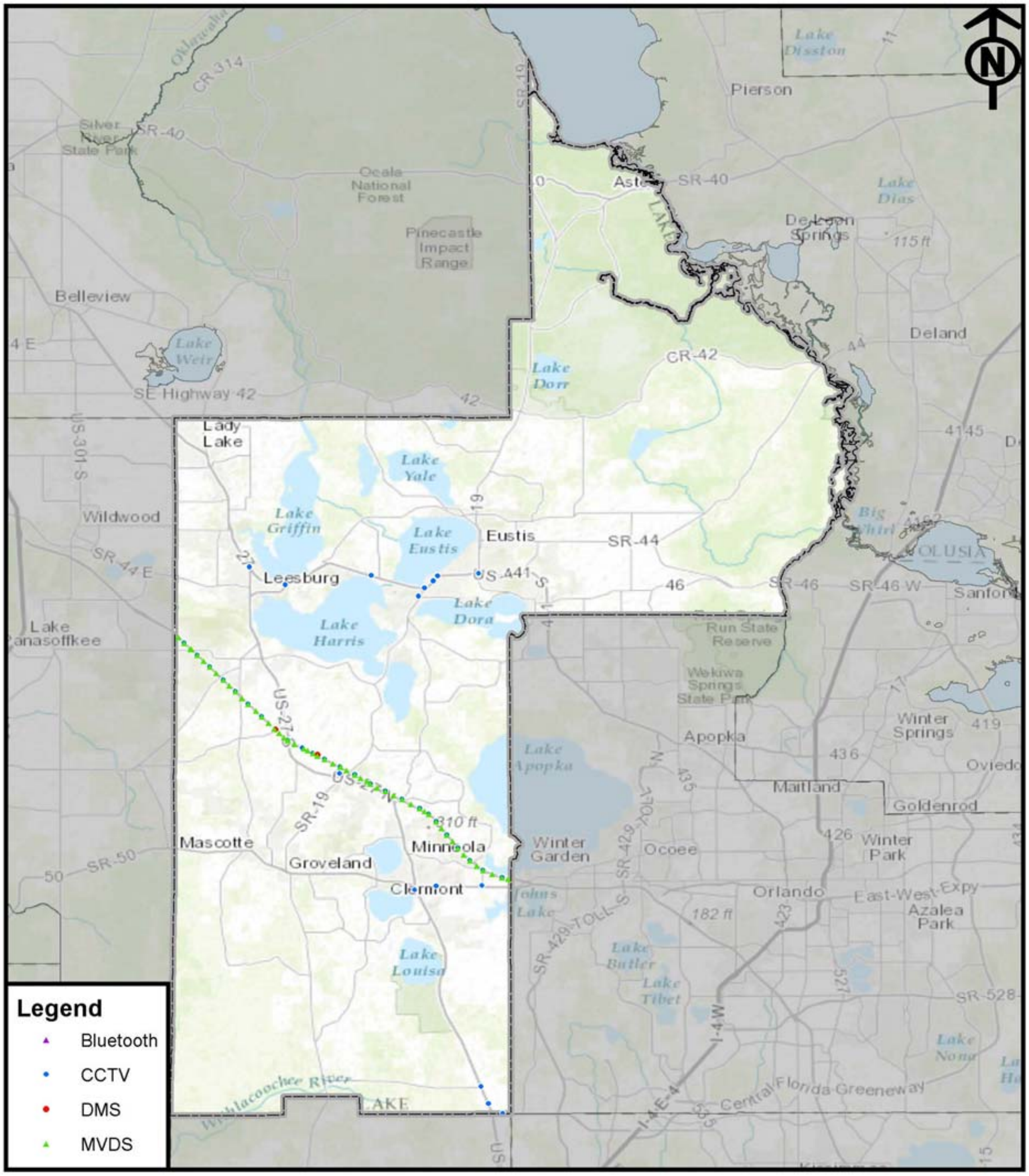


Figure 6 – Marion County ITS End Devices

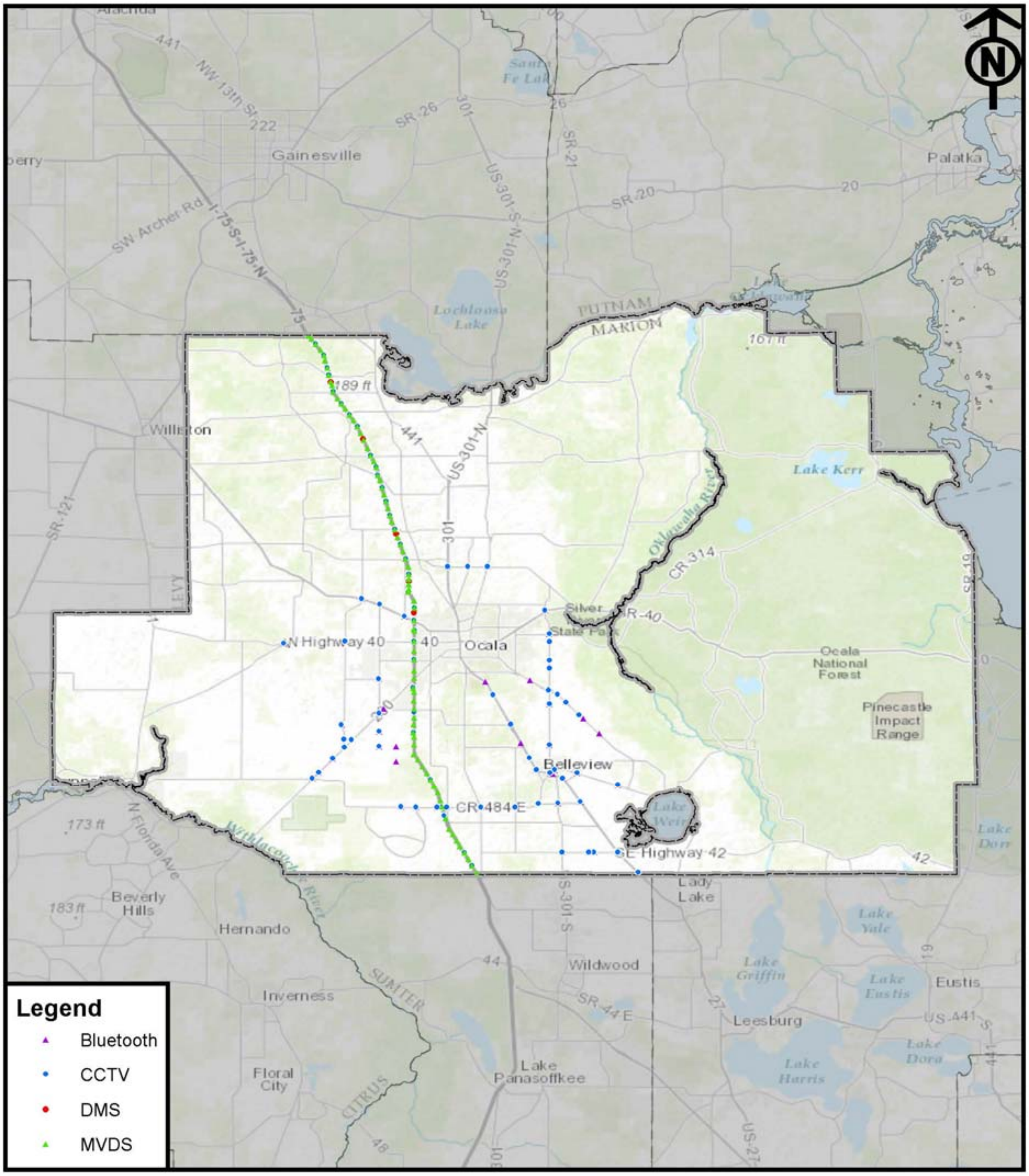


Figure 7 – Orange County ITS End Devices

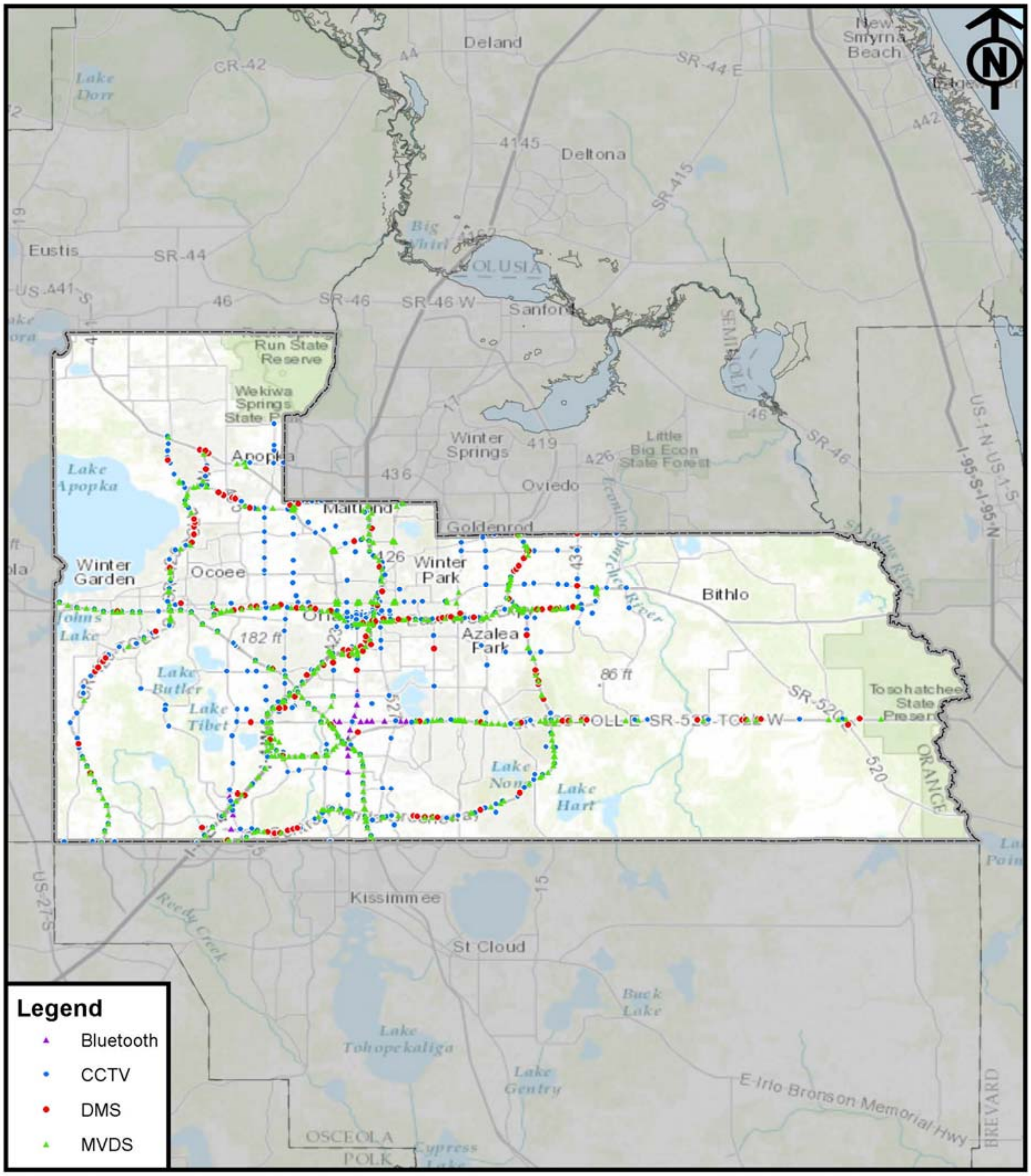


Figure 8 – Osceola County ITS End Devices

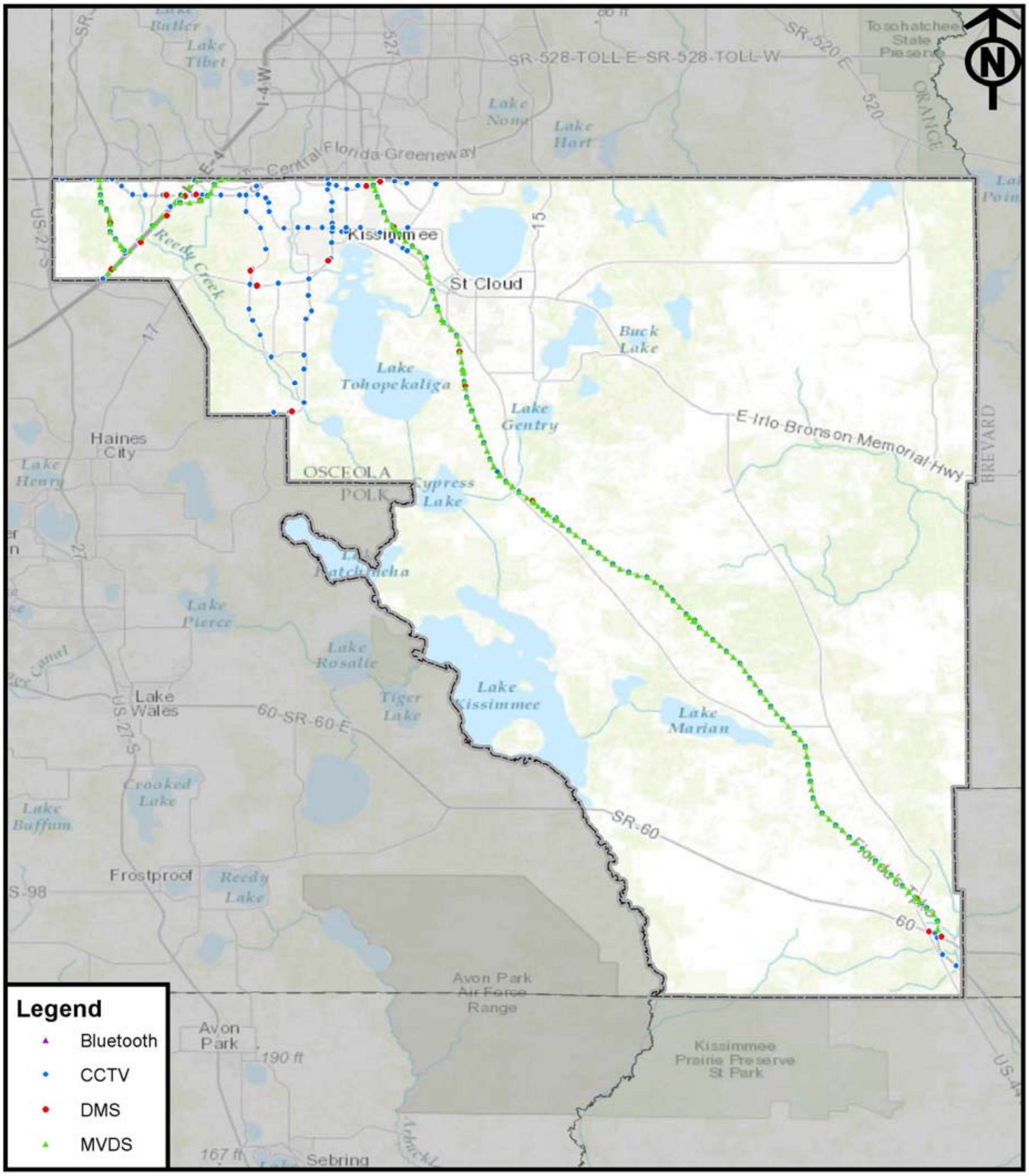


Figure 9 – Seminole County ITS End Devices

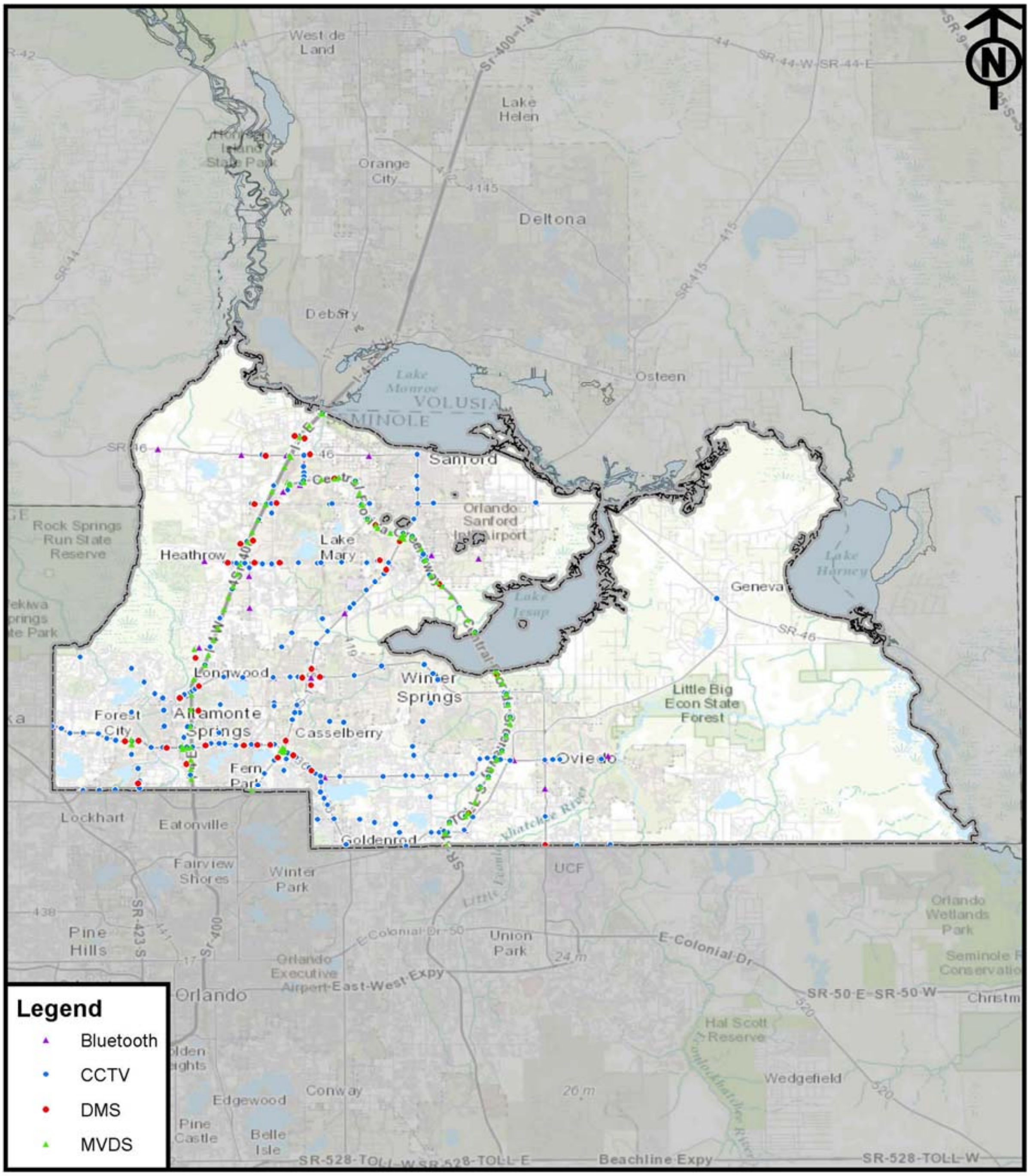


Figure 10 – Sumter County ITS End Devices

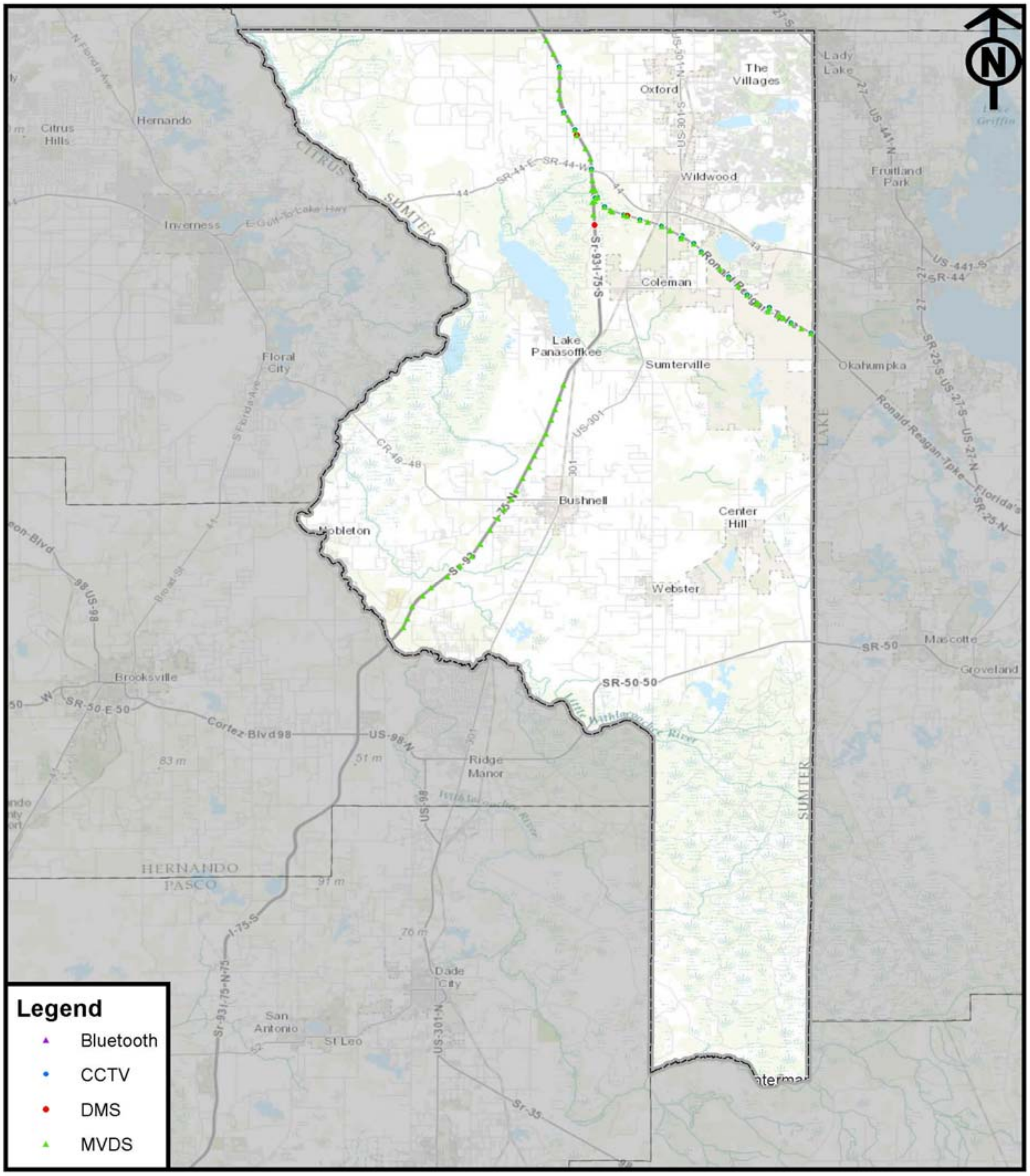


Figure 11 – Volusia County ITS End Devices

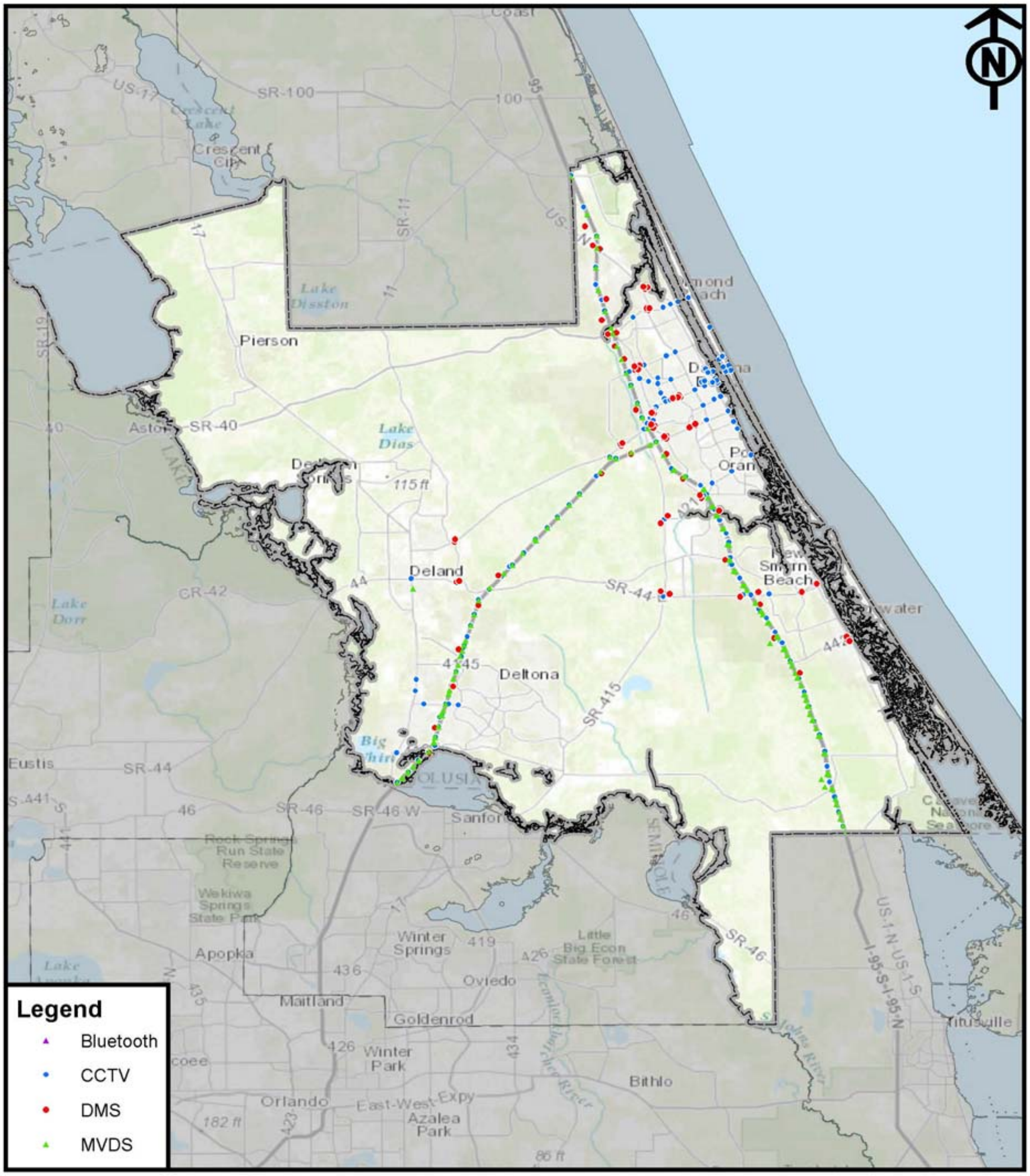


Table 3 – Summary of Transit ITS End Devices

Summary of Transit ITS End Devices Maintained						
LEGEND CAD = Computer Aided Dispatch, MDT = Mobile Data Terminal, CCTV = Closed Circuit Television Camera, APC = Automated Passenger Counter, AVL = Automated Vehicle Locator, and TSP = Transit Signal Priority						
STAKEHOLDER	**Total Transit ITS Devices**	**CAD/MDT**	**CCTV**	**APC**	**AVL**	**TSP**
LYNX	1391	486	174	111	486	134
SCAT	NA	NA	NA	NA	0	0
SUNTRAN	84	12	50	10	12	0
VOTRAN	948	124	638	62	124	0

3.3. Signal Systems Summary

Based on the information provided by each agency in the region, this section offers a snap shot of the existing signal systems operated and maintained by each stakeholder with signalized arterial roadway systems. This summary includes an agency breakdown of the total number of signals, the number of signals that are interconnected, the number of signals that belong to coordinated signal corridors, and the number of adaptive traffic signals, shown below in **Table 4**. The number of interconnect or "on-line" signals shown is the number of signals that are connected and can be remotely monitored by the stakeholders' Traffic Management Center (TMC). This section also includes a summary breakdown of the type of communication network used to communicate with interconnected signals, the central software system being used, and the types of signal controllers being used by each stakeholder. The existing signal system network summary can be found in **Table 5** of this section.

Table 4 – Summary of Signalized Intersections

Summary of Signalized Intersections				
Stakeholder	**Number of Signals**	**Number of Interconnected Signals**	**Number of Adaptive Signals**	**Number of Coordinated Signals**
Brevard County	332	149	110	Unavailable
Flagler County	3	0	1	2
Lake County	198	74	0	102
Marion County	115	46	Unavailable	Unavailable
Orange County	591	457	88	369
Osceola County	150*	86	0	42
Seminole County	383	382	57	282
Sumter County	49	0	0	0

Summary of Signalized Intersections				
Stakeholder	Number of Signals	Number of Interconnected Signals	Number of Adaptive Signals	Number of Coordinated Signals
Volusia County	326	187	5	171
City of Daytona Beach	125	93	22	46
City of Kissimmee	37	22*	0	31
City of Maitland	29	0	0	17
City of Melbourne	67	67	0	45
City of Ocala	126	126	14	75
City of Orlando	537	460	0	368
City of Palm Bay	43	0	0	11
City of Palm Coast	50	0	0	23
City of Titusville	42	4	4	0
City of Winter Park	47	25	0	30

* City of Kissimmee maintains all Osceola County and the City of St. Cloud signals. All interconnected signals in the City of Kissimmee are operated from the Osceola County TMC. The seven signals owned by the City of St. Cloud are shown with the City of Kissimmee, since they are maintained through contract with the City of Kissimmee.

Table 5 – Summary of Signal System Networks

Summary of Signal System Networks						
STAKEHOLDER	**Number of Signals**	**Number of Signals Interconnected**	**Type of Communication for Interconnection**	**Type of Network Used**	**Central Software System**	**Type of Controllers**
Lake-Sumter MPO						
Lake County	198	74	Fiber and one wireless connection. Some backhauled by microwave radio system through LC Public Safety	ITS Express bypass switches, some left over Dell switches. Bosch cameras	Trafficware's Streetwise (Plans to upgrade to Trafficware ATMS.now	Naztec with Ethernet capability
Sumter County	49	0	Fiber (there is fiber in some areas of the Villages but none of it is currently connected)	There is no ITS/ATMS network in place	There is no current ITS/ATMS and operations center in Sumter County	Eagle, Peek and Siemens controllers
MetroPlan Orlando						
Orange County	591	457	Primarily Fiber and a few wireless locations	Local area network, server based, connected via Ethernet at about 100 mb/s with a juniper switch	Tactics Central System Guide (Version 2.2.8)	Siemens/Eagle (Models M03, M04, M40, M42, and M52)
Osceola County	150	86	Fiber	MFES: Etherwan and a few Ruggedcom, Layer 3 Juniper and Garrettcom, Impath encoders	Centracs	Econolite ASC3 and Eagle EPAC M50
Seminole County	383	382	Fiber, Radio	Juniper, 10G core, 1G to devices	Trafficware's ATMS.now	Naztec (ATC and 980)

Summary of Signal System Networks						
STAKEHOLDER	Number of Signals	Number of Signals Interconnected	Type of Communication for Interconnection	Type of Network Used	Central Software System	Type of Controllers
City of Kissimmee	37*	22*	*Note the City of Kissimmee maintains all of the signals within Osceola County limits but all interconnected signals are operated from the County TMC.	None	None	Econolite
City of Maitland	29	8	Fiber and Copper	None	None	Peek/Eagle (1880 EL/ M03, M40, M50)
City of Orlando	537	460	Primarily Fiber, a few copper systems and radio systems	Layer 3 (Juniper Hub Switches) and Layer 2 (ITS Express and Dell signal cabinet switches)	Trafficware's ATMS.now (Version 1)	Naztec
City of Winter Park	47	25	Copper	None	None	Eagle (EPAC M50)
Ocala-Marion TPO						
Marion County	115	46	Primarily wireless with a some fiber between signals	SN	Tactics	Eagle
City of Ocala	128	128	Fiber	Flat Layer 2 Ethernet. Layer 2 Ethernet switch ITS Express 8020	Trafficware's ATMS.now 2.3	Naztec 980 TS2 Type 1
River to Sea TPO						
Flagler County	3	0	None	None	None	SN
Volusia County	326	187	Fiber and Wireless	Point-to-Point /Juniper Switches	Centracs (Version 1.11.15.49)	Econolite ASC3 and Cobalt Peek 3000E

Summary of Signal System Networks						
STAKEHOLDER	Number of Signals	Number of Signals Interconnected	Type of Communication for Interconnection	Type of Network Used	Central Software System	Type of Controllers
City of Daytona Beach	125	93	Fiber and 1 wireless bridge	Layer 2 and Layer 3 switches	Trafficware's ATMS.now (Version 2.1 currently set to upgrade to Version 2.3)	Naztec
City of Palm Coast	50	0	Fiber in the future	NA	NA	Naztec, Peek, and TRANSYT (TS2, 3000e, and 1880EL)
Space Coast TPO						
Brevard County	332	149	Fiber	Routed / Distributed Network containing Physical / Virtual lands. Layer 2 edge devices segmented logically to maintain spanning tree limitations.	Trafficware's ATMS.now (Version 2.4)	Naztec
City of Melbourne	67	67	Fiber and Wireless	Layer 2 (ITS Express and Dell) and Layer 3 (Foundry Edgelron 2402) switches	Trafficware's ATMS.now	Naztec
City of Palm Bay	43	0	NA	NA	NA	Naztec
City of Titusville	42	4	Fiber	4 signals connect to Brevard County's TMC	NA	SN

4. Staffing Guidance for Existing Deployments

ITS solutions can have tremendous benefits for mobility as a whole; however, it is important to remember that operations and maintenance are essential to ensure the success of the transportation system. Adequate maintenance staffing ensures reliability and proper operations staffing protects the technology investment and enables adjustment capabilities to changing traffic conditions. Without proper staffing and training, agencies will be hard pressed to exploit the additional capabilities gained through a successful ITS deployment. A primary lesson learned from FHWA Successful Traffic Signal Systems Procurement Techniques is the importance of retaining properly trained staff to deploy, operate, and maintain systems.[4]

As part of the overall ITS Master Plan, it is important to establish guidelines for staffing needs anticipated by different programs. The first step in establishing those needs is to look at current existing staffing levels. The purpose of this section is to document the existing operations and maintenance (O&M) staffing levels, which includes traditional O&M, IT and TMC as applicable for each stakeholder. Once potential ITS strategies have been agreed upon and prioritized, this information will serve as the baseline condition for analyzing available resources anticipated for different agencies.

Traditionally, O&M has been split between arterials and freeways. For arterials, the signal systems and ITS devices are typically operated and maintained by the local agencies (i.e. City of Orlando, Orange County, Volusia County, etc.) and partially funded by the District through maintenance agreements. In addition to the O&M funding, FDOT provides retiming services for signals on the SHS with a combination of in-house and consultant staff. With regards to ITS on the arterial roadways, typically these devices are local agency owned and operated (Although at times, FDOT operates and maintains arterial devices).

For ITS that comprises the Freeway Management System (FMS), operations and maintenance is performed by the regional owner (i.e. FDOT District 5, Florida's Turnpike Enterprises' (FTE), or Central Florida Expressway Authority (CFX)). The FMS for FDOT District 5 and CFX is operated from the District 5 Regional Traffic Management Center (RTMC), which is co-located with the Florida Highway Patrol Troop D Headquarters and the FDOT District 5 Orlando Urban Office at 133 South Semoran Boulevard, Orlando, Florida. FMS operations for FTE is performed from two

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[4] Federal Highway Administration, *Successful Traffic Signal System Procurement Techniques*, Washington, DC: January 2002. ITS Lessons Learned Knowledge Resource: www.itslessons.its.dot.gov/its/benecost.nsf/Lesson?OpenForm&78E81A40197E84A4852570A60055F16B

RTMCs. Only a portion of the FMS for FTE is located with the FDOT District 5 region, as their facilities are located throughout the state.

The staffing analysis in this section was performed by first looking at local agencies, then organized by MPO/TPO, and finally organized for the entire District 5 region; to facilitate a future analysis of regional resource sharing of staffing within the overall ITS Master Plan report based on the selected ITS strategies. It should be noted that some agencies have in-house staff, but are also supported by contractor and consultant services contracts (Either their own or FDOT). The contract funds were converted to full time equivalents (FTE) by agency for the purpose of this analysis. Also, it should be noted that a review of existing staffing levels for Florida's Turnpike Enterprise was not performed, since their facilities are located throughout the entire state and only a portion of their FMS is located within the District 5 region.

4.1. Existing Local Agency Staffing

As previously discussed, an individual one on one meeting with each stakeholder was held to discuss the overall scope of the project and to request documentation on their current systems and deployments. Primary ITS Master Plan stakeholders have been identified as any local agency or MPO, TPO that operates and/or maintains elements of the transportation system, with an emphasis on existing ITS or signalization technologies within the region. Each agency was asked to fill out a data and information request form; copies of these forms can be found in the Appendix. As a part of the overall information request, each agency was asked about existing operations and maintenance staffing levels. Based upon the stakeholder provided data, **Table 6** summarizes the current O&M staffing level of each local agency. It should be noted that only stakeholders who operate and maintain traffic signal systems and/or ITS end devices within the District 5 region have been included in this analysis.

As a part of this analysis, various positions were considered. The various staff positions that are required to adequately operate an ATMS are summarized below. Dependent upon the number and length of corridors and number of devices within the ATMS, multiple personnel may be required for several of these positions.

Program Oversight

Management and oversight of the ATMS is normally the responsibility of a Traffic Engineering Operations Manager or Traffic Signal Engineer. This person is responsible for both local agency and regional coordination. Staffing, budget allocation, project planning and many other duties may fall under this position.

This position generally requires a Bachelor's of Science Degree in Civil or Electrical Engineering and more than 10 years of experience with analysis and design of the functional and operational elements of traffic signal systems. A Professional Engineer's license in the State of Florida is also required.

Arterial TMC/Signal Operations Center Management

Traffic Management Center (TMC)/Operations Center management is normally the responsibility of the TMC Manager or Traffic Signal Engineer. This person is responsible for ensuring that day to day activities of the center are conducted efficiently and effectively by operations staff under their management. While keeping day to day operations on the forefront of their thinking, they must also plan for what the future holds for their ATMS and how future projects and initiatives will impact the functionality and capabilities of their operations.

This position generally requires a high school diploma or GED and a minimum of 5 years of traffic management experience working with Arterial and/or Freeway systems. Previous experience with the agency's ATMS software is highly recommended.

Arterial TMC/Signal Operations Center Operator

The operator reports directly to a TMC Supervisor and/or the TMC/Signal Operations Manager. The operator monitors the ATMS software, local law enforcement websites, third party websites, and other sources of information to detect and verify incidents. The operator must have the ability to sit for long periods of time while watching computer screens/monitors. They must also be able to communicate effectively to both internal personnel and personnel working for other agencies. This position requires a high school diploma or GED. The Supervisor position is typically someone that has functioned as an Operator for at least three years.

Network Management

Network Management is normally the responsibility of the Network Specialist/Manager. This person is responsible for the management and functionality of the communications equipment and infrastructure from the TMC/Operations Center equipment to the field devices. This person is responsible for ensuring that the network is operating as efficiently as possible and minimizing network downtime and communications failures. Dependent upon the extent and complexity of the network, these responsibilities may be a part of the position description of another staff position or may require a full time position. The Network Manager (Layer 3) and their staff (Layer 2+) can either be part of the Operations or Maintenance section; as they work with both divisions on a daily basis.

Network Manager (Layer 3)

- General Tasks – Design and implementation of Network Architecture, configuration and maintenance of all Layer 3 Network devices, network coordination and planning with other agencies, network security, and licensing/warranty tracking for all network devices.
- Education and Experience - Combination of training, education and experience for a minimum of five years. Certifications for Cisco Certified Network Professional Routing and Switching and Security or approved equivalent certification/experience.

Network Technician (Layer 2+)

- General Tasks – Configuration and maintenance of all Layer 2 Network devices, initial troubleshooting for ATMS field devices, and repair/replacement of failed ATMS devices.
- Education and Experience – Two years prior experience working with Layer 2 networking devices. Certifications for Cisco Certified Network Associate Routing and Switching and Security or approved equivalent certification/experience are desirable.

Table 6 – Existing Local Agency Traffic Signal Maintenance and TMC Staffing

Existing Traffic Signal Maintenance and TMC Staffing									
STAKEHOLDER	Traffic Engineering Operations Manager	Traffic Signal/ITS Engineer	Traffic Signal Analysts / Technician	Traffic Signal Maintenance / ITS Fiber Technician	Network Specialist	Electronics Specialist (L2 Network Tech)	TMC Manager / ITS Engineer	Supervisor	TMC Operators
Lake-Sumter MPO									
Lake County	1	0	1	5	1	1	0	0	0
Sumter County	0	0	0	0.5	0	0	0	0	0
MetroPlan Orlando									
Orange County	1	0.5	4	16	2	2	0.5	0	3
Osceola County	0	1	1	3	0	1	0	1	1
Seminole County	1	2	5	16	2	0	0	0	1
City of Kissimmee	0	0.25	2	7	0	0	0	0	0
City of Maitland	0	1	0	2	0	0	0	0	0
City of Orlando	1	4	0	8.5	0	0	1	0	5
City of Winter Park	0	0	0	2	0	0	0	0	0
Ocala-Marion TPO									
Marion County	0	1	1	4	0	0	0	0	0
City of Ocala	1	0	0.5	4	0.5	1	1	0	0
River to Sea TPO									
Flagler County	0	0	0	0	0	0	0	0	0
Volusia County	1	1	0.25	7	1	0	0.5	1	0.25
City of Daytona Beach	1	0	0.5	2.5	0	0.5	0	0	0.5
City of Palm Coast	1	0	0	3	0	0	0	0	0
Space Coast TPO									
Brevard County	1	0	0	8.5	0.5	0.5	0	0	0.5
City of Melbourne	1	0	1	2	0	0	0	0	0
City of Palm Bay	1	0	0	2	0	0	0	0	0
City of Titusville	0	0	0	2	0	0	0	0	0

4.2. Staffing Guidelines

The US DOT FHWA June 2008 Signal Timing Manual[5] provides general guidelines on staffing requirements for a traffic signal system as it relates to signal retiming. This information can be found in the **Table 7** below and forms a portion of the basis for the needs analysis identified in the following tables:

Table 7 – USDOT Recommended Staffing Guidelines

Position	<50 Signals	<100 Signals	<200 Signals	<500 Signals	<1000 Signals
Traffic Signal Engineer	0 to 1	1	1 to 2	2 to 5	5 to 10
Traffic Signal Analyst/Technician	0 to 1	0 to 1	1	1 to 3	3 to 5
ITS Engineer	-	-	0 to 1	1	1 to 3
Traffic Signal Maintenance Technician	1 to 2	2 to 4	4 to 7	7 to 17	17 to 33
Electronic Specialists	1	1	1 to 2	2 to 4	4 to 9
TMC Operators	-	-	2	2 to 4	4 to 9

Therefore, for agencies that do not currently have a TMC or ITS end devices and are exclusively maintaining traffic signals and traffic signal systems, the following staffing guidelines in **Table 8** apply:

Table 8 – Current Needed - Recommended Staffing Guidelines (Signal Systems Only)

Position	<50 Signals	<100 Signals	<200 Signals
Traffic Engineering Operations Manager	0	0	1
Traffic Signal Engineer	0.5	1	1
Traffic Signal Analysts/Technician	0.5	0-1	1
Traffic Signal Maintenance/ITS Fiber Technician	1-2	2-4	4-7
Network Specialist	*	*	0-1
Electronics Specialist (L2 Network Tech)	0-1	0-1	1

* This position is desirable, but not necessarily required in a signal only environment for smaller agencies.

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[5] http://www.ops.fhwa.dot.gov/publications/fhwahop08024/fhwa_hop_08_024.pdf

For agencies that currently operate and maintain both traffic signal systems and ITS end devices with a TMC, the following recommendation criteria was established. It is important to note that at this point in time, there are no USDOT recommended staffing guidelines for ITS operations and maintenance. Therefore, it was necessary to glean this information by interviewing the FDOT and Maintaining Agencies, which was conducted as a part of the Statewide Active Arterial Needs Plan[6] as well as separate interviews as a part of this Master Plan. Based on these interviews, it was determined that employing two TMC monitoring personnel per 350 signals and/or end devices (i.e. CCTVs, DMSs, etc.) was a reasonable staffing level. By combining the information from **Tables 7 and 8** and incorporating this premise, **Table 9** was developed.

Table 9 – Current Needed - Recommended Staffing Guidelines (Signal Systems, ITS and TMC)

Position	Number of Signals + ITS End Devices				
	<100	<200	<350	<700	<1400
Traffic Engineering Operations Manager	0	0-1	1	1	1
Traffic Signal Engineer	0-1	0-1	1-2	2-3	3-6
Traffic Signal Analysts/Technician	0-1	1	1-2	2-4	2-5
Traffic Signal Maintenance/ITS Fiber Technician	1-3	3-5	4-10	8-16	15-30
Network Specialist	*	0-1	1	1-2	2-3
Electronics Specialist (L2 Network Tech)	0-1	0-1	1	1-3	2-7
TMC Manager	*	0-1	1	1	1-2
Supervisor**	*	0-1	1	1-2	2-3
TMC Operators**	0-1	1	1	2-4	4-6

* This position is desirable, but not necessarily required.

** This position is required 14 hours a day (Weekdays Only). Note that FDOT and the City of Orlando are 24 hours a day/7 days a week/365 days a year.

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[6] Statewide Active Arterial Management Needs Plan, Metric Engineering, Inc. July 2013.

4.3. Existing Local Agency Staffing Analysis

In this section, the existing staffing levels of each stakeholder that maintains an existing signal system and/or ITS network (documented in **Table 6** of the previous section) was compared to the current needed - recommended staffing guidelines set forth in **Table 8** and **Table 9**, previously in this section. This data is organized by the MPO/TPO to facilitate future analysis of regional resource sharing of staffing within the overall ITS Master Plan report based upon the selected ITS strategies in the Commitments section.

There are five MPO/TPO organizations within FDOT District 5:

- Lake-Sumter MPO
- MetroPlan Orlando
- Ocala-Marion TPO
- River to Sea TPO
- Space Coast TPO

Please see **Figure 12** below for the MPO/TPO regions within District 5.

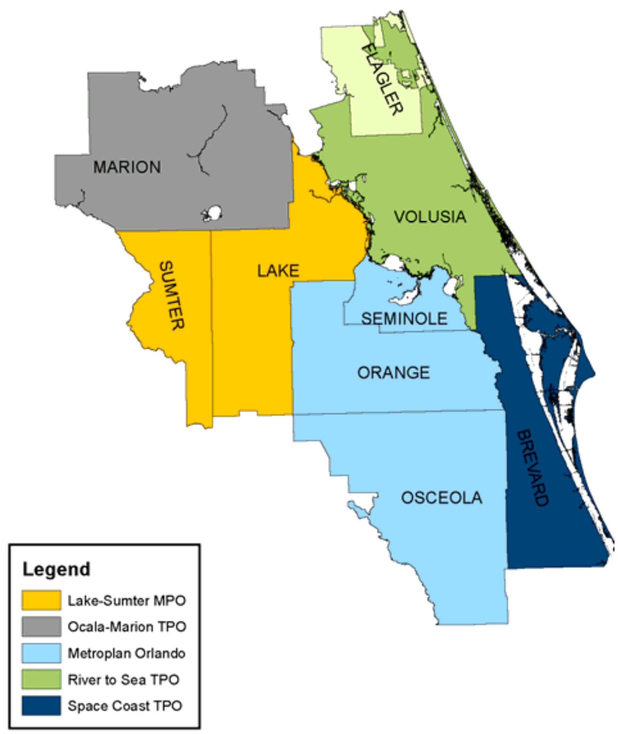


Figure 12– MPO/TPO Boundaries within FDOT District 5

LAKE-SUMTER MPO

Lake-Sumter MPO is the lead agency for regional transportation planning throughout the urbanized area of Lake and Sumter Counties. They provide the forum for local elected officials, their staff and industry experts to work together to improve transportation for Lake-Sumter area residents, businesses, and visitors. The MPO is responsible for the planning of several modes of transportation. It prioritizes capital improvements to address the counties' transportation needs and allocates federal funding to implement the projects as identified in the LRTP and TIP.

LAKE COUNTY

Lake County currently operates an unofficial TMC at the Lake County Division of Transportation administration building. The County operates and maintains 198 traffic signals within their jurisdiction. The County has standardized to Naztec controllers as the accepted signal controller in the area. The County can remotely monitor 74 of the 198 traffic signals on a primarily fiber optic and wireless network using Trafficware's Streetwise. Of the 198 traffic signals, 102 belong to coordinated signal systems. In addition, Lake County maintains fourteen CCTVs and 62 Ethernet switches. **Table 10** below shows the current staffing for O&M within Lake County as compared to the recommended staffing criteria. Please note that the existing Traffic Engineering Operations Manager is assumed to function as a Traffic Signal Engineer.

Table 10 – Lake County Staffing

Lake County			
Position	Existing Staff	Current Needed - Recommended Staff	Current Needed - Additional Staff
Traffic Engineering Operations Manager	1.0	1.0	0.0
Traffic Signal/ITS Engineer	0.0	0.0	0.0
Traffic Signal Analysts/Technician	1.0	1.0	0.0
Traffic Signal Maintenance/ITS Fiber Technician	5.0	5.0	0.0
Network Specialist	1.0	1.0	0.0
Electronics Specialist (L2 Network Tech)	1.0	1.0	0.0
TMC Manager*	0.0	0.0	0.0
Supervisor*	0.0	0.0	0.0
TMC Operators*	0.0	0.0	0.0

*Not required until TMC is built.

SUMTER COUNTY

Sumter County currently has no TMC or existing ITS/ATMS network. The Sumter County Countywide ITS Development Study is in the FDOT Five Year Work Program (FPID #436365-1), funded in FY 2016. This study is to be the first step in the design and construction of a Countywide ITS System and operations center in Sumter County. Sumter County maintains 49 traffic signals; 26 on state roads and 23 on county roads. There are 3 signals on state roads not maintained by Sumter County; two in Bushnell and one in Coleman. The number and type of controllers for the 49 signals in Sumter County are 24 Eagle, 11 Peek, and 12 Siemens. Siemens controllers are now the specified controllers for the County. At this time, none of the signals are interconnected and all operations and maintenance activity is contracted out to Control Specialists, Inc. **Table 11** below shows the current staffing for O&M within Sumter County as compared to the recommended staffing criteria.

Table 11 – Sumter County Staffing

Sumter County			
Position	Existing Staff	Current Needed - Recommended Staff	Current Needed - Additional Staff
Traffic Engineering Operations Manager	0.0	0.0	0.0
Traffic Signal/ITS Engineer	0.0	0.5	0.5
Traffic Signal Analysts/Technician	0.0	0.5	0.5
Traffic Signal Maintenance/ITS Fiber Technician	0.5	2.0	1.5
Network Specialist	0.0	0.0	0.0
Electronics Specialist (L2 Network Tech)	0.0	0.5	0.5
TMC Manager	0.0	0.0	0.0
Supervisor	0.0	0.0	0.0
TMC Operators	0.0	0.0	0.0

*Sumter County maintains all signals by contract with Control Specialists consisting of 0.5 FTE's.

Table 12 shows the combined regional staffing for the Lake-Sumter MPO regional area within FDOT District 5. It should be noted that at this point in time Sumter County does not have an existing ITS/ATMS network and devices. The Sumter County Countywide ITS Development Study is in the FDOT Five Year Work Program (FPID #436365-1), funded in FY 2016. This study is to be the first step in the design and construction of a Countywide ITS System and operations center in Sumter County. Additionally, the Lake-Sumter MPO, recently retained consultant services for the development of Lake County ITS Master Plan for the Lake-Sumter MPO member governments. The purpose of this master plan is to evaluate the current systems in Lake County, determine the future needs and formulate an implementation strategy for the future development and maintenance of the ITS. One item to be evaluated within the Lake County ITS Master Plan is an official TMC. Considerations should be given to re-examining regional staffing for the Lake-Sumter MPO area after the completion of the ITS Development Study in Sumter County and the Lake County ITS Master Plan.

Table 12 – Lake-Sumter MPO Regional Staffing Combined

Lake-Sumter MPO Region			
Position	Existing Staff*	Current Needed - Recommended Staff	Current Needed - Additional Staff
Traffic Engineering Operations Manager	1.0	1.0	0.0
Traffic Signal/ITS Engineer	0.0	0.5	0.5
Traffic Signal Analysts/Technician	1.0	1.5	0.5
Traffic Signal Maintenance/ITS Fiber Technician	5.5	7.0	1.5
Network Specialist	1.0	1.0	0.0
Electronics Specialist (L2 Network Tech)	1.0	1.5	0.5
TMC Manager	0.0	0.0	0.0
Supervisor	0.0	0.0	0.0
TMC Operators	0.0	0.0	0.0

*Not required until Lake County TMC is built.

METROPLAN ORLANDO

MetroPlan Orlando is the MPO for the Orlando Urban Area in Orange, Osceola and Seminole Counties. They provide the forum for local elected officials, their staff and industry experts to work together to improve transportation for Orange/Seminole/Osceola County area residents, businesses, and visitors. Their mission is "To provide leadership in transportation planning by engaging the public and fostering effective partnerships". They are the largest MPO within the District 5 region. They are responsible for the development and implementation of the LRTP and determining how federal and state transportation dollars are spent in the three-county area that encompasses the Orlando Urban Area.

ORANGE COUNTY

Orange County currently operates a TMC from the Public Works complex on John Young Pkwy. The County operates and maintains 591 traffic signals. The County has Siemens/Eagle model M03, M04, M10, M40, M42, and M52 signal controllers. They can remotely monitor 457 of the 591 traffic signals on a fiber optic and wireless network using Tactics Central System Guide. Of the 591 traffic signals, 369 signals belong to coordinated signal systems and 88 are adaptive signal systems. In addition, Orange County operates and maintains 107 CCTVs, 13 DMS, 158 MVDS, and 28 Bluetooth devices on the network. **Table 13** shows the current staffing for O&M within the Orange County as compared to the recommended staffing criteria.

Table 13 – Orange County Staffing

Orange County			
Position	Existing Staff	Current Needed - Recommended Staff	Current Needed - Additional Staff
Traffic Engineering Operations Manager	1.0	1.0	0.0
Traffic Signal/ITS Engineer*	0.5	3.0	2.5
Traffic Signal Analysts/Technician	4.0	4.0	0.0
Traffic Signal Maintenance/ITS Fiber Technician*	16.0	20.0	4.0
Network Specialist	2.0	2.0	0.0
Electronics Specialist (L2 Network Tech)	2.0	3.0	1.0
TMC Manager	0.5	1.0	0.5
Supervisor	0.0	2.0	2.0
TMC Operators	3.0	4.0	1.0

* Includes 1 FTE for signal retiming.

** Includes 1 FTE for overtime hours.

OSCEOLA COUNTY

Osceola County currently operates a TMC located at the Emergency Operations Center. The County operates 150 traffic signals under the jurisdiction of Osceola County and the City of Kissimmee. The County has standardized to Econolite ASC3 controllers as the accepted signal controller in the area. The County can remotely monitor 108 of the 150 traffic signals on a fiber optic network using Centracs, and 42 of the 150 traffic signals belong to coordinated signal systems. In addition, Osceola County operates 70 CCTVs, 6 DMS, and 5 Bluetooth devices on a fiber optic network. The signals are maintained by contract with the City of Kissimmee and the fiber network is maintained by contract with Metric Engineering, Inc. (The City of Kissimmee staffing is located under the City of Kissimmee. The Metric Engineering staffing is included below). **Table 14** shows the current staffing for O&M within Osceola County as compared to the recommended staffing criteria.

Table 14 – Osceola County Staffing

Osceola County			
Position	Existing Staff	Current Needed - Recommended Staff	Current Needed - Additional Staff
Traffic Engineering Operations Manager	0.0	0.0	0.0
Traffic Signal/ITS Engineer	1.0	1.0	0.0
Traffic Signal Analysts/Technician	1.0	1.0	0.0
Traffic Signal Maintenance/ITS Fiber Technician	3.0	3.0	0.0
Network Specialist	0.0	0.0	0.0
Electronics Specialist (L2 Network Tech)	1.0	1.0	0.0
TMC Manager	0.0	0.0	0.0
Supervisor	1.0	1.0	0.0
TMC Operators	1.0	1.0	0.0

SEMINOLE COUNTY

Seminole County currently operates a TMC from the Public Safety 911 Communications Center in the Public Safety/Sheriff's Office complex in Sanford. The County operates and maintains 383 traffic signals. The County has standardized to Naztec ATC and 980 controllers. The County can remotely monitor 382 traffic signals on a fiber optic and radio network using Trafficware's ATMS.now. Of the 383 traffic signals, 282 belong to coordinated signal systems and 57 are adaptive traffic signals. In addition, Seminole County operates and maintains 192 CCTVs, 29 DMS, and 82 Bluetooth devices on the network. The County does not have a dedicated TMC operator at this time but they are in the process of hiring one. **Table 15** shows the current staffing for O&M within Seminole County as compared to the recommended staffing criteria. Please note that the required Level 2 Network Tech is assumed to be handled by the additional Network Engineer.

Table 15 – Seminole County Staffing

Seminole County			
Position	Existing Staff	Current Needed - Recommended Staff	Current Needed - Additional Staff
Traffic Engineering Operations Manager	1.0	1.0	0.0
Traffic Signal/ITS Engineer**	2.0	2.0	0.0
Traffic Signal Analysts/Technician*	5.0	5.0	0.0
Traffic Signal Maintenance/ITS Fiber Technician*	16.0	16.0	0.0
Network Specialist	2.0	2.0	0.0
Electronics Specialist (L2 Network Tech)	0.0	0.0	0.0
TMC Manager	0.0	1.0	1.0
Supervisor	0.0	1.0	1.0
TMC Operators	1.0	1.0	0.0

* Includes 4 FTEs for overtime and contracted services

** Includes 1 FTE for retiming

CITY OF KISSIMMEE

The City of Kissimmee currently has no TMC or existing ITS/ATMS network. The City maintains 187 traffic signals under the jurisdictions of City of Kissimmee, Osceola County and the City of St. Cloud. The City has standardized Econolite controllers as the accepted signal controller in the area. All signals in the area are operated by Osceola County, as discussed previously. **Table 16** shows the current staffing for O&M within the City of Kissimmee as compared to the recommended staffing criteria.

Table 16 – City of Kissimmee Staffing

City of Kissimmee			
Position	Existing Staff	Current Needed - Recommended Staff	Current Needed - Additional Staff
Traffic Engineering Operations Manager	0.0	0.0	0.0
Traffic Signal/ITS Engineer*	0.25	1.0	0.75
Traffic Signal Analysts/Technician	2.0	2.0	0.0
Traffic Signal Maintenance/ITS Fiber Technician	7.0	7.0	0.0
Network Specialist	0.0	0.0	0.0
Electronics Specialist (L2 Network Tech)	0.0	1.0	1.0
TMC Manager	0.0	0.0	0.0
Supervisor	0.0	0.0	0.0
TMC Operators	0.0	0.0	0.0

* Includes 0.25 FTE's for professional services for retiming.

CITY OF MAITLAND

The City of Maitland operates and maintains 29 traffic signals, 17 of which belong to coordinated signal systems. The City has a variation of Peek 1880EL, Eagle M03, M40, and M50 signal controllers. There is a combination of fiber and copper interconnect on US 17/92. At this point in time, none of the signals are connected back to an operations center. **Table 17** shows the current staffing for O&M within the City of Maitland compared to the recommended staffing criteria. Please note that the existing Traffic Signal Engineer is assumed to function as a Traffic Signal Analyst.

Table 17 – City of Maitland Staffing

City of Maitland			
Position	Existing Staff	Current Needed - Recommended Staff	Current Needed - Additional Staff
Traffic Engineering Operations Manager	0.0	0.0	0.0
Traffic Signal/ITS Engineer	1.0	1.0	0.0
Traffic Signal Analysts/Technician	0.0	0.0	0.0
Traffic Signal Maintenance/ITS Fiber Technician	2.0	2.0	0.0
Network Specialist	0.0	0.0	0.0
Electronics Specialist (L2 Network Tech)	0.0	0.5	0.5
TMC Manager	0.0	0.0	0.0
Supervisor	0.0	0.0	0.0
TMC Operators	0.0	0.0	0.0

CITY OF ORLANDO

The City of Orlando currently operates a TMC from the Orlando Operations Center. The City operates and maintains 537 traffic signals within their jurisdiction. The City has all Naztec signal controllers that are a mix of serial, NEMA, and soon to have ATC. They have standardized that all new controllers are to be the latest version of the Naztec 980 ATC Type I controller with full Ethernet functionality. The City can remotely monitor 460 of the 537 traffic signals on a mostly fiber optic network using Trafficware's ATMS.now. Of the 537 traffic signals, 368 belong to coordinated signal systems. In addition, the City of Orlando maintains 101 CCTVs, and 11 DMS. They are in the process of installing 80 new Bluetooth devices.

CITY OF WINTER PARK

The City of Winter Park operates and maintains 47 traffic signals. All 47 traffic signals have Eagle EPAC M50 controllers, which is the standardized controller for the City. 25 signals are interconnected with Copper into seven closed loop systems. None of the signals connect back to an operations center. **Table 18** shows the current staffing for O&M within the City of Winter Park as compared to the recommended staffing criteria.

Table 18 – City of Winter Park Staffing

City of Winter Park			
Position	Existing Staff	Current Needed - Recommended Staff	Current Needed - Additional Staff
Traffic Engineering Operations Manager	0.0	0.0	0.0
Traffic Signal/ITS Engineer	0.0	0.5	0.5
Traffic Signal Analysts/Technician	0.0	0.5	0.5
Traffic Signal Maintenance/ITS Fiber Technician	2.0	2.0	0.0
Network Specialist	0.0	0.0	0.0
Electronics Specialist (L2 Network Tech)	0.0	0.5	0.5
TMC Manager	0.0	0.0	0.0
Supervisor	0.0	0.0	0.0
TMC Operators	0.0	0.0	0.0

Table 19 shows the combined regional staffing for the MetroPlan Orlando regional area within FDOT District 5 as compared to the recommended staffing criteria.

Table 19 – MetroPlan Orlando Regional Staffing

MetroPlan Orlando MPO Region			
Position	Existing Staff	Current Needed - Recommended Staff	Current Needed - Additional Staff
Traffic Engineering Operations Manager	3.0	3.0	0.0
Traffic Signal/ITS Engineer	8.75	12.5	3.75
Traffic Signal Analysts/Technician	12.0	15.5	3.5
Traffic Signal Maintenance/ITS Fiber Technician	54.5	67.0	12.5
Network Specialist	4.0	5.0	1.0
Electronics Specialist (L2 Network Tech)	3.0	9.0	6.0
TMC Manager	1.5	3.0	1.5
Supervisor	1.0	6.0	5.0
TMC Operators	10.0	11.0	1.0

OCALA-MARION TPO

The Ocala/Marion TPO is the agency responsible for transportation planning in the Ocala/Marion County area. They provide the forum for local elected officials; their staff and industry experts work together to improve transportation for Ocala/Marion County area residents, businesses, and visitors. The TPO's planning responsibilities include highways, transit, bicycling and pedestrian facilities. The TPO is also the policy board for SunTran, their local fixed-route transit system. It prioritizes capital improvements to address the Ocala/Marion County regions' travel needs and allocates federal funding to implement projects as identified in their LRTP and TIP.

MARION COUNTY

Marion County currently operates a TMC at the Office of the County Engineer building. The County operates and maintains 115 traffic signals within their jurisdiction. The County has standardized to Eagle controllers as the accepted signal controller in the area. They can remotely monitor 46 of the 115 traffic signals on a network that is interconnected with fiber and sent to the TMC wireless. The County uses Tactics to communicate with the signals from the TMC. In addition, Marion County maintains 58 CCTVs and 52 Bluetooth devices. **Table 20** below shows the current staffing for O&M within Lake County as compared to the recommended staffing criteria.

Table 20 – Marion County Staffing

Marion County			
Position	Existing Staff	Current Needed - Recommended Staff	Current Needed - Additional Staff
Traffic Engineering Operations Manager	0.0	0.0	0.0
Traffic Signal/ITS Engineer	1.0	1.0	0.0
Traffic Signal Analysts/Technician	1.0	1.0	0.0
Traffic Signal Maintenance/ITS Fiber Technician	4.0	4.0	0.0
Network Specialist	0.0	0.5	0.5
Electronics Specialist (L2 Network Tech)	0.0	0.5	0.5
TMC Manager*	0.0	0.0	0.0
Supervisor*	0.0	0.0	0.0
TMC Operators*	0.0	0.0	0.0

*Not needed unless a TMC is opened.

CITY OF OCALA

The City of Ocala currently operates a TMC from the city of Ocala's municipal complex. The City operates and maintains 126 traffic signals within their jurisdiction. The City has standardized to Naztec 980 TS2 Type 1 controllers as the accepted signal controller in the area. The City can remotely monitor all 126 traffic signals on a fiber optic network using Trafficware's ATMS.now. Of the 126 traffic signals, 75 belong to coordinated signal systems and 14 are Insync adaptive control intersections. In addition, the City of Ocala maintains 37 CCTVs, and 7 DMS signs. The fiber interconnect is maintained by the City owned utility Telecom department. **Table 21** shows the current staffing for O&M within the City of Ocala as compared to the recommended staffing criteria. Please note that the existing Traffic Engineering Operations Manager is assumed to function as a Traffic Signal Engineer. In addition, since the existing staff for maintenance comes in a large part from the City's Telecom group, the staffing levels were assumed to meet current needs.

Table 21 – City of Ocala Staffing

City of Ocala			
Position	Existing Staff*	Current Needed - Recommended Staff	Current Needed - Additional Staff
Traffic Engineering Operations Manager	1.0	1.0	0.0
Traffic Signal/ITS Engineer	0.0	0.0	0.0
Traffic Signal Analysts/Technician**	0.5	1.0	0.5
Traffic Signal Maintenance/ITS Fiber Technician	4.0	4.0	0.0
Network Specialist	0.5	0.5	0.0
Electronics Specialist (L2 Network Tech)	1.0	1.0	0.0
TMC Manager	1.0	1.0	0.0
Supervisor	0.0	0.0	0.0
TMC Operators	0.0	1.0	1.0

*City of Ocala Fiber Network is maintained by the city owned utility Telecom.

** Includes 0.5 FTE's for contracted services.

Table 22 shows the combined regional staffing for the Ocala-Marion regional area within FDOT District 5 as compared to the recommended staffing criteria. Please note that resource sharing with the City of Ocala with regards to IT would appear to be unrealistic since the City uses a 3rd party to provide and manage their IT network.

Table 22 – Ocala-Marion TPO Regional Staffing Combined

Ocala-Marion TPO Region			
Position	Existing Staff	Current Needed - Recommended Staff	Current Needed - Additional Staff
Traffic Engineering Operations Manager	1.0	1.0	0.0
Traffic Signal/ITS Engineer	1.0	1.0	0.0
Traffic Signal Analysts/Technician	1.5	2.0	0.5
Traffic Signal Maintenance/ITS Fiber Technician	8.0	8.0	0.0
Network Specialist	0.5	1.0	0.5
Electronics Specialist (L2 Network Tech)	1.0	1.5	0.5
TMC Manager	1.0	1.0	0.0
Supervisor	0.0	0.0	0.0
TMC Operators	0.0	1.0	1.0

RIVER TO SEA TPO

The River to Sea TPO (formerly Volusia TPO) is the agency responsible for transportation planning and programming in the Volusia County, City of Daytona Beach, and City of Palm Coast Metropolitan Planning Area (MPA). They provide the forum for local elected officials, their staff, and industry experts to work together to improve transportation for MPA residents, businesses and visitors. The TPO's planning responsibilities include highways, transit, bicycling and pedestrian facilities. It prioritizes capital improvements to address the River to Sea MPO regions' travel needs and allocates federal funding to implement projects as identified in their LRTP and TIP.

FLAGLER COUNTY

Flagler County currently operates and maintains three traffic signals within their jurisdiction. The County does not currently operate a traffic signal network or any ITS devices. **Table 23** shows the current staffing for O&M within Flagler County as compared to the recommended staffing criteria.

Table 23 – Flagler County Staffing

Flagler County			
Position	Existing Staff	Current Needed - Recommended Staff	Current Needed - Additional Staff
Traffic Engineering Operations Manager	0.0	0.0	0.0
Traffic Signal/ITS Engineer	0.0	0.0	0.0
Traffic Signal Analysts/Technician	0.0	0.1	0.1
Traffic Signal Maintenance/ITS Fiber Technician	0.0	0.25	0.25
Network Specialist	0.0	0.0	0.0
Electronics Specialist (L2 Network Tech)	0.0	0.0	0.0
TMC Manager	0.0	0.0	0.0
Supervisor	0.0	0.0	0.0
TMC Operators	0.0	0.0	0.0

VOLUSIA COUNTY

Volusia County currently operates a TMC from 950 Bellevue Ave, Daytona Beach, FL. The County operates and maintains 326 traffic signals. The County has Econolite ACS 3 and Cobalt Peek 3000E signal controllers and have standardized all new controllers to Econolite ACS 3. The County can remotely monitor 187 of the 326 traffic signals on a fiber optic and wireless network using Econolite Centracs version 1.11.15.49. Of the 326 traffic signals, 171 belong to coordinated signal systems and 5 are adaptive control intersections. In addition, Volusia County operates and maintains 35 CCTVs on the network. **Table 24** shows the current staffing for O&M within Volusia County as compared to the recommended staffing criteria.

Table 24 – Volusia County Staffing

Volusia County			
Position	Existing Staff	Current Needed - Recommended Staff	Current Needed - Additional Staff
Traffic Engineering Operations Manager	1.0	1.0	0.0
Traffic Signal/ITS Engineer	1.0	2.0	1.0
Traffic Signal Analysts/Technician	0.25	2.0	1.75
Traffic Signal Maintenance/ITS Fiber Technician	7.0	10.0	3.0
Network Specialist	1.0	1.0	0.0
Electronics Specialist (L2 Network Tech)	0.0	1.0	1.0
TMC Manager	0.5	1.0	0.5
Supervisor	1.0	1.0	0.0
TMC Operators	0.25	1.0	0.75

CITY OF PALM COAST

The City operates and maintains 50 traffic signals within their jurisdiction. The City has Trafficware TS2, Peek 3000e, and TRANSYT 1880EL signal controllers. The City does not currently have a standard for new traffic controllers. They recently completed a Traffic Detection Hardware and Software Study Concept of Operations report in October 2015 that provided a benefit-cost analysis between different Central Management Software options and the impacts each would have on the existing signal controllers and detection methods. Of the 50 traffic signals, 23 belong to coordinated signal systems. In addition, the City of Palm Coast operates and maintains 7 CCTVs on a Fiber network. **Table 25** shows the current staffing for O&M within the City of Palm Coast as compared to the recommended staffing criteria. Please note that the existing Traffic Engineering Operations Manager is assumed to function as a Traffic Signal Engineer.

Table 25 – City of Palm Coast Staffing

City of Palm Coast			
Position	Existing Staff	Current Needed - Recommended Staff	Current Needed - Additional Staff
Traffic Engineering Operations Manager	1.0	1.0	0.0
Traffic Signal/ITS Engineer	0.0	0.0	0.0
Traffic Signal Analysts/Technician	0.0	0.0	0.0
Traffic Signal Maintenance/ITS Fiber Technician	3.0	3.0	0.0
Network Specialist	0.0	0.0	0.0
Electronics Specialist (L2 Network Tech)	0.0	0.5	0.5
TMC Manager	0.0	0.0	0.0
Supervisor	0.0	0.0	0.0
TMC Operators	0.0	0.0	0.0

Table 26 shows the combined regional resources for the River to Sea regional area within FDOT District 5 as compared to the recommended staffing criteria.

Table 26 – River to Sea Regional Staffing

River to Sea TPO Region			
Position	Existing Staff	Current Needed - Recommended Staff	Current Needed - Additional Staff
Traffic Engineering Operations Manager	3.0	3.0	0.0
Traffic Signal/ITS Engineer	1.0	2.0	1.0
Traffic Signal Analysts/Technician	0.75	3.1	2.35
Traffic Signal Maintenance/ITS Fiber Technician	12.5	18.25	5.75
Network Specialist	1.0	1.5	0.5
Electronics Specialist (L2 Network Tech)	0.5	2.0	1.5
TMC Manager	0.5	2.0	1.5
Supervisor	1.0	2.0	1.0
TMC Operators	0.75	2.0	1.25

SPACE COAST TPO

Space Coast TPO (SCTPO) is the agency responsible for transportation planning services for the Palm Bay-Melbourne and Titusville urbanized areas. They provide the forum for local elected officials and their staff and industry experts to work together to improve transportation for area residents, businesses, and visitors. The responsibility of the SCTPO is to manage a continuing, cooperative, and comprehensive planning process, resulting in the development of transportation plans and programs that improve quality of life and add to the economic viability and safety of the community. The TPO's planning responsibilities include highways, transit, bicycling and pedestrian facilities. It prioritizes capital improvements to address the SCTPO regions' travel needs and allocates federal funding to implement projects as identified in their LRTP and TIP.

BREVARD COUNTY

Brevard County currently operates an unofficial TMC at the Viera Government Center. Brevard County is responsible for the operation and maintenance of 332 traffic signals within their jurisdiction. The County has all Naztec signal controllers that are a mix of 980 and ATC. The County has standardized to Naztec ATC controllers as the accepted signal controller in the area. They can remotely monitor 149 of the 332 traffic signals on a fiber optic network using Trafficware's ATMS.now. Of the 332 traffic signals, 110 have adaptive traffic control. In addition, Brevard County operates and maintains 80 CCTVs, 49 DMS, and 50 Bluetooth devices. **Table 27** shows the current staffing for O&M within Brevard County as compared to the recommended staffing criteria.

Table 27 – Brevard County Staffing

Brevard County			
Position	Existing Staff	Current Needed - Recommended Staff	Current Needed - Additional Staff
Traffic Engineering Operations Manager	1.0	1.0	0.0
Traffic Signal/ITS Engineer	0.0	2.0	2.0
Traffic Signal Analysts/Technician	0.0	3.0	3.0
Traffic Signal Maintenance/ITS Fiber Technician	8.5	14.0	5.5
Network Specialist	0.5	1.0	0.5
Electronics Specialist (L2 Network Tech)	0.5	2.0	1.5
TMC Manager	0.0	1.0	1.0
Supervisor	0.0	1.0	1.0
TMC Operators	0.5	2.0	1.5

* Includes 1 FTE from contracted services and overtime budget.

CITY OF MELBOURNE

The City of Melbourne operates and maintains 67 traffic signals with Naztec controllers from their TMC, with a back-up location at City Hall. All signals are independent of the County and exist on a network outside of the City network. Currently, ten signals are connected to fiber, allowing for remote control (using ATMS.now) and monitoring. All other signals are actively monitored, but communicate via a wireless link. In addition, nine CCTVs were installed at City intersections as a part of the ATMS Expansion projects mentioned earlier. **Table 28** shows the current staffing for O&M within the City of Melbourne as compared to the recommended staffing criteria.

Table 28 – City of Melbourne Staffing

City of Melbourne			
Position	Existing Staff	Current Needed - Recommended Staff	Current Needed - Additional Staff
Traffic Engineering Operations Manager	1.0	1.0	0.0
Traffic Signal/ITS Engineer	0.0	0.0	0.0
Traffic Signal Analysts/Technician	0.0	0.0	0.0
Traffic Signal Maintenance/ITS Fiber Technician	2.0	2.0	0.0
Network Specialist	0.0	0.0	0.0
Electronics Specialist (L2 Network Tech)	0.0	0.5	0.5
TMC Manager	0.0	0.0	0.0
Supervisor	0.0	0.0	0.0
TMC Operators	0.0	0.0	0.0

CITY OF PALM BAY

The City of Palm Bay has no current or planned TMC or ITS deployment other than a single CCTV at Malabar Rd and San Filippo Dr. The City operates and maintains 43 traffic signals; 8 of which are owned by the State. The City currently uses Naztec controllers at all 25 signals it operates and maintains. Signal timings are coordinated based on GPS clocks. **Table 29** shows the current staffing for O&M within the City of Palm Bay as compared to the recommended staffing criteria. Please note the Traffic Operations Manager is fulfilling the requirement of the Traffic Engineer (half-time) and Traffic Signal Analyst (half-time).

Table 29 – City of Palm Bay Staffing

City of Palm Bay			
Position	Existing Staff	Current Needed - Recommended Staff	Current Needed - Additional Staff
Traffic Engineering Operations Manager	1.0	1.0	0.0
Traffic Signal/ITS Engineer	0.0	0.0	0.0
Traffic Signal Analysts/Technician	0.0	0.0	0.0
Traffic Signal Maintenance/ITS Fiber Technician	2.0	2.0	0.0
Network Specialist	0.0	0.0	0.0
Electronics Specialist (L2 Network Tech)	0.0	0.5	0.5
TMC Manager	0.0	0.0	0.0
Supervisor	0.0	0.0	0.0
TMC Operators	0.0	0.0	0.0

CITY OF TITUSVILLE

The City of Titusville has no current or planned TMC or ITS developments at this time. The City operates and maintains 42 traffic signals. There is currently no coordination among the signals controlled by the City, but four are connected to the Brevard County ATMS and the City intends to install Naztec controllers at the other five and will bring them online thereafter. **Table 30** shows the current staffing for O&M within the City of Titusville as compared to the recommended staffing criteria.

Table 30 – City of Titusville Staffing

City of Titusville			
Position	Existing Staff	Current Needed - Recommended Staff	Current Needed - Additional Staff
Traffic Engineering Operations Manager	0.0	0.0	0.0
Traffic Signal/ITS Engineer	0.0	0.5	0.5
Traffic Signal Analysts/Technician	0.0	0.5	0.5
Traffic Signal Maintenance/ITS Fiber Technician	2.0	2.0	0.0
Network Specialist	0.0	0.0	0.0
Electronics Specialist (L2 Network Tech)	0.0	0.5	0.5
TMC Manager	0.0	0.0	0.0
Supervisor	0.0	0.0	0.0
TMC Operators	0.0	0.0	0.0

Table 31 shows the combined regional staffing for the Space Coast TPO regional area within FDOT District 5 as compared to the recommended staffing criteria.

Table 31 – Space Coast TPO Regional Staffing

Space Coast TPO Region			
Position	Existing Staff	Current Needed - Recommended Staff	Current Needed - Additional Staff
Traffic Engineering Operations Manager	3.0	3.0	0.0
Traffic Signal/ITS Engineer	0.0	2.5	2.5
Traffic Signal Analysts/Technician	1.0	4.5	3.5
Traffic Signal Maintenance/ITS Fiber Technician	14.5	20.0	5.5
Network Specialist	0.5	1.0	0.5
Electronics Specialist (L2 Network Tech)	0.5	3.5	3.0
TMC Manager	0.0	1.0	1.0
Supervisor	0.0	1.0	1.0
TMC Operators	0.5	2.0	1.5

4.4. Existing Staffing Analysis

In the previous section, the existing O&M staffing of each local agency was compared to the staffing guidelines set forth in **Section 3** to begin to establish a baseline for analyzing the impacts of future ITS strategies. In this section, the existing O&M staffing of each agency will be combined to analyze the existing regional staffing and overall regional needs. Regional O&M staffing will be analyzed in two parts: existing regional arterial signal system staffing and existing regional FMS staffing. In addition, the cost for additional resources will be determined, while also considering contracts that are in use regionally and by local agencies.

EXISTING REGIONAL ARTERIAL SYSTEM STAFFING

The first step in reviewing the existing staffing levels for operations and maintenance of signal systems is to look at the nine staffing positions and group them into three distinct areas: Operations and Maintenance, IT, and TMC Operations. **Tables 32**, **33**, and **34** show a breakdown of the staffing positions and the average annual cost associated with each position for the Operations and Maintenance, IT, and TMC Operations categories, respectively. Please note that the 2.15 multiplier assumes consultant services.

Table 32 – Average Annual Pay for Operations and Maintenance Staff

Average Annual Pay for Operations and Maintenance Staff		
Position	Average Pay Without Multiplier	Average Pay (Includes 2.15 Multiplier)
Traffic Engineering Operations Manager (Local)	$125,000	$268,750
Traffic Signal/ITS Engineer	$93,600	$201,240
Traffic Signal Analysts/Technician	$62,400	$134,160
Traffic Signal Maintenance/ITS Fiber Technician	$52,198	$112,226

Table 33 – Average Annual Pay for IT Staff

Average Annual Pay for IT Staff		
Position	Average Pay Without Multiplier	Average Pay (Includes 2.15 Multiplier)
Network Specialist	$85,000	$182,750
Electronics Specialist (L2 Network Tech)	$53,759	$115,581

Table 34 – Average Annual Pay for TMC Operations Staff

Average Annual Pay for TMC Operations Staff		
Position	Average Pay Without Multiplier	Average Pay (Includes 2.15 Multiplier)
TMC Manager	$80,000	$172,000
Supervisor	$37,500	$80,625
TMC Operators	$25,000	$53,750

The next step is to look at the MPO/TPO area staffing data shown in **Tables 12, 19, 22, 26 and 31** of the previous section of this report and to multiply the current - needed additional staff for each position by the average annual pay per position for each of the three staffing categories. **Tables 35**, **36**, and **37** on the following sheets show the annual cost estimated to bring each MPO/TPO regional area agency staffing to the current needed - recommended level for Operations and Maintenance, IT, and TMC Operations, respectively. The cost has been estimated by multiplying the current needed - additional staff with average annual pay for the positions anticipated in each category, previously shown in **Tables 32**, **33**, and **34**.

Table 35 – FDOT District 5 Region (Local Agencies Only – Arterials: O&M) Cost Analysis

FDOT District 5 Region (Local Agencies Only – Arterials: O & M) Cost Analysis			
Position	Current Needed - Additional Staff	Average Pay (Includes 2.15 Multiplier)	Regional Annual Cost for Needed - Additional Staffing
Lake-Sumter MPO			
Traffic Engineering Operations Manager (Local)	0.00	$268,750	$0
Traffic Signal/ITS Engineer	0.50	$201,240	$100,620
Traffic Signal Analysts/Technician	0.50	$134,160	$67,080
Traffic Signal Maintenance/ITS Fiber Technician	1.50	$112,226	$168,339
Lake-Sumter O&M Staffing Total Cost			***$336,039***
MetroPlan Orlando			
Traffic Engineering Operations Manager (Local)	0.00	$268,750	$0
Traffic Signal/ITS Engineer	3.75	$201,240	$754,650
Traffic Signal Analysts/Technician	3.50	$134,160	$469,560
Traffic Signal Maintenance/ITS Fiber Technician	12.50	$112,226	$1,402,825
MetroPlan O&M Staffing Total Cost			***$2,627,035***
Ocala-Marion MPO			
Traffic Engineering Operations Manager (Local)	0.00	$268,750	$0
Traffic Signal/ITS Engineer	0.00	$201,240	$0
Traffic Signal Analysts/Technician	0.50	$134,160	$67,080
Traffic Signal Maintenance/ITS Fiber Technician	0.00	$112,226	$0
Ocala-Marion O&M Staffing Total Cost			***$67,080***
River to Sea TPO			
Traffic Engineering Operations Manager (Local)	0.00	$268,750	$0
Traffic Signal/ITS Engineer	1.00	$201,240	$201,240
Traffic Signal Analysts/Technician	2.35	$134,160	$315,276
Traffic Signal Maintenance/ITS Fiber Technician	5.75	$112,226	$645,300
River to Sea O&M Staffing Total Cost			***$1,161,816***
Space Coast TPO			
Traffic Engineering Operations Manager (Local)	0.00	$268,750	$0
Traffic Signal/ITS Engineer	2.50	$201,240	$503,100
Traffic Signal Analysts/Technician	3.50	$134,160	$469,560
Traffic Signal Maintenance/ITS Fiber Technician	5.50	$112,226	$617,243
Space Coast TPO O&M Staffing Total Cost			***$1,589,903***
Total Regional Annual Cost			**$5,781,873**

Table 36 – FDOT District 5 Region (Local Agencies Only – Arterials: IT) Cost Analysis

FDOT District 5 Region (Local Agencies Only – Arterials: IT) Cost Analysis			
Position	Current Needed - Additional Staff	Average Pay (Includes 2.15 Multiplier)	Regional Annual Cost for Needed - Additional Staffing
Lake-Sumter MPO			
Network Specialist	0.00	$182,750	$0
Electronics Specialist (L2 Network Tech)	0.50	$115,581	$57,790
		Lake-Sumter IT Staffing Total Cost	***$57,790***
MetroPlan Orlando			
Network Specialist	1.00	$182,750	$182,750
Electronics Specialist (L2 Network Tech)	6.00	$115,581	$693,486
		Lake-Sumter IT Staffing Total Cost	***$876,236***
Ocala-Marion MPO			
Network Specialist	0.50	$182,750	$91,375
Electronics Specialist (L2 Network Tech)	0.50	$115,581	$57,790
		Ocala-Marion IT Staffing Total Cost	***$149,165***
River to Sea TPO			
Network Specialist	0.50	$182,750	$91,375
Electronics Specialist (L2 Network Tech)	1.50	$115,581	$173,371
		River to Sea IT Staffing Total Cost	***$264,746***
Space Coast TPO			
Network Specialist	0.50	$182,750	$91,375
Electronics Specialist (L2 Network Tech)	3.00	$115,581	$346,743
		Space Coast IT Staffing Total Cost	***$438,118***
		Total Regional Annual Cost	**$1,786,056**

Table 37 – FDOT District 5 Region (Local Agencies Only – Arterials: TMC) Cost Analysis

FDOT District 5 Region (Local Agencies Only – Arterials: TMC) Cost Analysis			
Position	Current Needed - Additional Staff	Average Pay (Includes 2.15 Multiplier)	Regional Annual Cost for Needed - Additional Staffing
Lake-Sumter MPO			
TMC Manager	0.00	$172,000	$0
Supervisor	0.00	$80,625	$0
TMC Operators	0.00	$53,750	$0
		Lake-Sumter TMC Staffing Total Cost	*$0*
MetroPlan Orlando			
TMC Manager	1.50	$172,000	$258,000
Supervisor	5.00	$80,625	$403,125
TMC Operators	1.00	$53,750	$53,750
		MetroPlan Orlando TMC Staffing Total Cost	*$714,875*
Ocala-Marion MPO			
TMC Manager	0.00	$172,000	$0
Supervisor	0.00	$80,625	$0
TMC Operators	1.00	$53,750	$53,750
		Ocala-Marion TMC Staffing Total Cost	*$53,750*
River to Sea TPO			
TMC Manager	1.50	$172,000	$258,000
Supervisor	1.00	$80,625	$80,625
TMC Operators	1.25	$53,750	$67,188
		River to Sea TMC Staffing Total Cost	*$405,813*
Space Coast TPO			
TMC Manager	1.00	$172,000	$172,000
Supervisor	1.00	$80,625	$80,625
TMC Operators	1.50	$53,750	$80,625
		Space Coast TMC Staffing Total Cost	*$333,250*
		Total Regional Annual Cost	**$1,507,688**

As mentioned in previous sections, the overall purpose of this section is to examine the current existing O&M staffing levels regionally against established staffing guidelines. Once potential ITS strategies have been agreed upon and prioritized, this information will serve as the baseline condition for analyzing impacts anticipated by different agencies. By combining the total regional annual cost for each of the distinct staffing areas shown in **Tables 35-37**, the estimated overall total anticipated regional annual cost to bring existing FDOT District 5 Region (Local Agencies

Only-Arterial) staffing to the baseline recommended level is \$5,781,873 + \$1,786,056 + \$1,507,688 = **\$9,075,617**.

It should be noted that when analyzing the anticipated annual cost regionally, some agencies have in-house staff, but are also supported by contractor and consultant services contracts (Either their own or FDOT). Those additional support services have already been taken into account in the individual local agency staffing by converting the local agency contracts into full time equivalents (Labor Only).

The next step in this analysis is to take any additional supporting resources from MPO/TPO or FDOT contracts into account that have not already been considered. An example of a service contract to be taken into consideration is the AAM contracts that District 5 currently funds. These projects have consultant services, which provide real-time monitoring of signal systems and retiming of selected corridors on the SHS. Another example are signal retiming contracts funded by FDOT District 5 and MPO/TPO contracts.

Surveying regional operator/maintainer agencies with District 5, a majority of the local agencies rely on in-house staff or MPO/TPO funding for the retiming of non-SHS signals. Recently, Central Office mandated that isolated signals on the SHS are to be retimed at a minimum every five years and that coordinated signal systems are to be retimed at a minimum every three years. Year 2015 was the first year that the new signal timing mandate went into effect. As a part of this new initiative, Central Office provided funding to aid in the retiming efforts statewide, with \$850,000 going to District 5 for the SHS (Within District 5, there are 1,567 traffic signals on the SHS). Because of the enhanced signal timing maintenance mandate and funding from Central Office, MetroPlan Orlando has also begun allocating the \$750,000 annual funding originally provided to District 5 to perform retiming on non-SHS signalized intersections.

Table 38, on the following page, shows a list operation and maintenance funding contracts and supported contractor and consultant services that affect the overall estimated regional annual cost to bring existing local agency staffing to baseline conditions.

Table 38 – Regional Arterial Contractor and Consultant Service Contracts

Regional Arterial Services Contractor and Consultant Service Contracts		
Contract	Agency	Average Annual Funding
Signal Retiming (SHS)	FDOT District 5	$850,000
Signal Retiming (non-SHS)	MetroPlan Orlando	$750,000
Active Arterial Management*	FDOT District 5	$288,000
Continuing Services Contract for Traffic Operations**	FDOT District 5	$412,040
	Total	$2,300,040

* Assumes 192 Signals where operations (Including retiming) is handled by the AAM consultants. Thus this amount (Assumes $4,500 per signal per every 3 years) is deducted from the need. The AAM services were not considered as that is discussed later as a future ITS Strategy.

** Annual funding for retiming services on Continuing Services Contracts is variable. The average annual funding is estimated based on the annual cost of retiming task work orders over a ten-year period.

As shown above in **Table 38**, the total regional arterial services contractor and consultant contracts that supplement local agency O&M staffing is estimated to be $2,300,040. The overall estimated regional annual cost to bring existing local agency staffing to baseline conditions when taking supplemental contracts into account is therefore $9,075,617 - $2,300,040 = **$6,775,577**.

EXISTING DISTRICT 5 FMS STAFFING

As previously mentioned, the ITS that comprises the Freeway Management System (FMS), operations and maintenance is performed by the regional owner (i.e. FDOT District 5, Florida's Turnpike Enterprise, or CFX). The FMS for FDOT District 5 and CFX is operated from the District 5 RTMC, which is co-located with the Florida Highway Patrol Troop D Headquarters and the FDOT District 5 Orlando Urban Office. FMS operations for FTE are performed from two RTMCs. Only a portion of the FMS for FTE is located with the FDOT District 5 region, as their facilities are located throughout the state. Therefore, a review of existing staffing levels for FTE was not performed.

Regional FMS Staffing is typically comprised of two primary types of staff (Excluding overall management). The first is the supervisor and operator staff that monitors and operates the devices from inside the RTMC. The second type is the support staff that manages the network, software development, and computer technicians.

The first step in analyzing staffing was to look at the FDOT District 5 RTMC Relocation Study performed in 2013[7]. The purpose of the RTMC Relocation Study was to develop a concept plan for the relocation of the current RTMC to a new location at 4975 Wilson Road, Sanford, Florida 32771. The study provided an estimate of future space requirements based on an evaluation of workload and staffing of RTMCs around the state. This analysis was performed looking at operator staffing. The workload of five RTMCs was compared in the study. **Table 39** shows an inventory of devices operated by the RTMC's in Districts 1, 4 (Fort Lauderdale), 5, 6, and 7.

Table 39 – RTMC Relocation Study Inventory

RTMC Relocation Study Inventory					
Inventory	**D1**	**D4**	**D5**	**D6**	**D7**
Centerline Miles FMS	122	200	385	53	190
Centerline Miles AMS	484	200	107	154	0
Number of Mainline DMS	41	56	107	70	62
Number of Arterial DMS	0	48	117	40	9
Number of Mainline Cameras	113	201	423	155	153
Number of Arterial Cameras	6	0	143	155	153
Road Ranger Vehicles	17	30	10	30	20
Road Ranger patrolled centerline miles	180	217	224	56	190
Road Ranger Operations	M-F (5a-11p) S-S (9a-9p)	24/7 144mi 16/5 73mi	M-Th (6a-mid) F-S (6a-3:30a)	24/7	24x365
Number of Ramp Meters	0	0	0*	22	0
Number of Variable Speed Limit Signs	0	28	20	0	0

*This number is set to increase with the build out of the I-4 Ultimate project currently under construction and the future I-4 Beyond the Ultimate segments that are in planning.

As a part of the overall relocation study, each District was surveyed to determine the number of staff operating the RTMC by time of day. The staffing of each RTMC at the time of the study can be seen on the following page in **Table 40**.

[7] Florida Department of Transportation District 5 RTMC Relocation Study - Final Report, Prepared by HNTB Corporation, March 29, 2013.

Table 40 – RTMC Relocation Study Staffing Survey

RTMC Relocation Study Staffing Survey					
Staffing	**D1**	**D4**	**D5**	**D6**	**D7**
AM Shift	5.5	10	6	12	5
PM Shift	4.5	8	5	12	3
Night Shift	3	5	3	4	2
Weekend	4	5	3	4	2

The next step in the analysis, was to look at the three major workload generators; cameras, dynamic message signs, and Road Rangers. **Table 41** provides an inventory comparison for each RTMC analyzed in the relocation study.

Table 41 – RTMC Relocation Study Workload Inventory Comparison

RTMC Relocation Study Workload Inventory Comparison					
Inventory	**D1**	**D4**	**D5**	**D6**	**D7**
Mainline Cameras/Mile	0.9	1.0	1.1	2.9	0.8
Arterial Cameras/Mile	0.01	0.00	1.34	0.54	NA
Mainline DMS/Mile	0.3	0.3	0.3	1.3	0.3
Arterial DMS/Mile	NA	0.24	1.09	0.26	NA
Patrolled Miles/Road Ranger	11	7	22	2	10

Finally, the major workload generators were compared to the number of staff for both the AM and weekend shift. **Tables 42** and **43**, below, shows the results of that comparison found within the relocation study for the AM Shift and the Weekend Shift, respectively.

Table 42 – RTMC Relocation Study Workload per Full Time Equivalents for AM Shift

RTMC Relocation Study Workload per Full Time Equivalents for AM Shift					
	D1	**D4**	**D5**	**D6**	**D7**
Centerline Miles FMS/FTE	22	20	64	4	38
Mainline DMS/FTE	7	6	18	6	12
Mainline Cameras/FTE	21	20	71	13	31

Table 43 – RTMC Relocation Study Workload per Full Time Equivalents for Weekend Shift

RTMC Relocation Study Workload per Full Time Equivalents for Weekend Shift					
	D1	**D4**	**D5**	**D6**	**D7**
Centerline Miles FMS/FTE	31	40	128	13	95
Mainline DMS/FTE	10	11	36	18	31
Mainline Cameras/FTE	28	40	141	39	77

Based on this comparison, the staffing workload per full time equivalent at the District 5 RTMC is at least twice as great as the average of the five RTMCs surveyed. When looking at current needed - recommended staffing guidelines for the FMS, it is important to take this into account. Additionally, it should be noted that in the time since the RTMC relocation study was completed, four additional operators have been added to supplement the current staffing levels during varying times of day depending on peak hours of incidents. Therefore, the number of TMC operators recommended will need to be reduced to account for these additional four staff members.

Shown below in **Table 44** is a comparison of the current FDOT District 5 FMS staffing against the needed-recommended staffing guidelines developed by analyzing the operator and support staff in this section previously.

Table 44 – FDOT District 5 FMS Staffing

FDOT District 5 FMS Staffing			
Position	Existing Staff	Current Needed - Recommended Staff	Current Needed - Additional Staff
Regional TSM&O Engineer (Freeways)	1	1	0
Regional ITS Project Manager/Supervisor	3	3	0
Sunguide Software Developer	0.5	0.5	0
Sunguide Database Administrator	0.5	0.5	0
Sunguide Software Analyst	0.5	2	1.5
Network Engineer	1	1	0
Network Server Administrator	1	2	1
Network Security Administrator	1	2	1
Computer Technician	0.5	1	0.5
TSM&O Operations Manager	1	1	0
TMC Manager	1	1	0
Supervisor	2	3	1
Lead TMC Operator	5	5	0
TMC Operators	11	12	1

Now that the difference between the existing staffing and the current needed - recommended staffing has been determined, the regional cost to bring regional FMS staffing up to baseline conditions can be estimated. The annual cost estimated to bring regional FMS staffing to the current needed - recommended level has been estimated by multiplying the current needed - additional staff with average annual pay for fourteen positions anticipated. **Table 45** below shows the estimated cost per positions annually.

Table 45 – FDOT District 5 FMS Staffing Cost Analysis

FDOT District 5 FMS Staffing Cost Analysis				
Position	Current Needed - Additional Staff	Average Pay Without Multiplier	Average Pay (Includes 2.15 Multiplier)	Regional Annual Cost for Needed - Additional Staffing
Regional TSM&O Engineer (Freeways)	0	$125,000	$268,750	$0
Regional ITS Project Manager/Supervisor	0	$90,000	$193,500	$0
Sunguide Software Developer	0	$66,560	$143,104	$0
Sunguide Database Administrator	0	$85,000	$182,750	$0
Sunguide Software Analyst	1.5	$56,160	$120,744	$181,116
Network Specialist	0	$85,000	$182,750	$0
Network Server Administrator	1	$85,000	$182,750	$182,750
Network Security Administrator	1	$85,000	$182,750	$182,750
Computer Technician	0.5	$46,800	$100,620	$50,310
TSM&O Operations Manager	0	$67,000	$144,050	$0
TMC Manager	0	$65,520	$140,868	$0
Supervisor	1	$37,500	$80,625	$80,625
Lead TMC Operator	0	$31,200	$67,080	$0
TMC Operators	1	$25,000	$53,750	$53,750
	Total Estimated Regional Annual Cost			$731,301

As shown above in **Table 45**, the total anticipated regional annual cost to bring existing FDOT District 5 FMS staffing for the RTMC to the baseline recommended level including the future needs anticipated for the I-4 Beyond the Ultimate (BtU) projects is **$731,301**.

Finally, a staffing analysis was performed for the anticipated additional support staffing that is to be needed for the BtU projects. The District has provided the current projections for total District 5 FMS staffing required when the BtU is complete as well as the additional IT staffing that will be required. These are shown in **Table 46** and **Table 47** respectively.

Table 46 – Total FDOT District 5 FMS Staffing Cost Analysis (After Beyond Ultimate)

Total FDOT District 5 FMS Staffing Cost Analysis (After Beyond Ultimate)							
	Position	I-95	I-4	I-75	Average Annual Pay (without multiplier)	Average Annual Pay (with 2.15 multiplier)	Annual Cost (with 2.15 multiplier)
	PM	1	1	1	$85,000	$187,000	$561,000
	Lead Operator	3	3	3	$50,000	$110,000	$990,000
6 AM-2 PM	Arterials	3.5	4.5	1.5	$40,000	$88,000	$836,000
	Freeway	2.5	3	1.5	$40,000	$88,000	$616,000
	Managed Lanes	0	1.5	0	$40,000	$88,000	$132,000
	Ramp Meter	0	1	0	$40,000	$88,000	$88,000
2 PM-10 PM	Arterials	3.5	4.5	1.5	$40,000	$88,000	$836,000
	Freeway	2.5	3	1.5	$40,000	$88,000	$616,000
	Managed Lanes	0	1.5	0	$40,000	$88,000	$132,000
	Ramp Meter	0	1	0	$40,000	$88,000	$88,000
10 PM-6 AM	Arterials	2	2.5	1.5	$40,000	$88,000	$528,000
	Freeway	2	2	1.5	$40,000	$88,000	$484,000
	Managed Lanes	0	1	0	$40,000	$88,000	$88,000
	Ramp Meter	0	0.5	0	$40,000	$88,000	$44,000
Total (per Weekday)		20	30	13	Overall Annual Cost		$6,039,000

* Note that a 2.2 multiplier is used based on future estimates provided by the District.

Table 47 – Total FDOT District 5 FMS Staffing Cost Analysis (After Beyond Ultimate)

FDOT District 5 FMS IT Staffing Cost Analysis (After Beyond Ultimate)				
Position	Current Needed - Additional Staff	Average Pay Without Multiplier	Average Pay (Includes 2.2 Multiplier)*	Regional Annual Cost for Needed - Additional Staffing
Network Technician (Advanced)	1	$60,500	$133,100	$133,100
Sunguide Database Administrator	1	$82,000	$180,400	$180,400
Network Analyst	1	$63,500	$139,700	$139,700
Network Specialist (IT Lead)	1	$90,000	$198,000	$198,000
Network Server Administrator	0.5	$92,000	$202,400	$101,200
Network Security Administrator	0.5	$92,000	$202,400	$101,200
	Total Estimated Regional Annual Cost			$853,600

* Note that a 2.2 multiplier is used based on future estimates provided by the District.

4.5. Possible Cost Saving Staffing Alternatives

There are a number of possible cost savings alternatives that have been developed in order to mitigate operations and maintenance costs. Some are as follows:

REGIONAL SHARING OF IT RESOURCES

One of the items that has consistently been agreed upon by the stakeholders is that the sharing of IT resources could be possible. The idea is that by creating a small group of technical experts that can provide support to a number of stakeholders, hundreds of thousands of dollars can be saved per year.

Currently, an idea that is being discussed is the use of an Interlocal Agreement between multiple agencies to share the costs of four full-time equivalents consisting of four positions. The distribution of how many hours each type of position may receive per year would be based on need, but in general, the available pool of positions would consist of the following:

- Network Manager/Network Architect
- Network Technician
- Network Server Administrator/Security Administrator
- SunGuide Database Administrator/Software Analyst/Software Developer

The intent of sharing IT resources is not only to share costs, but also to provide highly qualified professionals that can create and maintain stable and reliable networks.

Currently, nine agencies have expressed an interest in the sharing of IT resources with the intent that FDOT would manage the contract.

RTMC MANAGEMENT OF THE ARTERIAL NETWORK DURING OFF-PEAK HOURS

The use of the RTMC as an after-hours facility for managing the arterial network in lieu of long hours for arterial TMCs would provide savings of manpower and would also allow the arterials to be managed at a high level during off-peak hours. This alternative is currently being developed as a part of two AAM contracts by FDOT, specifically along I-4.

5. ITS Strategies

5.1. Introduction

The next step in the Intelligent Transportation Systems (ITS) Master Plan is to identify regional deficiencies where ITS improvements could have the greatest benefit. A significant part of this ITS Master Plan entails sorting through the various options that are available that can better serve the transportation system. Emerging technologies, tried and true safety applications, along with up-and-coming initiatives, bring together a melting pot of viable and attainable strategies to implement within the region. These strategies touch on all facets of a transportation system, and when implemented in concert, will further the flow of goods, safety of travelers and keep the public informed. ITS technologies can vary in different types of applications, including different types of traffic signal controllers, variable message signs, vehicle speed detections and road weather information, to more complex applications, which integrate real time data to actively manage the traffic. ITS Strategies presented in this Master Plan cover a wide range of technology solutions; and each solution serves as a “tool” within a toolbox. It must be understood that one strategy is not always an “end-all” solution and that some of these tactics have multiple applications, while a few may only be warranted for unique situations.

In the past, ITS technologies have been segregated between arterial and freeway applications, but with the initiation of the TSM&O program and its goal of intertwining operations between the arterials and freeways, ITS technologies are starting to merge their fields of application. An integrated traffic management approach utilizing various strategies (or tools) at different time frames or for different circumstances will ultimately depend on the stakeholders’ views and decisions documented through this plan. When or where a strategy will be used depends on who is going to use it. Each strategy must be properly evaluated to determine if it is an implementable option. The need must be identified and regional support must be present for a strategy to be truly actionable.

This section presents the identification and explanation of 70+ approaches to enhance the driving experience for the end users, the traveling public. This section provides a summary of some of the ITS techniques and technologies available today and in the foreseeable future designed to increase system efficiency and improve traveler mobility. These technologies can then be considered to improve regional deficiencies where ITS improvements are determined to have the greatest potential benefits.

Over thirty stakeholders have been met with individually to discuss the following strategies identified within this plan. In order to document whether a stakeholder generally approved or was interested in a strategy, it was noted as a "Yes", "No" or "Maybe." A general rule of thumb utilized as the intention of all stakeholder responses is the following:

- "Yes" - An agreeable option where they would have direct or indirect involvement;
- "No" - An option that may not apply to that stakeholders, or the region's needs, or the organization has no foreseeable role;
- "Maybe" – An option with no definitive side (positive or negative) but with the notion that it could be a viable choice in the future.

An ITS Strategies Matrix tracks the answers from each of these stakeholders in order to identify trends or synergies between certain agencies or planning organizations.

Connected Vehicles, which is briefly discussed within this memorandum and is further touched upon in Task 5 – Connected Vehicles Initiatives, is a goal and vision for the transportation industry. Connected Vehicle technology has the potential to eliminate the majority of crashes, improve capacity on existing roadways, save money and provide a safe trip for travelers and while complete connectivity in transportation is the ultimate goal, many of these strategies can be implemented in the meantime to work towards that goal while improving various transportation aspects.

5.2. ITS Strategies Overview

This section provides a brief description of the ITS strategies discussed with the master plan stakeholders. These strategies have been broken down into twenty-two major categories for discussion. Those categories are as follows:

- Active Traffic Management,
- Advanced Parking Management,
- Integrated Corridor Management,
- Traveler Information,
- Dynamic Ridesharing,
- Dynamic Wayfinding,
- Traffic Control,
- Incident Management,
- Traveler Demand Management,
- Emissions Testing and Mitigation,
- Highway Rail Intersection,
- Public Transportation Management,
- Personalized Public Transit,
- Public Traveler Security,

- Electronic Payment Services,
- Commercial Vehicle Operations,
- Emergency Management,
- Advanced Vehicle Safety Systems,
- Information and Data Management,
- Wrong Way Driving Countermeasures,
- Asset Management Database, and
- Bicycle and Pedestrian Innovative ITS Solutions

Below is a brief description of each major ITS strategy organized by category. In the next section, these strategies will be analyzed and prioritized by stakeholder interest.

ACTIVE TRAFFIC MANAGEMENT

Active Arterial Management (AAM)

AAM is defined by the FHWA as: *"The active prioritization of objectives and collection of information to efficiently manage traffic signal infrastructure and control devices to maximize safety and throughput while minimizing delays. The working definition of traffic signal maintenance is the preventative and responsive activities to preserve traffic signal infrastructure and control devices necessary for the safe and efficient utilization of arterial, collector and local roadways."*

Essentially, AAM is the use of sensors and advanced traffic signal control on major arterials that are used to collect traffic flow and travel time data, while TMC operations provide the ability to adapt signal timings to prevailing traffic conditions. A lower-cost version of AAM involves the use of a more limited range of sensors and less sophisticated traffic control, supported by the technical resources with a focus on maintaining traffic signal timings on a regular basis.

AAM, a concept developed by the statewide TSM&O Program, seeks to optimize the arterial network through performance based operations and maintenance initiatives. The FDOT District 5 region currently has two projects for AAM already in place. Corridors were chosen that are well equipped in terms of ITS infrastructure to begin some basic arterial management practices using AAM principles. A driving force for these projects is the ongoing construction taking place on the I-4 corridor to build the I-4 Ultimate (A 22 mile - $2.2 Billion Project). When travelers begin to favor arterials during periods of heavy construction, the trend is to flood streets with more congestion than usual. AAM will benefit the region by actively managing that influx of traffic and informing the public of all options in order to alleviate congestion on the primary arterials.

Dynamic Junction Control

Dynamic Junction Control is a primarily a freeway & expressway application where lane assignments are controlled and dynamically assigned according to traffic conditions. Sensors installed in the ramps and mainline are used to determine traffic conditions and algorithms are used to assign lanes appropriately. For example, an inside right lane on the mainline could be closed in order to facilitate merging vehicles from an on-ramp. A free-flowing condition on the outside left lane from the on-ramp would be created to eliminate the merged weave, allowing for traffic to vacate the arterials more quickly and efficiently get cars onto the mainline during applicable time periods.

This tool can be used to improve the operation of freeways and expressways by better matching demand and capacity on mainlines and ramps. This has been applied as part of active traffic management projects on I-66 in Northern Virginia and the Washington State Smarter Highways projects. In the District 5 region, with the creation of a new and improved I-4 and the high use of toll roads within the region, it could be a useful tool for these situations and even on arterials. Many of the region's stakeholders find it to be a good tool and it should be considered as a viable TSM&O tool.

Dynamic Lane Reversal

Dynamic Lane Reversal takes into account an imbalance between directional flows during the morning peak hours and evening peak hours. Therefore, lanes are dynamically reassigned using overhead variable message signs, maximizing the available capacity to the dominant traffic flow direction. This is typically considered a freeway and expressway application and has the ability to maximize available capacity and better match the travel demand. However, for grade separated arterials, this strategy is also viable. Typically, about half of the relevant stakeholders favor this strategy and see probable benefits, while others do not have the existing infrastructure or the need for such an application.

Dynamic Lane Use Control

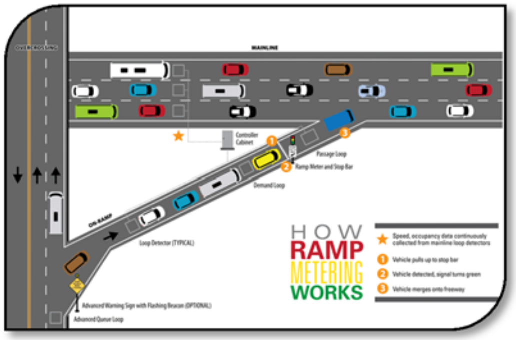
Dynamic Lane Use Control makes use of overhead variable message signs that are lane specific. During an incident, certain lanes can be opened or closed depending on the location of an incident. Approaching traffic can also be slowed down in increments well in advance of an incident and/or directed to change lanes. This strategy has the ability to maximize available capacity and better match the travel demand. This application would ultimately inform travelers making them aware of an irregular occurrence ahead of time in order to eliminate secondary crashes. This may be a plausible application and some of our region's stakeholders have seen some merit in implementing it.

Dynamic High Occupancy Vehicle & Managed Lanes

Dynamically HOV and Managed Lanes is principally a "freeway within a freeway" where a set of lanes within the freeway are separated from the general purpose lanes and are managed using a combination of tools and techniques (pricing, vehicle eligibility, and access control) in order to sustain optimal conditions. Typically implemented in areas of high congestion, Managed Lanes have been proven to provide enhanced travel time reliability and provide incentives to carpool or use transit along the corridors in which they are installed. Examples of Managed Lanes include HOV lanes, value priced lanes, or high-occupancy toll (HOT) lanes. Managed Lanes solutions allow for transportation system user's "choice".

This strategy involves dynamically changing the qualifications for driving in a HOV or Managed Lane(s). HOV lanes (also known as car pool lanes or diamond lanes) are restricted traffic lanes reserved at peak travel times or longer for exclusive use of vehicles with a driver and one or more passengers, including carpools, vanpools and transit buses. The normal minimum occupancy level is two or three occupants. Many agencies exempt other vehicles, including motorcycles, charter buses, emergency and law enforcement vehicles, low emission vehicles, and/or single-occupancy vehicles from paying a toll. In an Active Transportation and Demand Management (ATDM) approach, the HOV lane qualifications are dynamically changed based on real-time or anticipated conditions on both the HOV and general purpose lanes. Qualifications that can potentially be dynamically adjusted include the number of occupants (e.g., from two to three occupants), the hours of operation, and the exemptions (e.g., change from typical HOV operation to buses only). Alternatively, the HOV restrictions could be dynamically removed, allowing general use of the previously Managed Lane.

This application can be experienced on US 290 Northwest Freeway in Houston, Texas and more locally, on I-95 in South Florida's Broward County. In addition, in 2020, when the construction on I-4 Ultimate concludes, one of Central Florida's most important freeways will also include Managed Lanes. Regionally speaking, very few favor this strategy on arterial roadways. Some stakeholders think this could be considered from a transit perspective on the freeway system, allowing buses to use such lanes in order improve transit reliability and overall ridership.



Adaptive Ramp Metering

Adaptive Ramp Metering involves the installation of traffic signals at the end of entrance ramps to freeways and expressways. Sensors on the mainline detect prevailing traffic conditions and specially developed algorithms are used to meter traffic from the on ramp onto the mainline. This minimizes the disruption to mainline traffic flow caused by additional traffic entering at on ramps. Vehicles entering the roadway are temporarily stored on the on-ramps, while the loops will measure and calculate the traffic flow, speed and occupancy levels; allowing the vehicle to enter the freeway in a permissive manner, avoiding “bottle neck” concerns and improving safety. A further evolution of this strategy involves the use of adaptive traffic signal control techniques to identify bottlenecks, automatically detect incidents and integrate the ramp meters with adjacent arterial traffic signal operations. While there has not been a study to support coordinating ramp metering signals with arterial traffic signals, the two systems working together may have significant benefits for the traffic performance of a corridor. When installing ramp meters, it is important to monitor the immediate area’s varying traffic conditions, as the delay caused by the ramp meter waiting period may cause some drivers to choose other routes. In addition, the ramp queue should be reviewed and monitored to ensure that it does not negatively affect the arterials.

Ramp Metering is to be included in the I-4 Ultimate Managed Lanes project. Adaptive Ramp Metering has been defined as a “maybe”, or a possible solution between stakeholders, and it is noted that challenges with this strategy include the need to expand ramp capacity, the installation of the system and the clogging of arterials.

Dynamic Merge Control

Dynamic Merge Control, also known as dynamic late merger or dynamic early merge, is a technique that makes use of dynamic message signs or lane control signs approaching a merge point. The signs show advisory messages that encourage motorists to display direct and cooperative merging behaviors. It is typically applied on a part-time basis during congested conditions. This strategy allows the driver to be informed ahead of time and eliminate last minute weave conditions. Improving merging behavior will have a significant influence on intersection capacity and could be used to improve the effectiveness of traffic management on the region's freeways and arterials. Areas without significant weaving may not benefit from this application, but it could be used instances when a six-lane roadway section goes down to four.

Dynamic Shoulder Lanes

Dynamic Shoulder Lanes consist of sensors in the highway continuously monitoring traffic conditions to determine when the shoulders should be brought into operation. This provides the ability for a highway to act as a high-speed, higher capacity facility, with the shoulder used as a running lane. Implementation of this strategy may also require dynamic speed control, since the dynamic shoulder lane is usually at a slightly lower speed to keep within safety standards. Dynamic Shoulder Lanes are also known as "hard shoulder running" or temporary shoulder use.

This strategy provides regional Freeway and Expressway operators with the additional flexibility to match supply and demand during peak periods. This application is being considered as part of the "I-4 Beyond the Ultimate" projects in Central Florida. The idea being that once traffic heads away from the I-4 Ultimate limits, the five-lane expressway will decrease to a three-lane typical section, creating bottlenecks and delay. In peak hours, the shoulders could be opened to mitigate this potential problem and facilitate the flow of traffic by maintaining a portion of the capacity of the I-4 Ultimate through those transition locations.

Although some areas do not have shoulders to permit such a strategy, there are several Central Florida areas that can be utilized for this tactic. In addition, an excellent use for this strategy could be to focus this towards a transit-specific application. During peak hours, only buses could be permitted to use the dynamic shoulder lane, thus making transit a viable and competitive option compared to personally commuting on a clogged freeway. This would be especially true for major local events when freeways reach capacity and buses are able to move more people to final destinations. No matter what the use, signs informing the public when lanes are “open” versus “closed” and ultimately educating the public of this strategies implication would be a crucial key to the success of this strategy.

Queue Warning (Q-WARN)

Q-WARN is used to inform travelers of the presence of downstream stop-and-go traffic (based on real-time traffic detection) using warning signs and flashing lights. Drivers can anticipate an upcoming situation of emergency braking by slowing down ahead of time and avoid erratic behavior, ultimately reducing queuing-related collisions. Dynamic message signs show a symbol or word, along with flashing lights, to inform motorists of queues with significant slowdowns ahead. Sensors in the highway detect traffic speeds and flows and these are passed to a specially developed algorithm that determines what messages should be displayed on various parts of the highway. This strategy might also be combined with the use of a variable speed limit system to reduce severe acceleration and deceleration on the approach to a bottleneck. Speed harmonization and lane control signals that provide incident management capabilities can also be combined with queue warning. The system can be automated or controlled by a traffic management center operator. Work zones also benefit from Q-WARN with portable dynamic message sign units placed upstream of expected queue points.

Slowdowns and bottlenecks are well documented to increase the probability of rear end collisions, particularly in nonrecurring situations. “Fairbanks curve” on I-4 in central Orlando is a picture-perfect candidate for this application (Although it will be flattened as a part of the I-4 Ultimate project). Crash history should be reviewed thoroughly to show a need for this application to identify applicable sites. This system has been installed as a part of the Washington State Smarter Highways project, the I-66 active traffic management system in Northern Virginia and using variable speed limits on the I-285 top-end in Atlanta.

Dynamic Routing

Dynamic Routing makes use of roadside variable message signs to direct traffic around an incident on the mainline of freeways and arterials. Traffic sensors along the highway can also be used to detect prevailing traffic conditions on the mainline and also in diversion routing. An algorithm can be used, or manual operator intervention, to dynamically change routing instructions based on congestion levels. Dynamic routing can also be achieved through the use of in-vehicle information systems; in specific cases where individual drivers can be given different re-routing instructions. Typically, the private sector would provide the in-vehicle equipment and the information content to be delivered to the driver. Examples of this include WAZE and recent versions of Google maps with traffic condition information.

Use of dynamic routing can significantly improve the effectiveness of incident management plans, particularly with a regional significance. The region's transportation partners can take full advantage of this by partnering with the private sector information providers for in vehicle systems. Dynamic routing utilizing dynamic message signs has been implemented extensively across the District controlling freeways and expressways. The private sector in-vehicle version of dynamic routing also has a fairly significant market penetration nationwide. Dynamic routing is unanimously favored among the District 5 stakeholders.

ADVANCED PARKING MANAGEMENT

An Advanced Parking Management system would use ITS technologies for parking systems to reduce congestion by allowing motorists to know in advance if a parking garage is full. This minimizes the number of vehicles on the roadway looking for parking spaces, which alleviates traffic from main roadways. These systems are extremely useful in urban areas with limited parking, during special events, and for park-n-ride or transit facilities. This may be as simple as a smart phone based application, which could, for example, display how many parking spots are available in a particular parking facility in the area. The information made available can eliminate unnecessary congestion, as vehicles would otherwise drive in circles looking for parking.

The provision of real-time parking information improves parking operations efficiency and helps alleviate corridor congestion by making it more efficient for drivers to find parking. These parking management solutions could be an option for the main parking garages in high volume cities or at highly sought out destinations.

Dynamic Parking Guidance and Reservation

Dynamic Parking Guidance and Reservation is a good strategy when it comes to downtowns or special events that will fill parking garages to capacity, creating traffic on arterials. Sensors in both off-street and on-street parking slots are used to determine if a slot is available or occupied. This information is transmitted to a central back office, which then transmits the information to motorists looking for a parking space. The information to the motorist could then be delivered via dynamic message signs, to parking structures, or through the use of in-vehicle information technologies or smart phones. A more advanced meshed version of dynamic parking reservation would also enable motorists to make advance reservation of parking spaces for an additional fee. Motorists can also be offered guidance to navigate to available slots.

This strategy is implemented in a number of cities across the United States, most notably the San Francisco Park project. Relevant to District 5, the City of Orlando recently completed a parking study due to particular challenges with respect to multiple events and the proximity of event venues to the freeway network.

This strategy can also be used to improve event management while also supporting more effective commuter parking provision.

Dynamic Overflow Transit Parking

Dynamic Overflow Transit Parking is a favored strategy among transit agencies and cities where these services are provided. Sensors are used to monitor the availability of parking around transit facilities and park-and-ride locations. When the sensors indicate that parking is nearing capacity, dynamic message signs and other information delivery techniques are used to guide drivers to overflow parking locations.

This strategy could improve the attractiveness of public transit to regional travelers by making it easier to find a parking space convenient to transit facilities. This would be particularly relevant to the SunRail project (which is wide reaching within the Central Florida region). Parking facilities for these additional stops could incorporate dynamic message signs to inform the traveling public of available parking and when parking has been filled and offer other viable options.

Dynamically Priced Parking

Dynamically Priced Parking is very much how it sounds. It makes use of smart parking meter technology and communications between parking meters in a central back office where, based upon parking garage capacity, parking rates are varied according to the demand for parking. Typically, the rates will be varied to achieve an occupancy rate of between 60% and 80% (which is regarded as optimum) to service parking demand, while minimizing the time taken to find a space.

It should be noted that this tool can have a dual effect on downtown parking. In the first instance, it becomes easier to find a parking space and to maximize the utilization of parking spaces. In the second instance, this strategy will support zeroing out of parking meters when the occupant leaves, requiring the next document to pay the full price. This can have a significant impact on parking revenue. The City of Orlando has new meters in place that have some of the capabilities for dynamic pricing. However, dynamic pricing is not currently in use.

Freight Parking

Similar to general parking management efforts, freight traffic on freeways is another opportunity to use parking management. This system would inform truck drivers of available parking spaces in rest areas. Information management systems are also used to make the acquisition of a freight parking permit more efficient and effective and to provide guidance to truckers on suitable parking locations and the availability of freight parking slots.

In addition to garage parking, commercial truck parking has become a concern throughout Florida due to the increasing number of trucks on the interstates, as the number of truck parking areas has not increased to keep up with the demand. This causes many truck drivers to park along the interstate near rest areas or on/off ramps. These trucks then become potential hazards for drivers who may drift out of their lane and collide with the parked truck. Transportation officials are exploring ways to inform truck drivers of the availability of parking spaces at rest areas so that they will have this information prior to entering the rest area and will have the ability to seek parking at nearby truck stops or other areas in the event that there is limited available space.

FDOT District 2 has installed a system to provide parking availability information to truckers as they approach the Rest Area in St. Johns County, north of County Road 210. The MVDS (vehicle detectors) are used to count the number of vehicles entering and leaving the truck parking area and the CCTV is used by TMC Operators to visually verify the MVDS data. Software constantly updates the number of available spaces. The number of spaces is then sent to the dynamic display sign so that truckers know the number of available spaces at the rest area.

“Problem areas” for freight parking should be looked at on a case-by-case should basis to determine the value of use.

INTEGRATED CORRIDOR MANAGEMENT (ICM)

An ICM transportation system is the ultimate objective when it comes to operating and maintaining a complex multi-modal traffic network. ICM involves an integrated approach to transportation along a specific designated corridor or corridors. Multiple agencies and multiple modes are coordinated through the use of shared back office systems and the adoption of compatible strategies. Through an ICM approach, transportation professionals manage the corridor as a multimodal system and make operational decisions for the benefit of the corridor as a whole.

Multiple roadway types within the corridor as well as transit and other types of transportation facilities are managed in a coordinated fashion to try to optimize transportation service delivery and align agency strategies. This strategy provides the ability to treat transportation as a single system, increase the operational efficiency of the whole transportation network and maximize the effect of transportation investments.

An important aspect of this strategy is the balancing of the system appropriately between all possible roadways and, more importantly, the inclusion of all modes of transportation: the intricate network of arterials, freeways, transit, freight and rail. This would support statewide TSM&O initiatives as well, where the use of technology is used to manage existing infrastructure, improving the transportation system with minimal investment and greater benefits to costs. Through the ICM initiative, the U.S. DOT is providing guidance to assist agencies in implementing ICM and creating supporting analysis tools, approaches, and technical standards. U.S. DOT selected two corridors - US 75 in Dallas, TX and I-15 in San Diego, CA - to demonstrate the nation's first ICM systems.

In addition, a locally funded ICM program is currently underway in Central Florida under the leadership of District 5 through their AAM Operations contract (Discussed earlier). As indicated earlier, this strategy demonstrates what ITS and emerging technologies can produce when implemented in concert with one another, integrated seamlessly through clear channels of communication and cooperation between neighboring agencies or partners.

TRAVELER INFORMATION

With each strategy that is discussed, an end result is always to provide travelers with reliable information in real-time. Travelers want the ability to stay connected while going from Point A to Point B – they want to be informed of all modes and all options (mode choice, travel time, cost, reliability and more). The following strategies are similar in nature and all have one responsibility: informing the public. This includes anything from trip planning, congestion avoidance or weather alerts; all of which can impact a user's plans. Traveler information (in general) and the five strategies categorized under it, are strongly favored as viable and desired strategies that should be executed within the region. Transportation agencies, along with private, third-party vendors, work tirelessly to provide the most reliable information to the traveling public – an expected service from commuters.

Predictive Traveler Information

Predictive Traveler Information uses data from multiple sources that has been fused together to create a comprehensive picture of current traffic conditions. A special purpose algorithm is then applied to make short-term predictions regarding future traffic conditions. This information is supplied to drivers through a variety of information delivery techniques including roadside dynamic message signs, mobile applications and in-vehicle information systems.

This strategy improves the effectiveness of traveler information by informing drivers of conditions they are likely to encounter further along the highway, providing time for diversion and behavior adaption. The extra time bought by these predictions may also improve the performance of incident management systems. This strategy has been implemented by the land transport authority in Singapore using a specially developed algorithm from IBM. Central Florida's application of this strategy would include historical data and all stakeholders would be directly impacted, due to each agency disseminating travel time data to the RTMC and third-party applications and also receiving traffic volumes and other data to aid in the operation of their respected region.

Pre-Trip Travel Information

Pre-Trip Travel Information utilizes data from multiple sources, used together, to create a comprehensive picture of current traffic conditions. A range of information delivery techniques is then used to deliver information to regional travelers. In this particular instance, smart phones, interactive voice response and web-based systems are used to provide information before travel.

According to FHWA, pre-trip traveler information is being provided within the context of 511 system deployments in more than 30 states. In addition, third parties already provide this service to some level. Florida already offers traveler information support via the 511 system, where users can hear travel information for specific routes or even receive phone, text or e-mail alerts about incidents. Delivering quality traveler information at the pre-trip stage allows maximum flexibility in terms of travel choice of route, mode and timing of the journey. This significantly improves traveler decision-making, making the best use of current transportation capacity in the region.

En Route Driver Information

Smart phones or in-vehicle information systems are used to provide driver information during the course of the journey, known as En Route Driver Information. Roadside dynamic message signs can also provide en route driver information on a more limited basis. The driver information is based on data from multiple sources fused together into a central database. This data is packaged into meaningful information and delivered to drivers. There is significant private sector involvement in the delivery of information to drivers in vehicles and this forms part of the Connected Vehicle program.

Similar to pre-trip traveler information, en route driver information is being provided within the context of 511 system deployments with private sector entities, including

WAZE and Google who also provide this via smart phones on a nationwide basis. Delivering quality traveler information en route allows drivers to improve decision making. This would optimize the use of the transportation network, making the best use of current transportation capacity in the region.

Route Guidance

Smart phones and in-vehicle information systems are used to provide turn by turn driving directions to enable drivers to get from origin to destination. Guidance is based on a centralized navigation database, digital maps and often takes into account current and prevailing traffic conditions. This is already being provided through Google and presently, many cars come standard with navigation systems.

Maintaining and improving traveler information is important to all of the District 5 stakeholders because the more informed the traveling public is, the less delay occurs and the more traffic continuously flows. Many of the region's stakeholders are willing to pump data to and from their own TMC or databases to aid in the transportation of information to end users.

DYNAMIC RIDESHARING (D-RIDE)

D-RIDE makes use of information management systems to precisely match the supply of rides to the demand for rides. This enables travelers who wish to ride share to gain access to information on the possibilities.

D-RIDE helps with the challenge of providing cost-effective transit in major US cities, including Orlando. By increasing vehicle occupancy, more highway capacity can be utilized, and by minimizing the number of duplicate trips being made by single occupancy vehicles, demand can be managed. This could be of particular relevance during the construction period for the I-4 Ultimate project.

There are numerous examples of ridesharing systems supported by the public sector across major cities in the USA. These include the commuter project in San Francisco, the Los Angeles smart traveler project, the Bellevue smart traveler project in Washington State and the Sacramento area real-time ridesharing matching project. There is also significant private sector activity in this area, and currently, the most prominent example of this is UBER and LYFT.

Many agencies within this plan support the idea of ridesharing to meet the demands of travelers. UBER and LYFT has been used for the "first" and "last mile" in terms of the transit system. In particular, the City of Altamonte Springs and other Cities have begun to offer local subsidies to encourage the use of SunRail within their jurisdictions.

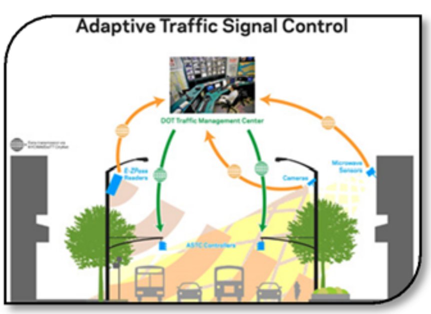
In addition, local taxi companies are developing applications to become competitive with Dynamic Ridesharing. Although this is more of a private sector dominated technique, transportation systems will reap the benefits from having more options for end users and moving these goods and people more efficiently. The "first/last mile" is a perfect example of how the public sector can remain competitive as well and provide optimum customer service for all avenues of travel.

DYNAMIC WAYFINDING

Dynamic Wayfinding uses smart phone technology that displays icons and information in an easily understood format which can be superimposed on the smart phone screen, enabling the user to access information regarding service possibilities in the locale or to be provided with navigation instructions to get to a specific destination. This technology is typically used in large convention centers, hotels and hospitals, where the strategy truly optimize user experience. District 5 can mirror this strategy through a transportation lens by providing data for other route guidance and navigation strategies to provide a comprehensive end-to-end solution to guide and support travelers from original origin to final destination.

TRAFFIC CONTROL

Traffic Control involves directing vehicular and pedestrian traffic through various routes within a transportation system or around a construction zone, incident or other road disruption; thus ensuring the safety of emergency response teams, construction workers and the general traveling public. Traffic and ITS technologies like CCTVs are used to monitor traffic, manage traffic flows and advise concerning traffic congestion. Below are two strategies that aid in the traffic control of arterials.



Adaptive Signal Control

Adaptive Signal Control responds more intelligently to fluctuations in traffic patterns by utilizing sensors for traffic data, and specially developed algorithms that then take the traffic data and derive signal timings that are customized to the prevailing conditions. Traffic signal timings adapt continuously to the changes and fluctuations in traffic flows, optimizing the control of traffic along corridors. These systems can account for changes in traffic speeds due to severe weather or unique situations.

According to NCHRP Synthesis 403 "Adaptive Traffic Control Systems: Domestic and Foreign State of Practice," there are more than 25 major implementations of adaptive traffic signal control in the United States. These include Orange County, Seminole County and Volusia County in Central Florida. The adoption of this strategy has significantly improved traffic flow along major arterials in some instances, providing benefits in time and fuel savings and an enhanced user experience.

Transit Signal Priority

Transit Signal Priority (TSP) was developed to improve schedule adherence for transit agencies. TSP slightly modifies the existing timing plan at an intersection by "stealing" green time from movements with lower demand to allow qualified transit busses to pass through the intersection. TSP may extend or reduce the green time for the approach of the bus using the extra time taken from a conflicting movement. Additional sensors are installed at traffic signals that sense the presence of transit vehicles. These transit vehicles are given priority to pass through the signalized intersection. Such systems can also take a count of the number of people on board the transit vehicle and the current schedule status of the transit vehicle before deciding if priority should be granted. Some systems require the installation of an in-vehicle unit on the transit vehicle.

Much like Central Florida's Adaptive Signal Control system, the local region has also implemented TSP. This strategy should not be confused with Traffic Signal Preemption, which is a system that allows the normal operations of traffic signals to be interrupted and altered, typically to accommodate an approaching emergency vehicle, to help reduce emergency response times and improve traffic safety at the intersection. TSP is similar, but is focused on the transit side, while pre-emption is focused on first responders within the transportation system.

Overall, TSP increases the attractiveness of transit to regional travelers. Wide scale adoption of this strategy can increase trip time reliability for transit vehicles and the passengers on that mode choice. This influences travelers' decision-making with respect to mode of travel. It is also noted that sometimes TSP cannot fix certain corridors – at the end of the day, sometimes there are just "slow routes" that may take longer than usual every time unless bus density is increased. TSP may also impose a negative effect to the traffic signal system as a whole; when TSP "steals" the green movement seconds from another phase, it alters the overall signal timing as the system takes a few minutes to get back to normal operations. Generally speaking, the positive benefits stemming from TSP do outweigh the negative.

INCIDENT MANAGEMENT

Incident Management supports the detection, verification, clearance and traffic management associated with incidents on freeways, expressways and arterials. This strategy uses CCTV, traffic sensors, telecommunications and centralized command to control a regional traffic management center. Incident management has a significant effect on the operational efficiency of roadways. Continued adoption of this strategy will be critical to the management of both recurring and nonrecurring congestion in the region. With the onset of TSM&O initiatives promoting active arterial management and incident management on the arterials, this strategy has adopted/birthed some of the technologies and strategies discussed throughout this document. Incident management strategies have re-shaped the operations of state roadways over the past few decades; specifically, the freeway system.

Incident management uses operators stationed in a RTMC or local TMC that identify non-reoccurring active traffic incidents such as vehicle crashes, disabled vehicles and severe weather through the use of roadside detectors and camera surveillance. Upon detection of an incident, the operators are instructed to follow a pre-developed set of standard operating guidelines (SOG) to notify the appropriate first response agencies (i. e. Fire, Police, etc.). In addition, not only are the emergency first responders notified, but the traveling public is also notified via the ITS traveler information system (i.e. HAR, DMS, FL 511, etc.). The technologies and strategies utilized by these programs have drastically improved incident response practices and incident clearance times. Statewide, the average roadway clearance times on freeways have been cut almost in half since the inception of incident management.

Overall, incident management has shown significant savings in terms of reducing unnecessary delay, idling, fuel consumption, automotive gas emissions and secondary crashes. Currently, incident management operations along Florida's freeways are recognized at the highest level throughout the nation. As stated earlier, up until just recently, these practices were limited to the state's freeways. However, with the advent of ICM, which recommends that all types of roadways work to balance traffic within a region, the desire to bring incident management to the arterial corridors is growing – hence the new AAM projects in District 5 currently underway and additional similar projects scheduled within the work program over the next five years.

TRAVEL DEMAND MANAGEMENT

Travel Demand Management encompasses a range of techniques designed to influence traveler behavior by either reducing the demand for travel or spreading the demand in space and time. Travel demand management techniques include congestion pricing, ridesharing, development of transit alternatives, promotion of non-motorized transportation such as cycling and pedestrian activities, telecommuting and land use management.

In most major US urban areas, this is usually performed under the auspices of the MPO. In order to accommodate future growth and transportation demand, it will be necessary to consider travel demand management strategies in addition to capital investment programs. This tactic is thoroughly supported among the stakeholders, since these agencies are able to influence the choices of the travelling public. Mode choices normally overlooked may be advertised in such a way that those options truly are viable options. Bike Share and/or Car Share Programs would also be included in this strategy.

EMISSIONS TESTING AND MITIGATION

Emissions Testing and Mitigation is truly about traffic and the emissions expelled from idling vehicles. There are emissions sensors to determine traffic conditions and emissions levels in the vicinity of roads and highways. Based on this data, algorithms are used to re-route traffic, change traffic signal timings and assist in distributing emissions. These systems can also identify high emitting vehicles and provide information to fleet operators to enable them to tune the fleet. Emissions and fuel consumption go hand in hand and can be used to measure the effects of traffic, particularly on arterials where acceleration and deceleration are more variable – providing the Central Florida region with a more effective arterial traffic management system. Pinellas County in Florida has implemented air quality management as part of their ATMS.

HIGHWAY RAIL INTERSECTION

Highway Rail Intersection is the application of advanced technologies to improve safety of at-grade highway intersections. This strategy incorporates a number of techniques to improve the safety of the interface between the railroad and a highway. For example, an automated enforcement system using sensor technology and high-resolution CCTV cameras can be used to enforce when the barriers are closed. Vehicle proximity alert systems can also be used to warn drivers about the impending arrival of a train. Positive train separation techniques can also be used to automatically detect obstacles ahead of the train and apply brakes automatically. Variable message signs can also be used to warn drivers that a second train is approaching.

This particular strategy has specific relevance to the Central Florida region with regards to the new SunRail system that has been constructed through the region and encompasses a considerable number of at-grade crossings. Unfortunately, SunRail has had some incidents at crossings and the safety of these at grade crossings could be improved by the application of the techniques encompassed by this strategy.

PUBLIC TRANSPORTATION MANAGEMENT

Public Transportation Management has come a long way in the past decade or two due to the use of transit-based ITS. A regional goal is to expand the role of transit within the District and make it a clear mode choice that is advantageous for commuters to utilize; benefitting the overall transportation system. More seats filled on busses, and other means of transit, results in less personal vehicles on the arterials and freeways, thereby reducing congestion. Increasing transit based ITS, such as Automatic Vehicle Location (AVL) and Automatic Passenger Count (APC) systems, in conjunction with TSP, would improve the travel time reliability, which could result in greater ridership. Quite possibly the two most significant advancements in transit technology of recent decades, AVL and APC systems, enable transit agencies to much more efficiently track the activity of their busses. A quick description of the two systems is provided below:

- **AVL –** Uses standard GPS technology to monitor vehicle locations, which allows transit agencies to more efficiently monitor schedule adherence and provide accurate estimated arrival times to users based on predefined check points the bus must pass to follow its route. This information is pivotal to determining whether a bus should be allowed to activate TSP or similar systems, and to assist in identifying more critical routes used by the public.
- **APC –** Allows transit agencies to track active ridership on any of their equipped vehicles.

These strategies are widely favored by the transit agencies within the regions and the government agencies that help to support these groups within the District. If stakeholders have identified this as a possible “No” or “Maybe,” it would be within the context that they may not have any role of providing travel time data to aid in the implementation of these strategies.

Dynamic Transit Capacity Assignment

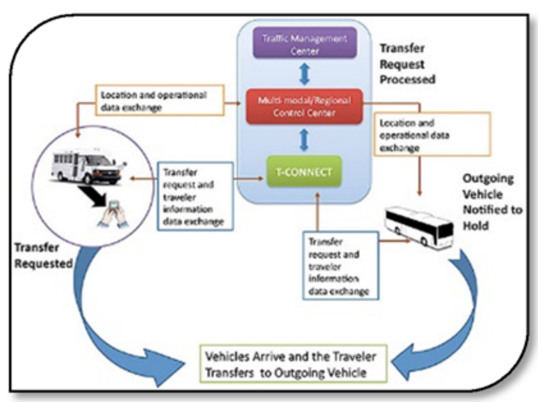
Dynamic Transit Capacity Assignment is where data is collected regarding the performance of the transit fleet and real-time demand for transit. Information management systems are then used to optimize schedules and aid in the assignment of transit vehicles based on current transit demand. This enables the transit operator to reconfigure the assignment of vehicles and drivers to address the areas of the network with peak demand, while maximizing the number of passengers on each vehicle. While this would help regional transit operators to optimize the use of vehicles, reduce operating costs and maximize the user experience; the transit industry would need to stick to minimums and not exceed maximums in terms of number of buses in order to keep reliability dependable.

Dynamic Fare Reduction

Dynamic Fare Reduction utilizes sensors to monitor traffic and transportation conditions along the corridors. In times of high congestion for private vehicle traffic, the transit fares along the corridors are reduced to encourage a switch from private vehicles to transit. Traveler information systems communicate this fair change to the traveling public. Passenger counters and other sensors are used to establish the occupancy of transit vehicles to ensure that sufficient spare capacity exists to accommodate the anticipated shift.

As part of an ICM implementation, this strategy would make transit more attractive along regional corridors in Central Florida. It would also provide transit operators with the flexibility to adjust vehicle assignments to optimize operations and costs. This strategy is noteworthy but in instances where counties and MPOs drive the cost of fares, it would need to be considered by those institutions before a definitive decision is made whether to implement this strategy.

Transfer Connection Protection



Transfer Connection Protection helps to bring transit operations together as a single system by recognizing the need for travelers to make connections between routes. Travelers can request protection for their connection either using a smart phone or using onboard equipment on a personal automobile or a transit vehicle. Fleet information systems are then used to ensure that if the initial service is running late, that any subsequent services have an option (for a fee) to be delayed to allow the travelers to make the connection successfully.

Within recent stakeholder meetings, it has been noted that this may not be the best strategy due to the fact that it may not be feasible to have an entire bus waiting on a single person. However, in the case of connection points for the overall bus, it may make more sense.

Transit Traveler Information

Similar to Traveler Information, Transit Traveler Information's goal is to inform the public, specifically the transit schedule and updates. Equipment on board the transit vehicle enables travelers to gain access to information regarding the current transit stop, upcoming transit stops and real-time transit schedule information. The system can also be extended to provide traveler information at bus stops and for pre-trip through the use of kiosks or web-based delivery systems. This strategy also increases the attractiveness of transit use and could influence the modal split in favor of transit within the Central Florida region.

Queue Jump

Queue Jumping uses separate lanes (for example, a right turn lane) and signals (similar to designated bus lanes) to allow only a bus to proceed through the intersection, thus "jumping" past other vehicles. This would be a transit-specific strategy to aid in the reliability of on-time arrival and reduce route travel time delay.

PERSONALIZED PUBLIC TRANSIT

On Demand Transit

On-Demand Transit, or personalized public transit in simplified terms, occurs when vehicles do not follow fixed routes and passenger trips are generated by reservations from passengers to the transit operator who then dispatches a vehicle. The transit operator will make use of information management systems to attempt to optimize the number of passengers picked up on each trip. Passengers may use telephone, web-based or smart phone applications to make reservations and requests for travel. This strategy is particularly relevant to passengers that are not able to use conventional transit systems, such as elderly travelers heading to medical appointments. Private services such as SuperShuttle and Uber can be considered as on-demand transportation services, both of which are available nationwide.

This strategy could be useful for off-peak transit services in the Central Florida region. While transit operators already operate paratransit services, these could be extended to wider application. Many agencies within the region can see great potential for the "first/last mile" within the transit system and is generally favored as a plausible strategy.

PUBLIC TRAVEL SECURITY

Public Travel Security uses ITS technologies such as video feeds, sensors, telecommunications, command-and-control, etc., working together to increase the level of travel security for the traveling public. Sensors monitor roadways, structures, transit facilities, transit vehicles, transit stations, parking lots, bus stops and generate alarms either automatically or manually when necessary. District 5 currently has a project that will upgrade a security system that monitors the St. John's River Bridge.

Many stakeholders agree upon the need for this strategy. It is viewed as a necessary tool to keep transportation infrastructure and the community safe. The reason why this needs to be implemented could easily be tied to a benefit-to-cost ratio: the amount of money saved from stolen or damaged infrastructure would provide a positive return on investment. CFX already implements this strategy through the monitoring of expressways and toll plazas; monitoring authorized versus unauthorized contractors or notifying Road Rangers when cars have broken down on their system.

ELECTRONIC PAYMENT SERVICES

Electronic Payment Services make it stress-free and expedient to pay for transportation services. With the onset of smart phones and digital payment systems at people's fingertips, the transportation industry has also implemented electronic payments for travelers on the go. Two services that aid in this are: Regional Payment Systems and Electronic Transit Ticketing.

Regional Payment System

A Regional Payment System enables regional travelers to pay for transit tickets, tolls and parking fees without the use of cash. The system is an integrated, interoperable electronic fare payment system that can be utilized by all modes at all times; making it easier and convenient for travelers to use. Transportation agencies benefit from simplified transactions, streamlined revenue collection, improved efficiency and lower transaction costs. Electronic payment devices such as smart cards or smart phone applications enable travelers to pay for a range of transportation services. The electronic payment services are managed by a central back office that manages the transactions and also handles clearance to ensure that the service provider receives the appropriate fee.

Further research is needed to extend these systems across all modes and address interoperability. SunPass/EPASS is only implemented in a limited capacity (toll systems and parking payments) so there is much to consider to expand this strategy further into a seamless regional payment system.

Electronic Transit Ticketing

Electronic Transit Ticketing enables transit travelers to pay for transit tickets without cash. The transit tickets, used for rails and buses, can be on based on a case-by-case basis, weekly, monthly or even annually. Travelers are able to pay using a special smart card, credit card or smart phone.

Electronic transit ticketing would provide travelers in the Central Florida area with a higher level of convenience and customer service. Regionally, stakeholders identify the use of this strategy; electronic transit ticketing is a more efficient method of ticket entry, processing and marketing for companies in the railways, flight and other transport and even within entertainment industries. Other areas of the United States have implemented this strategy, most notably the Metro System in Houston, Texas.

Electronic Toll Collection

Regional toll road users can pay for tolls without the use of cash and without the need to stop at a toll plaza. Electronic toll collection system users establish a prepaid account with the relevant toll road operator and have a specially designed transponder sticker installed on the windshield of the vehicle. Vehicles can then pass through Express Lanes at toll plaza's obviating the need to stop. The prepaid account is linked to a credit card and automatic transfers are made by the back office. Alternatively, users can visit a customer service location and add cash to the prepaid account. Electronic toll collection has been implemented extensively in the Central Florida region through the EPass and SunPass systems on both the Central Florida Expressway Authority and Florida's Turnpike Enterprise.

Dynamic Pricing

Through electronic toll collection technologies, Dynamic Pricing takes this concept one step further by enabling the use of dynamic pricing on toll roads in the region. Pricing can vary dynamically based on time of day or sensors can be used to establish prevailing traffic conditions to drive the variation in tolls. In most cases, the objective of this strategy is to maintain the target level of service on the toll road. For instance, if traffic is moving slowly during Peak PM hours, tolling authorities may reduce pricing to encourage the use of an Express Lane (See the previous Managed Lanes Section). However, if the capacity of Express Lanes exceeds the intended use and speeds begin to drop, pricing is driven up to deter travelers from entering the Express Lanes.

Dynamic Pricing provides an additional demand management tool that helps with operational efficiency and preserving the customer experience. Several major cities in the United States implement dynamic pricing through the use of Express Lanes or Managed Lanes: Seattle, Atlanta, Houston and Miami. The I-4 Ultimate PPP project, currently under construction with anticipated completion in 2021, will have Express Lanes that will dynamically change pricing. This strategy is ultimate a congestion management strategy first and a revenue generation strategy second.

While Dynamic Pricing is currently implemented within this region, how far it reaches remains up for debate. Some agencies may not see an actionable use for this due to only having arterial roadways or, perhaps if dynamic pricing eventually transferred to arterial corridors, there are potential benefits to both owners and travelers.

Demand Pricing

Another form of electronic toll collection is Demand Pricing. This is a fee or tax paid by users to enter a restricted area, usually within a city center, as a part of a demand management strategy to relieve congestion within that area. Travelers would simply pay a fee if they reach within a certain radius of the area of restriction. In most cases, the objective of this strategy is to relieve congestion within the restricted area; not only for traffic, but for parking as well.

This strategy could be used to deter drivers from entering metropolitan areas during major events or during peak hours of the day. It would encourage users to park and ride into these restricted areas – by effectively getting travelers to ride into the controlled area, rail systems and transit can ultimately benefit. Demand Pricing can be found in London, Singapore, and Stockholm. There is much validity in this strategy due to the nature of it discouraging high levels of traffic and promoting transit services - a truly integrated multi-modal system. However, many stakeholders do not view this as a tool within Central Florida’s tool box at this time.

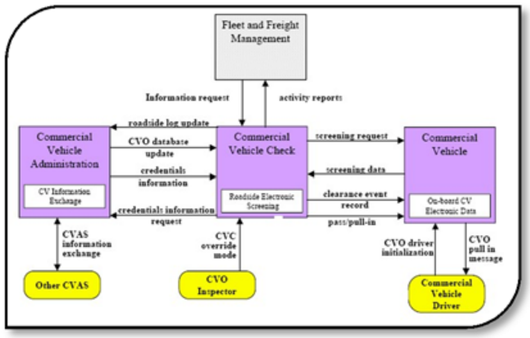
Corridor Pricing

Electronic toll collection and dynamic pricing can also be extended to cover other modes of transportation along the corridor. In addition to tolls being varied by time of day or by prevailing traffic conditions, transit fares could also be varied and parking fees could be varied in order to conduct demand management. This tactic provides the ability to create a balanced approach to operations and management of corridor facilities across multiple modes. It also helps to ensure that the users or travelers get the maximum value for their money by supporting optimized transportation operations. No current implementations are identified so far and additionally, nearly 1/3 of participants did not view it as a viable option at this point with so many other agreeable options (dynamic pricing). On the hand, some stakeholders do acknowledge this strategy in their Master Plans and Long Range Transportation Plans.

COMMERCIAL VEHICLE OPERATIONS

Commercial Vehicle Operations is an application of ITS for freight. Trucking companies install satellite tracking systems in order to receive signals and know where a truck has traveled. This information goes back to a central office where dispatchers can aid operations by directing truck drivers to better routes during heavy congestion, for example. Strategic ITS devices aid commercial vehicles in their on-time delivery goals. Systems let the ITS devices, dispatchers and drivers collaborate on finding the best route possible, or a technique to move the load. One special value is that the computer can automatically eliminate routes over roads that cannot take the weight of the truck, or that have overhead obstructions. Freight logistics is very competitive across the country and forces businesses, carrier companies and transportation to research ways to cut costs, create safer conditions and improve service.

Generally, rural counties/cities along with agencies overseeing large amounts of freeway systems see the value in the following six (6) ITS applications for commercial vehicles. These systems allow for ease of inspection and monitoring of freight. Urban areas support these strategies although they may not have a large role within these applications if they are more of a destination for freight traffic. Two strategies that particularly stood out included On-Board Safety and Security Monitoring and Hazardous Materials Security and Incident Response.



Commercial Vehicle Electronic Clearance

Pre-screened truck drivers are entitled to equip their vehicles with an electronic transponder. This allows enforcement personnel to automatically check safety, credentials, size and weight of the vehicle prior to inspection site locations. This strategy reduces operating costs for truck companies while reducing the resources required for enforcement. Given the strategic importance of freight movement within the state of Florida, the strategy would be relevant in assisting more cost-effective freight operations. A commercial vehicle electronic clearance program known as Pre-Pass is currently available at more than 300 facilities in 30 states.

Specific applications to the FDOT District 5 area include Commercial Vehicle Electronic Clearance for inspections of these vehicles during special events at the Amway Center. In addition, FDOT already regulates freight entering managed, or Express Lanes, depending on their weight by reading truck information from the transponder.

Automated Roadside Safety Inspection

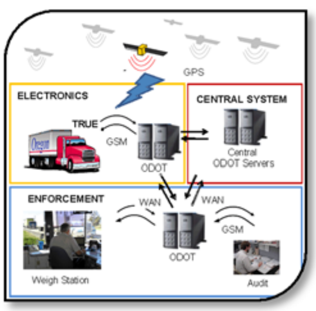
Automated Roadside Safety Inspection makes use of data from the commercial vehicle electronic clearance applications and enables more selective and rapid inspections of freight vehicles and goods. Sensors and diagnostic equipment are used to check vehicle systems and driver requirements. For instance, automated inspection equipment can be implemented to remotely test commercial trucks for faulty equipment, such as non-functioning brakes. Although there are no current implementations identified so far, this strategy could potentially reduce operating costs for trucking companies while reducing the resources required for inspection.

Weigh-In-Motion is another technology for determining the weight of a commercial vehicle without requiring it to stop on a scale – an automated inspection technique that is used and the beginning to a more comprehensive Automated Roadside Safety Inspection approach. There are currently 10 Weigh-In-Motion stations in Florida.

On-Board Safety and Security Monitoring

On-Board Safety and Security Monitoring is a tool that can inform truck drivers if an unsafe situation arises during operation of the vehicle. Through on-board sensors, continuous monitoring of the system allows for safer trips. This alert system can monitor cargo, alert drivers of potentially unsafe circumstances, address driver fatigue, problems with vehicle systems or issues related to the cargo on board the vehicle. Similarly, if an incident were to occur, on-board alerts could be sent back to the central back office to notify them of the occurrence and disseminate that information to first responders more quickly.

Ultimately, this strategy reduces operating costs for truck companies through accident and incident reduction. Given the strategic importance of freight movement within the State of Florida, the strategy would be relevant in assisting more cost-effective freight operations. However, the major role would lie with truck operators and not local transportation agencies.



Commercial Vehicle Administrative Processes

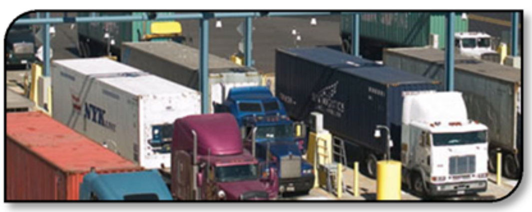
Commercial Vehicle Administrative Processes is an information management system used to streamline the processes through which carriers purchase credentials. Processes consist of all activities and transactions that must take place in order for commercial vehicles to legally operate on the nation's roadways. This application also allows carriers to electronically report vehicle registration, carrier operating authority, fuel tax registration, permitting and mileage reporting. FDOT is implementing this strategy as a part of their commercial vehicle information systems and networks program.

This strategy reduces operating costs for truck companies while reducing the resources required for commercial vehicle administration. Given the strategic importance of freight movement within the State of Florida, the strategy would be relevant in assisting more cost-effective freight operations.

Hazardous Materials Security and Incident Response

Hazardous Materials Security and Incident Response is established and managed using a centralized hazardous materials database, which tracks sensitive security hazardous materials shipments. If a freight truck is involved in an incident, emergency personnel can be notified prior to arrival at the scene that hazardous materials, or “HAZMAT” for short, are involved and the appropriate safety measures can be done prior to exposure. In the past, first responders would show up to an accident, find out hazardous materials were involved and notify the correct personnel to assist in containment of those substances – sometimes exposing first responders to dangerous supplies.

HAZMAT Security and Incident Response supports a more effective incident management when hazardous materials are involved and given the level of freight movement across the State of Florida, this strategy has great relevance to the FDOT District 5 area. The question remains as to who would maintain this database. The Hazardous Materials Information Resource System (HMIRS) is a Department of Defense (DOD) automated system developed and maintained by the Defense Logistics Agency. HMIRS is the central repository for Material Safety Data Sheets (MSDS) for the United States government military services and civil agencies. It also contains value-added information input by the service/agency focal points. If the Department of Defense has already implemented this application, the demarcation points would need to be clearly defined. Overall, this strategy is favorable (due to the advancement of safety precautions).



Freight Mobility

Freight Mobility connects drivers, dispatchers and intermodal transportation providers to enable them to take advantage of real-time traffic information, vehicle and load location, in order to optimize operations. FRATIS, or Freight Advanced Traveler Information Systems, ties into freight mobility. It consists of three applications that can provide operational solutions for moving vast quantities of goods through highly urbanized areas. FRATIS is currently in the development phase of three applications by the FHWA and the ITS Joint Program Office:

- **Freight Real-Time Traveler Information with Performance Measures** – Enhances traveler information systems to address specific freight needs and increase their use and effectiveness;
- **Drayage Optimization** – Optimizes drayage operations so that load movements are coordinated among freight facilities – maximizes productive moves and seeks to eliminate unproductive ones;
- **Freight Dynamic Route Guidance –** Utilizes real-time traveler information to provide best route options between freight facilities for carriers.

This strategy is being implemented in many of the states in the U.S. that have a significant freight movement pattern. In Florida, the office of freight, logistics and passenger operations has led to the development of a freight mobility and trade plan for the state. Freight mobility has an extremely high impact on the efficient operation of freight activities. The state has significant freight activity emanating from the ports forming a significant component in the state economy.

EMERGENCY MANAGEMENT

There are multiple ITS strategies and technologies that can be used before, during, and after emergencies (i.e. natural disasters) to facilitate the movement of residents and necessary resources into and out of the affected area. Strategies such as dynamic signal retiming and reversible lanes help optimize evacuation activities as demand on the transportation system fluctuates and information dissemination practices allow traffic operation's staff to inform travelers of an alternative routes. Many strategies throughout this section aid in emergency preparation, security, response and recovery. Three applications are highlighted below that specifically address emergency management. The application of appropriate ITS with sufficient staffing resources to operate them can significantly lower evacuation times and enhance safety along the roadways in the event of an emergency.

Stakeholders within the District 5 region agree on the importance of overall transportation safety and the importance of efficient emergency management practices. Those agencies shown as "maybe" or "no" within the stakeholder matrix are marked that way simply because they won't have an actionable role accomplishing these strategies.

Emergency Notification and Personal Security

Emergency Notification and Personal Security enables travelers to notify appropriate response personnel regarding the need for assistance due to emergency or non-emergency situations. Notifications can be initiated manually or automatically based on data. This strategy also includes threat alerts to secure areas and wide-area alerts to inform the public in the case of an emergency.

Emergency notifications and private security systems have been implemented in many locations across the U.S. The most notable implementation comes from the private sector in the form of the General Motors OnStar system. This enables drivers of suitably equipped vehicles to summon assistance in the event of an emergency and obtain access to concierge information services in non-emergency situations.

This application is particularly appealing due to the amount of visitors that come to Central Florida. They have very little or no knowledge of the area and therefore during emergencies may miss out on critical moments just trying to find a hospital. Instead, this ITS application can notify the correct authorities to respond more quickly. Another benefit is the use of this for severe weather alerts due to Florida's subjection to hurricanes and other natural elements. Again, this could also be used for transit as well. Agencies could have supportive roles, tied to the network and able to alert the proper authorities when incidents do occur.

Emergency Vehicle Management

Emergency Vehicle Management reduces the response time to incidents for emergency responders by making use of automated vehicle location and computer-aided dispatching technologies. Unlike Opticom, where signals pick up sensors from emergency vehicles and turn lights green to allow those vehicles to move through intersections easily (i.e. move the affected signals "out of step"), this application would open a certain corridor or pathway to the incident by turning the entire pathway green. Therefore, emergency vehicles can flow relatively seamlessly to an incident.

This has been implemented by a large number of fire, police and ambulance services across the country. This strategy would form part of an overall incident management program for the region; which is a goal for the area. Central Florida already has an incident management coalition and the activities of this group could be reinforced by emergency vehicle management systems that improve the efficiency of emergency management services in vehicle dispatch. It should be noted that the software driving this application is fairly expensive.

Disaster Response Evacuation

Disaster Response and Evacuation uses ITS to enhance the ability of the surface transportation system to respond to disasters. The user service provides enhanced access to the scene for incident response personnel and resources via smart phones or in-vehicle instrumentation. It provides better information about the transportation system within the vicinity of the disaster and provides more efficient and safer evacuations for the general public, if needed. In addition, the transportation system includes a wealth of trained professionals and resources that constitute a portion of the disaster response. The use of this technology through this lens is to prioritize, allocate and track these personnel and resources; providing a more effective response to disasters. Not only would these responses be more efficient, ITS solutions to disaster response and evacuation would help minimize confusion to the traveling public during a stressful event such as a hurricane evacuation.

There are no current implementations known, but Florida deals with an abundance of natural disasters due to hurricanes and tornados. Hurricane evacuations alone take an enormous of amount of preparation and coordination between multiple agencies, let alone adding a transportation network moving people to safety. Stakeholders are on board with this application due to Florida’s disasters and truly, to have a fully ICM approach, this tactic must be included because this region must address these concerns.

ADVANCED VEHICLE SAFETY SYSTEMS

Connected Vehicles

USDOT defines Connected Vehicles Technology as *“The development and deployment of a fully connected transportation system that makes the most of multi-modal, transformational applications requiring a robust, underlying technological platform. The platform is a combination of well-defined technologies, interfaces, and processes that, combined, ensure safe, stable, interoperable, reliable system operations that minimize risk and maximize opportunities. A successful platform will be developed through a process of thorough and considered research while meeting a set of rigorous criteria: The platform will allow for growth, expandability, and incorporation of newly evolving technologies. In knowing the architectural configuration and definition of interfaces, creative private-sector firms will be able to develop new applications that are not yet envisioned but remain for future imagination. And finally, the platform will be developed based on the complexity and range of human behaviors that will interact with and impact upon the system. For the ITS Program and its partners to deliver such a platform, further research is needed in the creation of standards for interoperability; security of the system; strategies that address the complexity of human behavior and risks associated with the driver's workload; and processes that define how travelers and equipment become a certified part of the system. Other technical research will also be pursued to identify and resolve technological limitations with positioning, scalability, and other technical issues.”*

The above definition is alluding to a paradigm shift within the transportation industry fueled by technological advances and the ability to provide safer, more efficient options for daily commuters. It was during the 1920’s when Ford created the assembly line and ultimately mass produced the automobile that formed a pivotal invention at the time – cars over horse buggies. Shortly after, during the 1940’s, Eisenhower built the interstate system after witnessing the notable benefits from having a roadway system, like the Autobahn, connecting far-spaced regions. It cannot be argued that the advent of Connected Vehicle technology will alter many of the aspects that comprise a transportation system. Florida is eager to join in the preparation for this initiative and is currently making strides to be at the forefront of these history-making changes with the end result being Connected and, ultimately, Autonomous Vehicles.

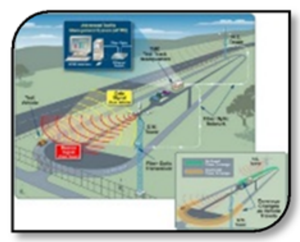
Please see the following section for additional information regarding Connected Vehicles.

The following ITS strategies, filed under Advanced Vehicle Safety Systems, are all strategies that play significant roles in the context of Connected Vehicles and can certainly be strived towards regionally. However, it should be noted that since the role of public agencies is still being resolved with regards to Connected Vehicles, particularly as they relate to in-vehicle functions, all stakeholders responded "No" to these strategies. That was not because they did not like the strategies; only because their role is not clear. Upon clarification of their role, most (if not all) agencies would likely change their response to "Yes."

In-Vehicle Information

In-vehicle Information involves the delivery of information to drivers using Connected Vehicle technologies. The Connected Vehicle technologies can either be dedicated by short range communications between the vehicle and the roadside or wide-area cellular wireless technologies. The information content delivered to the driver is likely to come from private sector information providers working in cooperation with automotive suppliers. In-vehicle information allows different messages to individual drivers and enables drivers to have access to quality information to enable decisions regarding traffic condition, routes and other service availabilities.

Probe Vehicle Data



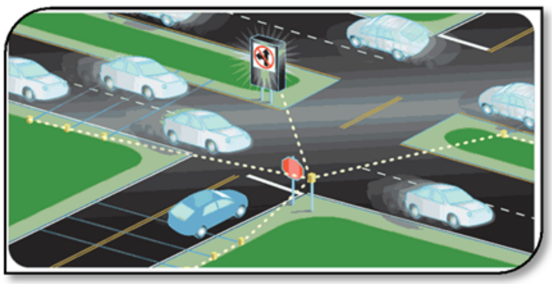
Probe Vehicle Data makes use of Connected Vehicle technology to extract data from the carrier network and make it available to a central location. The data can range from instantaneous vehicle speed, vehicle location and vehicle identification to extremely detailed information regarding the performance of the engine, the vehicle and the driver.

Longitudinal Collision Avoidance

Longitudinal Collisions Avoidance, also known as adaptive cruise control, employs sensors on board the vehicle to detect the current speed and the distance between the users' vehicle and the vehicle ahead. The system can either generate an alert or automatically apply the brakes to maintain a safe distance.

Lateral Collision Avoidance

Lateral Collision Avoidance utilizes technology on board the vehicle to warn the driver of a lane departure that might lead to a collision. Sensors on board the vehicle detect the lane and detect the presence of other vehicles. Alerts can take the form of an audible tone or vibration of the steering wheel. This tool is promising when applied to the transit industry, ensuring safety from other cars or curb-running, which is when buses hit curbs on tight turns, damaging costly equipment.



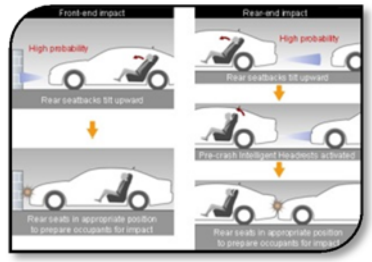
Intersection Collision Avoidance

Intersection Collision Avoidance employs high-speed wireless communications, roadside and in-vehicle technology to warn drivers of any potential conflict at intersections. For example, a driver approaching an intersection too fast to stop as the light turns red can be detected, and an appropriate accident mitigation strategy can be implemented, such as turning the lights all red or extending the green for the driver's approach. Although this strategy is the subject of a research program currently funded by the FHWA, this is particularly relevant to arterial traffic management, which is an important element in the Central Florida transportation network. Due to the need for cooperation between roadside equipment for traffic control and on-board vehicle equipment, it will be necessary for local agencies to work together with automotive suppliers and manufacturers.

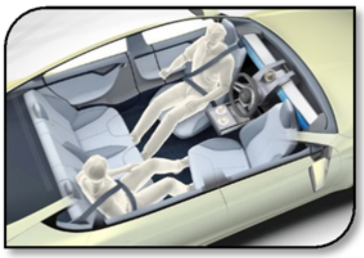
Vision Enhancement for Crash Avoidance

Vision Enhancement for Crash Avoidance employs night vision and heads-up displays installed in advance to improve driver vision by technological enhancement. This strategy within connected vehicles technology is specifically appealing to rural areas, where wild animals can venture into roadways and cause crashes. Applied within urban or downtown areas; pedestrians can better be identified in the evening.

Pre-Crash Restraint Deployment



Pre-Crash Restraint Deployment makes use of on board sensors to anticipate vehicle crashes by measuring the angle of the steering wheel, vehicle wheels and the status of the brakes. If the crash cannot be avoided, actuators will automatically deploy additional restraints to mitigate damage to the vehicle and the passengers.



Automated Vehicle Operation

Automated Vehicle Operation, or Autonomous Vehicles, enables vehicles to be operated autonomously with no human intervention. This is the ITS Master Plan's "end goal" in terms of selecting strategies that can be done presently in preparation for autonomous driving. The possibilities would be endless and would enable autonomous demand actuated transportation services using a fleet of autonomous vehicles. Transit operations of busses could be done autonomously; saving labor costs. Safety is the primary driving factor for implementing such a strategy. Every major vehicle manufacturer with a presence in the US market is currently working on an autonomous vehicle program, as well as Tesla, Apple and Google. In addition, an autonomous vehicle testbed is being established on a Tampa Hillsborough County Expressway Authority toll road. Although this will be driven by the automotive manufacturers, the potential impact of autonomous vehicles, safety, efficiency and user experience make this a strategy that should be monitored closely by Central Florida transportation agencies.

The previous eight Advanced Vehicle Safety System strategies are currently being developed by every major vehicle manufacturer (private sector) with a presence in the United States automobile market, trying to establish their presence with regards to Connected Vehicle technologies. Connected Vehicle technologies will mainly be driven by the automotive manufacturers and their electronic suppliers. However, due to the usefulness of probe vehicle and in-vehicle data to improve local agency understanding of traffic conditions and the ability to deliver personalized in-vehicle information, this strategy is extremely relevant to the Central Florida region in upcoming years. It is likely that local transportation agencies will play a supporting role by encouraging automotive adoption of Connected Vehicle technologies, making use of data emanating from Connected Vehicle systems and providing additional contextual data that cannot be derived from the probe vehicle.

INFORMATION & DATA MANAGEMENT

The ITS systems presently in place in Central Florida, along with the addition of any of the many strategies discussed in this Master Plan, innately produce massive amounts of data. Data is often used for real-time operations and ultimately for performance measurement (discussed later in this section). There is a significant amount of resources focused on the topic of data – namely, how and when to obtain it and make sure it is accurate and reliable.

To actually share the data - or information received from ITS equipment - between the agencies, the first step is collecting all of the equipment already deployed and creating a database which is to be updated as new projects get deployed. Some TMCs may save this data, but few have the tools for sharing the data resources among other transportation groups or agencies within the same jurisdiction, or region. Even if the information is saved, industry experts are faced with the issue of making it useable information. Many transportation analysts and researchers struggle to obtain precise, dependable data about existing transportation performance and patterns.

Data Management addresses the concerns for dependable information and touches on how we store information more efficiently and collectively as a region. It is crucial that all of the local agencies work together to expand data sharing. Data sharing and the efficient management of it will allow the owner to reduce cost and ultimately benefit the transportation network user. The goal is storing and organizing data in such a way that it is searchable in order to run the necessary reports that make the data effective in phases such as transportation planning or present operations.

Data assists in the adjustment of operating policies, evaluating system performance, or making decisions about future transportation investments. The use of data management techniques such as big data and transportation data analytics are currently being studied by FDOT Central Office and by District 5. The following four ITS strategies are specifically related to data management. These approaches are widely accepted as applicable strategies that should be implemented comprehensively across District 5.

Archived Data

Archiving data is the process of moving data that is no longer actively used to a separate storage device for long-term retention. This data may be older information, but it is still important to a particular agency and could be used for future reference. Additionally, there are regulatory compliance laws regarding the retention of this information. This strategy recognizes the value of data that can be generated by ITS. In particular, data from transportation operations can be brought to a centralized location and used for performance management that can then be repurposed for future planning. Data is likely to be generated by multiple sources, including freeway management, traffic signal control, transit ticketing and electronic toll collection systems, among others. This strategy takes a look at the best way for data to be stored, named, shared, disseminated and easily accessible.

The volume of data transportation agencies see, store and have available within the Central Florida region is growing in leaps and bounds. Advances in data science help to reduce the cost of data storage and management. The region is also continuing to conduct performance measures, discussed later in this section, on transportation initiatives and develop results-driven investment programs. The use of data to show performance measurements and return-on-investments is an important element when it comes to determining and funding for future initiatives.

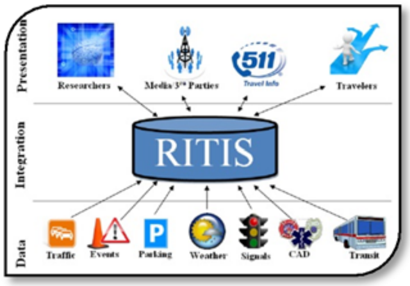
Big Data

Big Data makes use of data analytics where techniques have been developed beyond transportation to handle the emerging big data sets that transportation systems generate. The strategy involves a data platform technology to bring together multiple disparate data sets into a common format and location. This also involves the use of discovery tools to understand patterns and trends from within the data and develop new analytics for performance management and results driven investment programs.

Planners and engineers in Central Florida have observed that the application of Big Data techniques through the implementation of a Big Data Solution Center will yield substantial value to transportation planning and operations in the region. High-performance big data analytics, such as text mining, have the potential to generate significant value from data, providing answers and delivering a competitive advantage to decision-makers. Even information gathered from social media, electronic articles and third-party vendors are open sources of readily available information, and also maintain databases of user related information that can be accessed in real-time.

District 5 is currently working with local consultant firms for a Big Data Management Pilot Program. The purpose of this project is to demonstrate the usefulness and benefits of utilizing data analytics to analyze common issues within the traffic operations and transportation industry; and from this analysis, determine creative solutions. This pilot project will have consultants gather all required data, analyze existing data sources, process and clean the data and perform gap analysis with recommendations as to how to fill those gaps. This contract's purpose is to provide new insights into challenges that the industry has struggled to fully understand and combat.

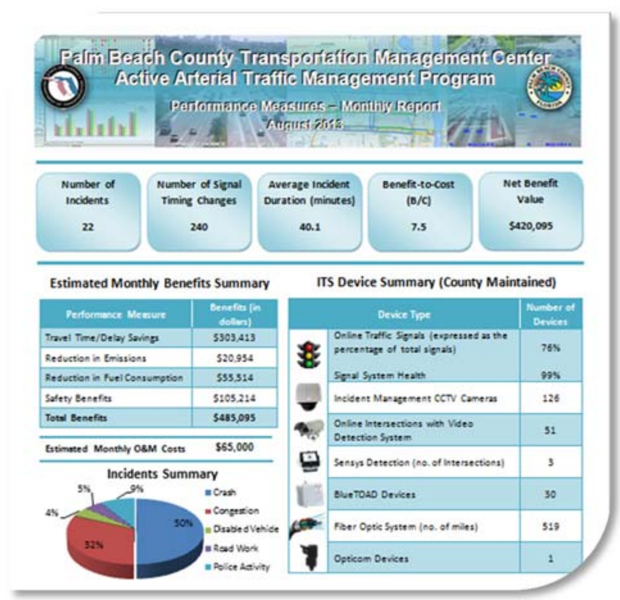
The information that can be derived from big data holds the power to revolutionize traffic operations and transportation planning. It holds the potential for the future adoption of scientific approaches to traffic engineering and transportation management. The importance of accurate, reliable data in transportation analyses is paramount to sound decisions in planning, designing, operating, and maintaining the transportation system.



Transportation Data Analytics

Transportation Data Analytics can be used to guide effective operations and planning within Central Florida. The University of Maryland has provided the use of a "Regional Integrated Transportation Information System (RITIS)" - an automated data sharing, dissemination, and archiving system that includes many performance measure, dashboard, and visual analytics tools that help agencies to gain situational awareness, measure performance, and communicate information between agencies and to the public. FDOT already sends their data to RITIS or other data gathering platforms. Between this already implemented strategy and the pilot Big Data initiative, data will receive the focus needed from multiple agencies in order to produce performance measures that quantitatively define how ITS benefits a region.

Performance Management



Performance Management, or Performance Measurement, is an important strategy that is heavily associated with system reporting. This strategy employs sensors to collect data regarding transportation system performance and reports back to a back office system to analyze performance, create reports and analytics. Performance measures are highly associated with ICM and AAM Programs due to the real-time nature of system management and the ability to report on effective or ineffective transportation management plans. The development of these measurements generally include:

1. Data Collection
2. Development of Baseline Plans
3. Establishment of Performance Measures

4. Establishment of Initial Performance Targets
5. Use of Real-Time Data Inputs (Travel Time, Incident Reports, Weather, Volumes, Freight, parking, Numbers of Devices, etc.)
6. Reporting and Analysis

It is important to note the last step in this process, Reporting and Analysis. Agencies create reports daily, weekly and monthly to report on how the transportation system is working and how effective transportation management has been performed. Some items these reports portray may include:

- System Benefits
  - Delay Savings
  - Emissions Reductions
  - Fuel Consumption Savings
  - Safety Benefits

- System Health (ITS and Signal System)
  - Device Operability
  - Device Up-Time/Down-Time
- Corridor Travel Time Reliability Measures
  - Average Speed
  - 95th Percentile Travel Time
  - Travel Time Index
  - Buffer Time Index

Once these items are captured over a certain period of time, it is important to analyze these performance measures/reports both quantitatively and qualitatively.

All transportation departments across the United States are currently planning or implementing performance management systems in reaction to the requirements of the MAP-21 legislation. The Central Florida region specifically has a considerable need to maintain the efficiency and effectiveness of our region’s transportation network. New data is becoming available that, when managed correctly and converted to information, can have a significant impact on operational effectiveness and future planning.

EVENT MANAGEMENT

Event Management is a strategy that appeals to all stakeholders because most agencies have events that take place within their limits. Events can wreak havoc on a transportation system due to the nature of an influx of vehicle and pedestrian traffic for a specific amount of time within a condensed area. Event Management, similar to how incident and active arterial management techniques perform, uses a combination of traffic control and traveler information techniques, along with parking management, to manage the flow of transportation during major events. Typically, this involves a traffic management center and an extensive communication network, link to sensors on the transportation network and staff directing traffic.

Working together as a region on how to address dissemination to the traveling public of how traffic management will be handled can create informed drivers who may opt for other mode choices (transit, SunRail, etc.) and/or have a clearer pathway to destinations. Because of this, there is a continuous need for excellence in event management and event parking. Transit ridership could also benefit from well-coordinated event management plans by encouraging alternate means of transportation other than personal vehicles.

WRONG WAY DRIVING COUNTERMEASURES

Wrong Way Driving Countermeasures use intelligent solutions like LED WRONG WAY signs on ramps to grab the attention of wrong way drivers prior to entering the mainline. Other countermeasures include using microwave vehicle detection systems to detect wrong way drivers and alert traffic management centers and highway patrol immediately.

Wrong way crashes, while they do not occur as often, result in incapacitation or death 50% of the time, which is much higher than the average crash. Wrong way driving is usually linked to intoxicated drivers, roadway design challenges, or lighting or signing concepts. By using this simple technology, this strategy could be used to protect drivers of major Freeways and Expressways from wrong way drivers. Major deployments can be found in Texas, Florida, California, New Mexico and Washington. In Florida (Central Florida more specifically), wrong way driving countermeasures are being used on CFX's system.

ASSET MANAGEMENT DATABASE

ITS systems are comprised of a complex network of fiber optic cables, electrical cables, wireless communications, and an array of field devices. This strategy is a central location, or database, where assets are recorded and managed; basically a way to inventory an entire transportation system and be able to track where this equipment is installed and maintained. Keeping track of the constantly changing system, whether it is expansion, maintenance, and/or upgrades is imperative. An asset management database tool would help manage the overall ITS system.

This database would help operate and maintain ITS deployments throughout the region. Furthermore, in various sections of this ITS Master Plan, there is the idea of sharing resources regionally, where applicable, to cut down on costs. Asset Management has been brought up as potentially serving as a shared resource; for example, one regional asset management database is agreed upon and administrative positions help to maintain this database. Field crews can call up this resource, let them know what equipment has been installed, maintained or removed and this database keeper can input the information – serving as record keeper and a Quality Control process combined.

BICYCLE AND PEDESTRIAN INNOVATIVE ITS SOLUTIONS

As described in "Florida's Bicycle/Pedestrian Focused Initiative" published during the 2015 Design Training Expo by the FDOT State Bicycle Pedestrian Safety Program Manager, a total of 633 pedestrians and bicyclists lost their lives in Florida crashes in 2013. The impact of these figures equates to nearly $6 billion economically in addition to the tragic loss of parents, daughters, sons, neighbors, friends and loved ones – and all were preventable. To aid in this prevention, Florida implemented a focused initiative to improve pedestrian and bicyclist safety on Florida roadways in November 2011. Among education, enforcement and emergency response, engineering opens up a plethora of options to help address this issue. Bicycle and Pedestrian ITS solutions call upon technological advances to help in the prevention of lost lives. Some of these systems can address several problem areas including: failure to yield, darting into traffic, and speeding, distracted driving, right turns on red, lack of crosswalks and transit Stop locations, amongst numerous others. In conjunction with this above mentioned initiative, other programs have come to light to address these issues as well.

People want safer, healthier streets that accommodate all modes of transportation, and Smart Growth policies offer the opportunity to design based upon these principles. The initiative to modify conventional "incomplete street" designs and enhance other viable transportation choices and economic opportunities for residents has come to be known as "Complete Streets." These Complete Streets Guidelines provide practical guidance to planning and engineers on how to utilize current roadway design standards to create a more well-balanced streetscape environment that promotes community connectivity and safety for motorist, pedestrians, and bicyclists alike, thereby promoting social interaction and economic activity.

From an urban design perspective, it is important to provide a variety of street types while keeping in mind important community destinations. Designing roadways for shared use between vehicles and bicycles, where continuous linkages are provided not only for vehicles but also for bicycles, is important in fostering alternative transportation options. Designs that account for proposed transit projects or enhance facilities used by current transit operations are critical for the use of multi-modal facilities by commuters and tourists, which not only reduce traffic congestion, but also polluting vehicle exhaust emissions.

Safety of the walking and biking public is one of the key components to having a successful Complete Streets project. Pedestrian-friendly design includes opting for lower-speed environments, reducing roadway cross-section widths, particularly in crosswalk areas, and enhancing landscaping. While providing adequate parking is necessary for the success of businesses and residents with limited onsite parking facilities, optimized parking can reduce the number of parking spaces and thereby provide more roadway width for sidewalks, landscaping and storefronts. Another way of optimizing parking is via increased or variable parking fees (by time of day), which encourage persons to entertain other forms of transportation and ensure that adequate parking is available during peak hours. Bicycle parking will further encourage persons to opt for these healthier modes of transportation on shorter trips.

Florida's Bicycle/Pedestrian Focused Initiative and Complete Streets are important policy decisions that entail planning, designing, operating, and maintaining transportation projects and systems, while keeping in mind all users – motorists, bicyclists, pedestrians, and transit. With that in mind, implementing options to ensure safety of all users is imperative. Below describes the technology behind the specific strategies, both for pedestrians and bicyclists.

Pedestrian Safety Systems

Pedestrian Safety Systems utilize innovative ITS solutions that focus on the safety of the users on foot. These systems can help protect pedestrians by activating in-pavement lighting to alert drivers as pedestrians enter crosswalks. Countdown pedestrian signals are a highly common application that assist pedestrians in knowing how much time remains to cross and aids motorists to judge timeframes when pedestrian traffic is expected. Other innovative solutions include:

- **Infrared detectors -** Microwave detectors which can talk back to the controller and minimize or extend clearance times.
- **Illuminated Pushbuttons -** Accessible pedestrian signals that produce a sound, vibration, or both during the walk interval.
- **Rectangular Rapid Flashing Beach (RRFB) -** Low-cost countermeasure to increase driver compliance in yielding to pedestrians at midblock locations.
- **Advanced Pedestrian Detection Systems -** Adapting signal timings in real-time to better meet pedestrian needs is also a low cost countermeasure.

Bicycle Alert System

Bicycle Alert Systems are innovative ITS solutions that focus on the safety of the bicyclists. Bicycle warning systems can use detectors and electronic signs to identify bicycle traffic and notify motorists when a cyclist is in an upcoming segment. Other solutions include: GIS/GPS bike route mapping, bicycle safe rumble strips, trail-roadway intersections, shared lane signing markings and automated bicycle parking.

INNOVATIVE INTERSECTION DESIGN

Throughout this section, various ITS strategies have been identified, explained and shown their relevance of application to the Central Florida region. Although Innovative Intersection Designs are not technically a “technological” tactic, this option has been included to show the significance of looking at all options the transportation industry has to offer. Sometimes an intersection improvement is exactly what a certain location needs to improve driving conditions. Innovative intersection designs are often able to reduce traffic congestion and many safety concerns. Again, choosing the proper tool from the tool box is imperative to a smoothly run transportation system.

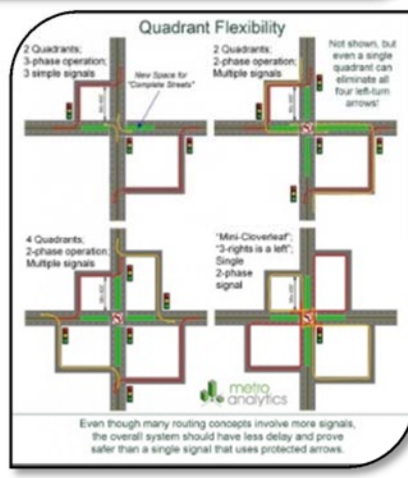
There are numerous types of innovative intersection designs. Some of the most commonly used are displaced left turn intersections, restricted crossing U-turn intersections, median U-turn intersections, and diverging diamond intersections at interchanges. Many of these designs can be found across the United States, from Maryland to New York, Michigan to North Carolina. Florida recently completed its first diverging diamond interchange. With mobility needs and population increasing and limited resources and right-of-way, regions need to be more creative. These intersections offer alternative ways to reduce congestion as opposed to just widening the roadways.

Examples of innovative intersection designs include:

- **CONTINOUS FLOW INTERSECTIONS (CFI)** - At a traditional intersection, through traffic must wait while left turns get their “arrow.” The CFI allows opposing lefts and throughs to occur at the same time using one signal at the main intersection, and up to four interconnected mid-block signals (one for each leg that has the CFI strategy). For example, while east-west traffic is moving, lefts on the north-south street cross-over oncoming traffic at a mid-block intersection. Then when north-south signals turn green, both through and left turn movements can go at the same time, because lefts are already on the opposite side of the throughs.

- **THRU-TURN INTERSECTIONS:** In the diagrams, some lefts are completed as “right-U-through.” Others are “through-U-right.” Either way, the result is that the former left turn pocket is no longer needed and since there are no left-turn arrows, the intersection can handle more traffic with significantly less delay, and it is also much easier for pedestrians to cross.

- **SINGLE-POINT URBAN INTERCHANGE:** A single-point urban interchange (SPUI) is a type of highway interchange created to help move large volumes of traffic through limited amounts of space safely and efficiently. It is similar in form to a diamond interchange but has the advantage of allowing opposing left turns to proceed simultaneously. The term single-point refers to the fact that all traffic from the arterial street, and the lefts onto and off the interchange can be controlled from a single set of traffic signals.



- **DIVERGING DIAMOND INTERCHANGES:** The Diverging Diamond is based upon the idea that if you can eliminate the need for left-turn arrows, then signals will have maximum efficiency, fewer conflict points, and be able to serve more traffic with better safety and less congestion.
- **TOWN CENTER INTERSECTIONS (TCI):** The TCI, also known as a Split Intersection, is an intersection where one or both of the streets involved are a one-way street. Where two major arterials come together and would have normally formed a single massive, unwieldy intersection, the Town Center concept instead separates each arterial into one-way couplets, creating four small, efficient, easily manageable intersections of one-way streets that merge back to a two-way street a block or

two upstream. A TCI can also involve a "triplet", which is an alignment between the couplets, perhaps used as a pedestrian mall or for transit, bikes, and on-street angle parking.

- **QUADRANT INTERSECTIONS:** Quadrants make it easier and safer for pedestrians to cross, and they also make it possible for cars to access buildings from the back street, so you can eliminate driveways. Some advantages include up to 40% more capacity; Level of Service B-D rather than E-F; former lefts reclaimed for center-running transit; pedestrian refuge, etc.; safer for both autos and pedestrians; expands grid connectivity; enhances and motivates TOD; often very low cost; easy access to retail; back-side auto access; and compatible with traditional signals.
- **MODERN ROUNDABOUTS -** The first few modern roundabouts were able to solve awkward intersections that were previously unsolvable, helping them earn a great reputation. With planters and monuments, they are attractive and help create a sense of place. They also calm oncoming traffic, which combined with far fewer conflict points, have helped them prove to be very safe intersections for both vehicles and pedestrians.

Again, there are many options listed herein for innovative intersection designs and each one is a tool that has positive and negative effects. The goal is to find the right tool for the applicable situation to ultimately make intersections safer for the traveling public.

5.3. ITS Strategies Analysis

This section analyzes the input gathered from all the of the Master Plan stakeholders, looking for regional trends in the data. Identifying trends will help to select future ITS strategies on the regional level that work to improve connectivity and interoperability between elements of the transportation network, which improve the quality of service and mobility. The overall goal of these strategies is to bring together the different ITS programs in the region in a way that increases the overall efficiency of the transportation system in this area.

As previously mentioned, we individually met with over thirty stakeholders to discuss the strategies identified in the previous section. In order to document whether a stakeholder generally approved or was interested in a strategy, it was noted as a "Yes", "No" or "Maybe." A general rule of thumb utilized as the intention of all stakeholder responses is the following:

- "Yes" - An agreeable option where they would have direct or indirect involvement;
- "No" - An option that may not apply to that stakeholders, or the region's needs, or the organization has no foreseeable role;
- "Maybe" – An option with no definitive side (positive or negative) but with the notion that it could be a viable choice in the unpredicted future.

Table 48 on the following pages is an ITS Strategies Matrix that tracks the answers from each of the stakeholders in order to identify trends or synergies between certain agencies or planning organizations.

Table 48 – ITS Strategies Matrix

ITS STRATEGY	FDOT Districts	FDOT District 5	Florida's Turnpike Enterprise	Lake-Sumter MPO	Lake County	Sumter County	MetroPlan Orlando	Central Florida Expressway Authority	Orange County	Osceola County	Seminole County	City of Kissimmee	City of Maitland	City of Orlando	City of Winter Park	GOAA	LYNX	SunRail	I-4 Ultimate Team	Ocala-Marion MPO	Marion County	City of Ocala	SUNTRAN	River To Sea	Flagler County	Volusia County	City of Daytona Beach	City of Palm Coast	Daytona Beach Int'l Airport	VOTRAN	Space Coast TPO	Brevard County	City of Melbourne	City of Palm Bay	City of Titusville	Port Canaveral	Melbourne Airport Authority	SCAT
	STAKEHOLDER																																					
ACTIVE TRAFFIC MANAGEMENT																																						
Active Arterial Management		Y	Y	M	Y	M	Y	N	Y	Y	Y	Y	Y	Y	Y	NA	Y	NA	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Dynamic Junction Control		Y	Y	M	M	M	Y	M	M	M	Y	M	M	M	M	NA	M	NA	M	M	N	M	N	Y	Y	M	Y	M	N	N	M	M	M	Y	M	Y	N	N
Dynamic HOV & Managed Lanes		Y	N	M	N	N	Y	M	N	N	N	N	N	M	N	NA	N	NA	M	M	N	M	N	Y	M	M	N	N	N	N	N	N	N	N	N	N	N	N
Dynamic Lane Reversal		Y	Y	M	N	N	Y	M	N	Y	M	N	N	M	Y	NA	N	NA	N	M	N	M	N	M	N	M	N	N	N	N	N	N	N	M	Y	N	N	N
Dynamic Lane Use Control		Y	M	M	N	N	Y	M	M	M	N	M	M	M	N	NA	N	NA	N		N	M	N	Y	Y	Y	N	N	N	N	Y	Y	Y	N	N	N	N	N
Adaptive Ramp Metering		Y	Y	M	N	N	Y	M	M	Y	M	N	Y	M	N	NA	N	NA	Y	N	M	N	N	Y	Y	M	N	M	N	N	N	N	N	Y	M	M	N	N
Dynamic Merge Control		Y	Y	Y	M	M	Y	Y	N	Y	N	Y	M	M	N	NA	N	NA	M	N	Y	Y	N	Y	N	Y	M	N	M	N	N	N	N	N	N	M	N	N
Dynamic Shoulder Lanes, or "Hard Shoulder Running"		Y	Y	Y	N	N	Y	M	N	M	N	N	N	N	N	NA	Y	NA	M	N	Y	M	M	Y	N	M	M	N	N	N	M	M	M	N	N	M	N	Y
Dynamic Routing		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	Y	NA	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Queue Warning		Y	Y	Y	M	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	NA	M	NA	Y	M	Y	Y	N	Y	M	Y	Y	Y	N	N	Y	Y	Y	M	N	Y	N	Y
ADVANCED PARKING MANAGEMENT																																						
Dynamic Parking Guidance and Reservation		Y	N	N	N	N	Y	N	Y	Y	N	Y	Y	Y	Y	NA	M	NA	N	Y	Y	Y	N	Y	Y	Y	Y	M	Y	N	Y	Y	Y	N	Y	Y	Y	N
Dynamic Overflow Transit Parking		Y	N	M	M	M	Y	N	Y	Y	N	NA	M	M	Y	NA	Y	NA	N	Y	M	Y	M	Y	Y	Y	M	N	Y	Y	M	M	M	N	N	N	M	M
Dynamic Priced Parking		Y	M	N	N	N	Y	N	M	Y	N	M	N	Y	M	NA	M	NA	N	N	Y	Y	N	Y	Y	M	M	N	Y	N	M	M	M	N	M	N	N	N
Freight Parking		Y	Y	Y	Y	N	Y	M	N	M	N	N	N	M	N	NA	N	NA	Y	M	Y	M	N	Y	N	M	Y	Y	N	N	Y	Y	Y	M	Y	Y	N	N
INTEGRATED CORRIDOR MANAGEMENT		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	Y	NA	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	M	Y	Y	Y	Y	M	Y	N	Y	Y
TRAVELER INFORMATION																																						
Predictive Traveler Information		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	Y	NA	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	M	Y	Y	Y	Y	Y	Y	Y	Y	M
Pre-trip Travel Information		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	Y	NA	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y
En-route Driver Information		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	Y	NA	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	M	Y	Y	Y	Y	Y	Y	Y	N	Y
Route Guidance		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	Y	NA	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	N	Y
Traveler Services Information		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	Y	NA	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y
DYNAMIC RIDESHARING		Y	Y	Y	Y	N	Y	M	M	Y	Y	Y	Y	M	Y	NA	Y	NA	M	Y	Y	Y	Y	Y	Y	M	M	Y	Y	M	Y	Y	Y	N	Y	N	Y	Y
DYNAMIC WAYFINDING		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	Y	NA	M	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	M	Y	Y	Y
TRAFFIC CONTROL																																						

ITS STRATEGY	STAKEHOLDER																																					
	FDOT Districts	FDOT District 5	Florida's Turnpike Enterprise	Lake-Sumter MPO	Lake County	Sumter County	MetroPlan Orlando	Central Florida Expressway Authority	Orange County	Osceola County	Seminole County	City of Kissimmee	City of Maitland	City of Orlando	City of Winter Park	GOAA	LYNX	SunRail	I-4 Ultimate Team	Ocala-Marion MPO	Marion County	City of Ocala	SUNTRAN	River To Sea	Flagler County	Volusia County	City of Daytona Beach	City of Palm Coast	Daytona Beach Int'l Airport	VOTRAN	Space Coast TPO	Brevard County	City of Melbourne	City of Palm Bay	City of Titusville	Port Canaveral	Melbourne Airport Authority	SCAT
Adaptive Signal Control		Y	N	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	NA	M	NA	N	Y	Y	Y	M	Y	Y	Y	M	M	N	M	Y	Y	Y	Y	Y	Y	N	M
Transit Signal Priority		Y	N	Y	M	N	Y	N	Y	Y	Y	Y	Y	Y	Y	NA	Y	NA	N	Y	Y	Y	Y	Y	Y	Y	M	M	N	Y	Y	Y	Y	Y	Y	Y	N	Y
INCIDENT MANAGEMENT		Y	Y	Y	Y	Y	Y	Y	M	Y	Y	Y	Y	Y	Y	NA	Y	NA	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
TRAVEL DEMAND MANAGEMENT		Y	Y	M	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	Y	NA	Y	Y	Y	Y	Y	Y	Y	M	Y	Y	Y	Y	Y	Y	Y	M	Y	N	M	Y
EMISSIONS TESTING AND MITIGATION		Y	N	M	M	N	Y	N	N	N	Y	M	N	N	M	NA	M	NA	N	M	M	M	N	M	Y	N	Y	M	N	N	M	M	M	N	M	N	N	N
HIGHWAY RAIL INTERSECTION		Y	N	Y	Y	Y	Y	M	Y	Y	Y	Y	Y	Y	Y	NA	Y	NA	N	M	Y	Y	M	Y	Y	Y	Y	N	M	M	Y	Y	Y	Y	Y	Y	M	Y
PUBLIC TRANSPORTATION MANAGEMENT																																						
Dynamic Transit Capacity Assignment		Y	M	M	Y	N	Y	M	M	Y	Y	Y	Y	Y	Y	NA	Y	NA	M	M	M	M	Y	Y	Y	Y	Y	M	N	Y	Y	Y	Y	N	M	N	N	Y
Dynamic Fare Reduction		Y	N	M	Y	N	Y	M	M	M	Y	Y	Y	M	Y	NA	Y	NA	Y	M	M	Y	M	Y	Y	M	Y	Y	N	Y	M	M	M	N	Y	N	N	M
Transfer Connection Protection		Y	N	M	Y	N	Y	M	M	M	Y	M	Y	M	N	NA	Y	NA	N	M	Y	M	N	Y	Y	M	N	M	N	N	M	M	M	N	M	N	N	Y
Transit Traveler Information		Y	M	Y	Y	N	Y	M	M	Y	Y	Y	Y	Y	Y	NA	Y	NA	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	N	Y	M	N	Y
PERSONALIZED PUBLIC TRANSIT		Y	N	Y	Y	Y	Y	N	M	Y	M	Y	Y	Y	Y	NA	Y	NA	M	Y	Y	Y	Y	Y	Y	Y	M	Y	M	Y	Y	Y	Y	N	Y	Y	N	Y
PUBLIC TRAVEL SECURITY		Y	Y	M	M	N	Y	Y	Y	Y	Y	M	Y	Y	Y	NA	Y	NA	Y	M	Y	Y	M	Y	Y	M	Y	Y	Y	Y	N	N	N	M	Y	Y	Y	Y
ELECTRONIC PAYMENT SERVICES																																						
Regional Payment System		Y	Y	Y	Y	Y	Y	Y	M	Y	Y	Y	Y	Y	Y	NA	Y	NA	Y	M	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Electronic Transit Ticketing		Y	N	Y	Y	N	Y	M	Y	Y	Y	Y	Y	Y	Y	NA	Y	NA	M	M	Y	Y	Y	Y	Y	Y	Y	M	N	Y	Y	Y	Y	N	Y	N	N	Y
ELECTRONIC TOLL COLLECTION		Y	Y	Y	Y	Y	Y	Y	M	Y	N	Y	Y	N	Y	NA	M	NA	Y	M	M	Y	N	Y	N	M	Y	Y	Y	N	Y	Y	Y	N	Y	Y	N	N
Dynamic Pricing		Y	Y	Y	M	N	Y	N	M	Y	N	N	N	N	N	NA	N	NA	Y	M	M	M	Y	Y	N	M	Y	N	N	Y	M	M	M	N	N	N	N	N
Demand Pricing		Y	M	N	N	N	Y	N	M	M	N	N	M	N	M	NA	Y	NA	M	M	M	N	Y	M	Y	M	Y	M	N	Y	N	N	N	N	M	N	N	N
Corridor Pricing		Y	M	Y	Y	N	Y	N	M	M	N	N	N	N	N	NA	Y	NA	Y	M	M	M	Y	Y	N	M	Y	M	N	Y	M	M	M	N	N	N	N	Y
COMMERCIAL VEHICLE OPERATIONS																																						
Automated Roadside Safety Inspection		Y	Y	Y	Y	Y	Y	N	M	N	N	M	N	N	M	NA	N	NA	M	M	Y	M	N	Y	M	N	Y	Y	N	N	M	M	M	N	N	N	N	N
Commercial Vehicle Administration Process		Y	Y	Y	Y	Y	Y	N	M	N	N	M	M	N	M	NA	N	NA	Y	M	Y	Y	N	Y	M	N	Y	Y	N	N	M	M	M	N	N	N	N	N
Commercial Vehicle Electronic Clearance		Y	Y	Y	Y	Y	Y	M	M	N	N	M	N	M	M	NA	N	NA	M	M	Y	M	N	Y	M	M	Y	Y	N	N	M	M	M	N	N	N	N	N
Freight Mobility		Y	Y	Y	M	Y	Y	N	M	Y	N	M	M	N	Y	NA	N	NA	M	Y	Y	M	N	Y	Y	M	M	Y	N	N	M	M	M	N	N	M	N	N

ITS STRATEGY	STAKEHOLDER																																				
	FDOT Districts	FDOT District 5	Florida's Turnpike Enterprise	Lake-Sumter MPO	Lake County	Sumter County	MetroPlan Orlando	Central Florida Expressway Authority	Orange County	Osceola County	Seminole County	City of Kissimmee	City of Maitland	City of Orlando	City of Winter Park	GOAA	LYNX	SunRail	I-4 Ultimate Team	Ocala-Marion MPO	Marion County	City of Ocala	SUNTRAN	River To Sea	Flagler County	Volusia County	City of Daytona Beach	City of Palm Coast	Daytona Beach Int'l Airport	VOTRAN	Space Coast TPO	Brevard County	City of Melbourne	City of Palm Bay	City of Titusville	Port Canaveral	Melbourne Airport Authority	SCAT
Hazardous Materials Security & Incident Response		Y	Y	Y	Y	Y	Y	N	M	Y	N	Y	Y	Y	Y	NA	Y	NA	Y	M	Y	Y	N	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	N
On-Board Safety and Security Monitoring		Y	Y	Y	Y	Y	Y	M	M	Y	N	Y	M	N	Y	NA	Y	NA	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	M	Y	Y	Y	Y	M	Y	N	Y
EMERGENCY MANAGEMENT																																						
Emergency Notification & Personal Security		Y	Y	Y	Y	Y	Y	Y	M	Y	Y	Y	Y	Y	N	NA	Y	NA	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N
Emergency Vehicle Management		Y	N	Y	Y	Y	Y	N	M	Y	M	Y	Y	Y	Y	NA	N	NA	N	Y	Y	Y	N	Y	Y	N	Y	Y	Y	N	Y	Y	Y	Y	Y	N	M	Y
Disaster Response and Evacuation		Y	Y	Y	Y	Y	Y	Y	M	Y	Y	Y	Y	Y	Y	NA	Y	NA	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
ADVANCED VEHICLE SAFETY SYSTEMS *																																						
Connected Vehicles - In-vehicle Information		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	Y	NA	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Connected Vehicles - Probe Vehicle Data		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	Y	NA	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Longitudinal Collision Avoidance		Y	N	N	N	N	Y	N	Y	N	N	N	N	Y	N	NA	Y	NA	N	N	N	N	Y	N	N	N	N	N	N	Y	N	N	N	N	N	N	Y	Y
Lateral Collision Avoidance		Y	N	N	N	N	Y	N	Y	N	N	N	N	Y	N	NA	Y	NA	N	N	N	N	Y	N	N	N	N	N	N	Y	N	N	N	N	N	N	Y	Y
Intersection Collision Avoidance		Y	M	Y	Y	Y	Y	M	Y	Y	N	Y	Y	Y	Y	NA	Y	NA	N	Y	Y	Y	Y	M	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	M	M	Y
Vision Enhancement for Crash Avoidance		Y	N	N	N	N	Y	N	Y	N	N	N	N	Y	N	NA	Y	NA	N	N	N	N	N	N	N	N	N	N	N	Y	N	N	N	N	N	N	M	N
Pre-crash restraint deployment		Y	N	N	N	N	Y	N	Y	N	N	N	N	Y	N	NA	Y	NA	N	N	N	N	N	N	N	N	N	N	N	M	N	N	N	N	N	N	M	Y
Automated Vehicle Operation		Y	N	N	N	N	Y	N	Y	N	N	N	N	Y	N	NA	Y	NA	N	N	N	N	M	N	N	N	N	N	N	N	N	N	N	N	N	N	M	Y
INFORMATION MANAGEMENT																																						
Archived Data		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	Y	NA	Y	Y	Y	Y	Y	Y	Y	Y	M	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Data Management - Big Data		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	Y	NA	Y	Y	Y	Y	Y	Y	Y	Y	M	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Data Management - Transportation Data Analytics		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	Y	NA	Y	Y	Y	Y	Y	Y	Y	Y	M	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Performance Management (or Measurement)		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	Y	NA	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	M	Y	Y	Y	Y	Y	Y	Y	Y	Y
EVENT MANAGEMENT		Y	Y	Y	Y	Y	Y	Y	Y	Y	M	Y	Y	Y	Y	NA	Y	NA	Y	Y	Y	Y	M	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	M	Y	M
WRONG WAY DRIVING COUNTERMEASURES		Y	Y	Y	Y	Y	Y	NA	NA	Y	NA	Y	M	NA	Y	NA	N	NA	Y	M	Y	Y	M	Y	Y	M	Y	Y	M	N	NA	NA	NA	N	Y	N	Y	N
ASSET MANAGEMENT		Y	Y	Y	Y	Y	Y	NA	NA	Y	NA	Y	Y	NA	Y	NA	Y	NA	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	NA	NA	Y	Y	Y	Y	Y

ITS STRATEGY	STAKEHOLDER																																					
	FDOT Districts	FDOT District 5	Florida's Turnpike Enterprise	**Lake-Sumter MPO**	Lake County	Sumter County	**MetroPlan Orlando**	Central Florida Expressway Authority	Orange County	Osceola County	Seminole County	City of Kissimmee	City of Maitland	City of Orlando	City of Winter Park	GOAA	LYNX	SunRail	I-4 Ultimate Team	**Ocala-Marion MPO**	Marion County	City of Ocala	SUNTRAN	**River To Sea**	Flagler County	Volusia County	City of Daytona Beach	City of Palm Coast	Daytona Beach Int'l Airport	VOTRAN	**Space Coast TPO**	Brevard County	City of Melbourne	City of Palm Bay	City of Titusville	Port Canaveral	Melbourne Airport Authority	SCAT
BIKE & PEDESTRIAN INNOVATIVE ITS SOLUTIONS																																						
Pedestrian Safety Systems		Y	Y	Y	Y	Y	Y	NA	NA	Y	NA	Y	Y	NA	Y	NA	Y	NA	M	Y	Y	Y	N	Y	Y	M	M	Y	Y	N	NA	NA	NA	Y	Y	Y	Y	Y
Bicycle Warning Systems		Y	N	Y	Y	Y	Y	NA	NA	Y	NA	Y	Y	NA	Y	NA	N	NA	M	Y	Y	Y	N	Y	Y	M	Y	Y	Y	N	NA	NA	NA	Y	Y	N	Y	Y
INNOVATIVE INTERSECTION DESIGNS		Y	Y	Y	Y	Y	Y	NA	NA	Y	NA	Y	Y	NA	Y	NA	N	NA	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	M	Y	NA	NA	NA	Y	Y	Y	M	Y

** Contingent on manufacturer's development and when infrastructure is in place to support these systems*

Based on a review **Table 48**, it can be seen that throughout District 5 there is interest in every future ITS strategy shown, especially when looking out over a 20-40-year horizon. The ITS strategies surveyed vary greatly in the spectrum of possible future tools. Some strategies are desired by all stakeholders but will require regional cooperation and other strategies are very localized. The first step in the analysis of potential future ITS strategies is to categorize them between Districtwide strategies (Desired by the majority of stakeholders), MPO/TPO regional strategies (Desired by the majority of the stakeholders of a particular MPO/TPO), and local strategies (Desired by individual stakeholders).

FDOT DISTRICT 5 DISTRICTWIDE STRATEGIES

The following strategies have been identified as Districtwide ITS strategies since they involve operations on the SHS or require a consensus on standards throughout the District to be implementable.

- Active Traffic Management/Traffic Control
  - Active Arterial Management (AAM)
  - Dynamically HOV & Managed Lanes
  - Dynamic Routing
  - Adaptive Ramp Metering
  - Transit Signal Priority
- Integrated Corridor Management (ICM)
- Traveler Information
  - Predictive Traveler Information
  - Pre-trip Traveler Information
  - En-route Driver Information
  - Route Guidance
  - Traveler Services Information
- Travel Demand Management
- Public Transportation Management
  - Dynamic Transit Capacity Assignment
  - Dynamic Fare Reduction
  - Transfer Connection Protection
  - Transit Traveler Information
  - Personalized Public Transit
- Incident Management
- Dynamic Wayfinding

- Dynamic Ridesharing
- Electronic Payment Services
  - Regional Payment System
  - Electronic Toll Collection
- Emergency Management
  - Emergency Notification & Personal Security
  - Emergency Vehicle Management
  - Disaster Response and Evacuation
- Information Management
  - Archived Data
  - Big Data/Analytics
  - Performance Management/Measurement
- Wrong Way Driving Countermeasures
- Asset Management
- Public Travel Security

REGIONAL STRATEGIES (MPO/TPO)

The following ITS strategies have been identified as regional strategies on the MPO/TPO level within the District 5 region. These strategies are classified as regional at an MPO/TPO level because they involve cooperation between multiple stakeholders within an MPO/TPO region; although not necessarily all stakeholders within the District. They are identified by the related MPO/TPO organizations.

MetroPlan, River to Sea, Ocala/Marion, Space Coast

- Advanced Parking Management
  - Dynamic Parking Guidance and Reservation
  - Dynamic Overflow Transit Parking

MetroPlan, River to Sea, Ocala/Marion, Space Coast

- Commercial Vehicle Operations
  - Automated Roadside Safety Inspection
  - Hazardous Materials Security & Incident Response
  - On-Board Safety and Security Monitoring
  - Freight Parking

LOCAL STRATEGIES

The following ITS strategies have been identified as local strategies within the District 5 region. These strategies are classified as local because they do not necessarily require regional cooperation, involve specific intersections or corridors on arterial roadways, or are specifically applicable to only certain stakeholder types. For example, many of the advanced vehicle safety systems only apply to those stakeholders that physically operate and maintain a fleet of vehicles for public services such as transit agencies.

- Active Traffic Management
  - Dynamic Merge Control
  - Queue Warning
- Advanced Parking Management
  - Dynamic Priced Parking
  - Freight Parking
- Traffic Control
  - Adaptive Signal Control
- Highway Rail Intersection
- Electronic Payment Systems
  - Electronic Transit Ticketing
- Advanced Vehicle Safety Systems
  - Longitudinal Collision Avoidance
  - Lateral Collision Avoidance
  - Intersection Collision Avoidance
  - Vision Enhancement for Crash Avoidance
  - Automated Vehicle Operations
- Bike & Pedestrian Innovative ITS Solutions
  - Pedestrian Safety Systems
  - Bicycle Warning Systems
- Innovative Intersection Designs

5.4. Current Projects Using ITS Strategies

This section takes a look at ITS strategies that are currently being used around the District as mobility tools. It is important to note that some of these projects are in the early stages of deployment in design or under construction. Looking at the existing deployments throughout the region helps shape the picture of what tools are already in place and can be built upon. This is important to take into account, since significant investments have been made regionally on the communications network and devices in place. This section will look at the District 5 Districtwide ITS strategies identified in the previous section and current project efforts regarding them.

ACTIVE TRAFFIC MANAGEMENT/TRAVELER INFORMATION

There is a significant on-going effort to use active traffic management strategies to improve mobility within the District 5 area. Examples of active traffic management strategies include:

- Active Arterial Management (AAM)
- Dynamically HOV & Managed Lanes
- Dynamic Routing
- Adaptive Ramp Metering

Examples of current projects within District 5 utilizing active traffic management strategies include the three phases of the AAM construction and operations and the I-4 Ultimate project.

AAM (Design, Construction and Operations)

These contracts utilize consultant services to provide full ATMS operations and monitoring on selected corridors. The AAM contracts consist of design, construction and operations (separate contracts).

The design and construction contracts provide detection and data collection devices for AAM operations. The Operations contract provides staff necessary to supervise, train, manage, and operate the selected corridors, which generally are adjacent to the ongoing I-4 Ultimate construction project (see below). The AAM consultant is responsible to oversee the operations of the AAM and ensure that it conforms to the AAM's Standard Operating Guidelines (SOG). Typical operations are from 6:00AM – 10:00PM, Monday through Friday unless otherwise directed for special events, holidays, etc.

Operations include, but are not limited to the following:

- Providing measureable improvements for all users of the arterial TSM&O network
- Providing operations and monitoring of all arterial ATMS within the TSM&O limits
- Providing monitoring and operations support for the transit systems impacted by the District 5 arterial TSM&O network
- Providing real time traveler information

- Providing arterial traffic incident management
- Providing monitoring of the traffic signal systems
- Providing recommendations for improved signal operations to the local signal operating and maintaining agency
- Facilitating the implementation of improved signal operations through coordination with the local signal operating maintaining agency/agencies Provide emergency management coordination
- Providing notifications to/coordination with incident responders (Law Enforcement, Fire Rescue, FDOT On-Call Personnel, etc.)
- Providing support for state-wide 511 operations
- Providing maintenance reports on AAM infrastructure
- Providing coordination with other TMCs
- Providing performance measures and monthly, quarterly and yearly reports
- Monitoring weather alarms and alerts
- Providing statewide ITS related coordination
- Providing coordination with the District 5 ITS freeway management program and Florida's Turnpike Enterprise

I-4 Ultimate

I-4 Ultimate, currently under construction, is an important project for Central Florida. This is a 21-mile makeover — from west of Kirkman Road in Orange County to east of State Road 434 in Seminole County – which includes: 13 widened bridges, 74 replaced bridges and 53 additional bridges; totaling 140 permanent bridges. In addition, 15 major interchanges will undergo complete reconstruction. New Express Lanes with dynamic toll pricing will be added to the center of I-4, two in each direction, and the general use and auxiliary lanes will be rebuilt. The posted speed will be increased from 50 to 55 mph.

The I-4 Ultimate project is going to completely revamp the face of Central Florida. Most importantly, it will improve traffic flow by easing congestion. Some exciting things to look forward to include:

- Four new tolled Express Lanes (two in each direction)
- A world-class signature pedestrian bridge
- Accent lighting
- Fountain illumination
- Art sculptures and monuments
- Bold landscape design
- Monumental direct-connect pylons

- Bridge architecture
- Concrete paving
- Steel tub girders
- Architectural cladding

To provide more reliable travel times for Central Florida drivers and manage traffic efficiently, two dynamic tolled Express Lanes will be added in each direction of I-4. Pricing will go up or down depending on the number of vehicles using the Express Lanes. The tolls will be collected electronically, with automated signs notifying motorists of the cost, which drivers will lock in when entering the Express Lanes.

The Express Lanes will be separated by a concrete barrier and are designed to keep traffic moving at 50 mph. Direct-access ramps will link the 4 Express Lanes with State Road 408 for a smooth transition.

Regional ATMS/DSS

District 5 currently has a study underway looking at how to create an ITS Decision Support System (DSS) that uses predictive traveler information. The purpose of the ITS DSS and ATMS software development study is to provide the District with a concept study for developing an ITS Decision Support System & ATMS Software, determine future needs and formulate an implementation strategy for the future development and maintenance.

The DSS is the heart and soul of ICM. It is the rule set by which the data from local agencies, FDOT, SunRail, and CFX are converted into actions. The system would push out recommended plans to react to existing/project conditions. The Concept of Operations would include the ATMS software development and coordination.

A Regional ATMS Software, local agency traffic signal system, is a system that would sit on top of the local agencies various ATMS software creating a unified interface to collect information and provide it to the Decision Support System. Additionally, the software could allow for centralized control of the traffic signal systems.

The primary objectives of this study are to:

- Integrate multiple separate systems from the regional stakeholders to create a unified response seeking to optimize system performance.
- Partners with AAM Operations Consultant for development of signal timing to support system needs.

- Evaluates alternative means of effective control of traffic signal systems, determines the impact of alternatives. (Legal, political, society, cost...)
- Provides comprehensive study of state of the practice.
- Evaluates contracting means:
    - Open source
    - COTS
    - Custom software
- Develops architecture of the software.
    - Module structure
- Outlines roles & responsibilities of each agency.
- Ensures scalable requirements.
- Provides cost estimates:
    - Development, Operations, Maintenance, Renew & Replace
- Line of data for operations, maintenance & reporting.
- Develops organization structure for continued operation & maintenance of the software.
- Obtains MOU & MOA to ensure partner support.
- Procedures required for future software acquisition.

INCIDENT MANAGEMENT

Incident Management is crucial to a safe transportation system and has growing support of TIM Teams within Florida. Currently, incident management operations along Florida's freeways are recognized at the highest level throughout the nation. As stated earlier, up until just recently, these practices were limited to the state's freeways. However, with the advent of ICM Principles, which recommend that all types of roadways work to balance traffic within a region, the desire to bring incident management to the arterial corridors is growing – hence the new AAM projects in District 5. District efforts for incident management include the RTMC Operation contract summarized below.

RTMC Operations Contract

The purpose of this contract is to provide full traffic management, ITS operations, and monitoring for the Department and CFX at the RTMC. The District covers Flagler, Volusia, Brevard, Seminole, Orange, Osceola, Lake, Marion and Sumter County.

Operations include, but are not limited to the following:

- Provide operations and monitoring of all ITS Devices at the RTMC
- Provide real time traveler information on DMS
- Provide traffic incident management
    - Provide Road Ranger dispatch
    - Provide emergency management coordination
    - Provide notification to and coordination with responders during incidents to Law Enforcement, Road Ranger, Fire Rescue, Emergency Operations Centers, Department and CFX Personnel, and other RTMCs
    - Provide coordination with other TMCs for incident management
    - Input accurate information for data collection regarding incidents, emergency management, road ranger, etc. for performance measures
- Provide and operate the 511 Traveler Information System
- Provide Statewide Coordination for Amber Alerts
- Provide operations of bridge security systems
- Provide operations of Variable Speed Limit Signs
- Provide assistance to the maintenance Vendor to troubleshoot ITS device issues
- Monitor weather information and identify potential weather problems affecting traffic

DYNAMIC WAYFINDING

This technology is typically used in large convention centers, hotels and hospitals, where the strategy truly optimizes user experience. This strategy is currently in use within District 5 at the Orange County Convention Center. It provides wayfinding for individuals via a phone or computer from one location to another; basically functioning door to door.

ELECTRONIC PAYMENT SERVICES

Electronic payment service strategies currently in use in the FDOT District 5 region include a regional payment system and electronic toll collection. These strategies utilize two centralized back offices as a part of the State's Florida Turnpike Enterprise and CFX. In addition, it is important to note that Florida Statute requires transit and toll to be connected to the Florida Turnpike Enterprise back office, thus taking a natural step toward integrated fare collection for multimodal mobility.

EMERGENCY MANAGEMENT/EVENT MANAGEMENT

All stakeholders agree on the importance of overall transportation safety and the importance of efficient emergency management and event management practices. The use of Opticom to provide traffic signal pre-emption for emergency response vehicles is common practice within the District 5 region. Additionally, current project efforts using event management and emergency management ITS strategies include the District 5 Event Management project in east Volusia County. A brief description of the event management project is provided below.

District 5 Event Management

The purpose of the District 5 Event Management project is to design the necessary ITS components and their locations to facilitate traffic flow following an event or during an evacuation in and around east Volusia County. The events include, but are not limited to NASCAR races, Bike week functions, hurricane/severe weather evacuations, I-95 closures, etc. This project requires working closely in a coordinated effort with the various stakeholders in the area to come up with a design for an effective event management solution within the Daytona area

INFORMATION MANAGEMENT

Information management is a critical component of many of the future ITS strategies discussed within this technical memorandum. The ITS systems presently in place in Central Florida, along with the addition of the many strategies discussed in this Master Plan, innately produce massive amounts of data. Data is used for real-time operations and ultimately for performance measurement. An example of current FDOT project efforts regarding information management ITS strategies such as archived data, big data, traffic data analytics, and performance management (measurements) is the University of Florida (UF) Big Data study. The scope of the Big Data study presently being studied by UF is found below.

UF Big Data

The purpose of this project is to demonstrate the usefulness and benefits of utilizing big data sets that are available along with data analytics to analyze, model and solve important challenges in the traffic operations and transportation industry. This pilot project will apply the key steps of big data lifecycle processes and tools for the five well defined use cases. For this purpose, the project will utilize the existing data collected from FDOT's sensors, data collection servers, social and digital media as well as any other third party vendor data that is necessary to develop solutions. Through this process the project will:

- Explore current data availability, quality and gaps and provide recommendations on possible shortcomings and potential methods for addressing it.
- Apply data cleaning, mining, modeling, and visualization techniques to develop prototype solutions for the use cases.
- Document challenges encountered, facilities needed and the personnel capabilities required for developing next generation of big data transportation applications.
- Provide recommendations on the directions that the District should move towards in utilizing big data technologies and staffing requirements to solve current and future transportation industry issues such as pedestrian safety, estimating ridership and enhancing corridor reliability.

FDOT Subject Matter Experts for the five use cases:

- Use Case 1: Pedestrian Fatalities
- Use Case 2: Impact of Sun Rail on Regional Transportation
- Use Case 3: Effectiveness of Road Ranger Patrols
- Use Case 4: Assessing Public Perception of Central Florida Regional Transportation
- Use Case 5: Evaluating the Effectiveness of Investments in Transportation

WRONG WAY DRIVING COUNTERMEASURES

Wrong way crashes, as previously mentioned, often result in incapacitation or death 50% of the time, a severity much higher than the average crash. There are currently several major deployments underway in Florida, and specifically the Central Florida region, to utilize ITS devices for wrong way driving countermeasures. CFX currently has two deploymentment projects scheduled and is incorporating Wrong Way Countermeasures into some of their roadway projects.

CFX Wrong Way Driving Detection and Prevention System

The wrong way driving prevention program is a three phase program in partnership with the University of Central Florida to ensure safety of CFX customers.

Phase 1 – Completed in May 2013, extensive research was conducted to determine the extent of the wrong-way driving problem and examine potential solutions. It was determined that no technology currently in use adequately addresses wrong-way driving. Texas had the best approach available.

Phase 2 – Currently underway, and includes the development of technology to help detect wrong-way drivers and take appropriate action. During this phase:

- Different technologies were evaluated.
- The manufacturer added a confirmation camera.
- Feasibility tests were conducted to determine the best technologies to implement.
- Testing began in January 2015 at the SR 528/SR 520 Interchange. Data from the test sites was collected for one year.
- During the testing period, the system was active and alerted the RTMC if a wrong-way driver was detected.
- RTMC has a standard procedure that includes notifications to the Florida Highway Patrol and the use of overhead Dynamic Message Signs during wrong-way driving events to alert “right-way drivers.”

Phase 3 – Currently underway; additional sites were added at the SR 408/Hiwassee Road Interchange and the SR 408/Kirkman Road Interchange. In addition, CFX is moving forward with the two deployment projects discussed above, consisting of 29 ramp locations.

ASSET MANAGEMENT

ITS systems are comprised of a complex network of fiber optic cable, electrical cable, wireless communications, and an array of field devices. The asset management strategy consists of a central location or database where assets are recorded and managed; basically a way to inventory an entire transportation system and be able to track where this equipment is installed and maintained. Currently, FDOT District 5 has an asset management software used for this purpose called Maintenance Inventory Management System (MIMS). A part of the overall Districtwide master plan involves looking at resource sharing of software that the District has an enterprise license for, such as MIMS.

INTEGRATED CORRIDOR MANAGEMENT (ICM)

ICM has been a specific focus for the Central Florida region for years, but has taken on even more significance since the conceptualization and deployment of the I-4 Ultimate project. As previously mentioned, the I-4 Ultimate project is a $2.4 billion Express Lanes project that runs through the heart of the Central Florida region. However, this project is also scheduled to be in construction until 2022. Therefore, given the massive vertical and horizontal roadway changes being constructed along the corridor, it was realized that the parallel arterials within the region were likely to be hit with increased volumes of traffic. This led to the planning of multiple ICM deployments in order to help to manage this additional vehicular demand.

ICM includes a wide variety of strategies, which include but are not limited to: active traffic management, traveler information, incident management, emergency management, and information management. Elements of these strategies coming together to form the foundation of ICM is detailed in the following paragraphs.

Data Collection: Understanding that the first step in ICM is to ensure proper data is available to operations, the District has developed an Intersection Movement Counts (IMC) project to deploy an automated method to determine intersection movement counts at 32 signalized intersections throughout Central Florida. However, this was just the beginning of the District's efforts to ensure the best possible data for ICM. As previously discussed, the District is in the process of deploying three phases of AAM infrastructure (CCTVs, Bluetooth, etc.) to ensure the appropriate management of the arterials. This combined with the hundreds of ITS devices and advanced traffic signal systems already deployed throughout the region insures that operations will have the best possible data.

Data Cleaning/Fusion: The District currently utilizes multiple disparate data sources to confirm incidents and perform other transportation incident management functions. However, while all datasets contain valuable information, they may also contain errors, duplications or overlapping values. Additionally, duplicate and/or overlapping datasets may conflict with one another. Therefore, a project has been developed that recognizes the benefit of comparing the existing data derived from each of these datasets to create a master dataset of more accurate information. This project will develop the ITS System Input Quality and Analysis (ITS SIQA) software that will store, aggregates and compare the datasets from the existing disparate sources to one another.

Data Analytics/Operations: The University of Florida is currently working with the District to develop a Proof of Concept to build off a subset of data to look at five critical use cases identified by the MetroPlan MPO; a project that was previously outlined in the Information Management section earlier in this document. The goal of this project is to help to refine the requirements for the region's future Sunstore.

ICM Operations: In addition to the deployment of ITS infrastructure, the District let the two previously discussed two AAM operations contracts. These contracts provide personnel that work side by side with our freeway personnel to ensure an integrated approach to operations throughout the region.

Regionally Coordinated Responses: In addition to advanced ICM Operations already in place, the region will also use the previously discussed DSS tool that will take the input from all regional data and either automatically implement or provide suggestions to the regional partners for implementing specific signal timing plans, incident response plans, etc.

5.5. Closing

In closing, this section has identified and explained 70+ various ITS approaches and their relevance to District 5's region. These are ITS techniques and technologies available currently and in the foreseeable future designed to increase system efficiency and improve traveler mobility. These technologies have been considered as tools to improve regional deficiencies where ITS improvements are determined to have the greatest potential benefits. Insufficient resources are a high priority and consideration when considering any ITS Strategy. When proposing any ITS Strategy, resources must be considered as a part of any overall deployment.

6. Connected Vehicle

6.1. Introduction

District 5's ITS Master Plan takes a look at the various agencies, or stakeholders, and individual ITS Master Plans in order to set a framework of what can be accomplished presently, as well as in the future, through regional cooperation. The previous section, ITS Strategies, took an in-depth look at each strategy and how it could be applied to the Central Florida region. One of those strategies included Advanced Vehicle Safety Systems.

This Section defines these systems further, explains the history, identifies various applications that make up the technology, and takes a look at the regulation/ethics behind these new systems.

Currently, the trend is for travelers to use smart phones and personal navigation devices to receive traffic information. Connected Vehicles is now emerging as the next wave of technology to further empower travelers. CV is the communication of data from vehicle-to-vehicle (V2V), V2I, and infrastructure-to-vehicle (I2V). These communication paths provide the ability to transmit and receive real-time traffic conditions to and from surrounding vehicles, Traffic Management Centers and other transportation agencies. V2V and V2I communications together are referred to as V2X.

The Connected Vehicle Initiative uses cutting edge technologies to quickly identify roadway hazards, speed

USDOT defines Connected Vehicles Technology as *"the development and deployment of a fully connected transportation system that makes the most of multi-modal, transformational applications requiring a robust, underlying technological platform. The platform is a combination of well-defined technologies, interfaces, and processes that, combined, ensure safe, stable, interoperable, reliable system operations that minimize risk and maximize opportunities. A successful platform will be developed through a process of thorough and considered research while meeting a set of rigorous criteria: The platform will allow for growth, expandability, and incorporation of newly evolving technologies. In knowing the architectural configuration and definition of interfaces, creative private-sector firms will be able to develop new applications that are not yet envisioned but remain for future imagination. And finally, the platform will be developed based on the complexity and range of human behaviors that will interact with and impact upon the system. For the ITS Program and its partners to deliver such a platform, further research is needed in the creation of standards for interoperability; security of the system; strategies that address the complexity of human behavior and risks associated with the driver's workload; and processes that define how travelers and equipment become a certified part of the system. Other technical research will also be pursued to identify and resolve technological limitations with positioning, scalability, and other technical issues."*

optimization, weather advisories, BSM and provide drivers with vehicle analyses. These technologies have the potential to revolutionize the transportation system – a huge shift in travel that has not been seen for decades. Just as we have seen the far reaches of the Internet's potential; once CV is applied to the movement of goods, services and people, the possibilities are limitless. In-depth research is being performed nationwide; however, there is still a large amount work ahead to make this "connected" dream a reality. District 5's ITS Master Plan is striving to prepare the region through unified networks, security protocols, data labeling/sharing/storing, etc. However, it's imperative to know what is being done within the industry in order to shed light on some of the steps that Central Florida can be taking now to organize the region's transportation system for this technology and be a frontrunner in the development of connected vehicles.

The levels of how much technology impacts the driving experience are defined as follows and discussed in the following sections:

- Connected Vehicle
- Automated Vehicle
- Autonomous Vehicle

6.2. Connected Vehicles Overview

Connected Vehicle technology leverages the potentially transformative capabilities of wireless communication to make surface transportation safer, smarter and greener. Connected vehicles are a new wave of intelligent transportation technology that can address up to 80 percent of unimpaired driver crashes while potentially reducing the estimated 4.8 billion hours Americans spend in traffic each year.

Why Connected Vehicles? The United States Department of Transportation's (US DOT) goal of **zero fatalities** is one of the driving forces behind the Connected Vehicle research effort. Statistics show that over 80 percent of avoidable collisions could be prevented with the inclusion of Connected Vehicle technology.[8] The nation is swept up in the advances of the internet with social media and staying connected is playing a large role in society's day to day life. Travelers want that connectivity even while on the road, with information at their fingertips 24/7. There is

[8] http://www.dot.state.fl.us/trafficoperations/its/projects_deploy/cv/Connected_Vehicles.shtm

no reason why travelers cannot access bus routes, travel times or even route options via different mode choices at the touch of a button. However, this must be done safely so as not to distract the driver.

Imagine a safe, interconnected wireless communications network that includes cars, buses, trucks, trains, airplanes, traffic signals, cell phones and other devices. Connected Vehicle technology between vehicles and infrastructure can prevent crashes, enable mobility, and produce environmental benefits while providing continuous real-time connections between all system users. All sectors - government, public transportation, private industry and original equipment manufacturers (OEMs) - are working rapidly to make this technology work. OEMs is a term used when one company makes a part or subsystem that is used in another company's end product. The following statistics provided by the National Highway Safety Transportation Administration (NHTSA) and USDOT[9] demonstrate exactly why connected vehicles are needed and why it has become such a viable option:

- Traffic congestion is an $87.2 billion annual drain on the U.S. economy, with 4.2 billion hours and 2.8 billion gallons of fuel spent sitting in traffic.
- In 2009, there were 5.5 million crashes, almost 34,000 fatalities, and 2.2 million injuries on U.S. roads as the result of vehicle crashes. In 2010, the number of fatalities dropped by 3 percent but was still too high, accounting for 32,788 deaths according to the NHTSA.
- According to a USDOT report, combined V2X systems potentially address about 81 percent of all-vehicle target crashes; 83 percent of all light-vehicle target crashes; and 72 percent of all heavy-truck target crashes annually.

WHAT IS A CONNECTED VEHICLE?

According to the Center for Automotive Research (CAR) Publications, connected vehicles are vehicles that use any of a number of different communication technologies to communicate with the driver, other cars on the road (V2V) and roadside infrastructure (V2I). This technology can be used to not only improve vehicle safety, but also to improve vehicle efficiency and commute times. Listed below are some of the benefits[10] of connected vehicles:

✓ **Crash Elimination:** Crash-free driving and improved vehicle safety could change the concept of a vehicle as we know it.

[9] http://www.its.dot.gov/connected_vehicle/connected_vehicle_research.htm

[10] Center for Automotive Research (CAR) Publications

- ✓ **Reduced Need for New Infrastructure:** Self-driving can reduce the need for building new infrastructure and reduce maintenance costs.
- ✓ **Travel Time Dependability:** Convergence of technologies can substantially reduce uncertainty in travel times via real-time, predictive assessment of travel times on all routes.
- ✓ **Productivity Improvements:** Convergence of technologies will allow travelers to make use of travel time productively.
- ✓ **New Models for Vehicle Ownership:** Self-driving vehicles can lead to a major redefinition of vehicle ownership and expand opportunities for vehicle sharing.
- ✓ **Improved Energy Efficiency:** Reduced energy consumption in at least three ways: more efficient driving; lighter, more fuel-efficient vehicles; and efficient infrastructure – this will decrease vehicle pollution.
- ✓ **New Business Models and Scenarios:** Convergence of technologies may realign industries such that ecosystem participants need to compete and collaborate at the same time.

USDOT estimates that V2V warnings could lead to driver warnings for up to 76% of V2V crashes. With regards to mobility – V2I capabilities and information from travelers' wireless devices relayed through wireless transmission media has the potential to provide transportation agencies with dramatically improved real-time traffic, transit, and parking data; making it easier to manage transportation systems for maximum efficiency and minimal congestion. In addition, connected vehicles could enable travelers to change their route, time, and mode of travel, based on up-to-the-minute conditions, to avoid traffic jams. Once traffic congestion starts decreasing and more efficient routes and travel times are achieved, this will significantly reduce greenhouse gases (GHGs) that can be released during stop and go situations as compared to free-flowing traffic.

Other benefits include reduction of traffic congestion, improved intersection safety, improved efficiency in freight-heavy corridors, improved safety of crosswalks for pedestrians and the disabled, allowing for public bus transfers to move more smoothly, increased work zone safety for roadside personnel and improved safety for first responders during high-incident management.

As applications are researched further, new developments progress and more agencies become involved with these processes; the government looks to standardize these applications and regulate them to ensure safety, security and reliability. Further discussion of these regulatory actions are outlined towards the end of this section.

AUTONOMOUS VS AUTOMATED VEHICLES VS CONNECTED VEHICLES – DEFINING THE DIFFERENCE

What is the difference between Connected Vehicles and Autonomous Vehicles? With the base knowledge that is defined previously for CV, they are extremely similar due to the end result of their applications – which is to "ensure safe, stable, interoperable, reliable system operations". The difference is: CV communicates with other vehicles and the infrastructure while a driver operates the vehicle (they are alerted of upcoming incidents or warned of potential threats), while AV offers the additional ability to drive a vehicle without the driver using their hands or feet at all.

> DATA ASSOCIATED WITH VEHICLES:
>
> Latitude & Longitude
>
> Time
>
> Heading Angle
>
> Speed
>
> Lateral & Longitudinal Acceleration
>
> Yaw Rate
>
> Throttle Position
>
> Brake, Headlight & Wiper Status
>
> Steering Angle
>
> External Temperature
>
> Turn Signal Status
>
> Vehicle Length, Width & Mass
>
> Bumper Height

Fully automated or "self-driving" vehicles (sometimes called autonomous) are defined by the USDOT's NHTSA as, "those in which operation of the vehicle occurs without direct driver input to control the steering, acceleration, and braking and are designed so that the driver is not expected to constantly monitor the roadway while operating in self-driving mode." Further, the NHTSA has defined vehicle automation into five levels; the higher the level the more automated the vehicle is. Listed below are the NHTSA's five levels of automation[11]:

- **No-Automation (Level 0):** The driver is in complete and sole control of the primary vehicle controls – brake, steering, throttle, and motive power – at all times.
- **Function-specific Automation (Level 1):** Automation at this level involves one or more specific control functions. Examples include electronic stability control or pre-charged brakes, where the vehicle automatically assists with braking to enable the driver to regain control of the vehicle or stop faster than possible by acting alone.
- **Combined Function Automation (Level 2):** This level involves automation of at least two primary control functions designed to work in unison to relieve the driver of control of those functions. An example of combined functions in a Level 2 system is adaptive cruise control in combination with lane centering.
- **Limited Self-Driving Automation (Level 3):** Vehicles at this level of automation enable the driver to cede full control of all safety-critical functions under certain traffic or

[11] http://www.nhtsa.gov/About+NHTSA/Press+Releases/U.S.+Department+of+Transportation+Releases+Policy+on+Automated+Vehicle+Development

environmental conditions and in those conditions to rely heavily on the vehicle to monitor for changes in those conditions requiring transition back to driver control. The driver is expected to be available for occasional control, but with sufficiently comfortable transition time. The second-generation Google car is an example of limited self-driving automation.

- **Full Self-Driving Automation (Level 4):** The vehicle is designed to perform all safety-critical driving functions and monitor roadway conditions for an entire trip. Such a design anticipates that the driver will provide destination or navigation input, but is not expected to be available for control at any time during the trip. This includes both occupied and unoccupied vehicles. The third-generation Google car is an example of full self-driving automation. **Vehicles with Level 4 automation may also be referred to as autonomous vehicles.**

**Note: Vehicles with automation levels above 3 must also incorporate Connected Vehicle technologies. There are many connected and automated vehicle technologies and many will overlap. It's important to understand a vehicle can be connected but not autonomous, however, to be a certified automated vehicle, it must also be a connected vehicle.*

Of the five levels described above, only up to Level 2 are currently available to the public. However, the federal government and manufacturers are now researching, developing, and testing Level 4 automation technologies on public roads in certain states that have passed enabling legislation. The states that have passed legislation allowing higher level automated vehicles include Texas, California, Florida, Michigan and Nevada. Several other states are also working to pass similar legislation.

Ultimately, the goal of this technology is to make driving as safe as possible by ending with full automation (AV). First, the industry will (and already has implemented in some cases) roll out Connected Vehicle technology, as described in the previous section. This is essentially the backup cameras, blind spot alerts, etc. The next level will be Automated Vehicles (Levels 1-3). The driver can apply technologies such as an "adaptive cruise control" application that actually drives for you using lane centering. However, the driver must be cognizant the entire time because this technology cannot fully operate on its own. It can drive on its own and obey the lines of the roadways, change lanes and more but ultimately there is still room for error as the technology is still learning and the driver must know when to, for example, turn it off in order to exit a ramp on an interstate. Finally, Autonomous Vehicles will literally travel from point A to point B driverlessly. Passengers can sleep, be on their phones, etc., and the car is smart enough to the work for them.

Although adding connectivity to vehicles has its benefits, it also has challenges. By adding connectivity, there can be issues with security, privacy, data analytics, and aggregation due to the abundance of data associated with vehicles – hence legislation and regulatory action.

With the footprint of where the region would like to go, there is still much work to be done regionally to prepare for the day of CV and ultimately AV. In a perfect world, CV would come first followed by AV, which would allow the AV technology to utilize CV to its maximum potential. The benefits that surround these initiatives are much too important to ignore. If transportation systems could have Connected Vehicle capabilities and, in due time, be truly autonomous – then human error could be mitigated and the safety of traveling would be improved. In addition, roadway capacity could be increased, since instead of a following distance of two to three car lengths away, the gap could narrow to a mere two or three feet following distance; thus increasing roadway capacity significantly while eliminating car crashes.

HISTORY OF CONNECTED VEHICLES

The USDOT, in cooperation with the automotive industry and other partners, strives toward the goal of enabling networked wireless communications among all vehicles types and is promoting development and deployment by the private and public sectors.[12]

For the past decade, the USDOT has been researching and testing a system of vehicles that can sense the environment around them and communicate with other vehicles and with infrastructure. This V2X communication will enable safety, mobility, and environmental advancements that current technologies are unable to provide. The technology is expected to reduce unimpaired vehicle crashes by 80 percent, while also reducing the 4.8 billion hours that Americans spend in traffic annually[13].

Florida is eager to join in the preparation for this initiative and is currently making strides to be in the forefront of these history-making changes with the end result being connected and, ultimately, autonomous vehicles. The Florida Automated Vehicle initiative began in 2014. Part of the pilot project was to enhance CV safety features by providing drivers advanced assistance within the system. The Driver alert warnings included forward collision, lane departure, bike/ped detection (Infrastructure to Mobile - I2M) speed limit detection and more. These features are readily available, as they are being offered by automobile manufacturers and as aftermarket devices as safety add-ons. One particular aftermarket device is Mobileye. The Mobileye provides all of these features and more.

[12] http://www.its.dot.gov/connected_vehicle/dot_cvbrochure.htm
[13] http://www.its.dot.gov/factsheets/pdf/JPO_CVPilot.pdf

Central Florida, as a region, is ready to begin preparation for these applications. However, the public sector's role is still evolving as private sector manufacturers continue to expand on in-vehicle technology. Thus planning for CV and AV has become a work in progress that requires constant attention and planning for the latest innovations and standards that are being developed.

HOW DO CONNECTED VEHICLES WORK?

CV is the AVSS that is currently being tested at test beds throughout the United States and specifically in Florida. Travelers will be able to receive real-time information and feedback with the aid of their "smart cars." Traditionally, drivers have received their traffic information from a number of sources including radio, smart phone applications and DMS. The CV Initiative offers additional methods to receive and disseminate information. Some methods of receiving this information are as follows:

- V2X communications technology is designed to increase motorists' awareness and improve safety. This technology allows wireless data exchange between nearby vehicles regarding position, location and speed. The system is designed to actively alert the motorists (motorcycle, buses, trucks and automobiles) of potential hazards, such as merging into a vehicle in a driver's blind spot, running a red light, rapid deceleration (brake light warning), etc.

- Dynamic real-time data collection and management methods and practices create and expand access to high-quality multimodal transportation real-time data captured from connected vehicles (speed, direction, acceleration, etc.), mobile devices (location), and infrastructure (traffic control device status) with the goal of providing travelers and system operators with access to information to facilitate improved traveler decision making.

- Road Weather Management — Travelers and transportation agencies can use vehicle-based data for current weather and road conditions. This system provides awareness of weather conditions and forecasts.

- Applications for the Environment Real-Time Information Synthesis (AERIS) — Still in the early stages of development, the AERIS program is intended to generate, capture, and analyze data to allow system users and operators to make green transportation choices; such as which travel modes and routes offer the most environmentally friendly path to a destination and how to operate traffic signals and other system elements to reduce vehicle gas emissions.

Estimated to have made substantial progress by the end of this decade, the CV Initiative has established itself as the future of ITS and will ultimately give new definition to the term "automobile".

CV uses multiple technologies to function. Some of the technologies include:

- Dedicated Short Range Communications (DSRC) and Cooperative, Active Safety Systems
- 4G and now 5G cellular communications

DSRC is an immediate communication with no lag. Basic safety messages come directly in the vehicle to provide pending crash conditions to the driver. Today's cellular connections are not fast enough to support V2V active safety applications. New communication technologies may provide the necessary capabilities for active safety, but today DSRC is the only viable option and the only wireless communication technology that meets the requirements for safety-critical applications while using cellular protocols as a redundancy. Privacy is protected using DSRC because the vehicles are never recorded. Connected V2V safety applications are built around the SAE J2735 BSM which has two parts. Part 1 contains core data element such as vehicle size, position, speed, heading, acceleration while Part 2 contains features such as speed harmonization, queue warning, Cooperative Adaptive Cruise Control and Transit Signal Priority. These transmissions are approximately 10 times per second at a range of approximately 1,000 meters.

At this time, it appears that DSRC will be commonly viewed as being standard equipment by 2017. By 2022, Global Positioning Systems (GPS) receivers, satellite radios, and Wi-Fi transceivers will also be included as standard equipment. DSRC is needed for cooperative, active and safety systems while 3G and 4G cellular communications tend to be thought of as appropriate for other applications. As Connected Vehicle technology evolves, many wonder whether certain types of equipment will primarily be built into the vehicle or brought-in via mobile devices such as smartphones. Overall, DSRC transceivers are the most likely type of equipment to be embedded in vehicles within the next ten years. In a recent survey conducted by Michigan Department of Transportation, 85% of people expect to see significant integration of sensor systems (e.g., camera, RADAR, LiDAR) and Connected Vehicle communication systems by 2022. Those same people were asked which technology was more valuable V2V or V2I and most respondents think the best system to maximize public good is V2X working cooperatively. V2V alone was considered to be valuable but suggested to achieve full benefits they would have to work in concert. [14]

[14] http://www.michigan.gov/documents/mdot/09-27-2012_Connected_Vehicle_Technology_-_Industry_Delphi_Study_401329_7.pdf

BENEFITS AND CHALLENGES

Potential Benefits of the CV/AV Program include:

- Increases in safety, mobility, system efficiency, and access to resources for disadvantage groups, and decreases in negative environmental impacts such as vehicle emissions, the need for expansion and noise.
- Decreases in undesirable transportation impacts to the environment and society.
- Increased opportunities to partner with non-government groups, such as private industry and universities.
- Real-time and real-world data to help with transportation planning and transportation system operations.
- Demonstrations of CV environments that fit into real-world environments of today.
- Reduction of fatalities through weather-related safety, infrastructure-based, and other applications.[15]

Potential challenges of the CV/AV Program include:

- Encourages distracted driving.
- Makes vehicles susceptible to hacker.
- Raises the question, how safe is it really?
- How reliable are these systems? Data connection reliability.
- Developing regulations and standards for CV and AV.
- In the event of a crash, who's at fault?
- The cost of CV and AV.
- Are the consumers ready for this technology?
- Adding cost to the consumers

Additional challenges and lessons learned based on Studies from deployments of V2X include:

- Technical Challenges to Connected Vehicle Infrastructure Deployment.
- Technical Maturity, Interoperability and Standards.
- Technical Obsolescence and Changing Requirements.
- Application Support Considerations.
- Data Management Considerations.
- Communications.
- Security Considerations
- Planning for the Connected Vehicle Environment – Technical Issues

[15] http://www.its.dot.gov/strategicplan.pdf

Security in a CV environment is a valid concern for the consumer. However, the use of the vehicle data is for processing only and will never be broadcasted based on an explanation by Alberto Broggi, the director of Artificial Vision and Intelligent System Labs at the University of Parma. The security is in the connection itself. Vehicles will only be using sources with trusted connections whether it is vehicle to vehicle or vehicle to infrastructure. These trusted connections are created through standards set within the industry. As Mr. Broggi describes, cyber security is not a new technology that started with CV or AV, but one that has been around for a while and one that is ever changing. Data privacy is always going to be a learning process and it starts with security of the connection by which the original equipment manufacturers make pledges. A pledge by which all data is kept private. The Vehicle to Infrastructure communication operators in a license frequency band allocated by the FCC are based upon the Wi-Fi standard IEEE 802.11. Specially, 802.11p defines the DSRC Lower Layer and is known as Wireless Access in Vehicular Environments (WAVE).

6.3. Planning and Pilot Programs

PLANNING

Like all developments in the transportation industry, a course of action must be defined and followed. Every region must plan their ITS programs within the National ITS Architecture to ensure consistency and overall regulated elements. CV technology is no different and thus the Connected Vehicle Reference Implementation Architecture (CVRIA)[16] has been developed to inform organizations and agencies about defined standards and policies regarding these new and upcoming tools. CVRIA is a research effort released by the ITS Joint Program Office (ITS JPO) and it defines standards and key nuances of CV. It also defines the environment, the prioritization, and outlines the policies in which this all should be conducted. Ultimately, this effort supports the development, testing and implementation of these technologies.

“The CVRIA Team, led by the ITS Joint Program Office, is comprised of the National ITS Architecture Team (led by Iteris), the Standards Program Technical Support Services Team (led by Booz Allen Hamilton) and the Policy Team (ITS JPO Policy Program and the Volpe National Transportation Systems Center). The CVRIA development includes stakeholder engagement and development of an integrated standards strategy and action plan[17].”

[16] https://www.standards.its.dot.gov/DevelopmentActivities/CVReference

[17] https://www.standards.its.dot.gov/DevelopmentActivities/CVReference

The standards being defined within the CVRIA are crucial to instituting the environment from which CV will thrive. The following are the major players that participate in industry standards that make up the base standards and policies set forth by the CVRIA.

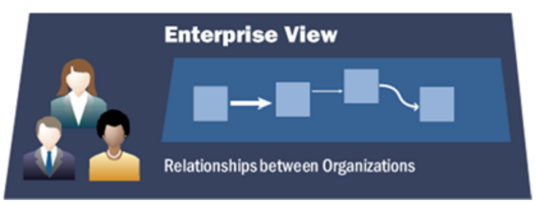
The following organizations participate in ITS standards activities:

- AASHTO (American Association of State Highway and Transportation Officials)
- ANSI (American National Standards Institute)
- APTA (American Public Transportation Association)
- ASTM (American Society for Testing and Materials)
- IEEE (Institute of Electrical and Electronics Engineers)
- ITE (Institute of Transportation Engineers)
- NEMA (National Electrical Manufacturers Association)
- SAE (Society of Automotive Engineers)

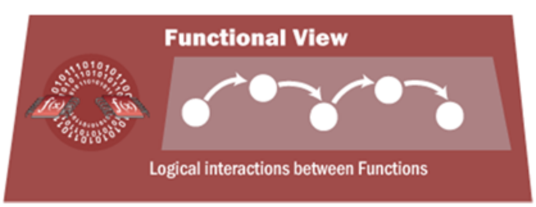
In addition, the following organizations have developed communications protocols and standards widely implemented in ITS, typically included by reference for the standards developed by the organizations listed above[18].

- IETF (Internet Engineering Task Force)
- W3C (World Wide Web Consortium)
- ISO (International Organization for Standardization)

CVRIA is developed in four Views[19]:



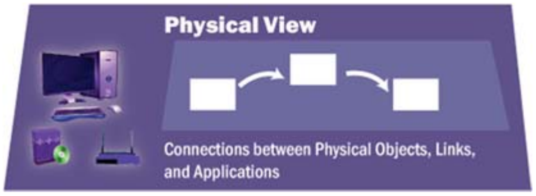
Enterprise - Describes the relationships between organizations and the roles those organizations play within the Connected Vehicle environment.



Functional - Describes abstract functional elements (processes) and their logical interactions (data flows) that satisfy the system requirements.

[18] http://www.iteris.com/cvria/html/standards/cvstandards.html

[19] http://www.iteris.com/cvria/



Physical - Describes physical objects (systems and devices) and their application objects as well as the high-level interfaces between those physical objects.

Communications - Describes the layered sets of communications protocols that are required to support communications among the physical objects that participate in the Connected Vehicle environment.

PILOT PROGRAMS - BACKGROUND

Further planning of where these programs and applications will go depends upon the success within real-world test situations. The public and private sectors are working to define goals and objectives to make decisions on how CV and AV will grow and how success will be judged. One of the most important aspect of this is performance measurement (PM). Transportation agencies have embraced this concept further with the recent statewide TSM&O initiatives, which promotes PM reporting in order to show monetary benefits from various ITS strategies. CV and AV are no different. With so much at stake, it is imperative to know what is needed to measure and report in order to feed data results accurately to key stakeholders and allow growth to align itself with success.

Locations of the Safetv Pilot Driver Clinics

The ITS JPO has developed the new ITS Strategic Plan 2015-2019, which focuses on six priority areas, which are also the guiding subjects within the CVRIA effort (As discussed previously, these agencies are interconnected to ensure industry wide consistency and growth): (1) Connected Vehicles, (2) Automation, (3) Enterprise Data, (4) Emerging Capabilities, (5) Interoperability, and (6) Accelerating Deployment. In the transportation planning process, strategic direction is based on a vision for the future. This includes a state or regional vision, goals and objectives along with performance measures. With this and on-going research, agencies begin to notice trends, analyze alternatives, develop priorities when it comes to investments and more focused research. All of this is constantly monitored, evaluated, reported to portray the effectiveness of the initiatives to policy makers, stakeholders and the public.

Since 2002, the USDOT has been engaged in research with automotive manufacturers on V2V crash avoidance systems that use high-speed wireless communications and vehicle-positioning technology. In 2006, the USDOT joined with a partnership of automotive manufacturers, Crash Avoidance Metrics Partnership (CAMP)[20], which was established since 1995 between Ford Motor Company and General Motors Corporation, to develop and test prototype V2V safety applications. The overarching goal was to determine whether this technology would work better than existing vehicle-based safety systems, like adaptive cruise control, to address imminent crash scenarios. In order for NHTSA to make the final decision for regulation, CAMP (Ford, GM, Honda, Hyundai-Kai, Volkswagen, Mercedes-Benz, and Toyota) had to provide definitive data from their research proving V2V safety applications would work better than current safety systems to avoid crashes. The Connected Vehicle Safety Pilot (CVSP) was formed to test performance, analyze human factors and ease of usability, define policies and processes and collect accurate data to quantify the safety benefits of V2X. Two platforms[21] came out of this program – Safety Pilot Driver Clinics and the Safety Pilot Model Deployment. Both are detailed below:

Safety Pilot Driver Clinics

In August 2011, Safety Pilot Driver Clinics tested how drivers would react to such technology within "light" vehicles, i.e. cars. Each clinic involved over 100 drivers. They provided advanced training about the technologies prior to testing at controlled environments such as test tracks and parking facilities. Researchers noted participant's acceptance of the in-vehicle alerts and warnings throughout various controlled roadway conditions. Six clinics in total ran until spring of 2012, and were held in Brooklyn, MI; Minneapolis, MN; Orlando, FL; Blacksburg, VA; Dallas, TX; and San Francisco, CA.

Safety Pilot Model Deployment

The Safety Pilot Model Deployment proceeded with the tested technologies by hosting a test site with approximately 3,000 vehicles (cars, buses and trucks) in order to continue real-world data collection. This particular deployment applied the CV technologies to both environment and vehicles to test how these applications interacted, or "spoke to each other." When

[20] Crash Avoidance Metrics Partnership, Annual Report, April 2001 – March 2002, published by the United States Transportation and National Highway Traffic Safety Administration (December 2002 by Richard Deering; Report No. DOT HS 809 531)
[21] http://www.its.dot.gov/connected_vehicle/connected_vehicle_research.htm

environmental data was combined with the vehicle's own data, it created a highly accurate data set that is now the foundation for reliable crash avoidance safety applications. This deployment ran from the summer of 2012 to the summer of 2013.

The Safety Pilot included vehicles with integrated safety applications and other vehicles that use aftermarket devices (i.e., not built into the vehicle), which would communicate with surrounding vehicles using 5.9 GHz DSRC technology. This technology and other safety applications tested included[22]:

- **Blind Spot Warning/Lane Change Warning** – Warns drivers when they try to change lanes if there is a car in the blind spot or an overtaking vehicle.
- **Forward Collision Warning** – Alerts and then warns drivers if they fail to brake when a vehicle in their path is stopped or traveling slower.
- **Electronic Emergency Brake Lights** – Notifies drivers when a vehicle ahead is braking hard for some reason.
- **Intersection Movement Assist** – Warns the driver when it is not safe to enter an intersection—for example, when something is blocking a driver's view of opposing traffic.
- **Do Not Pass Warning** – Warns drivers if they attempt to change lanes and pass when there is a vehicle in the opposing lane within the passing zone.
- **Control Loss Warning** – Warns the driver when another nearby vehicle has lost control.

CONNECTED VEHICLE PILOT DEPLOYMENT PROGRAM[23]

To further advance the deployment of CV, the USDOT is currently funding regional CV pilots around the country. The FHWA is helping public agencies plan for deployments by providing Connected Vehicle deployment guidance.

The pilots will demonstrate CV solutions in real-world environments. The program seeks to spur innovation among early adopters of CV application concepts by using the best available and emerging technologies. The pilot deployments are expected to integrate CV concepts into practical and effective elements by enhancing existing operational capabilities. The intent of these pilot deployments is to encourage partnerships of multiple stakeholders (e.g., private companies, states, transit agencies, commercial vehicle operators, and freight shippers) to deploy applications using data captured from multiple sources (e.g., vehicles, mobile devices, and infrastructure) across all elements of the surface transportation system (i.e., transit, freeway,

[22] http://www.its.dot.gov/connected_vehicle/connected_vehicle_research.htm
[23] http://www.its.dot.gov/pilots/pdf/5min_v9.pdf

arterial, parking facilities, and tollways) to support improved system performance and enhanced performance-based management.

According to FDOT, this program will help to strategically accelerate deployment, promote interoperability and enterprise data. By testing these applications in the field, it will help aid the needs-driven planning, investment strategies and integrate performance-based measurement necessary to expand CV nationwide. The needs-driven aspect allows for each deployment to address a certain concern, focus or specific technology. Any success within the deployments is expected to become permanent elements within the operability of a CV system. From previous research and these types of test beds, development of the Concept of Operations, Systems Requirements, and Short and Long-term Impacts Assessments can start to be defined.

ONGOING PILOT PROGRAMS

In late 2015, as a part of the Connected Vehicle Pilot Deployment Program, the USDOT announced the selection of three CV deployment sites as Wave 1 participants – awarding up to $42 million in funds for "next-generation Connected Vehicle technology" real-world scenario research. The three sites collectively envision a broad spectrum of applications enabled by Connected Vehicle technologies driven by site-specific needs. The three Wave 1 sites[24] include:

- Wyoming – Uses Connected Vehicle technologies to improve safe and efficient truck movement along I-80 in southern Wyoming
- New York City – Exploiting V2V and intersection communications to improve vehicle flow and pedestrian safety in high-priority corridors
- Tampa – Deploying multiple safety and mobility applications on and in proximity to reversible freeway lanes in Florida.

These three pilot programs will work amongst themselves with the USDOT and appropriate stakeholders to maximize the efficiency of the program and in order to start the refinement of the concept of operations, system requirements and a comprehensive deployment plans. It should be noted how each pilot program addresses a different concern through various applications in order to get the most data/results out of these implementations.

The following looks further into the Phase I Wave participants and what can be expected from that research, along with the specific implementation that Florida is a part of.

[24] http://www.its.dot.gov/pilots/

New York City

New York City received $20 million in research funds for their pilot program to outfit as many as 10,000 vehicles with smart devices that will allow them to communicate with each other and to city infrastructure.

Specifically, the city's cars, taxi cabs, buses and trucks will be installed with V2V communication devices to avoid crashes. This technology is also being installed in infrastructure as well to start the V2I aspect of research.

The aim of the program is to cut the number of traffic crashes and deaths. The government states that it would eventually make V2V a requirement in all vehicles.

Wyoming

Wyoming Department of Transportation's (WYDOT) project under the USDOT's Connected Vehicle Pilot Deployment Program will connect snowplows, trucks, fleet management centers and roadside equipment to provide enhanced advisories to trucks and personal vehicles on the Interstate 80 corridor in Wyoming. The project will be done in three phases at a cost of $5.2 million in research money. The first phase of the project is about $730,000.

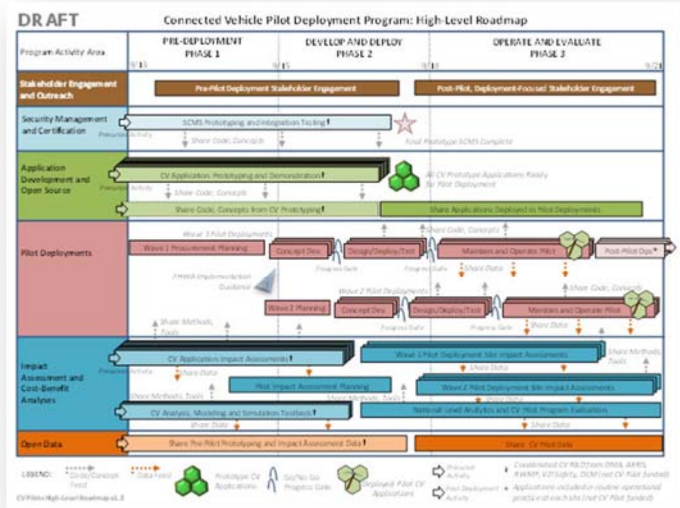
The pilot will develop applications that use vehicle-to-infrastructure and vehicle-to-vehicle connectivity to support a flexible range of services from advisories, roadside alerts, parking notifications and dynamic travel guidance. The goal is to improve the safety of the traveling public and reduce the incidents associated with adverse weather conditions frequently encountered on the corridor.

Through this pilot, WYDOT hopes to improve safety and freight mobility along the corridor through a reduction in the number of truck blow over incidents (weather-related incidents specific to wind), secondary incidents and road closures.

Florida

The third city to be awarded federal dollars to implement CV Pilot Program is Florida's Tampa - Hillsborough Expressway Authority (THEA); a total of $17 million. The THEA CV Pilot Program will outfit cars, buses and roadside equipment with technology so that they can communicate with each other about various traffic conditions. The proposal's main goals will be improved safety for vehicles, pedestrians and bicyclists; improved traffic flow and transit trip times; and a reduction of Tampa Bay's carbon footprint.

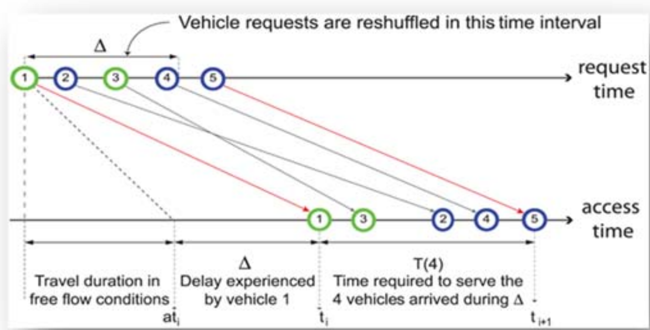
Tampa's Lee Roy Selmon Expressway and Meridian Avenue, where such technologies will be researched further, are ideal settings for this CV Pilot Program. Partnering agencies with THEA include: City of Tampa, Hillsborough Area Regional Transit Authority (HART), University of South Florida's Center for Urban Transportation Research (USF/CUTR) and private sector stakeholders, including Siemens and HNTB.



This pilot program is a profound compliment to Florida's transportation system as it exists today. The award of this pilot program keeps Florida in the forefront of these technologies and a national leader for implementation and future development.

ONGOING RESEARCH

Another application used in a V2I environment has been introduced by MIT. Imagine a future where connected vehicles pass through intersections without having to stop at traffic lights. This is accomplished by using slot-based systems, which is built on mathematics to allow more traffic to flow through intersections freely. By using sensors on these high-tech vehicles, this allows more movement through four-way intersections. The technology behind this idea is called Slot-based Intersections (SIs). These systems work by using what the researchers call the 'slower is faster' effect, which has been observed in many contexts related to the flow of entities, such as pedestrians moving through a narrow space, where they tend to move faster if they are in smaller clusters that keep going steadily.[25]



The road segment leading to the intersection would control the vehicles approaching the intersection. The calculations pushing this technology computes the optimal speed in which

[25]https://traffictechnologytoday.com/news.php?NewsID=78486

vehicles must travel prior to the intersection to allow them to hit their opening. This allows the vehicles to construct the phases of the traffic signals in a dynamic way. In order to achieve these innovative strategies, District 5 will first need to deploy a V2I system. Here are some suggested project ideas and why.

6.4. Connected Vehicle Strategies

The strategic methodologies defined below reflect the broad areas of impact that ITS has aimed to address. The themes articulate the results and performance goals that should be reflected in defining Connected Vehicle Strategies.

- **Enable Safer Vehicles and Roadways** by developing better crash avoidance for all road vehicles, performance measures, and other notification mechanisms. This strategic theme will include activities within the CV and automation areas; exploring how technology can help people avoid crashes and secondary crashes through new safety advisories, warnings, messages and ultimately automated responses when crashes occur.
- **Enhance Mobility** by increasing system efficiency and reliability by improving individual mobility.
- **Promote Innovation** by increasing awareness of new technology developments so that the ITS JPO is always on the cutting edge of current and upcoming innovations developed by others.
- **Support Transportation System Information Sharing** through the development of standards and systems architecture, and the application of advanced wireless technologies that enable communications among and between vehicles of all types, the infrastructure and portable devices. This work will support connectivity among vehicles, infrastructure, organizations, systems and people to support more efficient and effective transportation.
- **Support Smart Road Pricing (VMT)** perhaps in the form of a vehicle-miles-traveled (VMT) tax that could also serve as a "soft mandate" for vehicle connectivity. Initially, vehicle owners could be given the option to connect their vehicles and pay the VMT tax instead of paying license fees and gasoline taxes. Those who elect not to connect would continue to pay standard license fees and fuel taxes, perhaps at a higher rate to better reflect the true societal cost and provide additional incentives to opt-in. New vehicles would be connected by mandate, which would eventually result in nearly universal participation.[26]

Figure 13 identifies Connected Vehicle strategies for consideration based on regional needs.

[26] http://www.cisco.com/c/dam/en_us/about/ac79/docs/mfg/Connected-Vehicles_Government.pdf

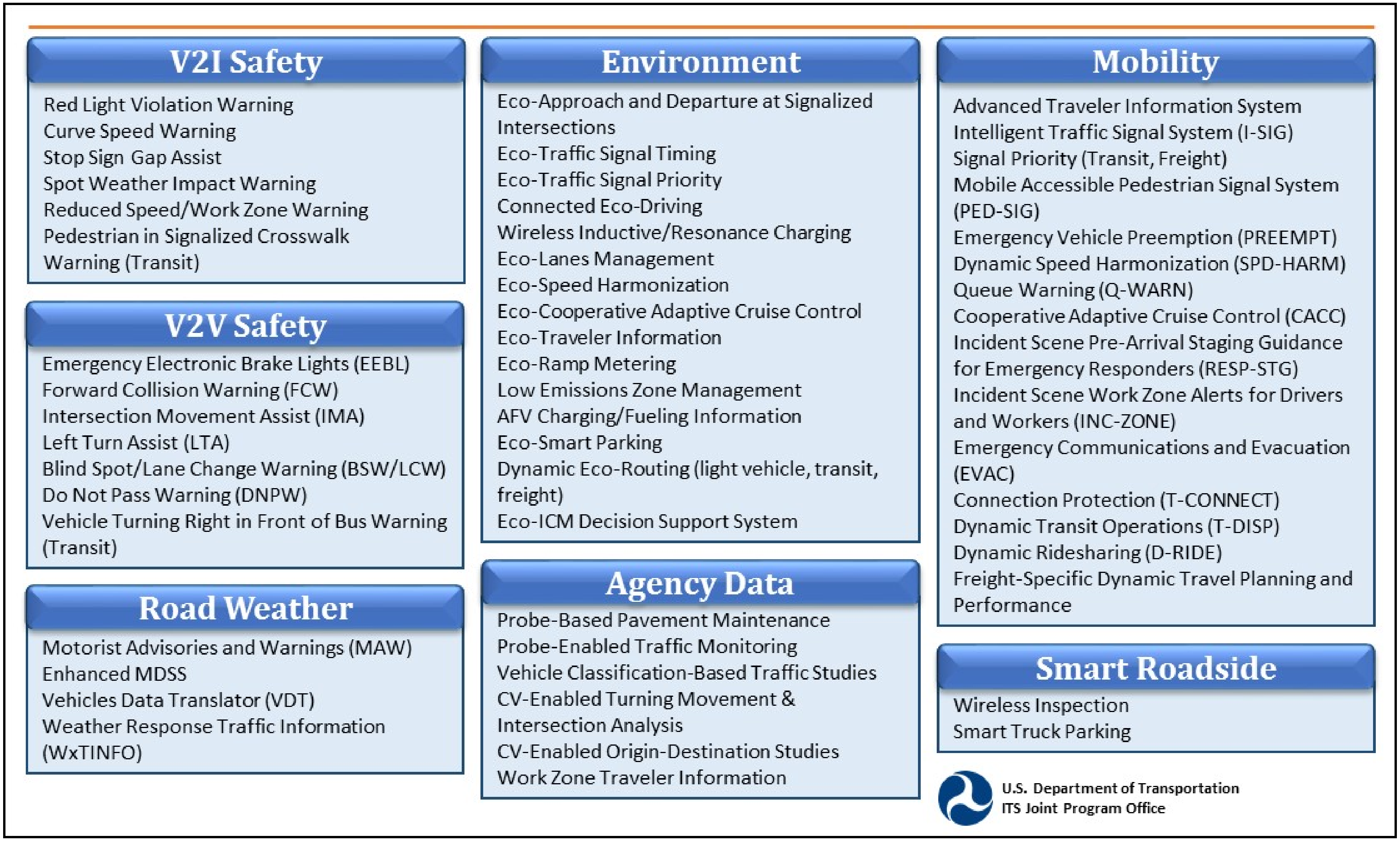


Figure 13 – Connected Vehicle Strategies

6.5. Connected Vehicle Deployment Scenarios

For the purposes of this Master Plan, the scenarios assume that NHTSA will, in some fashion, decide to move forward with a requirement to mandate factory-installed DSRC equipment on-board both light and heavy vehicles. Assuming this happens, prior experience would suggest that on-board equipment (OBE) will first appear in newly-manufactured light vehicles for the 2020 model year, rolling out in 2019.

This timing assumption has a major influence on the deployment approach presented in the scenarios. While it can be said that the benefits to drivers of OBE-equipped passenger cars and heavy vehicles will increase as the deployment of Roadside Units (RSUs) increases, it is also true that there are no benefits to the deployments of RSUs if there are no OBE-equipped vehicles with which to communicate. Therefore, in order to encourage near-term deployment of DSRC roadside infrastructure, the state and local agencies must pursue approaches that do not rely on the presence of a growing population of factory-equipped passenger vehicles before the end of the current decade.

Four deployment scenarios that were originally developed:

1. **Full Throttle** – This scenario is most similar to the predominant deployment view developed during the Vehicle Infrastructure Integration (VII) initiative. This scenario assumes that USDOT commits to the deployment of a DSRC-based infrastructure within the next 1-2 years and actively works with state agencies to develop deployment plans. The scenario also assumed a positive outcome to current federal research activities leading to NHTSA's actions to pursue DSRC-equipped vehicles in 2013 and 2014. The scenario further assumes that vehicle manufacturers would begin developing DSRC capabilities in advance of the any NHTSA decisions, allowing the first DSRC-equipped new vehicles to become available in late 2016.
2. **Safety Net** – This scenario assumes that USDOT focused on safety applications using DSRC for V2V communications. The scenario assumes that essentially no funding would be available for infrastructure deployment. With this premise, USDOT is assumed to spend the next two to three years assessing the benefits of V2V DSRC in support of possible NHTSA actions; and developing stakeholder support (Including state agencies and vehicle manufacturers).
3. **Proving Ground** – This scenario assumes that USDOT remains focused on the use of DSRC to provide V2X Connected Vehicle capabilities but that funding for a largescale deployment would not become available for at least 10-15 years. In the meantime, the private sector will have implemented Connected Vehicle applications using existing wireless communications networks. (No mention is made in the scenario description of

the likelihood of the state and local agencies similarly deploying applications using other wireless networks, which would seem to be a possibility).

4. **Facilitator –** This scenario assumes that USDOT is unable to prove the safety benefits of V2V DSRC and cannot justify any NHTSA actions to advance DSRC-equipped light or heavy vehicles. The scenario also assumes that funding is not available for a large-scale infrastructure deployment. Instead, USDOT would take a broad view of vehicle connectivity without focus on DSRC, and would emphasize near-term deployment efforts that can achieve desirable outcomes within the constraints of the available funding, technologies, and infrastructure.[27]

6.6. Connected Vehicles in District 5

It has been said that 85 percent of motorists claim they are "good drivers"; meanwhile, roughly 80 percent of crashes are caused by driver error. Since 2011, in District 5, motorists have been exposed to more and more secondary crashes. The numbers suggest this is happening at an alarming rate. There were 305 reported secondary crashes in 2011 as compared to 828 in 2015. This is a growth rate of 170 percent over 5 years. It has also been reported, by the FDOT's SunGuide Volume per Detector report, that over the past 3 years, the growth rate of motorists traveling through downtown Orlando has increased by 18%. With these growth rates increasing annually, there will need to be a solution for these issues. The V2I technology is a potential strategy to help resolve these existing issues simultaneously. Deploying CV technology in District 5 will add ITS infrastructure costs as well as operations and maintenance costs. However, especially in high crash areas, the safety benefits will likely outweigh the costs, which should be addressed as a part of a Cost Benefit Analysis.

Within the next 10 years, 90 percent of vehicles will be embedded with V2V technology. Understanding this as the wave of the future, District 5 will need to start planning for CV infrastructure located at regional problem areas.

In 2011, District 5 hosted the 18th Annual ITS World Congress conference, where they displayed the capability of transiting and receiving data within a CV environment. With 30 RSUs deployed in what was called FDOT's Test Bed, District 5 was able to send BSM from the RTMC into vehicles equipped with OBEs using DSCR technology and FDOT's SunGuide Software. With a combined effort from Orange County Traffic Engineering and Central Florida's Expressway Authority, District 5 installed this test bed on the freeway and arterial roads in Central Florida. These locations covered eight miles on I-4 from Orange Blossom Trail (mile marker 80) to SR 528 (mile marker 72), 9 RSUs on International Drive from Westwood Blvd to Sand Lake Road and 2 units at the intersections of Pointe Plaza and Convention Way on Universal Blvd. With additional support

[27] http://ntl.bts.gov/lib/43000/43500/43514/FHWA-JPO-11-090_AASHTO_CV_Deploy_Analysis_final_report.pdf

from the private sector, District 5 exhibited evidence that Signal Phasing and Timing (SPaT) can work within a CV environment in Central Florida. These units were tested on John Young Parkway and International Drive.

As it exists today, District 5 can support the hardware and software to outfit CV/AV systems. Through the use of the existing software, SunGuide, an operator at the RTMC can send BSMs directly to vehicles traveling within the CV network to provide various safety messages. These messages range from advanced weather warnings, evacuation messages, advance incident warnings, detour and evacuation message and Amber Alerts. With the increased number of tourist and motorist traveling to Orlando annually, the numbers support the need for CV. Proper planning, budgeting and training for this type of system is essential for preparing District 5 as pioneers in CV systems.

It is vital that District 5 stays one step ahead of the times. FDOT needs to consider implementing CV technologies in highly concentrated pedestrian areas where high numbers in pedestrian fatalities have occurred over the last five years. Tampa has deployed a traffic signal system called the I-Sig. This allows THEA to stay ahead of the curve and be on the cutting edge to embrace Infrastructure to Mobile (I2M). The technology can work in concert with V2X environments to support SPaT and I2M. As Orlando's population raises, there will be a need for an interactive feature for pedestrians to connect with transportation infrastructure for safety, while also considering mobility. As end users are on the move, they are able to draw upon not only the usefulness of a single device, such as a phone, but upon all the resources that surround them in each new environment they encounter.[28] District 5 and neighboring agencies combined already have the infrastructure it would take to establish a Connected Vehicle project. Now is the time to begin utilizing this technology for the benefit of the traveling public.

Connected Vehicle Strategies that have been identified as appropriate to the region include:

- V2I Safety
    - Red Light Violation Running*
    - Curve Speed Warning
    - Stop Sign Gap Assist*
    - Spot Weather Impact Warning
    - Reduced Speed/Work Zone Warning*
    - Pedestrian in Signalized Crosswalk
    - Warning (Transit)

[28] http://www.eweek.com/c/a/Enterprise-Applications/Mobile-Technologies-and-Infrastructure-Will-Transform-Business

- Road Weather
  - Motorist Advisories and Warnings
  - Enhanced MDSS
  - Weather Response Traffic Information
- Agency Data
  - Probe-Based Pavement Maintenance
  - Probe-Enabled Traffic Monitoring*
  - Vehicle Classification-Based Traffic Studies*
  - CV-Enabled Turning Movement & Intersection Analysis*
  - CV-Enabled Origin-Destination Studies*
  - Work Zone Traveler Information
- Mobility/Environment
  - Advanced Traveler Information System – Eco*
  - I-SIG – Eco*
  - Signal Priority (Transit, Freight) – Eco*
  - Eco-Approach and Departure at Signalized Intersections*
  - Mobile Accessible PED-SIG
  - PREEMPT
  - Q-WARN*
  - RESP-STG*
  - INC-ZONE*
  - Eco-Ramp Metering*
  - EVAC
  - T-DISP - Eco
  - D-RIDE*
  - Freight-Specific Dynamic Travel Planning and Performance - Eco
  - AFV Charging/Fueling Information
  - Eco-Smart Parking*
  - Eco-ICM Decision Support System*
- Smart Roadside
  - Wireless Inspection
  - Smart Truck Parking

* Strategies that would require a substantial number of On-Board Units (Vehicular) to be cost effective. This would delay implementation, since it is dependent upon automobile manufacturers. Note that informational strategies that are not dependent upon V2V are not included, since these strategies would provide value to vehicles with OBU's regardless of the saturation of other vehicles.

***Florida Automated Vehicles (FAV) Program*[29]**

The FAV program, led by FDOT, helps to create the framework for implementation by engaging stakeholders, developing research and pilot projects, and creating awareness of the technologies and how they support FDOT's vision statement. These revolutionary technologies will support FDOT's vision statement of "Serving the people of Florida by delivering a transportation system that is fatality and congestion free." Automated vehicle technologies hold unprecedented opportunities in helping to reduce congestion and improve safety and this program oversees the development of the Florida-specific initiatives and the progression of connected and automated vehicles technology nationwide.

Florida Department of Transportation – Central Office

The Traffic Engineering Research Lab (TERL) out of Tallahassee, FL is now aiding in the deployment of roadside equipment in partnership with the Central Office. Recently reported in the SunGuide Disseminator at the end of 2014, in an article "Connected Vehicle Demonstration at FDOT's TERL" by Derek Vollmer (FDOT Traffic Engineering and Operations) and Stephen Norwood (Atkins), FDOT "commissioned a series of Connected Vehicle demonstrations in August 2014 at the TERL. The TERL demonstrated that the use of V2V, V2I, and RSU, configured with directional zones, can help aid the detection of a vehicle driving the wrong direction. The information provided by the vehicle and the RSU determined if the vehicle was traveling the wrong way within the configured zone. Once a wrong way vehicle was detected, a message was sent to the wrong way driver with a warning." These units would also notify the TMC operators about the presence of the wrong way driver. Wrong way driving countermeasures (an ITS strategy previously discussed) is a huge initiative gaining traction quickly in Florida. Central Office's initiative for implementing CV technologies within Florida furthers the CV effort.

University of Central Florida

Daniel Barber, Assistant Research Professor in Autonomous Systems for the Institute for Simulation and Training as part of the University of Central Florida's (UCF) research, furthers the Safety Pilot Driver Clinics research. As described by Mr. Barber, the objective will be accomplished through a multi-phased approach including simulation test bed development

[29] http://www.automatedfl.com/

followed by data collection with human participants performed throughout the State of Florida. Findings from these efforts will result in requirements and recommendations for how to implement multimodal vehicle displays for ease of use and increased safety.

6.7. Funding Opportunities

Funding these unique CV projects can be a shared among stakeholders from local, state, and federal levels. It is no secret that Central Florida is growing at an exponential rate and that these types of technical advancements need to be considered. The co-author of Slot-Based Intersections makes a value point. If you start from the intersection, as the intersection is the crucial point, once you solve the problems at the intersection, it has a beneficial effect on the whole system and the way traffic flows. By identifying the increased volume of motorists within District 5, along with the potential for crash reduction, it provides justification to budget accordingly.

USDOT announced in September 2015 that they invested $42 Million to pilot the next-generation technology in infrastructure preparing for V2X. It has been a core mission of the Department to support promising new technologies and through these types of smart investments a door opens to a safer and cleaner network expanding how future generations travel. Transportation Investment Generating Economic Recovery (TIGER) grants have been made available for transportation projects across the country can provide opportunity for these systems to be developed and deployed. This could help funding in capital investments in surface transportation, which is based upon significant impacts on the nation, a metropolitan area and/or a region.

As the 24th largest metropolitan area in the nation with 2,387,138 people, Orlando's rate of growth is up 11.84 percent. This number excludes the tourist population. According to a recent study, Florida drew a record 97.3 million visitors in 2014. The health of Florida's tourism is very strong and has set a fourth consecutive record which provides a compelling argument. Adding these numbers with the capacity that exists, suggests a solution in technology will need to be addressed. In addition to the TIGER Grants, there are also Transportation Safety Grants and FHWA Highways Grants that are available to the Department for future project. Between the City of Orlando, FDOT, USDOT, FHWA and the MPO; funding for CV will be need to be made available for a system that has already been proven to work in Central Florida dating to 2011's ITS Annual World Congress Conference.

6.8. Measuring Success

Performance Measures will determine the effectiveness of Mobility, Safety, Environment, and Agency Efficiency.

Mobility is improved by information transferred between vehicles and traffic signals, which improves signal optimization. Safety is improved by preventative alerts given to car drivers, transit drivers, trolley operators and pedestrians/bicyclist.

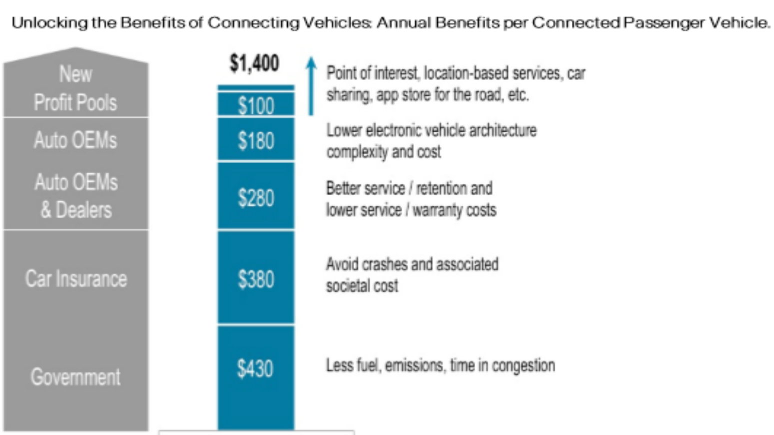
Safety and Mobility improvements are intertwined. Improvements to safety improve mobility, due to fewer crashes which reduces delays. Improvements to mobility improve safety as well. Fewer stops, a mobility improvement, means fewer occasions for rear end crashes (safety improvements). Performance Measures present challenges in the choice of appropriate data-driven techniques to make the best use of the data generated by Use Cases.

Environmental improvements will not be measured directly, but will be estimated indirectly from mobility improvements that are directly measurable such as travel time savings, queue reduction, and braking as impacts on emissions. Assessing environmental impacts will come from computer modeling based on the performance of the traffic system.

Agency efficiency is improved by new automated data collection methods that use new Performance Measures from CV communications (e.g. BSM). Improvement in data collection can also be measured in hours that staff is relieved from manually performing field collection of data.

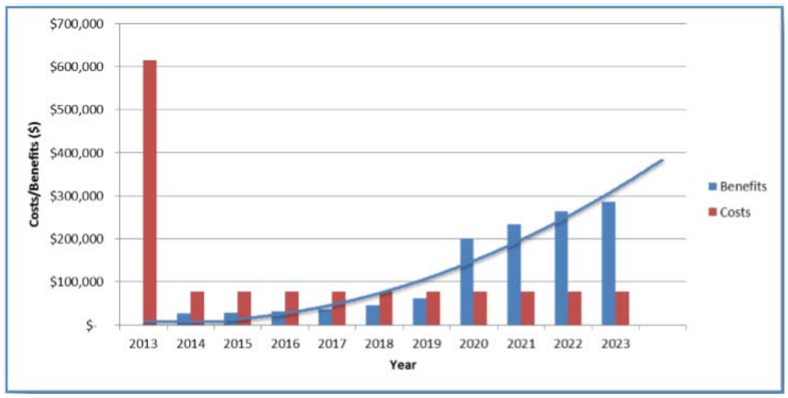
BENEFIT TO COST RATIO

Today's global personal transportation system is inefficient and costly, creating problems of global proportions. Every year, 8 million traffic accidents cost 1.3 million lives and injure more than 7 million people. Globally, we waste more than 90 billion hours in traffic jams, generating 220 million metric tons of carbon equivalent and wasting at least $1 trillion, or 2 percent, of the global gross domestic product (GDP). [30]



[30] http://www.cisco.com/c/dam/en_us/about/ac79/docs/mfg/Connected-Vehicles_Exec_Summary.pdf

Since Connected Vehicle technology has only been deployed in test beds, benefit and cost information is scarce. Preliminary analyses indicate that Connected Vehicle technology could address more than 80 percent of vehicular crash scenarios involving impaired drivers. A recent white paper from USDOT describes the premise of the original approach to the VII initiative that provides the basis for the earliest discussions of a deployment strategy. The white paper explains that V2V communication could provide the greatest safety gains but it would take time to equip all cars, trucks and buses to achieve these benefits and could potentially result in approximately $44 billion in safety benefits. RSUs will become less costly through maturing technology, competition and mass production. As concentration of connected vehicles increases, benefits can offset the operational expense required to maintain the RSU and some initial capital investments as seen in the figure to the right. [31]



6.9. Other Types of Implementation

As previously mentioned, Crash Avoidance Metrics Partnership (CAMP) was established since 1995 between Ford Motor Company and General Motors Corporation to develop and test prototype V2V safety applications. The overarching goal was to determine whether this technology would work better than existing vehicle-based safety systems, like adaptive cruise control, to address imminent crash scenarios.

Among Ford and General Motors, CAMP also includes Honda, Hyundai-Kai, Volkswagen, Mercedes-Benz, Toyota and more. Many modern versions of vehicles are already standard features on newer models, such as General Motor's OnStar, Ford's Sync, and Chrysler's Uconnect and simple features such as back-up cameras and self-parking. These car manufacturers along with innovative multi-disciplinary companies, such as Google, work to create applicable Connected Vehicles technology, as well as the actual equipment and vehicles used to drive – either connected or automated.

[31] http://stsmo.transportation.org/Documents/6-Taso%20NCHRP%2003-101_CV%20Cost%20Benefit%20Study.pdf

Google

Within the last three years, Google has set their eyes on driverless technology. They have developed their own self-driving technologies which are able to map out routes through roadways and intersections using laser scanner technology. This technology was first debuted in a Toyota Prius. Such efforts have led Google to be in talks with auto suppliers to take this technology and create driverless cars. Their bold and innovative imagination turned heads in the auto industries world with a reaction to an Internet company planning to have self-driving cars commercially available by 2017. Even though there is much to sift through with regards to regulation, network security and safety overall, Google plans to meet this target year.

Tesla Motors, Inc.

Tesla Motors, Inc. has also joined in the CV technology race by offering these features in many vehicles today. According to Diarmuid O'Connell, Vice President of Corporate & Business Development, during a meeting with House Subcommittees on Information Technology and Transportation and Public Assets on the Oversight and Government Reform Committee, the following was described as Tesla's Connected Vehicle abilities:

"What follows are two examples of Tesla's connected car functionality leading to significant safety benefits, compared to non-connected vehicles. The first example concerns Automatic Emergency Braking (AEB), a vehicle feature that attempts to avoid accidents by applying the brakes when a collision is believed imminent. Tesla is one of ten vehicle manufacturers who have committed to making this a standard feature in all vehicles, and Tesla has already delivered on this promise. But, not all AEB systems are created equal. AEB systems are hardware sensors paired with complicated software engines trying to make intelligent decisions about whether a collision is imminent. AEB systems in traditional vehicles have a certain amount of intelligence and this remains constant over the life of the vehicle. But the AEB system in a Tesla, using Connected Vehicle technology, is different. Because of vehicle connectivity, the collective fleet can learn based on encountering a large variety of different traffic situations. And because of vehicle connectivity, the fleet can be updated with overall improvements in intelligence. In effect, because of vehicle connectivity, Tesla's are getting safer day by day. The same CV technology is applied to Tesla's Autopilot functionality, where improvements are constant as vehicles "learn" from varying road conditions and share those learnings with the entire fleet."

Tesla's Autopilot functionality was demonstrated at the 2015 Florida Automated Vehicle Summit in Jacksonville, FL in December. This technology was demonstrated – yes, the car drove itself with the notion that drivers should always be cognizant of everything – and later explained this "learning" feature. The car is to follow the signing and pavement marking to know the course ahead; drivers noticed that it may follow an off-ramp pavement marking even when the route was to keep moving forward and not exit the road. If the driver corrects this, it automatically gets sent to the Tesla network as an error, corrected immediately and then that information is automatically available to all vehicles under Tesla's network; instant improvements as the technology is getting smarter.

After encouraging the security of networks to ensure this technology remains private and safe for the user, Mr. O' Connell later addressed the restrictive regulation government has placed on CV technology; stating, "one possible impediment to advanced technologies, and the safety benefits of CV, is of course overly restrictive regulation. Regulation at a time of rapid innovation runs the risk of limiting the realization of the full extent of safety advances."

Regulation has been passed to further CV technology, more specifically V2I technology, to be included in new vehicles.

The BMW Group

According to Traffic Technology Today, The BMW Group has become the first automaker to introduce the EnLighten V2I smartphone application into its vehicles. Developed by Eugene, Oregon-based Connected Signals (formerly Green Driver), the app provides drivers with traffic signal countdown information[32]. This technology allows for drivers to be more aware and make better decisions when it comes to stopping early.

Personal Rapid Transit (PRT) by Ultra Global

"UltraGlobal is delighted to announce that it has signed a contract with its partners China Engineering Consultants Inc. (CECI) to carry out a feasibility study into the deployment of Personal Rapid Transit (PRT) within Taiwan. The study is a high level planning and design project which aims to increase awareness and understanding of PRT with a range of decision makers, stakeholders and members of the public and make them aware of the social and economic opportunities associated with it. Also included within the scope of the study is a specific exploration into the implementation of PRT in New Taipei City, an area which has been identified by Ultra and CECI as a location where PRT can be a lever in unlocking latent economic potential. The project, drew on the expertise of consultant Sinclair Knight-Merz (SKM)[33]."

The PRT operates similar to a rail system, however, the Ultra "pods" are comfortable, personal, reliable vehicles that are built from off-the-shelf automotive industry components and use advanced technology to provide a unique transport solution. They include a wireless

[32]http://www.traffictechnologytoday.com/news.php?NewsID=71483
[33]http://www.ultraglobalprt.com/

communication system for two-way data and command exchange from the vehicle to the central control system.

The first pod system was introduced in Heathrow, United Kingdom – the world's first commercially operational PRT system, which now carried close to a million passengers and has amassed over 1,000,000 safe driverless passenger miles. The efficient operational performance at Heathrow, along with the popularity of the system, has resulted in tremendous interest across the world and the Taiwanese study is one of a number of studies Ultra is currently involved in to further the research and implementation of this system. 90% of Ultra pod passengers are served within one minute, thanks to the system's comprehensive operation procedures that ensure it runs safely, reliably and efficiently[34]. Once on board, they can relax as the vehicle takes them straight to their destination – similar to how the AV will work in the future, this system is just on a track system and geared towards transit.

Three layers of operations that control form the heart of the Ultra pod system and ensure that it functions to maximum efficiency and without error; these are:

- **Central Synchronous Control** – Ensures vehicle journeys do not conflict
- **Autonomous Vehicle Control** – Uses laser sensors to guide the vehicle on its path
- **Automatic vehicle protection system** – Ensures vehicles don't make contact with each other

Riders are able to contact the system controller at any time to respond to any questions or concerns. Benefits from this system include flexible routing, 24-hour availability, low energy use, low capital and operational costs and better transportation experience for users.

Other Countries

Beginning in May 2016, travelers going between the Dutch towns of Wageningen and Ede will be able to ride driverless electric shuttles called WEpods developed and tested at Wageningen University. These vehicles use cameras to map obstacles, are limited to about 15 miles per hour and are monitored by a control room.

In addition, Daimler's new connected and semi-autonomous bus, which has just begun trials in the Netherlands, is able to recognize traffic lights, communicate with them, and safely negotiate junctions controlled by them using V2I equipment that could soon become standard for all intersections and vehicles. The CityPilot technology used in the Future Bus is based on the system fitted to the autonomous Mercedes-Benz Actros truck with Highway Pilot that was originally

[34] http://www.ultraglobalprt.com/how-it-works/operations/

presented two years ago, and has since been demonstrated in several self-driving and platooning projects. The technology has undergone substantial further development, specifically for use in a city bus, with numerous added functions. The CityPilot system can also recognize obstacles, including pedestrians on the road, and brake autonomously. The vehicle approaches bus stops automatically, where it opens and closes its doors, without direct input from the driver.[35]

REGULATION

In August of 2014, the NHTSA gave V2V communications technology the green light and is working on a regulatory rulemaking that will require the technology to be installed in all new light vehicles in the coming years.

In May 2015, Secretary Foxx announced the USDOT would accelerate the deployment of connected vehicles. NHTSA will move ahead of its timetable for the proposed V2V rule. In the summer of 2015, the FHWA will release a V2I guidance document to assist transportation managers and operators interested in adapting their traffic signals and other roadside devices so they are compatible with the new connected vehicles.

It can be seen that these governmental parties support the steps needed to see V2V communications used within new models for cars.

"Vehicle-to-vehicle technology represents the next generation of auto safety improvements, building on the life-saving achievements we've already seen with safety belts and air bags," said U.S. Transportation Secretary Anthony Foxx. "By helping drivers avoid crashes, this technology will play a key role in improving the way people get where they need to go while ensuring that the U.S. remains the leader in the global automotive industry."

The research discussed within this section and other research in the works indicates that these Connected Vehicle technologies can address crashes by utilizing those safety features – both real-world and controlled environments. The safety applications currently being developed provide warnings to drivers so that they can prevent imminent collisions, but do not automatically operate any vehicle systems, such as braking or steering. NHTSA is also considering future actions on active safety technologies that rely on on-board sensors – i.e. some of the pilot programs mentioned previously.

[35] http://www.traffictechnologytoday.com/news.php?NewsID=80583

Specific to District 5's interest; Florida has now enacted legislation that allows the use of autonomous vehicles. These laws do not resolve all of the legal issues surrounding the use of autonomous vehicles. However, they do explicitly recognize the existence of autonomous vehicles and authorize their use in those States State. Some areas that will need attention are, according to the analysis of Stanford University, vehicle standards, general tort liability, insurance, data collection, transportation planning and environmental impact assessment. The box to the right is a summary of the bill CS/HB 1207 – Vehicles with Autonomous Technology[36].

One major issue these technologies are facing is that officials want to open up the 5.9 GHz spectrum that the network operates on to other users, which would result in V2V having to find a dedicated band in order to avoid interference from electrical devices such as smartphones. Another question to be answered is: is the information between two communicating parties (be it agencies, devices, etc.) secure and accurate?

CS/HB 1207 — Vehicles with Autonomous Technology
by Economic Affairs Committee; and Rep. Brandes and others (SB 1768 by Senators Negron, Ring, and Sachs)
This summary is provided for information only and does not represent the opinion of any Senator, Senate Officer, or Senate Office.
Prepared by: Transportation Committee (TR)
Currently, Florida law does not address the use of autonomous vehicles. This bill:

- Defines the terms "autonomous technology" and "autonomous vehicle" and provides the legislative intent to safely develop the operation of motor vehicles with autonomous technology on the public roads of the state.
- Requires autonomous vehicles registered in Florida to meet federal standards and regulations for motor vehicles and to comply with applicable traffic and motor vehicle laws of Florida.
- Requires safety mechanisms for engaging and disengaging the technology, indicators inside the vehicle that show when the vehicle is in autonomous mode, and a means of alerting the operator of a technology failure.
- Requires the presence of a human being and creates insurance requirements for testing autonomous vehicles.
- Creates a defense for the original manufacturer when legal action is taken due to issues arising from the conversion of a vehicle to an autonomous vehicle by a third party.
- Requires the DHSMV to prepare and submit a report relating to the safe operation of vehicles equipped with autonomous technology on public roads to the President of the Senate and the Speaker of the House of Representatives no later than February 12, 2014.

If approved by the Governor, these provisions take effect July 1, 2012.

[36] https://www.flsenate.gov/Committees/BillSummaries/2012/html/211

CLOSING/FUTURE OF CONNECTED VEHICLES

All in all, there is much to Connected Vehicle technology that needs to be worked out – technology aspects; security, ethics and regulation; safety; and more. If these elements can be solved, the possibilities are endless to the functionally of the transportation system. Research and Innovative Technology Administration (RITA) Deputy Administrator Greg Winfree once said, "The past several decades of auto safety have been dedicated to surviving crashes, but the future will be about avoiding crashes. That is what connected vehicles are all about." This speaks volumes to the changes in ideals of what makes up a transportation system. Technology and innovative solutions will be at the forefront of the planning process.

There will come a time when an autonomous vehicle driving cross-country while passengers sleep or play games will become as normal as buckling seatbelts for safety.

Florida has already put in a large amount of effort to stay at the forefront of these technologies and District 5's ITS Master Plan calls for the Central Florida region to start its preparation in anticipation of more funding and grants trickling down from USDOT in order to keep implementing these life-changing advanced safety applications. This plan focuses on regional cooperation and standardization for when that time comes. And it will be sooner, rather than later.

7. ITS Standards

7.1. Introduction

In the past, ITS technologies have been segregated by application and jurisdiction with each agencies' ITS system working within its own "silo". However, with the initiation of the TSM&O program and rapidly progressing technology, there are many benefits to be gained by taking a collaborative approach to ITS regionally, both as a MPO/TPO region and Districtwide. This will allow each local agency stakeholder to leverage their existing independent system investments to form a greater whole in combination with other regional partners. It will also create regional cost saving opportunities through resource sharing of device data, sharing software licensing and combined regional network contract staffing options. The purpose of this section is to document standards that either need to be implemented regionally or should at least be considered in order to facilitate the connectivity of stakeholders' Districtwide and the overall regional success of the TSM&O program. The fundamental goal is to allow for connectivity and resource sharing while also allowing each stakeholder to maintain control over their specific systems.

It is important to recognize that technology is ever changing and advancing, therefore the ITS Standards section of the District 5 ITS Master Plan should be considered a "living document" and should be updated whenever new devices, software or technologies are added to the System. Any proposed modification to the ITS Standards should be in accordance with the regional MOU agreement and be brought up for consensus within the TSM&O Consortium group or other regional management group.

7.2. ITS Regional Network and Security Standards

PURPOSE OF REGIONAL NETWORK AND SECURITY STANDARDS

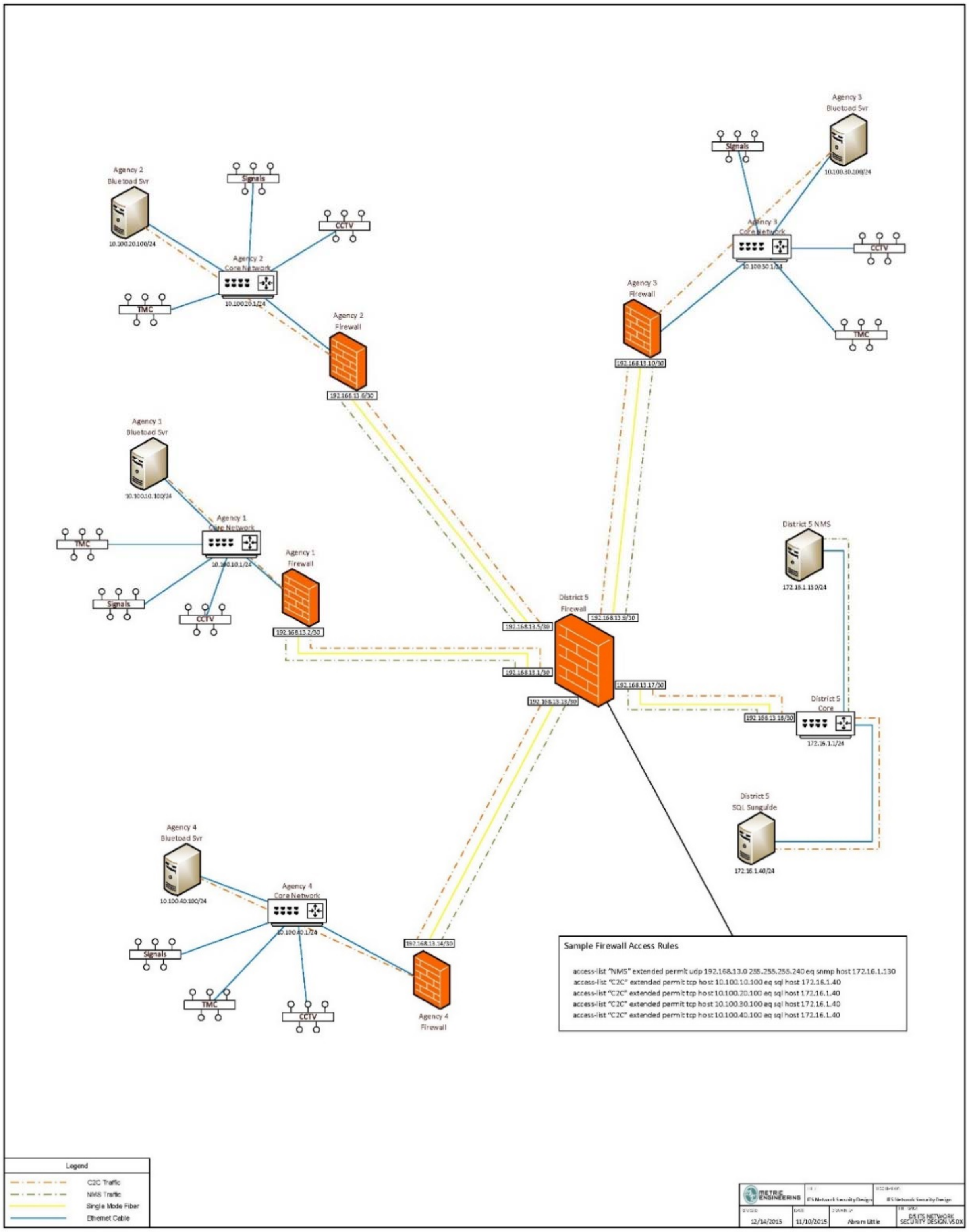
The purpose of this section is to propose a potential network topology that would facilitate communication between regional agencies within FDOT District 5. The goal of this communication is to facilitate data and information sharing between agencies, with the goal of improving the overall efficiency of the transportation system. It is understood that there are numerous ways to accomplish this goal. Therefore, as part of the development of the overall ITS Master Plan, the proposed network topology was provided to each agency for review so that a regional approach could be agreed upon and ultimately implemented. This review was to include any related IT personnel/departments who would ultimately be responsible for the approval of any implementation in the future.

OVERVIEW OF APPROACH TO REGIONAL NETWORK AND SECURITY STANDARDS

The task of interconnecting numerous regional partners to the FDOT District 5 – ITS network will require the deployment of a secure regional Metro-Area Network (MAN). The regional MAN is proposed to be deployed in a Hub and Spoke logical network topology (see **Figure 14** on the following page) with District 5 designated as the aggregate location for all of the partner agencies' connections. A Hub and Spoke design provides the necessary connectivity to enable the flow of data from the regional partners to District 5 while providing a network which can be easy to manage.

The first step for designing and deploying the regional MAN is immediate coordination with all regional partners. Each agency will need to compile of list of devices they intend to share across the proposed network connections. In addition, the associated unicast Internet Protocol (IP) addresses and multicast addresses will be determined by FDOT Central Office (CO) for state-wide IP allocations and will be further allocated by each FDOT District to be assigned to each agency connected to the FDOT ITS MAN. This is to ensure no duplicate IP assignments exist between the connecting networks as the connections will be direct and will not be utilizing the Network Address Translation (NAT) protocol. This step is critical, since all agencies will be participating in a single routed network. This will require each device across the entire proposed MAN to be assigned a unique IP address. If duplicate IP addresses are discovered, new IP addresses will be assigned and will be deployed for the conflicting devices and subnetworks. It should be noted that there is an ongoing project that is being managed by District 5 to update the IP addresses throughout the District. An overview of the ongoing IP addressing project was previously discussed within the regional ITS strategies section.

Figure 14 – Hub and Spoke Example (Logical Diagram)

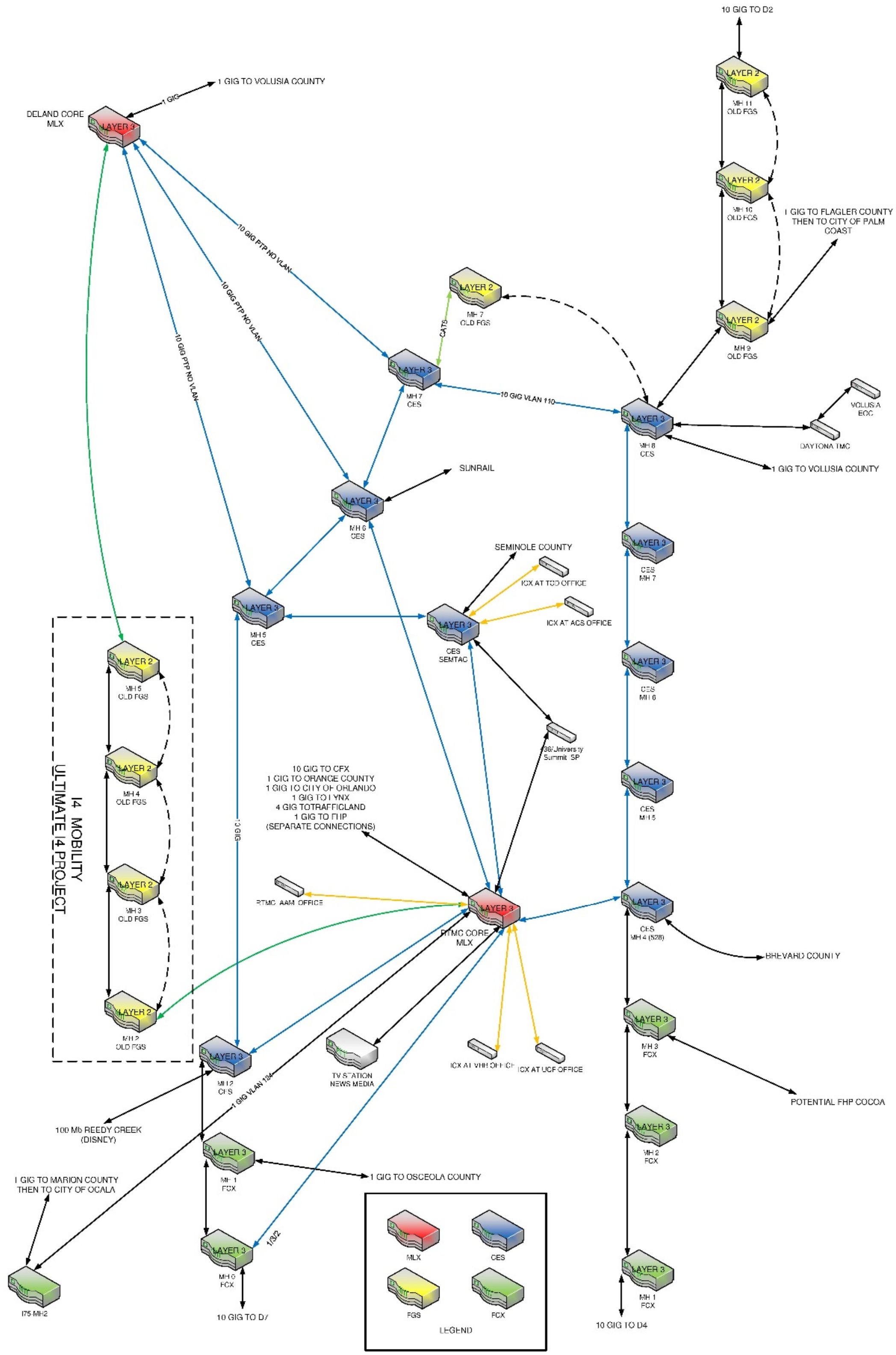


Once all agencies' local area networks (LAN) have been documented and all conflicts resolved, the new IP assignments for the entire MANs routed links will need to be allocated. These IP addresses will be used specifically for the point-to-point connections between each regional partner and the District 5 Firewall. The most efficient use of this new IP space will be to divide the proposed address space into subnetworks of two usable IP addresses. Once the IP assignments have been made, an IP address management document will be created to record each agencies allocation and will need to be maintained by the respective agency on a quarterly basis.

At no time will these addresses be sent via email for network security reasons. In addition, for ease of device configuration, static routing will be used within the MAN to ensure communications between all partnering agencies. Static routing has more administrative overhead than a dynamic routing protocol; however, once the configurations are deployed, the routing protocol is less susceptible to accidental changes unless communicated and implemented on both ends of an agency's link. Finally, in time, the plan will be to move towards BGP routing with a unique ASN. This would allow for the standardization of the exterior gateway protocol using BGP. When using BGP routing, due to the proposed Hub and Spoke design, it is proposed that FDOT would function as the administrative entity.

With the topology, protocols, and IP assignments determined; each agency will be required to establish a fiber connection between their respective router and the District 5 Carrier Ethernet Switch (CES) MPLS Edge network (see **Figure 15** – Topology and Connections Example Diagram). The MPLS Edge network will provide redundant paths between the agency's demarcation point and the District 5 Firewall Core. The District 5 Firewall Core will serve as the access point between all regional partners in addition to the District 5 core network. District 5 will leverage the Firewall Core to filter only approved traffic into their production network. Approved traffic will be defined in a Memorandum of Understanding (MOU) to be developed and approved by FDOT and all participating agencies. The use of firewalls and/or Access Control Lists (ACLs) by the regional partners will be determined by each agency as they see fit. Recommendations could be advised by District 5 to the partners; however, evaluation and implementation of said recommendations would be the responsibility of the partner agency's internal network engineering staff.

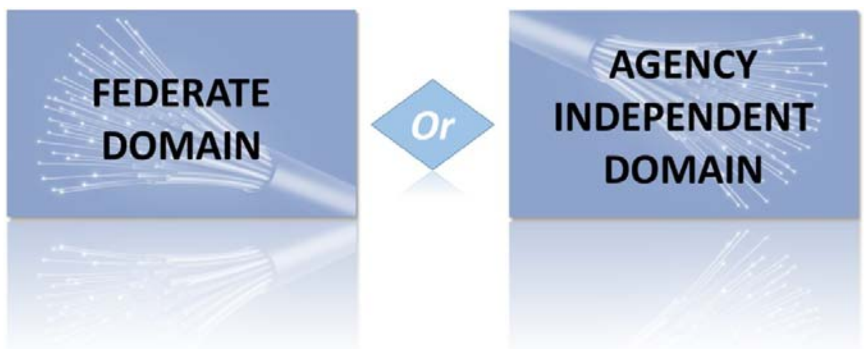
Figure 15 – Topology and Connections Example Diagram



If an agency does not have the resources to implement and manage the proposed network security equipment, District 5 may apply some basic firewall rules for that agency's connection. However, firewall requests would be processed in a queue type fashion by District 5 Security personnel. This would require mutually agreed upon Service Level Agreements (SLA) and a MOU to be established between District 5 and the partners.

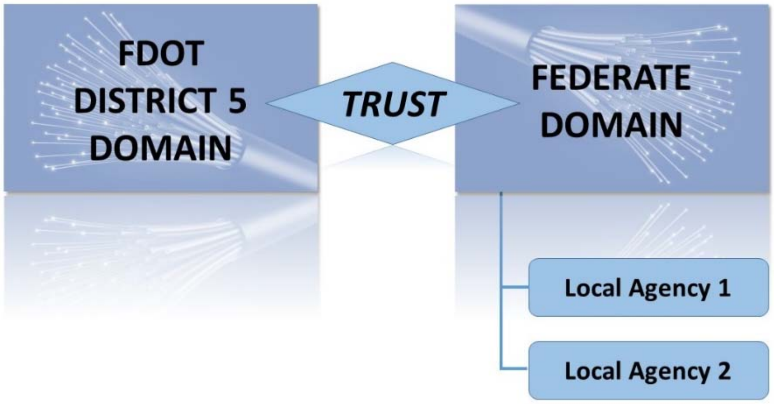
In addition, the Regional ITS Network will establish new Active Directory trust relationships with one another. The Regional ITS Network will consist of two domain types; 1) Federate Domain and 2) Agency Independent Domains.

ITS Network Domain Type



FEDERATE DOMAIN

The Federate Domain will be established as an active directory forest and will be comprised of several local government agency active directory domains. All agency domains joined under the Federate Domain will inherit the domain security policies established at the Forest level. An MOU will be developed and signed by each agency (This can be added to the MOU mentioned previously) that seeks to become a member of the Federate domain. District 5 will coordinate with the local agencies and schedule stakeholder meetings purposed to define the security policies that will be established at the Forest level and propagated to each domain within the Forest. The Federate Forest will not inherit nor be subject to any FDOT policies. District 5 will secure staffing to establish and maintain the forest through its consultant contractual agreement process. Said consultant staff will be a shared technical resource for each agency that is a member of the Federate Domain for matters related to the Federate Domain.

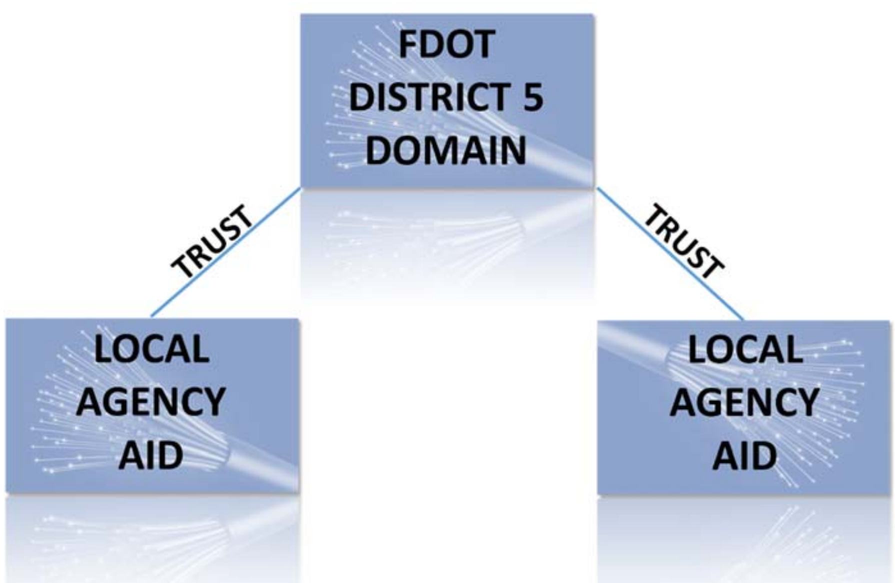


AGENCY INDEPENDENT DOMAIN (AID)

The Agency Independent Domain type is defined as an agency that has selected to continue to function as or establish an independent active directory domain and will establish individual domain trust relationships with each agency independent domain and the Federate Forest within the Regional ITS Network. Agencies that have selected to be an AID are:

- FDOT District 5
- Florida's Turnpike Enterprise
- Lake County
- Seminole County
- Central Florida Expressway Authority

The AID types will maintain its domain through its agency personnel and resources. All organizational units, computers and users will be subject to the active directory policies established by each respective AID. Due to the nature of this architecture, the active directory domain policies established within the AID will not propagate to another AID in which trust relationships have been established. An MOU will be developed to determine the security policies and data to be shared between each AID in which trust relationships have been established.



Finally, with several agencies participating in the regional MAN, each partner must review their security measures at the device and application levels. Active Directory would enable the use of security policies for password complexity, security groups for network resource access and easy user management for additions and terminations.

With all users having a unique network login; AAA can be implemented with a RADIUS or TACACS+ server. The RADIUS or TACACS+ server would utilize the security groups built within Active Directory to determine what network resources a specific user is allowed to access based on group membership. Once an AAA server has been implemented, all possible network resources should be configured to utilize the RADIUS/TACACS+ service and the passwords to all local resource administrative accounts would be changed and used only as a backup means for resource access. These local account passwords should be changed on an annual basis and if administrative personnel leave the agency. In addition, inactivity session lock should be incorporated.

There will be some proprietary applications or older devices that are not compatible with an AAA server. In these instances, the local passwords should be changed annually and communicated to only the necessary staff as it relates to their job duties. All privileges to network resources should be audited and analyzed annually to ensure that personnel do not have unnecessary access. If an agency is sharing resources with another partner; such as SunGuide and the Network Management Software (NMS), the accounts and privileges within the shared resource would be managed by the agency who owns and supports the resource. A process will be established for the remote agency to request staff additions/terminations and user privilege changes within the resource.

It should be noted that the RTMC has an increased level of access based on Florida Department of Law Enforcement (FDLE) requirements that could be considered as a higher level of security for the local agencies as appropriate. Some of these include:

- Access is based on need-to-know/need-to-share
- 128-bit Encryption
- Secured areas based on access levels and the level of required security
- Disabling SSID
- Approving MAC Address Filtering
- Developing a procedure for capturing, maintaining and reviewing the logs
- Segmenting the “Guest” Wi-Fi from the internal network environment

When the regional MAN is established, provisions for a stable multicast environment must include the formal segmentation and separation of disparate Protocol Independent Multicast (PIM) routing domains. The absence of adequate formal separation between unique network entities can result in the creation of a single PIM domain. If the multicast domains are not segmented it can result in undesirable changes or misconfigured items in one network, which can impact and result in downtime for that and other users. To alleviate this, each network seeking to share multicast IP data must employ the MSDP protocol alongside of BGP for external multicast data sharing. The internal multicast protocols implement by the agency (i.e. PIM, SSM, etc.) are at the sole discretion of each agency. The MSDP protocol utilizes peering sessions with designated peers in remote multicast domains to share and learn their respective multicast routes. Each agency will be required to establish BGP borders on their respective interface, which connects their network to the proposed regional MAN. Establishing separate multicast Domains via MSDP peering enables a certain level of network stability. This ensures only approved multicast addresses are shared with neighboring multicast Domains as opposed to multicast traversing all regionally connected agency networks with no security protocols in place.

With regional partners connected to the proposed MAN, the devices from the regional partners can be entered into the District 5 SunGuide Software and managed via the SunGuide Client established for each partnering agency. Each partner's devices within SunGuide will be logically separated so that each agency maintains primary control of their own equipment while providing access to District 5 and other partners when the resource is available. The use of a SunGuide client ensures all data is shared and transmitted in a consistent format across the region. The preferred data format would be JSON or XML, which can be imported by all data applications. District 5 can act as the sole source of regional data for partner agencies requesting data from another regional partner. However, based on discussions with stakeholders, it is clear that substantial discussion is required in order to formulate a real-time data storage and dissemination policy, both within the region and as it relates to third parties. That said, access to another partner's data would be provisioned as Read-Only so there would be no risk of accidental data manipulation or deletion. This will ensure consistent data is received by any party and/or agency requesting it.

For entities external to the proposed regional MAN; such as Traffic Land or Google Waze, travel data could be published via District 5 SunGuide exclusively. This would ensure the data from all regional partners is delivered to each third party in a standardized format. Again, having a sole source for data would ensure all parties are receiving the same information. This would also utilize existing mechanisms for publishing data which would eliminate the burden on the partners of establishing, maintaining and securing such a connection to a third party.

SUMMARY OF NETWORK AND SECURITY STANDARDS

To summarize the intent of this section is to identify the required standardized elements that are needed for regional information sharing, but also to note the areas that will not require regional standardization. Further it is proposed that FDOT function as the regional administrator of the Hub and Spoke Topology.

The proposed regional standards identified within this section include:

Network:

- Hub and Spoke Topology - Static Routing and gradually migrating to BGP with unique ASN
- Fiber Connection between the Agency Router and the District 5 Carrier Ethernet Switch (CES) - Use of MPLS
- Unique IP Addresses
- Use of MSDP

Security:

- Firewall at the D5 Carrier Ethernet Switch
- Centrally managed user account database (i.e. Microsoft Active Directory)
- AAA - RADIUS or TACACS+
- It is recommended that firewalls be used by each agency or that they establish a mutually agreed upon Service Level Agreement (SLA) for FDOT to manage

Data Sharing:

- Format - JSON or XML
- District 5 can be the sole source of regional data. However, additional coordination is needed regionally to determine real-time data policy.
- For 3rd party entities - Data can be published via SunGuide. However, additional coordination is needed regionally to determine real-time data policy.
- Access to a partner's data to be read only

Items that will *NOT* be standardized include:

Communication occurring behind the respective agency’s firewall would be at that agency’s discretion, with the exception of IP addressing standardization, which is currently underway as a part of a current contract.

7.3. ITS Maintenance Standards

PURPOSE OF ITS MAINTENANCE STANDARDS

This section is intended to propose a standardized approach to Maintenance of the Arterial Traffic Management Systems throughout the District 5 Region that can be implemented at each agencies’ option. This section provides an overview of the procedures, staff positions, and systems necessary to have consistent Maintenance programs for participating agencies. By using consistent Maintenance procedures and processes, the agencies can ensure that their systems function at a high level and motorists receive maximum benefit from the systems deployed along the arterial corridors. The ITS Maintenance Standards section provides a Maintenance Plan providing general guidance for FDOT, County and Contractor personnel in their daily duties associated with maintaining ATMS installations within District 5.

This Maintenance Plan provides a guide for consistent maintenance activities and procedures associated with all ATMS corridors being constructed, operated and maintained within FDOT District 5. Delivered and/or installed components that have not completed formal acceptance testing are not covered by this maintenance plan. The responsibility for maintenance including warranty, repair/replacement, and re-installation of these items rests with the supplier/installation contractor until District 5 and the local agency has formally accepted the components.

This section defines the maintenance activities and responsibilities of the parties who will authorize and perform maintenance activities on and for the ATMS. It also provides suggested standards and procedures for Maintenance related software packages for creating, tracking and closing work orders, tracking inventory and the management of the fiber optic communications network.

MAINTENANCE ACTIVITIES AND RESPONSIBILITIES

This section describes the various types of maintenance activities related to ATMS on the arterials and the responsibilities for the FDOT and local agency personnel assigned to work on these systems.

Typical maintenance activities include the following at a minimum:

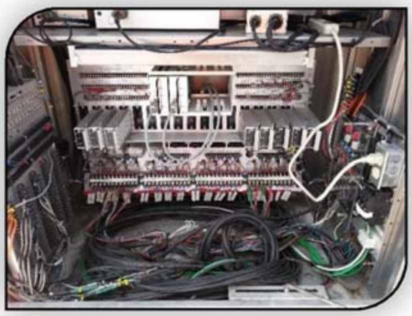
- The execution, administration and management of the ATMS/Signal control software, maintenance agreements and hardware maintenance contracts,
- Initial malfunction identification and fault isolation and diagnostics specifically related to communications, device failures and software,
- Problem reporting and response prioritization,
- Selection and notification of the appropriate entity to respond to the System's maintenance needs,
- Monitoring and tracking of all System maintenance activities, and
- Problem clearance notification.

PREVENTATIVE MAINTENANCE

The responsible agency should create a Preventive Maintenance Plan (PMP) to outline the tasks to be completed during a Preventive Maintenance Cycle and the frequency of which Preventive Maintenance is required on each type of device/structure/equipment. This plan shall be included as minimum maintenance guidelines on all contracts performing work on the ATMS.

Preventive Maintenance for ATMS field items includes, but is not limited to, the following:

Signal Control/ITS Cabinet - Interior:



- Vacuum floor of cabinet.
- Lift and or remove all equipment from shelves and wipe down shelves w/moist cloth or paper towel.
- Wipe down all equipment on shelves with a moist paper towel or rag.
- Replace cabinet air filter.
- Turn down thermostat and verify operation – replace if necessary. Return thermostat to original position – original position is 90 degrees.
- Verify that there is ant powder/granules on the cabinet floor, conduits are capped off and/or duct sealed, cables and or wiring harnesses are neatly bundled and or routed, label or replace labels as needed.
- For signal cabinets, verify loop or video detection operations. Are there any loops in failsafe, all cameras operational, are radar units functioning?
- For signal cabinets, if location has pre-emption: test pre-emption.
- Verify exterior of cabinet is sealed with silicone caulk: re-apply if needed.
- Verify tightness of all field terminals and cabinet power connections.

Edge or Cut Grass:

- Weed-eat around cabinet.
- Weed-eat around all signal poles, pedestrian poles, pull boxes, and any other agency maintained facility within 500’ of this location. (I.E. – street lights, load centers, beacon poles, etc.)
- Locate all pull boxes at this location and any other pull box maintained by the agency within 500’ of this location. (I.E. – street lights, load centers, beacon poles, system loops, fiber optic s, etc.)
- Replace any damaged pull box.
- Open all pull boxes and verify condition of cables. Repair/replace /re-splice any required connections. Raise pull box if needed. Add rock to box when required. Verify that all

conduits extend up out of the rock and are capped off. If conduits require extending – extend conduits.

Pedestrian Facilities:

- Verify all pedestrian poles and signs are level and plumb – adjust if necessary. If signs are missing – replace. If signs need re-attaching - re-attach sign(s). If signs need to be replaced – replace sign(s). Verify button is sealed and operational – repair/replace as required.
- Verify pole has locking collar – install if one is not installed. Verify door is in good condition and latched. Verify pole is grounded.
- Paint pedestrian head, collar, mounting hardware and pedestrian push button. Do not paint Astro Bracket mounting hardware.
- Check connections within pedestrian head for tightness and verify walk, don't walk and countdown functionality – replace if needed.
- Verify signal display is water-tight.
- Verify pedestrian display is aligned with the crosswalk.
- Walk out all pedestrian movements by actuating the pedestrian buttons to receive the proper signal displays.

Vehicular Signal Displays:

- Verify signal displays are properly aligned with the roadway. Re-align when necessary.
- Ensure signal displays are level and plumb. (Place level on back plate to check for level. Do not use the signal housing or Astro assembly.)
- Verify that all signal displays are a minimum of 17.5' above roadway. Raise if required.
- Verify that all signal mounting hardware, signal hardware, back plate hardware, visor screws, LED insert hardware is in good condition and properly tightened.
- Lubricate all door gaskets, hinges, and door fastening hardware. Do not use mechanics spray on plastic signal heads.
- Make certain all electrical connections in signal displays are good and tight. Confirm condition of signal cable conductors – i.e. – any cracking taking place?
- Verify all signal displays - replace when required.
- At span wire locations, make certain all electrical connections in signal disconnect are in good order. Verify that hub hold down hardware is not cracked and tight. Replace when necessary.
- Verify disconnect is securely attached to the span wire.
- Verify all cable ties are in place at all drip loops.

- Lightly scrape or wire brush each signal display then paint w/gloss black spray paint.

Video Detection Cameras:

- Verify all mounting hardware is secure and in good condition. – repair/replace as needed.
- Verify that the camera mast is level/plumb – adjust as required.
- Verify all connections are tight and/or waterproofed.
- Clean all camera lenses.
- Check camera video – is there a good clean video stream? Are calls being placed into controller? Are there any false calls? Correct issue if answered “yes” to any previous question.

Radar Units:

- Verify all mounting hardware is secure and in good condition – repair or replace as needed.
- Verify cable and connector(s) are in good condition – repair if needed.
- Make certain cable(s) are bundled together and have a neat appearance.
- Verify detection operation in cabinet. Are calls being placed into controller and into the correct phase?

Loops:

- Check condition of all loops in the roadway. Are the loop wires exposed? Is the home run in pavement exposed? Are splices in the pull box waterproof?
- At the cabinet, are there any false calls being placed into the controller cabinet?
- Verify all detectors are placing calls into the controller into the correct phase.

Street Signs – Static and Illuminated:

- Verify all mounting hardware is secure and in good condition – repair and replace as needed.
- Make certain signs are leveled and/or plumb.
- Check condition of sign face – replace or request replacement where necessary.
- On illuminated street name signs, is the door gasket in good condition? – Apply silicon spray if needed.

- On illuminated signs – verify operation, verify operation w/photocell and on/off/manual switch. Verify cable supplying power to the sign is secured and neatly bundled. Correct any issue encountered.
- Replace illuminated street name sign tubes as needed.

Mast Arm Structures (To be Done by Others as Appropriate):

- Inspect overall condition of pole and arm(s). Are all arm end caps and pole caps in place – repair or replace if needed.
- Are cables at top of pole upright supported? Install cable grip if needed.
- Verify that mast arm attachment bolts are tight and lock nuts are all in place.
- Inspect arm to arm attachment plate welds. Verify no visible cracks appear along w/no rusting.
- Verify that all pole anchor bolts are tight.
- Verify all nut covers are secure. If grout was installed between pole and top of foundation – when feasible, remove grout and install wire mesh screening.

Span Wire Structures:

- Verify that all span whips are securely bonded together with wire rope clamps and grounded. Repair as needed.
- Verify condition of all attachment hardware – i.e. eyebolts, dead ends, etc.
- Verify messenger cable is tight.
- Verify condition of cables attached to messenger wire. Replace any wire loom or cable ties along the horizontal run of signal cable/span wire. Verify drip loops at the concrete poles are securely attached.
- Check condition of weather heads at poles. Repair/replace if needed.

DMS/ADMS:

- Check for loose connections for power and data within the cabinet.
- Verify that there is no damage to the face of the sign or the DMS enclosure itself.
- Verify proper connections to each of the DMS modules and other components within the DMS enclosure.
- Run diagnostic test messages to check for failed pixels or other issues.
- Check the resistance reading at the main ground rod to verify that it meets 5 ohms or less resistance.

<u>CCTV Cameras:</u>

- Check for loose connections for power, video and signal within the cabinet.
- If the CCTV is analog, verify that the encoder is configured and working correctly.
- If the CCTV is pressurized, verify the pressure is appropriate.
- Clean the CCTV lens and dome.
- Verify proper connections at the CCTV.
- Check the resistance reading at the main ground rod to verify that it meets 5 ohms or less resistance.

<u>UPS Units:</u>

- Change or wash air filter.
- Check exhaust fan. Make certain fan and thermostat is operational. Thermostat should be set at 90 degrees.
- Check batteries with “load tester.” Check for signs of leakage, swelling or cracking.
- Make certain no alarms are active on the inverter.
- Make certain the temperature sensor is secured to a battery.
- Dust cabinet.
- Perform a manual test of the unit to verify battery backup condition.

The Maintenance Manager should read the manufacturers’ literature for each device to determine if additional maintenance, above and beyond that described above, is required.

ROUTINE MAINTENANCE

Many times a device failure does not impact the functionality of any other devices or portions of the system. As long as the failed device is not providing critical information, the issue can be resolved at the earliest possible time without the need to respond during non-business hours. Therefore, routine maintenance activities should be responded to and fixed within one business day following identification of the issue. If the issue cannot be resolved within one business day, a temporary work around should be put in place until the repair can be made. Maintenance personnel must notify operations personnel of the issue and provide an estimated repair timeframe.

<u>Maintenance of Vehicle Detection Sensors</u>

There are several types of roadway sensors available for use on ATMS projects. Sensors range from video detection, side-fire radar, acoustic, loops, pucks, and other technologies. It is suggested that agencies utilize a maximum of two different technologies throughout their area so that technicians do not have to be trained on several technologies and spare parts do not have to be maintained for each type of sensor, thus reducing maintenance costs. These various technologies can be classified into two installation types: overhead and in-pavement.

Overhead devices can be mounted on structures on the side of the roadway, behind curb and gutter, behind sidewalk, or on mast arms over the travel lanes. Depending on the location of the device, required MOT can vary greatly from minimal signage to full lane closures. If the device is located on a structure with adequate separation from the travel lanes to park a bucket truck and not impact traffic; only minimal signage is required. However, if the device is on a mast arm above a travel lane, MOT will be required to close the lane that the technician is working over while using the bucket truck. In-pavement sensors, as the term suggests, are installed within the pavement in the travel lane. Maintenance of the in-pavement sensors requires a full lane closure for the duration of the work.

<u>Maintenance of Signal Cabinets, Signal Heads, and Ancillary Equipment</u>

Most local agencies have been maintaining signal systems for quite some time and are well versed in the personnel, tools, equipment and vehicles required to maintain the signal system. MOT is minimal for signal cabinets and the equipment within the cabinet as it is either protected or outside of the clear zone. Full lane closures and a bucket truck are generally required for the signal heads, as they are located over the travel lanes. Technicians should be International Municipal Signal Association (IMSA) certified to work on all signal equipment to ensure the safety of motorists who rely on the signal system to negotiate intersections without interference of cross traffic.

<u>Maintenance of Communication System Devices and Infrastructure</u>

The System's communications infrastructure consists of local area networks within State, County, and City owned Right of Way with a combination of Ethernet over wireless, Ethernet over copper and fiber optic open transmission mediums in the field. Maintenance of the communications cable and devices can normally be performed without a bucket truck and with minimal MOT required. Exceptions occur when communications lines are on utility poles, span wires, or near the roadway.

Maintenance of copper over Ethernet communications lines can be performed by technicians with low voltage electrical experience and minimal data cabling experience. Maintenance of fiber optic communications lines requires specialized training and tools, which can be very expensive. Due to the cost of the training and tools, many agencies have outside contractors perform maintenance on fiber optic cables.

Maintenance of communications devices requires varying degrees of training and experience dependent upon the type of device and size of the network. Agencies should employ someone with Layer 2 network training at a minimum. Optimally, the agency would employ someone with Layer 3 network training who could manage and maintain their servers, routers, data storage devices, and other critical head-end equipment. If the agency does not have the budget to employ a Layer 3 network technician, they may choose to hire an outside consultant to manage and maintain their Layer 3 network equipment.

Maintenance of Structures and Devices

Operation of the ATMS is dependent upon physical structures, such as the building housing the TMC, the roadway DMS sign and camera support structures, roadway sensors, roadside equipment cabinets, and FDOT/agency owned communication system infrastructure. Once constructed, installed and accepted, the FDOT and local agencies are ultimately responsible for the maintenance of these structures and devices. These maintenance activities are to be performed in accordance with existing FDOT and local agency policies, procedures and agreements. The responsible maintenance groups include but are not limited to: Facilities Maintenance, FDOT District 5 ITS/Traffic Operations, Roadway Maintenance and Construction Offices, and City and County Signal Operations and outside maintenance contractors as appropriate. District 5 and local agencies are responsible for cooperating with and providing notifications of problems with these structures and devices to the appropriate maintenance divisions/personnel.

Maintenance of CCTV Cameras, Poles, and Signal Mast Arms

Routine maintenance of the freestanding CCTV camera poles and associated device cabinets can be performed by ITS/Signal Technicians who have received training on the type/manufacturer of CCTV in question as well as knowledge of low voltage electrical work. Maintenance can normally be performed with minimal MOT as the pole and cabinet must be protected or located outside of the clear zone. A bucket truck may be needed to perform maintenance (in lieu of a lowering device) on the CCTV camera if the camera is mounted directly to the pole.

CCTV cameras mounted on Mast Arms will more than likely require a bucket truck to access the CCTV and MOT to close a lane of traffic as the technician works overhead. Depending on the design, the ancillary equipment for a CCTV mounted on a mast arm can be located in the associated signal cabinet or a separate ITS cabinet. In either case, the cabinet must be located outside of the clear zone and therefore will require minimal MOT to maintain.

Maintenance of Dynamic Message Signs and Supports

Routine maintenance of DMS signs and support structures must be performed to ensure that the sign is performing at an optimal level and that the structure is not a safety hazard. Routine maintenance of the DMS can be accomplished by ITS/Signal Technicians who have had training from the manufacturer and are experienced with electronics and low voltage electrical work. Maintenance of the sign itself, not the cabinet, requires a bucket truck and many times a Maintenance of Traffic (MOT) setup, including a lane closure. Maintenance of the sign cabinet and the structure can normally be performed with minimal MOT due to the fact that the structure and cabinet must be protected or located outside of the clear zone.

EMERGENCY RESPONSE

Device failures, fiber cuts and damage to the System happen at all times of the day and night throughout the year. Some of these issues have the ability to directly impact the functionality of the system. These types of issues require an emergency response, which must take precedence over routine and preventive maintenance activities. Emergency responses require technicians to respond to the site within 2 hours and fix the issue within 24 hours. If available, a workaround to get as much of the system operational as possible should be implemented while the repair is taking place. Maintenance personnel must keep operations personnel apprised of the status of the failure and provide updated estimates of time to repair the issue.

Once an issue is discovered, personnel are responsible for ensuring that the issues are resolved as quickly as possible. FDOT and local agency personnel must follow the requirements of their Standard Operating Guidelines (SOG) for initiating and tracking a work order as well as tracking the impacts that both the maintenance issue and any possible repairs are having on the rest of the System. If maintenance or operations personnel notice at any time that the issue is getting better or worse or that the repair of the issue has now caused additional problems, they must notify their Supervisor immediately.

SPARES RECOMMENDATIONS

A 10% to 15% spare quantity is usually adequate for most systems. Local agencies are encouraged to obtain and use a maintenance and/or inventory software to maintain an inventory of ITS and signal components not to fall below 10% for any item that has more than a 2-day procurement lead time from order to receipt of the component. Spares availability should also not exceed 15% for any on-hand item. The software must be updated as spares are removed from inventory, as new items are purchased, as failed items are removed from service, as items are returned for warranty repair/replacement, and as repaired/replaced items are received from the manufacturer.

SOFTWARE MAINTENANCE AGREEMENTS/PRODUCT LICENSES AND RENEWALS

FDOT District 5 and local agencies should keep individual logs of all software maintenance agreements/product licenses and their associated renewal dates for their own software and products. It is the responsibility of these individuals to ensure that renewals are completed, as required, before the previous maintenance agreement/product license has expired.

INVENTORY MANAGEMENT

Inventory management includes conducting receiving inspections and functional testing (as appropriate) prior to accepting spare and repaired or replacement parts/equipment into the System's physical inventory and their labeling, storage and re-order. It also includes maintaining the maintenance/inventory control database.

Receiving Inspection

Prior to incorporating spares and repaired or replacement parts/equipment into the System's inventory, each item should be subject to a receiving inspection. First the shipping container should be inspected. If it appears to be significantly damaged, it should not be accepted from the shipper. Some minor damage to the shipping container may be acceptable provided that nothing is protruding from or has spilled out of the container, no contents leakage or water stains are evident and the contents seems to be otherwise intact. If there are any doubts as to the condition of the contents, the shipping container should be opened in the presence of the shipper's delivery agent. All packaging materials should be retained until the receiving inspection and functional tests (if appropriate) have been completed.

Inspection of spare or replacement parts/equipment should verify that:

- There is no apparent damage due to shipment,
- The item conforms to the procurement contract specifications or purchase order as to manufacturer, model number, operational features and options, quantity, cables, connectors, etc.,
- All mounting hardware (if required) has been furnished,
- The item is in a new and unused condition (unless otherwise specified), and
- All required documentation including calibrations, certifications, installation drawings, operating manuals, and warranty information has been furnished.

Inspection of repaired items should verify that:

- There is no apparent damage due to shipment,
- The serial number and/or Department inventory control number matches that on the repair order, and
- The documentation includes a description of the repairs made and re-calibration and/or re-certification if appropriate.

Functional Testing

If appropriate, a functional test should be performed following the receiving inspection. Where a formal receiving test procedure or checklist has been developed, it should be successfully completed before accepting the item.

Returns

Items found in the receiving inspection or subsequent functional tests to be damaged or otherwise not in compliance with the procurement specification/purchase order or repair order should be returned to the manufacturer or vendor as appropriate in the original packaging. If the original packaging is missing, damaged or unusable the return items should be re-packaged to prevent further damage during return shipment. A statement indicating the reason for rejection and a request for a compliant replacement should be included with the return shipment.

Maintenance/Inventory Control Software

It is desirable to have a software package which includes both maintenance and inventory tracking components. The maintenance portion of the software should be used to generate maintenance trouble tickets and track the progress and ownership of the trouble tickets through completion. Other maintenance components could include reporting such performance measures as Mean Time Between Failure, Percent Availability, Device Downtime, and others to determine the effectiveness of the current maintenance program and justify additional budget if required.

The inventory tracking portion of the maintenance software needs to be constantly updated so that at any time agency personnel can determine such things as where an individual item is located, quantity of any deployed items and quantity of spare items. Required information for each part/device includes, but is not limited to the following:

- Manufacturer, vendor or supplier name, address, contact and telephone number,
- Model and/or part number,
- Descriptive name,
- Serial number,
- Inventory control number,
- Location,
- Operational status,
- Service/warranty information (Date the item was added to the System's inventory, date first placed in service, recommended service interval and/or next scheduled service date, date last serviced/repaired or upgraded, and date warranty lapses or expires), and
- Failure history.

Fiber Management Software

A fiber management software should be used by all local agencies to track and make updates to the deployed fiber optic cable and infrastructure throughout their jurisdiction. The fiber management software is a Geographic Information System (GIS) based tool, which requires that all fiber optic cable, pull box, splice vault, and device locations must be GPS located in the field and placed within the software using this information. While creating the schematic representations of any fiber optic or power cable runs, it is important to try to get the run as close to the actual location as possible as others may use this information in the future for as-built information.

The fiber management software should be updated whenever there is a change to the system, as this software can be shared with other regional partners to allow for extensive coordination of multiple systems. All fiber optic cables within the software are to be noted with manufacturer, installation date, fiber optic lengths, fiber count, splice locations, and splicing details for each fiber at a minimum. The devices, cabinets, poles, and other notable items within the software must be noted with manufacturer, model, serial number, date installed and warranty information at a minimum.

TMC

TMC Facility Mechanical, Electrical and Telephone Systems

Operation of each ATMS is dependent upon the local agency TMC facility mechanical, electrical and telephone systems. Local agencies are responsible for maintaining these systems in an effort to minimize facility and system downtime. Each agency is responsible for the systems within their facility unless otherwise noted within an MOA or similar document. The facility mechanical, electrical and telephone systems include the following:

- Heating, Ventilation and Air Conditioning Systems – The equipment used within the TMC is very temperature sensitive, but also produces a lot of heat while in use. The need may arise for the use of portable coolers as a backup for the air conditioning system.
- Primary Electrical Power and Power Distribution Systems
- Facility Uninterruptible Power Systems
- Security Systems
- Telephone Systems.

STAFFING REQUIREMENTS

An in-depth analysis of existing regional staffing levels and recommended guidelines was previously discussed and should be utilized to the extent possible to provide proper staffing levels.

SUMMARY OF ITS MAINTENANCE STANDARDS

Although signal systems and ATMS deployments vary greatly in size and features throughout the region, standardizing maintenance procedures and processes will provide continuity between agencies. This continuity will benefit the public by ensuring a consistent level of service throughout the region.

The following items represent the suggested minimal items to provide consistency of maintenance throughout the District 5 Region. These items should be provided by the local agency or their contractors/consultants and utilized as documented within this Maintenance Plan.

<u>Documentation</u>

- Preventive Maintenance Plan with activities to include maintenance of the following at a minimum:
    - Signal Control/ITS Cabinet interior
    - Edge/Cut grass and remove weeds
    - Pull boxes and splice vaults
    - Pedestrian Facilities
    - Vehicular Signal Displays
    - Vehicle Detectors – Cameras, loops, radar, Bluetooth, etc.
    - Street Signs – Static and Illuminated
    - Mast Arm and Span Wire Structures
    - DMS/ADMS
    - CCTV cameras
    - UPS units
- Standard Operating Guidelines which cover the following areas at a minimum:
    - Preventive Maintenance Activities and Guidelines
    - Routine Maintenance Activities and Guidelines
    - Emergency Maintenance Activities and Guidelines to include on-call duties.
    - Maintenance of the TMC facility mechanical, electrical and telephone systems
    - Spare Quantities of Replacement Items
    - Tracking Software Maintenance Agreements/Product Licenses and Renewals
    - Inventory Management Processes and Procedures
    - Staff Positions and Organizational Chart

Software

- The following items require specialized software packages which should be obtained by the local agencies as possible:
    - Signal Control Software
    - Maintenance/Inventory Control Software which can provide the following capabilities:
        - Create and track maintenance work orders
        - Create/read inventory tags (barcodes)
        - Input unique information within the database to describe the item being inventoried.
        - Ease of access and user friendly interface to input items and update their location.
        - Report generation for inventory, location of inventory, performance measures, etc.…
    - Fiber Management Software – GIS based tool to track existing fiber optic cable assets.
    - Device specific maintenance and troubleshooting software
        - DMS/ Arterial Dynamic Message Signs (ADMS) manufacturer software
        - Vehicle Detection equipment manufacturer's software
        - CCTV manufacturer's software
        - Network scanning software such as Angry IP or equivalent

Equipment

- Maintaining ATMS field devices and communications infrastructure requires the use of specialized tools/equipment to include the following:
    - Ruggedized laptops which can stand up to harsh work environments.
    - Smartphone with cellular hotspot for updating inventory and other asset information real-time.
    - Fiber optic cable testing equipment to include an Optical Time Domain Reflectometer (OTDR), and visual fault locator at a minimum.
    - Fiber optic splicing equipment to include environmentally controlled splicing van/enclosure, fusion splicer with heat oven, and fiber cleaver.
    - Continuity and Cat 5/6 cable tester.
    - Telecommunications tools for stripping and terminating various types of cables/wires.

7.4. ITS Operations Standards

PURPOSE OF ITS OPERATIONS STANDARDS

The purpose of the ITS Operations Standards section is to propose a standardized approach to Operations of the ATMS throughout the District 5 region. This document provides an overview of the procedures and systems necessary to have consistent Operations programs for participating agencies. By using consistent Operations procedures and processes, the agencies can ensure that their systems function at a high level and motorists receive maximum benefit from the systems deployed along the arterial corridors. Although each local agency's needs and capabilities are vastly different, consistency of operations is needed to ensure that the region provides the maximum benefit available with existing ATMS equipment and infrastructure.

There are currently several versions of ATMS software being used by local agencies and even some agencies with no ATMS software deployed. Therefore, this plan does not include processes and procedures related to the use of specific software. This document focuses on daily activities and processes that can be used to provide cohesion throughout the region and maximize the abilities of the resources currently available to each agency.

OPERATIONS ACTIVITIES AND RESPONSIBILITIES

This section describes the various types of operations activities related to ATMS on the arterials and the responsibilities for the FDOT and local agency personnel assigned to operate these systems. Each TMC or signal operations center is funded separately and has different staffing levels and capabilities. This is mainly due to the number of signalized intersections and local funding levels due to population density and other factors.

Typical Operations Activities include the following at a minimum:

- Signal System Monitoring and Reporting
- ITS Device System Monitoring and Reporting
- Roadway Monitoring and Reporting
- Event Management
- Performance Monitoring
- Staffing Requirements

Day to day operations of the signal systems and ITS devices throughout District 5 are the responsibility of the owner agency, unless otherwise documented by MOU or other agreement. Daily activities should be centered on utilization of the tools available to operations personnel. Through the analysis of real-time and historical data, adjustments can be made to the various arterial systems to best utilize the available devices and to achieve the highest performance measures possible, which, in turn, increase the Return on Investment (ROI). The quality of performance data is one of the most important factors to the success of the program.

The field components of Active Arterial Traffic Management can include the following hardware: CCTV cameras, ADMS, vehicle detectors/Automated Vehicle Identification (AVI) such as MVDS, traffic loops, BlueTooth, LPRs, etc., and associated network equipment. Software and/or web based programs for the local signal agency TMC will vary by agency but can include vendor specific ATMS control software, SunGuide, 511, and third party data feeds such as Nokia, Inrix, Waze, Google, etc.

Standard Operating Procedures (SOPs), documenting policies and procedures, should be established to deal with every aspect of the duties of the staff in an effort to maximize the benefit of the hardware and software available. The SOPs should dictate how the system is utilized during normal traffic situations, increased congestion due to non-recurring events, and incidents. All personnel within the TMC should be aware of and familiar with the SOPs regarding their position.

The objectives of the SOPs include but are not limited to the following:

- Maintaining the health of the Traffic Signal System;
- Reducing the impact and occurrence of recurring congestion on the arterial roadway system;
- Reducing the impact of crashes involving motorists, pedestrians, and bicyclists on the arterial roadway system with real-time traffic signal adjustments that can include: Instant Preempts, Instant Pattern changes, queue flushes and other signal timing adjustments;
- Real-time signal adjustments to accommodate special events and construction;
- Maximizing the operational safety and efficiency of the traveling public while using the arterial roadway system;
- Providing motorists with the information necessary, (through tools such as 511, Arterial Dynamic Message Signs, Highway Advisory Radio, Social Media, etc.) to aid them in making the appropriate route choices;
- Intra-agency communication with law enforcement, the District 5 Freeway Management RTMC, as well as adjacent local agencies for coordination, as necessary, of events that can impact their roadways.

SIGNAL SYSTEM MONITORING AND REPORTING

Verifying and logging the status of operations center and field equipment to determine if maintenance personnel should be notified of device issues for subsequent troubleshooting and repair is a function of operations. At the beginning of each shift (and in real time while staffed), the local agency ATMS software (if available) should be checked for any current alarms that are active since the last review. Based on the type of ATMS software utilized, this can include, but not be limited to:

- Critical Failures: (Traffic Signal Maintenance staff should be notified immediately)
  - Stop Time
  - Coordinator Failure
  - Coordination Free Switch
  - Local Flash Input
  - External Flash Input
  - Faults/Failures
  - SDLC Failures
  - Pattern Error (except FREE signals)
  - Coordination Failure
  - Communications Failure (Persistent)
  - See PING procedure below for verification of failure
- Moderate Failures
  - MCE
  - Detector SDLC Failure
  - SDLC Failures
  - Detector Diagnostic Failure (Persistent)
  - Detector Failure from SDLC
  - Ped Detector Failure
  - Broken vehicle detectors – Use ATMS software to identify broken detectors (as available).
  - Ascertain the style of detector; loop, video, or AVI. Determine whether the detector is 100% failed or being "problematic".
  - Add broken detectors to Signal Performance Measure Log
  - Once a conclusion is reached, alert the signals engineer with the nature of the malfunction. This should include;
    - Type of detector
    - Detector number
    - Phase
    - Direction

- As detectors are fixed, update the list.
- Broken pedestrian detectors – Use ATMS software to identify broken pedestrian detectors.
- Add broken pedestrian detectors to the Signal Performance Measure Log
- Notify appropriate personnel
- Signal goes into FLASH – Notify appropriate personnel
- Coordinated signal goes into FREE
- Clock Synch issues:
    - Monitor the TIME DIFFERENCE in ATMS Software, when the absolute value is equal to or more than 5 in the TIME DIFFERENCE column, the controller should to be reset
    - Based on Local Agency Rules, the clock synch should be performed by the Operator (if allowed), or by the designated Staff member of the local agency
        - If the Operator is allowed to perform the Synch:
            - Highlight all ID's needed to be reset (max 2 if more than 3 notify Traffic Signal Engineer)
            - Synch the time, per the ATMS Software instructions
            - Every time this action is taken it should be logged under the Clock Sync tab of the Performance Measure Spreadsheet.
- Communication Failures:
    - If a communications failure is reported or it is believed that the signal controller is not receiving communications, open a command prompt by left clicking the Microsoft icon located on the lower left corner of computer screen, then choose command prompt from the list. Type PING (leave a space) and then type the IP address of the signal with the communications failure. The IP address can be obtained off of the ATMS software. If it times out, then it cannot communicate with the controller. Maintenance and/or Network personnel should be notified for troubleshooting.

ITS DEVICE SYSTEM MONITORING AND REPORTING

Perform device checks on ITS Field devices (CCTV, ADMS, MVDS, AVI, etc.) upon arrival and every four hours during operating hours. This should include verifying the status of the device on the ATMS software and sending/receiving commands to the device as applicable. For ADMS, the closest CCTV camera should be used, if available, to verify that the correct message is being displayed during each device check and upon posting a new message. If a device is being shown in an error state on the ATMS software, the operator can check to see if the switch at the device site is communicating with the network. The same procedure as outlined above for verifying communications failures with the signal controller can be used to verify that the local switch is communicating. If the device is not responding properly to the operator's commands or not receiving any communications, Maintenance and/or Network personnel should be notified for further troubleshooting.

ROADWAY MONITORING AND REPORTING

Vehicle Detection zones and/or travel time segments should be monitored constantly on the ATMS software map or third party data feeds and all CCTVs within the system should be checked, at a minimum, every 30 minutes. When reduced speeds are detected by means other than CCTV viewing, the nearest CCTV camera should be used to attempt to find the cause. Once the operator discovers the cause of the traffic slow-down they should enter the pertinent information into the Event Log. Once logging the initial information, the operator should begin disseminating information to motorists, first responders, and others as appropriate. This is further detailed in the following sections.

Available ADMS should be used to provide information regarding incidents and congestion to motorists prior to them encountering the issue. This information is provided by posting a succinct message on the ADMS to provide the motorist with relevant information. ADMS messages are stored in a library on the ATMS software for ease of use by the operator. The structure and content of the developed ADMS library matrix should be based upon using the ADMS for dual phase messaging. The message content must contain enough information to enable the motorist to make an informed decision, while still fitting on the sign, and whenever possible, there should be a uniformity to types of messages. Any abbreviations should be clearly understood, otherwise, it defeats the purpose of the message.

Operators should also provide incident and congestion information to motorists using the Florida 511 system, Twitter, or other social media forums, as per agency protocol. Similar to ADMS messages, these messages should be succinct without adding extraneous information or details. Operators must be aware that this information may be passed along to others via word of mouth or social media and only include relevant facts.

All activities performed relating to the incident must be documented on the event log. This includes, persons/agencies contacted, messages posted to ADMS/511/Social Media, event responder arrival and departure times, lane blockage, injuries, vehicles involved, Hazmat, etc. The use of event logs proves beneficial for performance measures reporting, after action reports and other documentation as needed.

EVENT MANAGEMENT

Event Management can be classified as planned and unplanned events. Planned events include such things as normal recurring congestion, roadway construction/maintenance and special events. Unplanned events include incidents and activities that the TMC were not previously aware of, including roadway construction/maintenance, special events, natural disasters, etc.

Planned Events:

Local Agencies benefit from relationships with Major Special Event Coordinators, local roadway construction and maintenance agencies, as well as requesting (if not already receiving) information from District 5 about planned construction and special events. This allows for exchange of information so that, if indicated, signal timing plan changes can be utilized for these lane blocking or traffic generating events.

For planned roadway construction/maintenance or special events, at the time of being informed, the operator or supervisor should make note of the event and provide the information to the personnel who will be on duty the day of the event. The District 5 PIO may distribute a weekly construction debrief, and this can be used as advanced notice as well. If construction is blocking a shoulder, use discretion on whether or not the incident needs to be reported. Construction with more than 50% of the lanes blocked should be reported to the Traffic Signal Engineer to see if traffic would be aided by signal retiming. Information should be disseminated through all sources available, including, but not limited to ADMS, 511, Social Media or other information dissemination methods. The local agency should attempt to get regular updates so that dissemination to the motoring public can be updated in a timely fashion.

For instances of recurring congestion, the Traffic Signal Engineer should already have the signals within the corridor timed to alleviate as much congestion as possible. However, congestion should be monitored frequently to determine severity and check for rear end crashes. It is also a good practice to compare the congestion on a weekly and monthly basis to determine if the congestion is getting worse. The Traffic Signal Engineer should be notified if it is determined that the congestion has been increasing over time, as this may indicate that a new timing plan may be required.

<u>Incidents</u>

Identify incident details through CCTV, Emergency Responder Agency contacts and other sources. When an incident is confirmed by sources outside of the local agency, gather details from available CCTVs and notify the appropriate agencies, including but not limited to, local police, fire/rescue, and the Traffic Signal Engineer if an alternate timing plan may be warranted based upon the severity of the incident and the percentage of lanes blocked. If the incident results in a full directional closure, coordinate with the District 5 RTMC and adjacent Local Agencies that could be impacted by the closure. It may be beneficial, when CCTV images are available, to take screenshots of the incident and associated lane blockage and congestion for future analysis. Disseminate the traffic related information to the public via any available means, including, but not limited to ADMS, 511, Social Media or other information dissemination devices. Log all pertinent information in the Incident Spreadsheet. Closely monitor the situation and update other Stakeholders as conditions change. Equally important to posting incident information promptly is to remove it promptly when the incident is cleared and traffic conditions have returned to normal (for time of day).

PERFORMANCE MONITORING

Performance monitoring must be in place to determine the effectiveness of the ATMS components, infrastructure and operations as a whole. By monitoring various aspects of the system and operations, management staff can determine where available budget can be best utilized and where additional funding may be required. ATMS software includes various means of tracking system performance and these tools should be utilized to the greatest extent possible. These tools minimize the work effort of the operators and maintenance personnel to input data and provide consistent reports and graphs to be analyzed over time.

When the ATMS software does not include tools for tracking specific system details or operational activities, simple spreadsheets should be developed to provide the needed reporting output(s). Sample spreadsheets are shown below for as **Tables 49 through 54** for Alarm Tracking, Clock Synch Adjustments, Device Availability, Maintenance Notification of Signal Failure, Signal Timing Adjustments, and Event Log, respectively.

Table 49 – Alarm Tracking Sample

Date	Time	Controller ID	Alarms
3/6/16	7:28:00	329	Local Flash Input
3/6/16	7:36:00	416	Ped Detector Failure
3/6/16	7:41:00	148	Stop Time

Table 50 – Clock Synch Sample

Date	Time	Controller ID	Time Off (Seconds)	Handled by Signal Agency
3/6/16	7:21 AM	461	-13	Yes
3/6/16	7:21 AM	458	-10	Yes
3/6/16	5:14 PM	335	-7	Yes
3/6/16	5:14 PM	337	-8	Yes
3/6/16	5:14 PM	342	-7	Yes
3/6/16	5:14 PM	345	-7	Yes

Table 51 – Device Availability Sample

Date	Time	Total Online Devices	Total Operational Devices	% Device Availability	% Change
3/6/16	7:05 AM	474	411	87%	
3/6/16	5:01 PM	474	374	79%	-8%
3/7/16	7:18 AM	474	391	82%	4%
3/7/16	4:11 PM	474	409	86%	4%
3/8/16	7:00 AM	474	415	88%	2%

Table 52 – Maintenance Notification of Signal Failures Sample

Date	Time	Controller	Notification Tool	NOTES
3/6/16	3:37 PM	SR 50 @ S. Primrose Dr.	CB Dispatch	2 left turn lights out
3/6/16	9:25 AM	Semoran Blvd @ Lee Vista Blvd	Conversation	Signal on Flash

Table 53 – Signal Timing Adjustments Sample

Date	Location	Adjusted by
3/7/16	W Lake Mary Blvd @ Primera Blvd	Technician/Engineer

Table 54 – Event Log Sample

Date	Event Type	Location	Notification Time	Confirmation Time	ADMS Used	Info. Disseminated	Comments
3/6/16	Maint	Semoran Blvd. @ Lee Vista Blvd.	10:42AM	10:42AM	0	511	Signal Maintenance
3/7/16	Crash	W Lake Mary Blvd. @ Lee Vista Blvd.	8:15AM	8:15AM	2	ADMS, 511	Right Lane Blocked EB

These spreadsheets can be used to create Performance Measures graphs, which can quickly and easily provide management, stakeholders, and others with useful information regarding the performance of the system. Sample graphs are shown in **Figures 16 through 21** on the following pages.

Figure 16 – Alarm Graph Sample

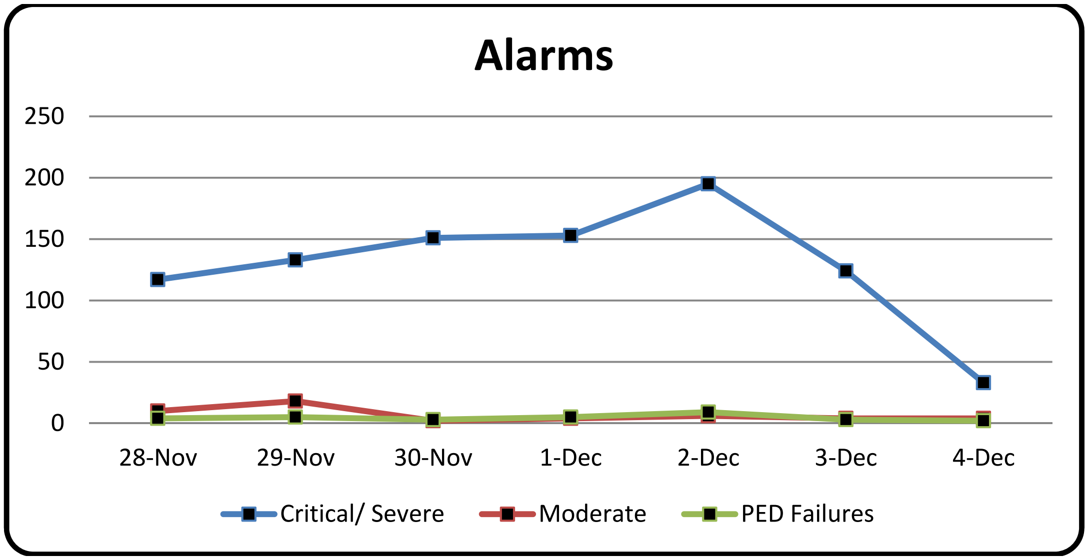


Figure 17 – % Device Availability Graph Sample

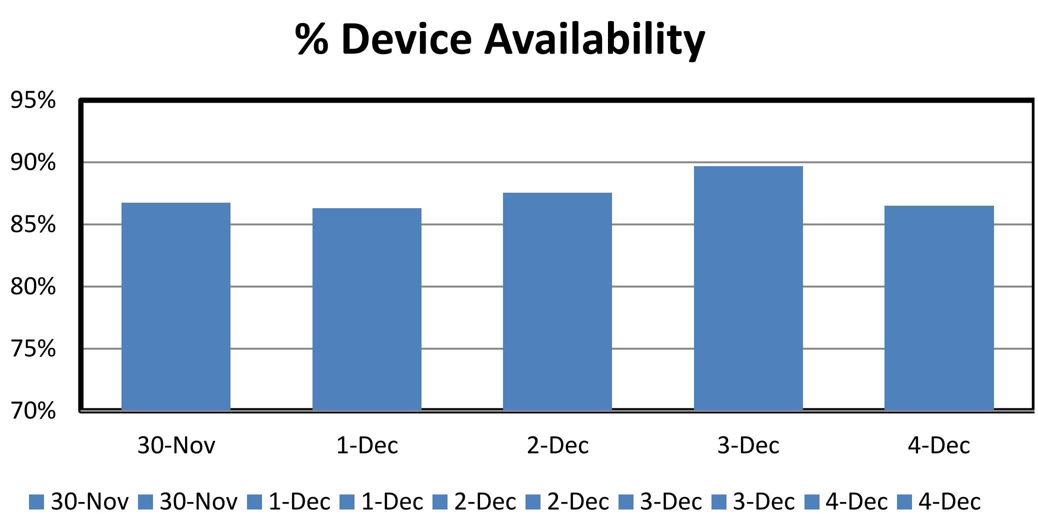


Figure 18 – Clock Sync Graph Sample

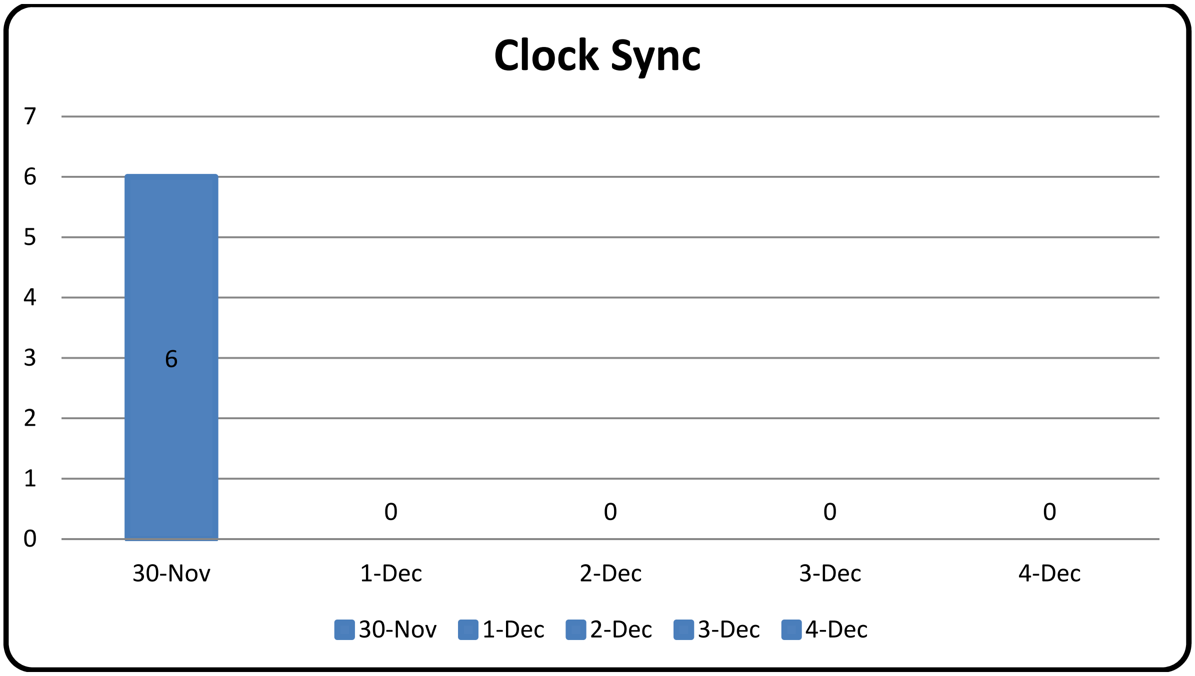


Figure 19 – Maintenance Notifications Graph Sample

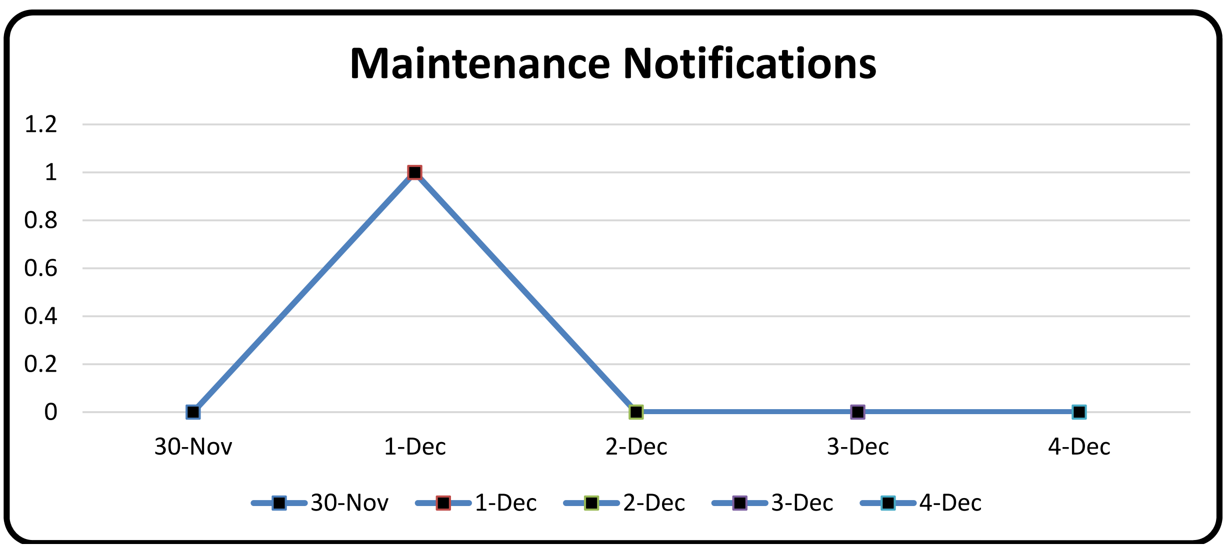


Figure 20 – Events Graph Sample

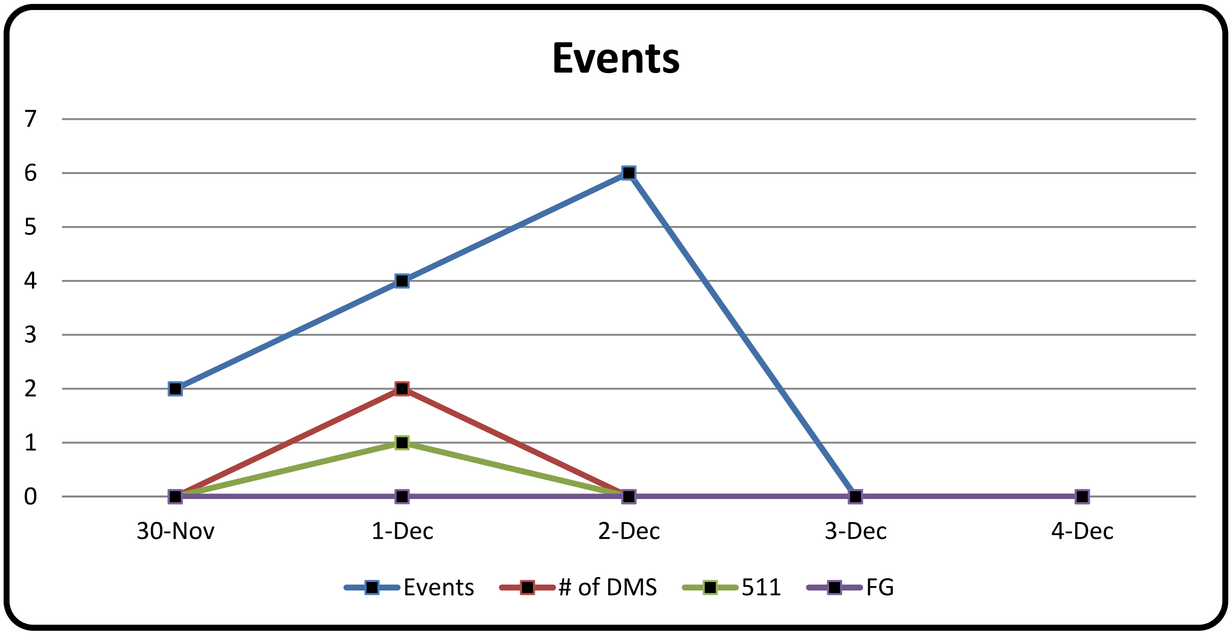
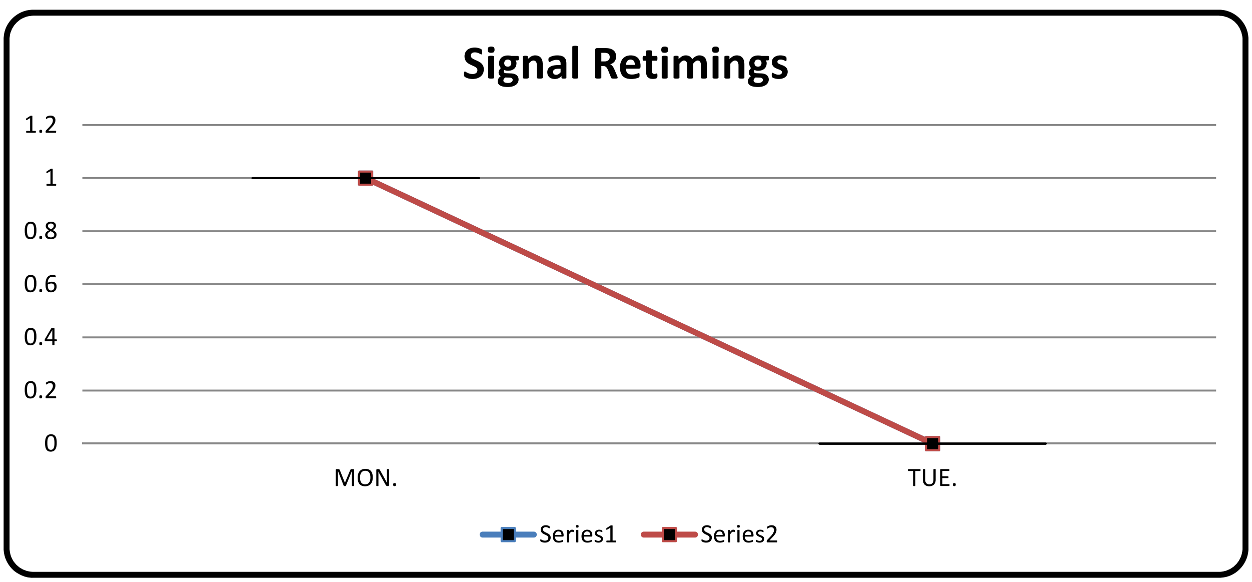


Figure 21 – Signal Retimings Graph Sample



In addition to the spreadsheets and graphs shown above, Incident Response and Traffic Incident Management Information can be tracked to show adherence to Florida's Statewide Open Roads Policy. The time of initial identification of the incident, as well as the Date Time that all travel lanes were opened allows tracking of the Roadway Clearance Duration. Additionally, operators should track notification times, arrival times, and departure times of incident responders to determine their response times and on-scene times. This type of information can be used to demonstrate the need for more emergency personnel or additional fire houses, etc.

STAFFING REQUIREMENTS

The details of various staff positions that are required to adequately operate an ATMS were previously defined. Dependent upon the number and length of corridors and number of devices within the ATMS, multiple personnel may be required for several of the positions.

7.5. Training Standards

PURPOSE OF TRAINING STANDARDS

The purpose of the Training Standards section is to propose a standardized approach to training for all personnel supporting ATMS Operations, Maintenance, and Networking. By having standardized training throughout the District 5 region, local agencies will be able to share resources in emergency situations and will be confident that the people working on their system are capable of doing the work.

This Training Plan provides recommendations for consistent training for all personnel who support ATMS systems being operated Districtwide. Although each local agency's needs and capabilities are vastly different, having standardized training for personnel throughout the region will facilitate resource sharing when needed for emergency situations and recovery from these same events. Standardized training will also provide consistencies in relation to the perception and level of service of motorists who travel between various jurisdictions.

The following provides suggested training requirements for each of the staff positions related to Operations, Maintenance and Networking as related to ATMS deployments within the Central Florida region.

OPERATIONS TRAINING

Suggested educational and training requirements by operations staff position is detailed below:

Traffic Signal Engineer or Traffic Engineering Operations Manager

- This position is responsible for the management and oversight of the ATMS and is responsible for both local agency and regional coordination. Staffing, budget allocation, project planning and many other duties may also fall under this position. A Bachelor's of Science Degree in Civil or Electrical Engineering, more than 10 years of experience with analysis and design of the functional and operational elements of traffic signal systems and a Professional Engineers license in the State of Florida are job requirements.
- This position must retain their Florida Professional Engineer's license by obtaining the appropriate number of Professional Development Hours (PDHs) each year. Four PDH hours per year are required to be specific to signal systems and another 12 PDH hours are required in topics pertinent to the practice of engineering. These PDH units can be obtained by attending trainings provided by organizations such as the Institute of Transportation Engineers (ITE).

Arterial TMC/Signal Operations Center Manager

- This position is responsible for the management of the Traffic Management Center (TMC)/Operations Center. In some instances, this position is a shared position with the Traffic Signal Engineer/Traffic Operations Manager. This person is responsible for ensuring that day to day activities of the center are conducted efficiently and effectively by operations staff under their management. This position requires a high school diploma or GED and a minimum of 5 years of traffic management experience working with Arterial and/or Freeway systems. Previous experience with the agency's ATMS software is highly recommended.
- This position requires a minimum of 5 years' experience using Microsoft Office products such as Microsoft Word, Excel, and PowerPoint. If the person in this position does not meet this requirement they must obtain certification in these software packages within 6 months of hiring. Certification classes are available at several training centers throughout the District 5 region.
- This position must also take the SHRP2 National Traffic Incident Management Responder Training four-hour course. This course provides an overview of safe practices when working on or near the roadway.
- This position is responsible for creating and ensuring adherence to the training program for TMC/Signal Operators as detailed below.

Arterial TMC/Signal Operations Center Operator

- This position reports directly to the TMC/Signal Operations Manager and is responsible for monitoring the ATMS software, local law enforcement websites, third party websites, and other sources of information to detect and verify incidents. This position requires a high school diploma or GED and basic computer skills.
- This position must follow the Four Module training plan described below.

Module 1: Basic Operations Overview

Time: 4-5 hours

Subject/Training:

- Operations Overview
- ATMS Software Introduction
- Tour of Facility
- Review Standard Operating Guidelines (SOGs)
- Review of daily duties

Testing:

- Self-Test (graded by Supervisor or Manager)
- Operator minimum grade of 80%
- New Hire monthly verification by QA/QC Supervisor for one year

Re-Certification: Every 2 years - refresher course (2 hours)

Module 2: Basic Operator Training

Time: 17-20 hours

Subject/Training:

- Basic ATMS Software Training
- Event Management with Supervisor
- Operations Scenarios (QC)
- Information Dissemination (Partnering Agencies and to the Public)
- Monitoring Plan
- SOG Walk Through
- Shadowing with Supervisor (New hire shadows Supervisor live) During Rush (AM + PM)
- Side by Side training with Supervisor (Supervisor shadows new hire live) During Rush

Testing:

- Self-Test (graded by Supervisor or Manager)
- Supervisor observation of scenarios (QC)
- Operator minimum grade of 80%
- New Hire monthly verification by QA/QC Supervisor

Re-Certification: Every 2 years - refresher course (2 hours)

Module 3: Multi-Agency Response and Coordination

Time: 5-7 hours

Subject/Training:

- Traffic Incident Management (TIM) Partners
- Agency Coordination
- o Asset Maintenance Coordination
- Multi-agency Response and tracking
- Scenarios (QC) (Run through scenarios)
- Review past Event Chronologies

Testing:

- Self-Test (graded by Supervisor or Manager)
- Supervisor observation of scenarios (QC)
- Operator minimum grade of 80%
- New Hire monthly verification by QA/QC Supervisor

Re-Certification: Every 2 years - refresher course (2 hours)

Module 4: Traffic Signals Operations

Time: 5-7 hours

Subject/Training:

- ATMS Overview
- System Health
- Monitoring Plan
- Event Based Signal Timing Changes
- Preemptions
- Traffic Escorts
- Alarms Management
- Performance Measures
- Signals and TMC Partnerships (where arterials meet Freeways)

Testing:

- Self-Test (graded by Supervisor or Manager)
- Supervisor observation of scenarios (QC)
- Operator minimum grade of 80%
- New Hire monthly verification by QA/QC Supervisor

Re-Certification: Every 2 years - refresher course (2 hours)

MAINTENANCE TRAINING

The following is a list of suggested educational and training requirements by maintenance staff position:

Maintenance Manager

- This position is responsible for the overall management and oversight of the Signal and ATMS Maintenance Program. The Maintenance Manager is responsible for the maintenance program for the signal and ATMS network. Duties include supervision of Signal Technician Level 1 and 2 personnel, ordering spare and replacement equipment, maintaining budget and ensuring training for themselves and employees. This position requires a high school diploma or GED, IMSA Traffic Signal Level I and Level II Field certifications and a minimum of 5 years of experience. This position shall receive all training listed below and maintain proficiency by performing field work with their employees.

Signal Technician Level I

- This position works under the direction of the Technician Level II and/or Maintenance Manager and is responsible for assisting with troubleshooting and repair of signal equipment, ATMS devices, power services, and communications cabling and infrastructure. This position requires a high school diploma or GED and the ability to obtain IMSA Traffic Signal Level I certification within one year of employment. This position shall receive all training listed below and maintain proficiency by performing tasks associated with the training as a part of their normal work duties.

Signal Technician Level II

- This position works under the direction of the Maintenance Manager and is responsible for programming and troubleshooting signal controllers, ATMS devices and ancillary equipment as well as troubleshooting and repair of power services, fiber optic and communications cable damage and installation of new fiber optic and communications cable. This position requires a high school diploma or GED, 2 years' experience as a Signal Technician Level I, and IMSA Traffic Signal Level I and Level II Field certifications. This position shall receive all training listed below and maintain proficiency by performing tasks associated with the training as a part of their normal work duties.

Required Training for Maintenance Personnel

IMSA Traffic Signal Level I – Certification for IMSA Traffic Signal Level I is required as described in the position descriptions provided above. Once the certification is obtained, personnel may not let the certification lapse.

IMSA Traffic Signal Level II Field – Certification for IMSA Traffic Signal Level I is required as described in the position descriptions provided above. Once the certification is obtained, personnel may not let the certification lapse.

Vendor Specific Signal Controller Training – Personnel shall attend a vendor provided signal controller training course, which is a minimum of 8 hours in duration including both classroom and field training, within 3 months of employment and every 2 years after their hiring date. This training is to be scheduled by the Maintenance Manager through the vendor or as part of a training already being held within the region.

Vendor Specific CCTV Training - Personnel shall attend a vendor provided CCTV training course, which is a minimum of 8 hours in duration including both classroom and field training, within 3 months of employment and every 2 years after their hiring date. This training is to be scheduled by the Maintenance Manager through the vendor or as part of a training already being held within the region.

Vendor Specific DMS/ADMS Training - Personnel shall attend a vendor provided DMS/ADMS training course, which is a minimum of 8 hours in duration including both classroom and field training, within 3 months of employment and every 2 years after their hiring date. This training is to be scheduled by the Maintenance Manager through the vendor or as part of a training already being held within the region.

Grounding and Surge Suppression Training – Personnel shall attend a training course provided by a vendor or other provider, which is a minimum of 8 hours in duration including both classroom and field training, within 3 months of employment and every 2 years after their hiring date. This training is to be scheduled by the Maintenance Manager through the vendor/qualified firm or as part of a training already being held within the region.

Fiber Optic Training – Personnel shall attend a training course provided by a nationally recognized fiber optic training provider within the first year of employment and every 2 years after their initial training date. The course shall be a minimum of 2 days in duration and shall include training on basic fiber optic theory, connectorization, splicing and testing. This training is to be scheduled by the Maintenance Manager through the nationally recognized provider or as part of a training already being held within the region.

Advanced Maintenance of Traffic (MOT) Training – Personnel shall obtain their Advanced MOT Training Certification from an FDOT Approved Provider within 6 months of their hire date. Once certification is obtained, personnel may not let the certification lapse.

SHRP2 National Traffic Incident Management Responder Training – Personnel shall attend the 4-hour training course provided by FDOT District Five and receive the certificate of training within one year of their hire date.

NETWORK TRAINING

The following is a list of suggested educational and training requirements by network staff position.

Network Manager

- This position is responsible for the overall operations and maintenance of the communications network for the Signal and ATMS systems. Responsibilities include design and implementation of Network Architecture, configuration and maintenance of all Layer 3 Network devices, network coordination and planning with other agencies, network security, and licensing/warranty tracking for all network devices. This position requires a combination of training, education and experience for a total minimum of five years and certifications for Cisco Certified Network Professional Routing and Switching and Security or approved equivalent certifications and/or experience. The Network Manager shall have the training as described below.

Network Technician

- This position is responsible for configuration and maintenance of all Layer 2 Network devices, initial troubleshooting for ATMS field devices, and repair/replacement of failed ATMS devices. This position requires a minimum of two years past experience working with Layer 2 networking devices and Network Plus certification or equivalent certification/experience. The Network Technician shall have the training as described below.

Required Training for Network Personnel

Vendor Specific Layer 2 Switch Training - Personnel shall attend a vendor provided Layer 2 switch training course, which is a minimum of 4 hours in duration within 3 months of employment and every 2 years after their hiring date. This training is to be scheduled by the Network Manager through the vendor or as part of a training already being held within the region.

Vendor Specific Layer 3 Switch/Router Training - Personnel shall attend a vendor provided Layer 3 switch/router training course, which is a minimum of 4 hours in duration within 3 months of employment and every 2 years after their hiring date. This training is to be scheduled by the Network Manager through the vendor or as part of a training already being held within the region.

Vendor Specific CCTV Training - Personnel shall attend a vendor provided CCTV training course, which is a minimum of 8 hours in duration including both classroom and field training, within 3 months of employment and every 2 years after their hiring date. This training is to be scheduled by the Maintenance Manager through the vendor or as part of a training already being held within the region.

Vendor Specific DMS/ADMS Training - Personnel shall attend a vendor provided DMS/ADMS training course, which is a minimum of 8 hours in duration including both classroom and field training, within 3 months of employment and every 2 years after their hiring date. This training is to be scheduled by the Maintenance Manager through the vendor or as part of a training already being held within the region.

Fiber Optic Training – Personnel shall attend a training course provided by a nationally recognized fiber optic training provider within the first year of employment and every 2 years after their initial training date. The course shall be a minimum of 2 days in duration and shall include training on basic fiber optic theory, connectorization, splicing and testing. This training is to be scheduled by the Maintenance Manager through the nationally recognized provider or as part of a training already being held within the region.

SHRP2 National Traffic Incident Management Responder Training – Personnel shall attend the 4-hour training course provided by FDOT District Five and receive the certificate of training within one year of their hire date.

7.6. Recommended Standard Drawings

Any ITS devices or ancillary equipment should meet the latest FDOT standards and specifications. Additionally, a GIS website is currently being developed as a tool to aid regional stakeholders and their consultants with ITS project questions and design understanding. Once operational, it will provide existing plans from past successful projects and lessons learned from past projects to consider on future deployments.

7.7. Other Regional ITS Standards

A number of potential regional standards were identified by the stakeholders for consideration. The following are the standards that were discussed and should or already have been considered for implementation:

- Software Licensing
  - GTT
  - BlueMac
  - ATMS
- Asset Management
  - MIMS
  - ITSFM
- Regional Operations and Maintenance w/ Federal Language
- Standard Testing and System Acceptance
- Creation of System Engineering Document Services
- Network/Re-IP Addressing (Existing Contract)
- Active Arterial Management (Existing Contracts)
- No More #2 Keys in cabinets that have communications. Suggest the use of cyber-locks, rekeying the cabinets or padlocks
- Common Clock for all Network and Signalization Applications

8. Configuration Assessment and Functions (TSM&O) Work Plan

8.1. Introduction

The purpose of this section of the Master Plan is to identify strategies which will aid in the linking of planning and operations as well as the rest of the FDOT project development process. This involves configuration assessment and functions for transportation system management and operations (TSM&O) as a part of the overall project development process. Generally, TSM&O has taken on a more prominent role within FDOT over the past few years. However, the use of TSM&O principles has just begun to be considered as having a role throughout the entire project development process. The following presents a general overview of TSM&O.

The Federal Highway Administration defines Transportation Systems Management and Operations (TSM&O) as "an integrated program to optimize the performance of existing multimodal infrastructure through implementation of systems, services, and projects to preserve capacity and improve the security, safety, and reliability of our transportation system."

The FDOT has adopted the following definition: "TSM&O is a program based on measuring performance, actively managing the multimodal transportation network, and delivering positive safety and mobility outcomes to the travelling public in Florida.[37]"

TSM&O or Transportation System Management and Operations focuses on the development and organization of transportation service delivery in a manner that treats transportation as a single system. A systems view of transportation would have the following features:

Clarity of Purpose – transportation as a single system in the overall region would have clarity of purpose achieved through the development and agreement of a set of regional, multimodal objectives and strategies.

Connectivity – each of the major components that comprise the regional Intelligent Transportation Systems architecture would be connected to enable operation as a single system. While each system would remain independent, preserving the autonomy of each regional partner, the connectivity would support coordinated operation of each system.

[37] Florida Department of Transportation, Traffic Engineering and Operations Office Transportation Systems Management and Operations website - http://www.dot.state.fl.us/trafficoperations/tsmo/tsmo-home.shtm , retrieved June 8, 2016.

Adaptability - the regional transportation system would be capable of sensing the demand for transportation and current transportation conditions and adapting accordingly.

Status Availability – it should be possible at any given point to obtain up-to-date information regarding the status of the whole transportation system and each individual component

8.2. Background

The complete transportation service delivery life cycle can be portrayed as a series of five stages is illustrated in the following diagram:

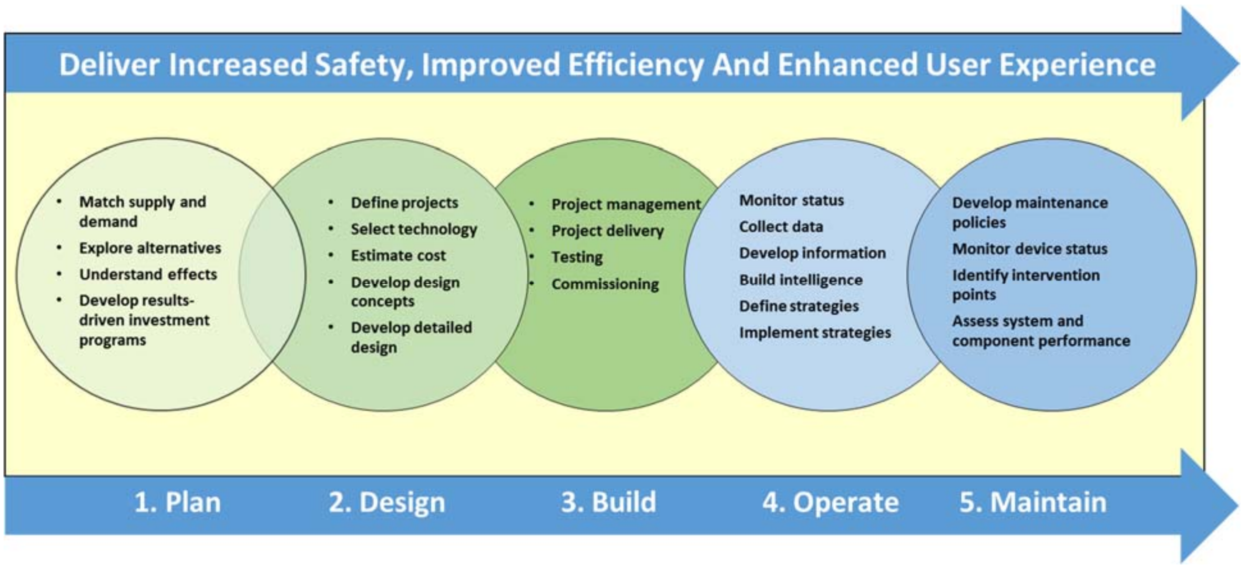


Figure 22 – Transportation Service Delivery Stages

Ideally, each stage or circle in the diagram involves coordination and harmony with the other to achieve the overall goals of increased safety, improved efficiency and enhanced user experience. However, typically each stage in the diagram has been focused and specialized on individual activity rather than coordination and convergence to a single system. This has created a notable gap between planning and operations activities for Intelligent Transportation Systems.

Bridging this gap becomes very important as a step in creating a single system view of transportation, especially when most of the data that can be used to determine transportation demand and prevailing transportation conditions originates from Operations. This data could be extremely valuable in the planning and design process.

8.3. How Can TSM&O Improve the Project Development Process?

Within the context of TSM&O, this section includes an assessment of current regional configurations and the development of a series of strategies that will support the incorporation of TSM&O principles within the current project development process that features multimodal and integrated activities across the region while applying national best practices. A literature search revealed guidance towards using TSM&O principles from both FHWA and the American Association of State Highway and transportation officials (AASHTO) sources.[38] [39]

Further research indicated that this guidance was based on an original piece of work conducted by IBM in 2007, involving the application of the Capability Maturity Model to transportation.[40] The Capability Maturity Model (CMM) is an approach designed to ensure the quality of systems and software development. The principles lend themselves to application for transportation governance structures. The following figure captures the overall concept showing how a migration towards integrated multimodal activity across agencies can be achieved in incremental steps.

The figure further shows how a range of strategies can be evolved over time to migrate from a disparate project development process to a more integrated process. Each step in the progression is defined as a Level and Levels I through V are used to show a roadmap from the current situation to the desired future state (Level V). Column 1, highlighted in blue, describes the range of strategies that can be applied and these are grouped under "strategic planning", real time information creation capability" and "real time response capability" headings.

The pink shaded areas in the figure show an assessment of a typical urban region in the USA.

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[38] Florida Department of Transportation, Traffic Engineering and Operations Office Transportation Systems Management and Operations website - http://www.dot.state.fl.us/trafficoperations/tsmo/tsmo-home.shtm , retrieved June 8, 2016.

[39] Delivering Intelligent Transportation Systems, Driving Integration and Innovation, IBM Technical Paper, 2007, Figure 2, Page 3], http://www-935.ibm.com/services/us/igs/pdf/transport-systems-white-paper.pdf, retrieved December 30 2015.

[40] Institutional Architectures to Improve Systems Operations and Management, REPORT S2-L06-RR-1, http://www.aashtotsmoguidance.org/browse/, retrieved December 30 2015

		Level 1 Silo	Level 2 Single Mode Integrated	Level 3 Partially Integrated	Level 4 Multimodal Integrated	Level 5 Multimodal Optimized
strategic planning	Planning	Functional Area Planning (single mode)	Project-based Planning (single mode)	Integrated agency-wide planning (single mode)	Integrated corridor-based multimodal planning	Integrated regional multimodal planning
	Performance Measurement	Minimal	Defined metrics by mode	Limited integration across organizational silos	Shared multimodal system-wide metrics	Continuous system-wide performance management
	Customer Relationships	Minimal capability, no customer accounts	Customer accounts managed separately for each system/mode	Multi-channel account interaction per mode	Unified customer account across multiple modes	Integrated multimodal incentives to optimize multimodal use
real-time information creation capability	Data Collection	Limited or Manual Input	Near real-time for major routes	Real-time for major routes using multiple inputs	Real-time coverage for major corridors, all significant modes	System-wide real-time data collection across all modes
	Data Integration	Limited	Networked	Common user interface	2-way system integration	Extended integration
	Analytics	Ad-hoc analysis	Periodic, Systematic analysis	High-level analysis in near real-time	Detailed analysis in real-time	Multimodal analysis in real-time
	Payment Methods	Manual Cash Collection	Automatic Cash Machines	Electronic Payments	Multimodal integrated fare card	Multimodal, multi-media (fare cards, cell phones, etc)
real-time intervention capability	Network Ops. Response	Ad-Hoc, Single Mode	Centralized, Single Mode	Automatic, Single Mode	Automated, Multimodal	Multimodal real-time optimized
	Incident Management	Manual detection, response and recovery	Manual detection, coordinated response, recovery	Automatic detection, coordinated response and manual recovery	Automated pre-planned multimodal recovery plans	Dynamic multimodal recovery plans based on real-time data
	Demand Management	Individual static measures	Individual measures, with long-term variability	Coordinated measures with short-term variability	Dynamic pricing	Multimodal dynamic pricing
	Traveller Information	Static Information	Static trip planning with limited real-time alerts	Multi-channel trip planning and account based alert subscription	Location-based, on journey multimodal information	Location based, multimodal proactive re-routing

Figure 23 – CMM for Transportation[41]

[41] Institutional Architectures to Improve Systems Operations and Management, REPORT S2-L06-RR-1, http://www.aashtotsmoguidance.org/browse/, retrieved December 30 2015

While the CMM for Transportation is a valuable tool for explaining the desired future outcome and baselining the current situation, it is even more valuable if it is customized for the Central Florida region. With this in mind, the CMM for Transportation approach was utilized as a model and an adaptation was created to take into account the specific needs and characteristics of the Central Florida region, also incorporating guidance from both FHWA and AASHTO sources.[42] [43] [44] The ITS strategies defined earlier in the project were also used as input to this adaptation. The 14 original strategies have been replaced by a Central Florida specific strategy set, consisting of 18 strategies. The Figure has also been amended to include a higher resolution scale within each level box enabling the current situation to be mapped to the nearest 20%. A histogram has also been incorporated to graphically illustrate the current progress in the central Florida region and the work still to be done to get the level V. This provides a region-specific graphical approach to defining the desired future outcome (Level V) and also capturing the current situation in the Central Florida region.

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[42] Institutional Architectures to Improve Systems Operations and Management, REPORT S2-L06-RR-1, http://www.aashtotsmoguidance.org/browse/, retrieved December 30 2015

[43] Delivering Intelligent Transportation Systems, Driving Integration and Innovation, IBM Technical Paper, 2007, Figure 2, Page 3], http://www-935.ibm.com/services/us/igs/pdf/transport-systems-white-paper.pdf, retrieved December 30 2015.

[44] Creating an Effective Program to Advance Transportation System Management and Operations, Primer http://ops.fhwa.dot.gov/Publications/fhwahop12003/background.htm, retrieved December 30 2015.

		Strategies	Level I: Silo	Level II: Single mode integrated	Level III: Partially integrated	Level IV: Multimodal integrated	Level V: Multimodal optimized
			20% 40% 60% 80% 100%	20% 40% 60% 80% 100%	20% 40% 60% 80% 100%	20% 40% 60% 80% 100%	20% 40% 60% 80% 100%
Plan	1	Scientific investment programs	regional architecture, transportation improvement plans	related to the regional architecture and based on effects	Investment plans for major modes are coordinated	Investment plans for all modes are coordinated	Investment plans for all modes are coordinated and completely based on an understanding of the effects
Plan	2	Analytics and discovery capability	Limited mode specific reporting	Definition of mode specific analytics	Definition of analytics for major modes	Definition of analytics for all modes	Analytics and discovery conducted on an integrated data set for all modes resulting in a combined analytics set for all modes across the region
Plan	3	Regional performance management goalsetting	Limited mode specific goal setting	Complete goalsetting for each individual mode	Coordinated goalsetting for major modes	Coordinated goalsetting for all modes	Coordinated goalsetting for all modes taking account of regional transportation objectives
Plan	4	Smart city planning	Foundation level planning for smart city: objectives, vision, concept of operations	planning of smart city projects for single modes: concept of operations	planning of smart city projects for major modes: concept of operations	Coordinated planning of smart city projects for all modes: cocnept of operations	End-to-end trip experience planning for all modes with concept of operations and plan for mode change management
Plan	5	TSM&O development	Limited professional development and training with mode specific culture	More extensive professional development and training and cultural development for each mode	Regional operations and maintenance linked to planning for every major mode	Regional operations and maintenance linked to planning for all modes on an integrated basis	Operation of the regional transportation system as a single entity with the ability to sense changes, adapt and provide status information any given time
Design	6	Incorporation of national best practice	Limited research and interaction with national and international practitioners and prior deployment sites	More extensive interaction and research with national and international practitioners and prior development sites on a modal basis	More extensive research and interaction with national and international practitioners and prior deployment sites on n integrated basis for all major modes in the region	Comprehensive research and interaction with national and international practitioners and prior deployment sites on an integrated basis for all modes in the region	Research and interaction with other sites with respect to the operation of the transportation system as a single entity
Design	7	Smart city design	No smart city design	Smart city design projects for single modes	Smart city design projects for major modes	Smart city design projects for all modes	Comprehensive smart city design with integrated projects and common goals
Build	8	Coordinated regional project delivery	Ad hoc, single mode	Projects coordinated across a single mode	Projects coordinated across all major modes	Projects coordinated across all modes in the region	Comprehensive project delivery program based on an integrated approach to all modes across the region
Build	9	P3 management	No automated P3 management all manual	Introduction of automated P3 management systems	Introduction of automated P3 management systems for all major modes	Automated P3 management system for all modes in the region	Comprehensive and integrated automated P3 management system for all modes in the region on a coordinated basis
Build	10	End-to-end trip experience delivery	Individual modes or links in the trip chain are managed independently	Improved management of individual modes within the trip chain	Coordinated management of all modes within the trip chain for major modes, including interchange management	Coordinated management of all modes within the trip chain for all modes within the region	Based on a detailed understanding of the user experience during the entire trip chain, deliver enhanced user experience across the entire trip
Operate	11	Urban automation	No significant urban automation	Automated private cars, automated buses, automated shuttles delivered independently	Automated vehicles delivered on a coordinated basis for all major modes	Automated vehicles delivered in a coordinated basis for all modes in the region	Regionwide multimodal on demand transportation service provided across the region
Operate	12	Connected Vehicles	No connected vehicles in operation	Connected private cars, buses and shuttles operate independently	Connected vehicles operate in a coordinated basis for all major modes	Connected vehicles operate in a coordinated basis for all modes within the region	Connected vehicles operate as a network of all vehicles across all modes within the region
Operate	13	Intelligent sensor-based infrastructure	Existing roadside sensor-based infrastructure with limited intelligence	Sensor-based infrastructure with enhanced intelligence for each mode independently	Sensor-based infrastructure with enhanced intelligence for all major modes in a coordinated basis across the region	Sensor-based infrastructure with enhanced intelligence for all modes	Smart network of sensor based infrastructure combines with data from other sources to provide a comprehensive and orthogonal approach to data
Operate	14	Strategic business models and partnering	No strategic business models and limited partnering with the private sector. Some partnering between public sector entities	Public public and public private partnership centered around single modes	Public public and public private partnerships centered around all major modes in the region on a coordinated basis	Public public and public private partnership centered around all modes in the region on a coordinated basis	Partnership activities within the region guided by a comprehensive and coordinated plan for partnership establishment and management
Operate	15	Coordinated results-based operations	Limited results based operations	Enhanced results based operations for single modes	Enhanced results based operations for all major modes in the region	Enhanced results based operations for all modes in the region	Single regional results based operations plan based on performance objectives, analytics, data discovery and agency cooperation
Operate	16	Smart city operations	No smart city operations	Smart city operations for individual modes	Smart city operations for all major modes within the region on a coordinated basis	Smart city operations for all modes within the region on a coordinated basis	Comprehensive smart city operations for all modes of transportation and other aspects of city life such as energy grids, social networks, governance and other citizen impact, urban analytics. . Response events triggere automatically by real time stream processing and triggering
Maintain	17	Regional maintenance standards and policies	No maintenance standards and policies on a regional coherent basis	Regional maintenance standards and policies for individual modes	Regional maintenance standards and policies for all major modes within the region	Regional maintenance standards and policies for all modes within the region	Comprehensive regionally coordinated maintenance standards and policies for all modes and for all devices
Maintain	18	Scientific maintenance planning	Ad hoc maintenance planning with little coordination between agencies	Scientific maintenance planning on a single mode basis	Scientific maintenance planning coordinated across all major modes within the region	Scientific maintenance planning coordinated across all modes within the region	Comprehensive regionally coordinated scientific maintenance planning

Figure 24 – CMM for Central Florida

8.4. CMM Proposed Strategies

There are 18 core strategies defined in the Capability Maturity Model for Transportation in Central Florida and each of these is used as a yardstick to indicate progress made in the Central Florida region. The strategies are grouped under headings as first introduced in **Figure 22 - Transportation Service Delivery Stages**. These Strategy Groups are described in detail in the following sections under the major headings of Plan, Design, Deliver, Operate and Maintain. As discussed earlier these represent the major stages of transportation service delivery.

STRATEGY GROUP 1: PLAN

Scientific Investment Programs

The implementation of this strategy involves an incremental improvement in the way the planning process is conducted. The current situation involves mode specific planning across the Central Florida region. The evolutionary improvement has two dimensions. In the first dimension plans are better synchronized across all modes and in the second dimension proposed investments are related to real-world effects of prior investments and are measured by the data collection and analytics capability discussed under the next strategy.

This strategy would also involve the development of a user service evolution approach which takes into account: social equity, implementation timescale, geographical implementation of user services over the central Florida region and the continuous improvement in the level of services delivered. For example, the evolutionary rollout of active arterial management would take into account the proposed timeframe for full implementation, the sequence of arterial roads to be implemented and the quality of the active arterial management service in terms of adaptive, coordinated signal control and data collection techniques. The development from a trip and to trip end management approach to user experience management and performance management would also include more active cooperation and collaboration with the Orlando International Airport and airline operators.

Analytics and Discovery Capability

There have been recent advances in data analytics and discovery capabilities as a part of the overall improvement in data science. These combined with the drastically reduced costs of data storage and manipulation courtesy of the Hadoop initiative, indicate that the best way to extract value from data lies in the creation of a central data lake or data repository. Insights and new trends and patterns can then be determined by conducting discovery on this new unified data set. The latest data analytics tools are capable of applying a wide range of analytics to such data sets. The implementation of the strategy involves an incremental evolution from the current situation, which could be characterized as excellent reporting to the desired future situation where analytics are being used to drive the quality of transportation service delivery across all modes in the central Florida region.

The strategy evolution moves the Central Florida region from limited mode specific reporting, through the definition of mode specific and multimodal analytics to the capability of advanced analytics and discovery on a full multimodal data set across the region. This would incorporate activities and data from Orlando International Airport and potentially airline operators. This will also require the establishment of regional data sharing agreements as an underpinning to creating the data lake. The adoption of a needs driven data collection, acquisition and integration approach will also be essential in order to ensure that the right data and quality of data is available in the data lake to support the desired analytics.

Regional Performance Management Goal Setting

The current approach to performance management within the Central Florida region has a heavy emphasis on performance measurement, with performance goals established for individual modes. The implementation of this strategy involves an incremental approach to a truly multimodal approach and complete performance management across the region. Performance management includes performance measurement, the extraction of information from data to create analytics, the use of the analytics to create strategies and the empowerment of transportation staff across the region to implement and monitor strategies. It is expected that the following modes will be included in this strategy:

- Transit
- Tolls
- Private car
- Freight
- Urban freight
- Cycles
- Pedestrians
- Motorcycles
- Orlando International Airport
- Airlines

A total regional multimodal approach to performance management will also enable the performance management of total end to end trip chains and the management of the connections or “whitespace” between the modal segments of a trip. The creation of a data horizon that spans the total trip will also support modal interchange management and end to end trip experience planning. For example, it will be possible to consider the total trip chain for the more than 61 million visitors to the central Florida region every year, whether the trip be by private car or by airline and rental car.

To provide a foundation for effective performance management across the Central Florida region, this approach will also involve the use of business process mapping and integration techniques to define the sequence of activities to be managed from a performance perspective. This will also reveal opportunities for coordinated data collection and collaboration on activities that possess common ground. For example, the information distribution system and activities for variable toll collection are likely to have significant common ground with the information delivery capability required for advanced traffic management and traveler information.

Smart City Planning

A groundswell of activity has developed recently under the heading of "smart cities". The term has become a banner for political support in the application of advanced technologies to our urban areas. A complete view of smart city planning would include the following elements at a minimum:

- Smart energy grids, roadway electrification and electric vehicles
- Social and telecommunication networks
- Smart governance, connected, involved citizens
- Urban analytics and modeling
- User focused mobility services and choices
- Urban delivery and logistics management
- Strategic business models and partnering
- Adoption of architecture and standards

The implementation of this strategy to Central Florida involves the initial development of coordinated plans for smart cities across the region including objectives, vision and the concept of operation. Migrating to complete plans for single modes, this then becomes a foundation for smart city planning for all major modes and eventually for all modes within the Central Florida region. Ultimately smart city planning addresses end-to-end trip experience for all modes including our urban delivery and logistics management. A comprehensive multimodal approach to this would also include cooperation and coordination with Orlando International Airport and airline operators.

While land-use planning is beyond the scope of this current project, it is expected that the use of data analytics will have a significant influence in future land use planning. A deeper understanding of transportation demand caused by various land uses, combined with insight and understanding regarding transportation operating conditions, will provide a higher resolution information feed into the land-use planning process. It is expected that modeling and analytics will be used in combination to provide a deeper insight into the effects of land-use and transportation in the central Florida region.

TSMO Development

TSM&O development is a particularly important strategy for discussion in this document. While most of the other strategies defined in the Capability Maturity Model support and enable the management of transportation in the Central Florida region as a single system, there are additional activities that can be implemented from a coordinated strategy basis. These include the following:

- Professional development and training
- Culture development
- Complete and relevant regional ITS architecture
- Regional operations and maintenance planning
- Coordinated response planning

With respect to professional development and training, the current situation in Central Florida is highly specialized by mode and by stage of the transportation service delivery process being supported. There is a need for professional development and training that covers the spectrum of transportation systems management and operations activities including the following:

- Scientific investment program development
- Use of data analytics and big data techniques
- Regional performance management
- Smart cities
- Coordinated project delivery
- Public private partnership management
- Managing the total end-to-end trip chain
- Urban automation
- Connected Vehicles
- Intelligent sensor-based infrastructure
- Strategic business models and partnering
- Complete and relevant regional its architecture
- Coordinated regional operations and maintenance planning
- Coordinated regional response planning
- Culture development

The professional development materials and course syllabuses will be designed to accommodate practitioners involved in planning, design, project delivery, operations and maintenance.

STRATEGY GROUP 2: DESIGN

Incorporation of National Best Practices

This strategy for improving design from the current situation to the desired future outcome (Level V) involves the incorporation of national best practices for design into the Central Florida regional approach. Building in the current situation where system engineering and focused research and interaction with national and international protect practitioners are mode specific, this strategy supports an evolution to comprehensive regional multimodal system engineering supported by suitable interaction on a regional multimodal basis with external practitioners. This strategy would also involve the definition of practical experiences and lessons learned from prior deployments and the incorporation of this information into future project designs. It is expected that the future design approach will incorporate the following elements, at a minimum:

- System engineering
- Incorporation of practical experiences and lessons learned from prior deployments
- Life cycle cost approach
- Design life defined and engineered
- Design of Infrastructure on a regional collaborative basis to support coordination and data sharing across modes and across agencies

Smart City Design

The future design approach for intelligent transportation systems in the Central Florida region, as well as including complete support for Transportation Systems Management and Operations, will also incorporate Smart City design elements including the following at a minimum:

- Smart energy grids, roadway electrification and electric vehicles
- Social and telecommunication networks
- Smart governance, connected, involved citizens
- Urban analytics and modeling
- User focused mobility services and choices
- Urban delivery and logistics management
- Strategic business models and partnering
- Adoption of architecture and standards

These were previously defined for the strategy on Smart City Planning and are repeated here for convenience.

STRATEGY GROUP 3: BUILD
Coordinated Regional Project Delivery

Coordinated regional project delivery spans planning, design and project delivery. The strategy defined here proposes an evolutionary approach to the Central Florida region, building on the existing mode specific approach to project delivery. It is intended that tools and techniques identified for use in each mode specific project will be applied in a multimodal regional basis for all projects.

Public Private Partnerships (PPP) Management

It is also anticipated that specific public private partnership management tools will be created as the FDOT continues to adopt this means of project financing and delivery. These will be applied on a uniform basis across the various modal projects as a means of enhancing coherence and structure at the regional level.

End to End Trip Experience Delivery

A coordinated regional approach to project delivery would also be expected to support a comprehensive view on end-to-end trip experience. By taking a regional multimodal approach to project delivery, it should be possible to consider the entire end-to-end trip for travelers visiting the region from original origin to ultimate destination, by various modes. This would include cooperation and coordination with Orlando International Airport and airline operations

STRATEGY GROUP 4: OPERATE
Urban Automation

It is envisioned that a significant part of future regional operations will involve the use of urban automation. Within the transportation context, urban automation refers to the emergence of automated vehicles, whether they be private vehicles, shared use vehicles, transit vehicles, shuttles or on-demand services.

The strategy evolution identified assumes that no significant urban automation is present within the Central Florida region, then builds this capability through the introduction of automated private cars, buses, shuttles and freight delivery on a mode specific basis. These are then brought together into a comprehensive Central Florida regional approach involving a network of automated vehicles.

Connected Vehicles

The Connected Vehicle strategy involves the application of vehicle to vehicle and vehicle to infrastructure communication technologies in order to support a two-way flow of data to and from vehicles and between vehicles. The strategy described supports an evolution in the Central Florida region from limited Connected Vehicles, which have been deployed as a part of early pilot projects, through mode specific Connected Vehicle implementation, to an ultimate network of Connected Vehicles operating as a single entity across all modes within the region. Connected Vehicles are also expected to contribute a large volume of probe vehicle data that will feed the data lakes, data analytics and discovery activities as described in earlier strategies.

Intelligent Sensors Based Infrastructure

This strategy describes the operation of a range of infrastructure based sensors, and an intelligent manner that combines data from different sources to improve the overall quality of the data. This strategy builds on existing roadside sensor-based infrastructure by adding intelligence to support coordination and cooperation between sensors. This begins on a mode specific basis and then evolves to cover all modes within the region. This strategy results in a smart network of sensor-based infrastructure that combines data from the Central Florida active arterial management system, passenger information systems and transit fleet management, electronic toll collection and non-traditional data sources such as credit card transactions and local energy usage. The objective is to provide the sensor-based feed for the data lake while enabling orthogonal analysis on the data to improve the overall quality. Ultimately, a combination of purpose specific sensors for the various applications within the region will combine with additional sensors designed to improve overall data quality and fill gaps.

Strategic Business Models and Partnering

This strategy defines the evolution of the application of strategic business models and the establishment of partnering approaches to support the implementation of a comprehensive intelligent transportation systems solution for the Central Florida region. It is becoming clear that the operation of intelligent transportation systems requires an effective approach to both public-public and public private partnerships. Public-public partnerships are required in order to achieve seamless operations across jurisdictions and modes and take advantage of the resource sharing possibilities intelligent transportation systems offer. Increasingly, public private partnerships are required in order to harness the motivation and resources of the private sector and establish a situation where these are applied to the achievement of public sector transportation objectives as well as private sector economic objectives. An example of this lies in the Uber service that has evolved over the past couple of years. This represents a highly successful private sector approach to ride sharing that could be a valuable component in the overall multimodal transportation service delivery approach for the Central Florida region.

Coordinated Results Based Operations

There are two critical dimensions to this strategy – coordination and results based. The coordinated operations dimension will build on the work of the Central Florida TSM&O Consortium, the Decision Support Tool Project and this ITS Master Plan. This strategy evolves from coordination on a single mode to coordination on all major modes. It then progresses to coordination on all modes within the Central Florida region. It is expected that this strategy will involve the establishment of coordinated operations forums. These forums will build on the data sharing agreements described earlier and support coordinated operations and maintenance management across the Central Florida region. With respect to results driven operations, the performance management strategy and the data analytics strategy will provide an information stream to enable results-based operations supported by real-time analytics for improved incident response and coordinated approaches to transportation demand and supply management. It is expected that coordinated results based operations will include the following elements at a minimum:

- Regional advanced traffic management
- Active arterial management
- Signal priority
- Freeway incident response and management
- Urban surface streets advanced traffic signal control
- Advanced parking management
- Freight parking
- Scientific transportation engineering
- Ramp metering
- Dynamic lane assignment
- Regional transit management
- Passenger information
- Transit fleet management
- Electronic ticketing
- Integrated corridor management
- Event management
- Regional traveler information
- Regional payment system
- Variable tolling
- Demand management
- Multimodal interface between surface transportation and airport and airline operations

This strategy also features a steady progression towards coordinated business process management, from process mapping and management on individual modes extending to all modes within the region. It is expected that coordinated organizational arrangements will form part of the strategy as the various agencies' responsibility for transportation service delivery in the Central Florida region fine-tune and align their organizational arrangements for optimum multimodal management across the region. As discussed when describing earlier strategies, a central focus for coordinated operations and for results-based operations will lie in efforts to improve the end to end trip experience for both visitors and citizens in the region.

It is envisioned that coordinated results based operations will also incorporate systems and technology refresh at predefined intervals.

Smart City Operations

This strategy involves the delivery and operation of:

- User focused mobility services and choices
- Urban data analytics
- Urban delivery and logistics management
- Strategic business models and partnering for smart cities
- Strategic business models and partnering for smart cities operations
- Smart grid road electrification and electric vehicles
- Connected, involved citizens

A brief description of each of these items follow:

<u>User focused mobility services and choices</u>

The delivery of a comprehensive set of mobility services and choices to both citizens and visitors for the Central Florida region. This will include cooperation across modes including transit, urban freight, private vehicle and the establishment of links to airport operations.

<u>Urban data analytics</u>

Data analytics has been described previously under the "Analytics and Discovery Capability" strategy. It involves the collection and acquisition of data according to a predefined plan, incorporating data from the following sources:

- Infrastructure based sensors
- Probes
- Crowdsource

- Other systems
- Transportation
- Non-traditional data sources

Urban Delivery and Logistics Management

In addition to the management of transit and private vehicle operations, this strategy also includes the use of public private partnerships to support urban delivery and logistics management. It is envisioned that this will begin with data sharing and information exchange between the proposed data lake and private sector urban delivery and logistics operators such as FedEx and UPS. It is possible, for instance, that a two-way information exchange be established with FedEx and UPS fleet vehicles acting as probes and both companies receiving current information regarding traffic and travel conditions within the central Florida region.

Strategic Business Models and Partnering for Smart Cities Operations

These have been described earlier in this document. Business models define the means for cooperation between the public and private sectors while the partnering arrangements provide the organizational framework to support cooperation and coordination.

Smart Grid Roadway Electrification and Electric Vehicles

This represents an interface between the other elements of a smart city and the transportation elements. It is expected that the operation of electric vehicles will be supported by the deployment of suitable infrastructure for vehicle charging. This will be coordinated by the strategy that is to deploy both connected and automated vehicles.

Connected, Involved Citizens

Building on the data lake and the analytics and utilizing information delivery techniques such as apps designed for smart phone use, citizens of the central Florida region will be better connected to each other and to information sources for transportation. This will support the shift from “pushing” information to citizens, enabling citizens to “pull” the required information from government sources.

As described earlier, smart cities will draw heavily on an evolved regional data infrastructure, data lake and analytics. The strategy shows an evolution of smart city operations from an initial base of no smart city operations to smart cities for individual modes, major modes and in all modes within the region. The ultimate goal is the development and implementation of a comprehensive smart city operations framework for all modes of transportation and other aspects of city life. As described earlier, the ultimate level V solution could also feature response events triggered automatically by real-time stream processing, representing a smart back office approach to match the implementation of smart, automated vehicles.

STRATEGY GROUP 5: MAINTAIN

Regional Maintenance Standards and Policies

To support the maintenance of intelligent transportation systems over the region, this strategy describes the development of regional maintenance standards and policies. This strategy evolves from the current situation where there is limited maintenance standards and policies on a regional coherent basis, moves through the implementation of standards and policies for individual modes and then to major modes then all modes within the region. The outcome of this implementation is a comprehensive regionally coordinate maintenance standards and policies framework for all modes of transportation and for all elements of the intelligent transportation system including back office, telecommunications, field devices, data collection devices and other system elements

Scientific Maintenance Planning

The availability of a comprehensive integrated data source from the data lake combined with the application of analytics and big data techniques will support the evolution of scientific maintenance planning. This involves the definition of maintenance quality levels and frequency requirements based on actual operational performance of the regional transportation system. The intention is to create a results based and effects driven maintenance planning framework for the Central Florida region. The strategy evolves from maintenance planning with little coordination between agencies, through modal cooperation and coordination, leading to a comprehensive regionally coordinated scientific maintenance plan for intelligent transportation systems

8.5. FDOT Project Development Process

In order to implement the strategies described, it is necessary to adopt the general material and convert it into something that is of regional significance and is appropriate for the Central Florida region. It was considered that an essential component in future configurations lies in all regional partners understanding the roles and responsibilities and coming to an understanding of the overall transportation systems management and operations process as it relates to the FDOT project development process. To support the development of this consensus, a high-level view of the current process was prepared. This was presented at a planning workshop in which information was gathered and insights were gained into how the process could be modified to optimize it using transportation systems management and operations. In particular, the goal was to map the existing process and provide guidance and a level of accountability as to where in the process additional steps were needed. The following primary project development phases were reviewed:

- Planning
- PD&E
- Design
- Construction
- Operations and Maintenance

Further, the stakeholders at the workshop were broken up into four teams. The key insights from each team were as follows:

TEAM 1

- There should be a project champion
- Operations and maintenance should propose projects
- Evaluation requires stakeholder input
- MPO/TPO should be involved in design

TEAM 2

- Technical Advisory Committee (TAC) and Citizens Advisory Committee (CAC) should provide strategy for input into the long-range transportation plan
- A prioritized project list should be developed and then distributed back to the TAC and the CAC
- In the course of the above two activities. There should be more data infusion into the process in a structured and consistent manner.
- More stakeholders should be brought into the transportation improvement program development process.
- There should be an evaluation of data needs and availability both before and after.

TEAM 3

- Local agency involvement should be more continuous
- The disconnect between design and construction should be addressed
- It is important that the right people are selected to review plans
- Planning should lead to the development of performance measures which should be subject to evaluation by operations
- A website should be developed to support the handoff of information between departments

TEAM 4

- Design, construction and operation should be involved throughout the process. Early in the planning process and during the course of PD&E
- Intelligent transportation solutions should be included in the PD&E process
- The disconnect between design and construction should be addressed, there is typically not enough detail.
- The fact that operations are not generally involved in PD&E needs to be rectified

Based on the input presented during the workshop, the figures on the following pages were developed to provide a high-level map of the process. In addition, the following areas were noted as desirable within the overall process:

- Consideration of Operational Strategies
- Consideration of Planning Involvement
- Consideration of Operations Involvement
- Consideration of Local Agency Involvement

The following are a breakdown of what is to be accomplished within a particular work area regarding the areas referenced above and then the figures follow.

PLANNING PROCESS

Cost Feasible Transportation Plans

<u>MPO LRTP</u>

Operational Strategies – Consideration should be given to operational strategies as a means of resolving transportation issues. This should include operations and maintenance as possible.

Operations Involvement – Operations should be consulted regarding data and their observations regarding the feasibility of an operational strategy as a means of resolving transportation issues. They should also be consulted regarding operations and maintenance requirements.

Note that Planning should be authoring System Engineering Documents as appropriate.

Programming Screen

<u>Qualifying Priority Projects</u>

Operational Strategies – Consideration should be given to operational strategies as a means of resolving transportation issues. This should include operations and maintenance as possible.

Operations Involvement – Operations should be consulted regarding data and their observations regarding the feasibility of an operational strategy as a means of resolving transportation issues. They should also be consulted regarding operations and maintenance requirements.

Local Involvement – Locals should be notified regarding any operational strategies that will affect them from an operations and maintenance perspective.

Note that Planning should be authoring System Engineering Documents as appropriate.

Project Level Planning

<u>Less Complex/Moderate/Complex</u>

Operational Strategies – Consideration should be given to operational strategies as a means of resolving transportation issues. This should include operations and maintenance as possible.

Operations Involvement – Operations should be consulted regarding data and their observations regarding the feasibility of an operational strategy as a means of resolving transportation issues. They should also be consulted regarding operations and maintenance requirements.

Local Involvement – Locals should be notified regarding any operational strategies that will affect them from an operations and maintenance perspective.

Note that Planning should be authoring System Engineering Documents as appropriate.

PD&E PROCESS

Preliminary Concept Analysis

Needs Analysis

Operational Strategies – Consideration should be given to operational strategies as a means of resolving transportation issues. This should include operations and maintenance as possible.

Operations Involvement – Operations should be consulted regarding data and their observations regarding the feasibility of an operational strategy as a means of resolving transportation issues. They should also be consulted regarding operations and maintenance requirements.

Local Involvement – Locals should be notified regarding any operational strategies that will affect them from an operations and maintenance perspective.

Planning Involvement – Planning should be maintaining and updating the system engineering documentation and confirming that the intent of the project remains intact.

Initial Concept Development

Operational Strategies – Operational strategies should be conceptualized and a Return on Investment (ROI) determined. The ROI should include operations and maintenance.

Operations Involvement – Operations should be consulted regarding data and their observations regarding the conceptualized operational strategy. They should also be consulted regarding operations and maintenance requirements.

Local Involvement – Locals should be provided the opportunity to review the Operational Strategy concept(s) that will affect them from an operations and maintenance perspective.

Planning Involvement – Planning should be maintaining and updating the system engineering documentation and confirming that the intent of the project remains intact.

Preliminary Concept Screening

Operational Strategies – Operational strategies should be compared against each other and also traditional “brick and mortar” solutions with a comparison of Return on Investment (ROI). The ROI should include operations and maintenance.

Operations Involvement – Operations should be consulted regarding data and their observations regarding the conceptualized operational strategy as well as any other solutions that are being considered. They should also be consulted regarding operations and maintenance requirements.

Local Involvement – Locals should be provided the opportunity to review the Operational Strategy concept(s) that will affect them from an operations and maintenance perspective as compared to other “brick and mortar” solutions.

Planning Involvement – Planning should be maintaining and updating the system engineering documentation and confirming that the intent of the project remains intact.

Engineering Analysis and Design

<u>Engineering Analysis/Engineering Design</u>

Operational Strategies – If an operational strategy is selected as the preferred alternative, the engineering analysis/design should be used to confirm the results of the Concept Analysis.

Operations Involvement – Operations should be consulted regarding data and their observations regarding the operational strategy. They should also be consulted regarding operations and maintenance requirements.

Local Involvement – Locals should be provided the opportunity to review the Operational Strategy design that will affect them from an operations and maintenance perspective.

Planning Involvement – Planning should be maintaining and updating the system engineering documentation and confirming that the intent of the project remains intact.

Final Documents

<u>Engineering Final Reports</u>

Operational Strategies – If an operational strategy is selected as the preferred alternative, the engineering analysis/design should be used to confirm the results of the Concept Analysis.

Operations Involvement – Operations should be consulted regarding data and their observations regarding the operational strategy. They should also be consulted regarding operations and maintenance requirements.

Local Involvement – Locals should be provided the opportunity to review the Operational Strategy design that will affect them from an operations and maintenance perspective.

Planning Involvement – Planning should be maintaining and updating the system engineering documentation and confirming that the intent of the project remains intact.

FDOT Review

Operations Involvement – Operations should be consulted regarding the operational strategy. They should also be consulted regarding operations and maintenance requirements.

Planning Involvement – Planning should be maintaining and updating the system engineering documentation and confirming that the intent of the project remains intact.

DESIGN PROCESS

30% Plans

<u>Activities</u>

Operations Involvement – Operations should be consulted regarding the operational strategy and any initial design requirements. They should also be consulted regarding operations and maintenance requirements.

Planning Involvement – Planning should be maintaining and updating the system engineering documentation and confirming that the intent of the project remains intact.

60%/90%/100%/Final Plans/Plans Update

<u>Activities</u>

Operational Strategies – The operational strategy should be designed to meet the overall requirements identified in the planning and PD&E process.

Operations Involvement – Operations should be consulted regarding the operational strategy and any initial design requirements. They should also be consulted regarding operations and maintenance requirements.

Local Involvement – Locals should be provided the opportunity to review the design(s) that will affect them from an operations and maintenance perspective.

Planning Involvement – Planning should be maintaining and updating the system engineering documentation and confirming that the intent of the project remains intact.

CONSTRUCTION PROCESS

Construction

Construction Activities

Operations Involvement – Operations should be consulted regarding the construction of an operational strategy; particularly as it relates to vendors, final construction and system acceptance.

Local Involvement – Locals should be provided the opportunity to participate in the final acceptance process, when they are involved in final operations or maintenance.

Planning Involvement – Planning should be maintaining and updating the system engineering documentation and confirming that the intent of the project remains intact.

OPERATIONS AND MAINTENANCE PROCESS

Operations

Activities

Operational Strategies – The operational strategy should be utilized and evaluated based upon the identified goals originating with the planning and PD&E process.

Local Involvement – Locals should operate and maintain the operational strategy as identified as a part of the planning and PD&E process.

Planning Involvement – Planning should be maintaining and updating the system engineering documentation and evaluating the project to determine if goals were reached. In addition, lessons learned should be identified for future projects.

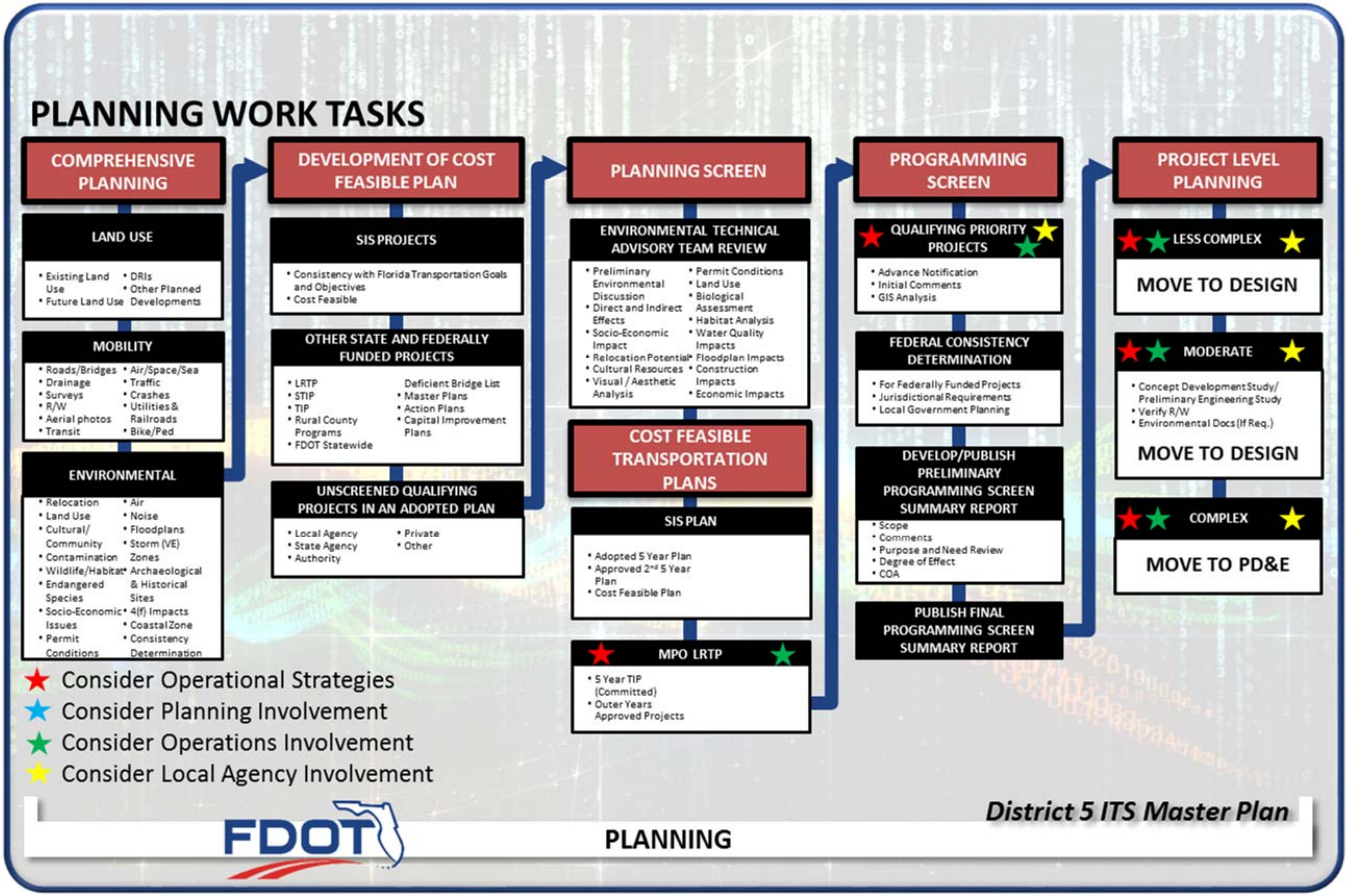

Figure 25 – Planning Process

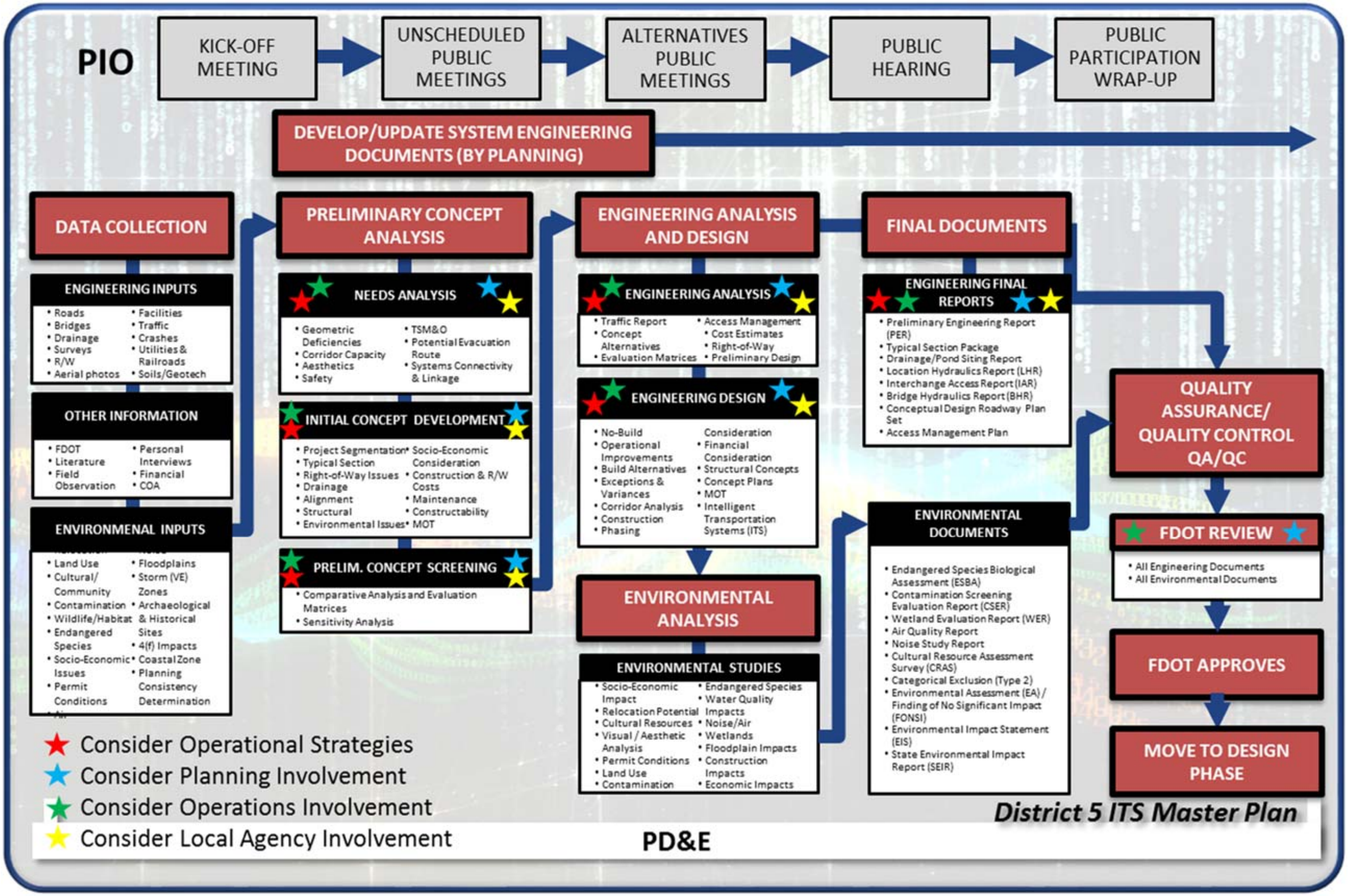

Figure 26 – PD&E Process

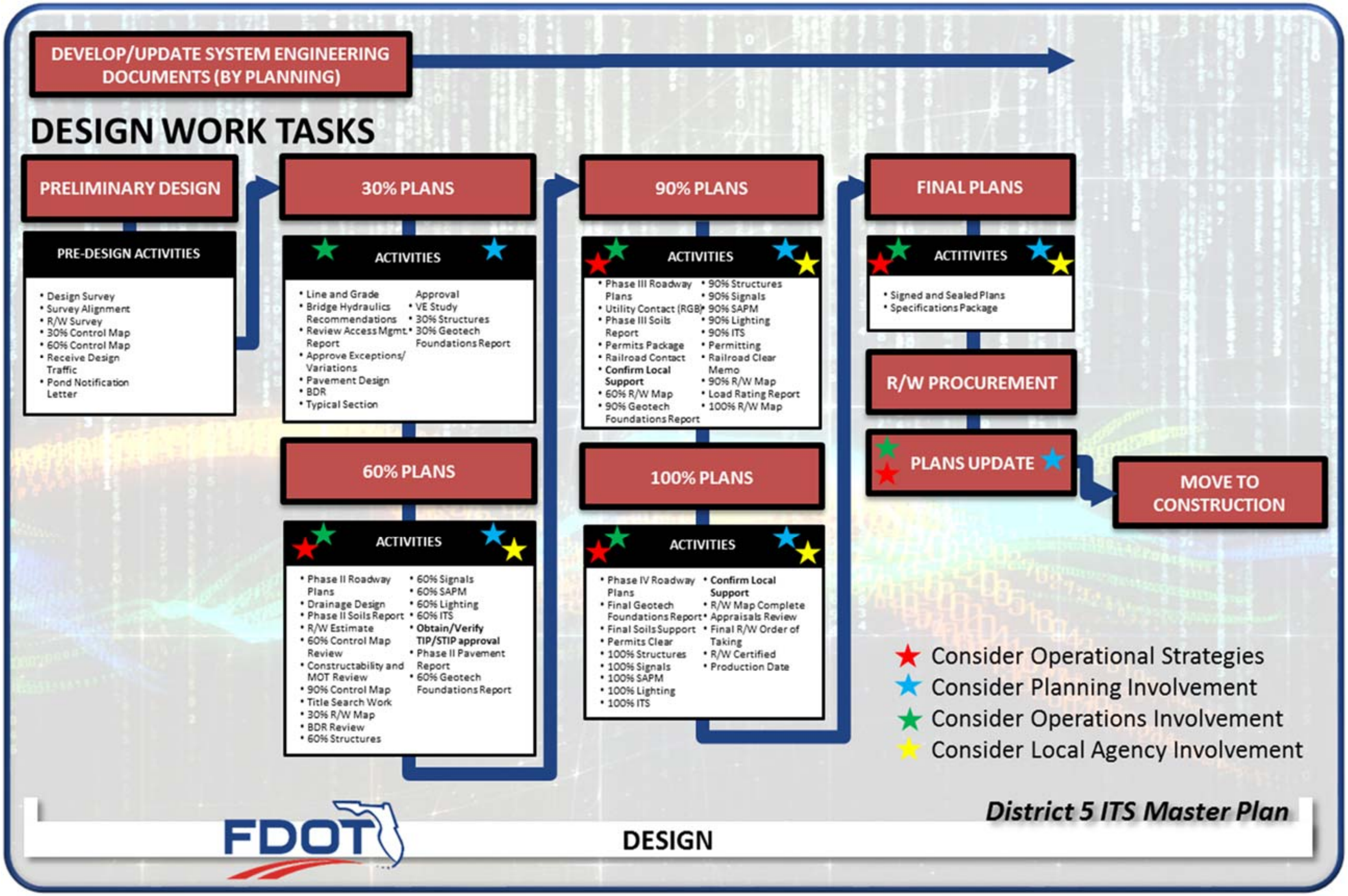

Figure 27 – Design Process

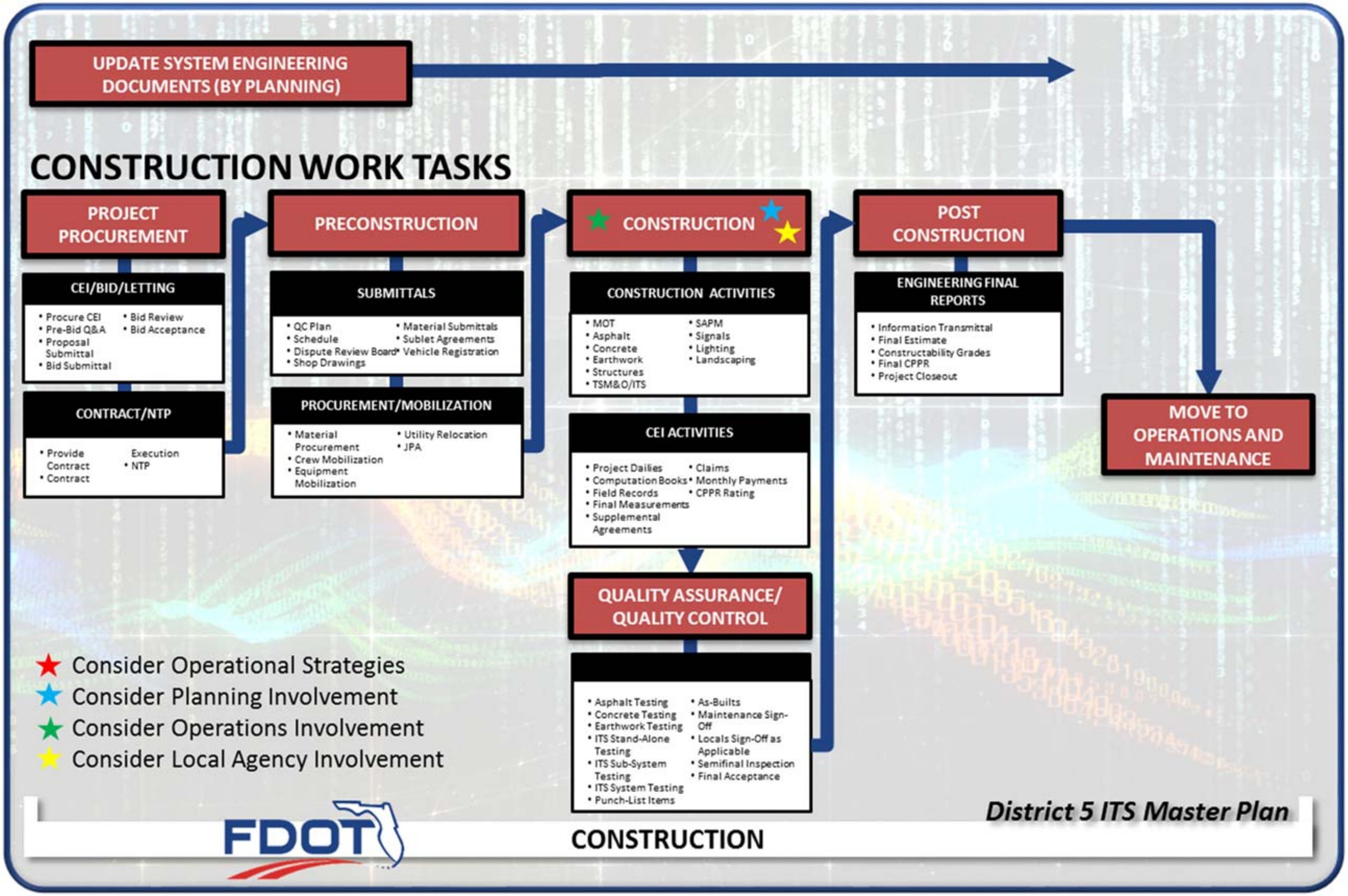

Figure 28 – Construction Process

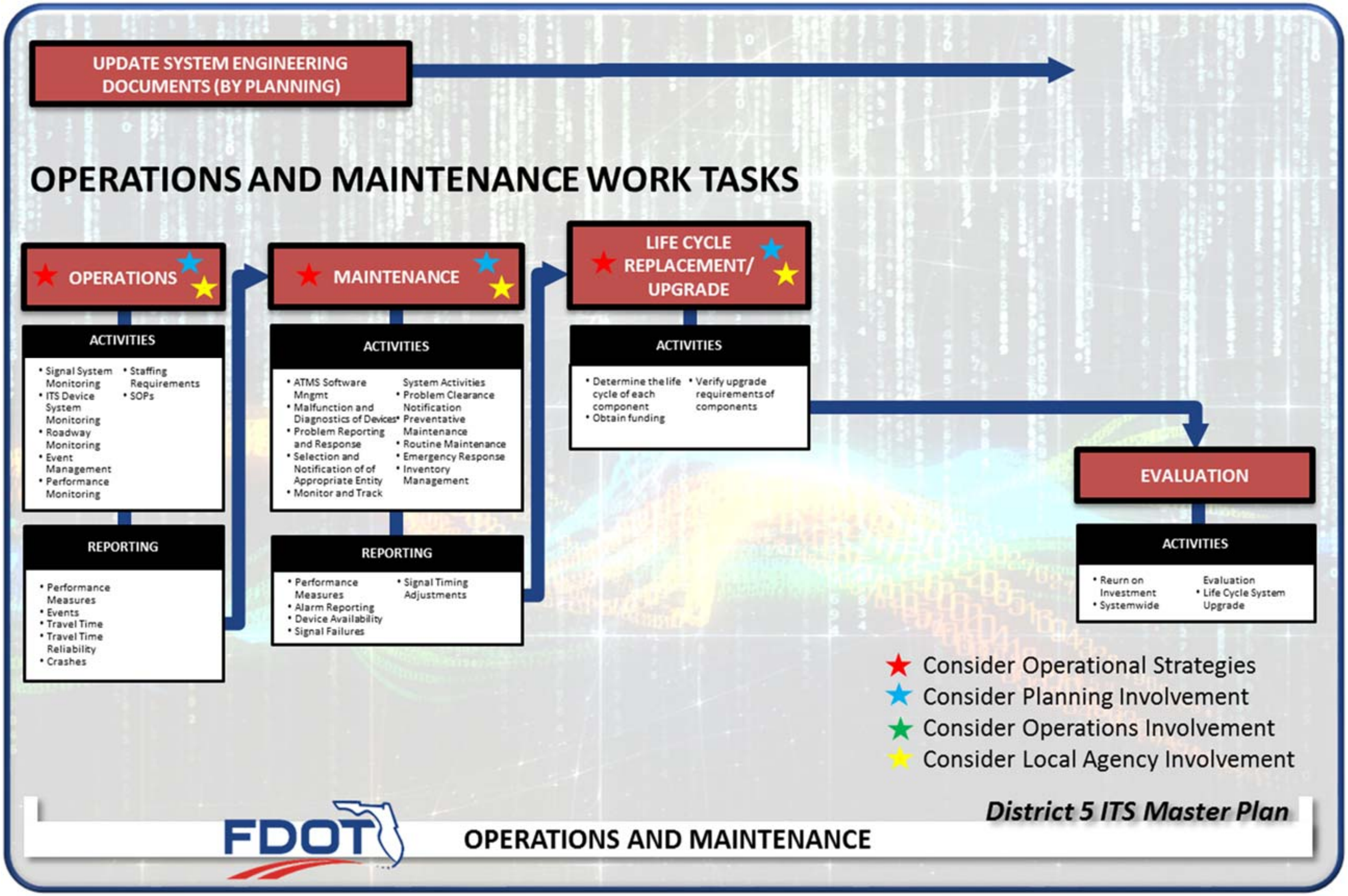

Figure 29 – Operations and Maintenance Process

The development of a vision for transportation systems management and operations for the Central Florida region, along with the opening of a dialogue across planning and operations, should provide the basis for further progress. Further activity is required to build on the progress of the workshop and develop an agreed upon vision for the future and a detailed plan for achieving that vision. It is recommended that this extend to individual FDOT Departments as well as the local agencies.

9. Commitments

9.1. Introduction

Throughout the development of this ITS Master Plan, various ITS strategies have been identified as desirable for implementation regionally. However, as noted in the ITS Standards section, various elements are required to be standardized within the region in order to make the implementation of these ITS Strategies feasible.

This section identifies ITS Standards that are needed throughout the region. These ITS Standards are noted as being either mandatory and being provided as guidance.

9.2. Mandatory ITS Standards

The following ITS Standards have been agreed upon to be mandatory by the regional stakeholders due to their necessity in implementing desired ITS Strategies.

COMMUNICATIONS

The following communications standards will be adopted by the region within two years from the date of this Master Plan:

- Hub and Spoke Topology
- Static Routing for Now; gradually Migrate BGP with Unique ASN
- Fiber Connection Between Agency Router and D5 Carrier Ethernet Switch (Master Hubs)
- Use of MPLS
- Unique Assigned IP Address Ranges – An existing contract is currently underway to re-IP the region
- Use of MSDP

SECURITY

The following security standards will be adopted by the region within two years from the date of this Master Plan:

- Firewall at the D5 Carrier Ethernet Switch (Master Hub)
- Each Stakeholder to Centrally Manage User Account Database (i.e. Microsoft Active Directory)
- AAA - RADIUS or TACACS+

DATA

The following data standards have been identified as possible data solutions; and data standards in general are deemed necessary by the region. However, it became apparent during coordination with the stakeholders that significant additional regional coordination is needed in order to achieve consensus. As a part of this regional coordination, it is necessary to determine a method in which the region can benefit from 3rd party data, by providing real-time data as a part of a data sharing agreement. This will require a legal interpretation of the Sunshine Law requirements as it relates to data as well as regional consensus.

The following data standards are offered as possible solutions pending additional regional deliberation. Please note that these data standards must ultimately be adopted by the regional stakeholders as a part of further regional coordination efforts:

- Format - JSON or XML
- District 5 will be the sole source of regional data
- Access to a partner's data to be read only
- For 3rd party - Data would be published through the Department

COMMON CLOCK

In order to allow for ease of signalization coordination across jurisdictional boundaries, a common clock is required to be implemented within one year of the date of this ITS Master Plan. This clock will ensure that all systems can be tied to a common sync point.

DISCONTINUE THE USE OF #2 KEYS AT CABINETS WITH NETWORK COMMUNICATIONS

In order to ensure physical network security, the region must move away from #2 keys at all cabinets that have network communications. This is due to the fact that #2 keys are easily obtained by other parties. The #2 keys can be replaced by other less common keys; cyber-locks or padlocks can be used. The timing of this requirement is pending identification of funding.

9.3. ITS Standards - Guidance

The following ITS Standards are offered as recommendations for the region, but are not mandatory at this time:

LOCAL AGENCY SECURITY

It is recommended that each agency consider a firewall to protect their individual network. If a firewall is not possible, a mutually agreed upon Service Level Agreement (SLA) to be managed by District 5 may be possible.

ITS MAINTENANCE STANDARDS

A regional approach to ITS maintenance makes sense in order to provide consistency of device and system uptime.

ITS OPERATIONS STANDARDS

A regional approach to ITS operations makes sense in order to provide consistency of operations, including system performance and measurement.

ITS TRAINING STANDARDS

A regional approach to ITS training would provide for a regional level of expertise; thus ensuring that maintenance and operations are completed at the highest possible level. This can also address any issues that stakeholders are having with turnover of staff.

STANDARD ITS TESTING AND SYSTEM ACCEPTANCE

Currently, ITS projects are tested and accepted in various ways depending on the agency and the project. This can result in desired tests being omitted by a particular project or confusion by the construction team regarding a specific testing or system acceptance requirement. By standardizing these elements of an ITS project, consistency can be achieved, both for the operator and maintainer, as well as the constructor.

SOFTWARE LICENSING

Regional licensing of software provides for a potential cost savings as well as a sharing of regional expertise of particular software packages. The following software packages have been identified as being appropriate for regional sharing:

- BlueMac (Is Available for Use Now)
- CMS (Is Available for Use Now)
- ATMS/DSS (Pending)

ASSET MANAGEMENT

Common asset management software provides a cost savings to the regional stakeholders (In some cases the cost is zero) and always simplifies data sharing, if needed. The following asset management software packages have been identified for use by the stakeholders:

- MIMS – Device/Infrastructure Maintenance
- ITSFM – Fiber/Communications

REGIONAL OPERATIONS AND/OR MAINTENANCE CONTRACT (W/ USDOT LANGUAGE)

In order to share resources and provide regional cost savings, a regional operations and/or maintenance contract should be considered. This type of contract should also have the required USDOT language to allow for the use of Federal funds. These types of contracts could provide network support, operations staff, maintenance services, etc.

SYSTEM ENGINEERING DOCUMENT SERVICES CONTRACT

In order to share resources and provide a regional cost savings, a system engineering document services contract could be used by the region for the development and upkeep of system engineering documents.

ACTIVE ARTERIAL MANAGMENT CONTRACT

There are currently Active Arterial Management contracts in place that can be used to provide AAM services throughout the District.

APPENDIX A

Meeting Minutes

FDOT District 5 – ITS Master Plan
Meet with Stakeholders: Meeting Minutes – Lake-Sumter MPO
September 4, 2015 from 9:00 AM – 11:30 AM

Attendees:

TJ Fish	MPO	☒
Pam Richmond	MPO	☒
Fred Schneider	Lake Co.	☒
Angela Newland	Sumter Co.	☒

Manny Rodriguez	FDOT	☒
Dale Cody	Metric	☒
Chris Walsh	TEDS	☒

I. **Introductions**
   a. See list of attendees above
   b. Overview of what will be discussed, focusing on the what and not the how and why
      i. Determining how we communicate
      ii. What will this Master Plan look like and learning about strategies and what will work for the Region

II. **Transportation Overview**
   a. People hope to get from A to B as quickly as possible, while connected
      i. The method of transportation is flexible as long as it is easy and efficient (See Slide 1)
      ii. The goal is to provide information to enable people to make that determination… and one day to automate travel
         1. We are seeing a shift to automated ITS and now is the time to embrace it
   b. If this seems unlikely, consider the cell phone and computer (see Slide 2)
      i. The evolution of technology is ever changing, for instance the cellular phone started as a “bag phone” and then moved from Blackberry to iPhones. You can now make calls with a smart watch. The movement of technology continues to change, grow and push limits that we did not even fathom ten years ago
   c. … and finally transportation (See Slide 3)
      i. Transportation is moving exponentially faster and it is our goal to keep up with these changes

III. **Project Overview and Purpose**
   a. Goal of this Project
      i. Develop a Regional Master Plan with an eye towards Complete Connectivity (i.e. Connected Vehicles)

1. Cooperative approach
    a. What should each agencies' role be
2. Identify goals and needs (ITS Strategies)
3. Gather and use data to meet the goals and needs
4. How do we work together/integrate
5. NOT a deployment Plan

b. Maximize and identify needs for regional staff and resources
c. Identify Risks
d. Develop Regional ITS Standards

IV. ITS Strategies (See Attachment)

a. We go through strategies that you are interested in (Yes, No, Maybe)
    i. See Strategies Matrix for overall input
b. These answers along will all other stakeholders will be placed into an overall matrix in order to see a trend regionally
c. Below are strategies that had some comments or discussion. While there were representatives from Lake and Sumter Counties, the positions below are those stated by TJ Fish and Pam Richmond of the Lake-Sumter MPO:
    i. Active Arterial Management – Maybe;
        1. Sumter County is planning a TMC, but at some undetermined future date.
        2. Dale discussed the current FDOT contracts being used to assist with traffic control during I-4 construction.
        3. Fred is interested in FDOT's assistance with managing and implementing a TMC.
    ii. Dynamic Junction Control – Maybe; for I-75
    iii. Dynamic Lane Reversal – Maybe; consider for highways, not arterials.
    iv. Dynamic Lane Use Control – Maybe;
    v. Dynamic High Occupancy Vehicle and Managed Lanes – No;
    vi. Adaptive Ramp Metering – Maybe;
    vii. Dynamic Merge Control – Yes;
    viii. Dynamic Shoulder Lanes – Yes; for the interstate, not for arterials.
    ix. Dynamic Routing – Yes;
    x. Queue Warning – Yes;
    xi. Dynamic Parking Guidance and Reservation – No;
    xii. Dynamically Priced Parking – No;
    xiii. Dynamic Overflow Transit Parking – Maybe;
    xiv. Freight Parking – Yes;
    xv. Integrated Corridor Management – Yes;
    xvi. Predictive Traveler Information – Yes;

xvii. Pre-Trip Travel Information – Yes;
xviii. En Route Driver Information – Yes;
xix. Traveler Services Information – Yes;
xx. Route Guidance – Yes;
xxi. Dynamic Ridesharing – Yes;
xxii. Dynamic Wayfinding – Yes;
xxiii. Adaptive Signal Control – Yes;
xxiv. Transit Signal Priority – Yes;
xxv. Incident Management – Yes;
xxvi. Travel Demand Management – Yes;
xxvii. Emissions Testing and Mitigation – Maybe;
xxviii. Highway Rail Intersection – Yes;
xxix. Dynamic Transit Capacity Assignment – Maybe;
xxx. Dynamic Fare Reduction – Maybe;
xxxi. Transfer Connection Protection – Maybe;
xxxii. Transit Traveler Information – Yes;
xxxiii. On Demand Transit – Yes;
xxxiv. Public Travel Security – Maybe;
xxxv. Regional Payment System – Yes;
xxxvi. Electronic Transit Ticketing – Yes;
xxxvii. Electronic Toll Collection – Yes;
xxxviii. Dynamic Pricing – Yes for Interstate, no for arterials;
xxxix. Demand Pricing – No;
xl. Corridor Pricing – Yes for Interstate, no for arterials;
xli. Commercial Vehicle Electronic Clearance – Yes;
xlii. Automated Roadside Safety Inspection – Yes;
xliii. On-Board Safety and Security Monitoring – Yes;
xliv. Commercial Vehicle Administrative Processes – Yes;
xlv. Hazardous Materials Security and Incident Response – Yes;
xlvi. Freight Mobility – Yes;
xlvii. Emergency Notification and Personal Security – Yes; noted that security is a concern on the coast-to-coast trail.
xlviii. Emergency Vehicle Management – Yes; financially expensive
    1. Example – Broward County spends $1.3 million ($200,000 per year)
xlix. Disaster Response and Evacuation – Yes;
l. In-Vehicle Information – Yes; discussion on connected vehicles - Not a question of “if,” but “when” since connected vehicles are progressing.
    1. Transition to driver taking over vehicle
        a. How do we transition?

        2. Cellular based right now, needs more resiliency
        3. Security of connected vehicles
            a. Example – Ability to hack into a connected vehicle is doable, hence the example set by Chrysler
    li. Probe Vehicle Data – Yes;
    lii. Longitudinal Collision Avoidance – No;
    liii. Lateral Collision Avoidance – No;
    liv. Intersection Collision Avoidance; Yes;
    lv. Vision Enhancement for Crash Avoidance – No;
    lvi. Pre-Crash Restraint Deployment – No;
    lvii. Automated Vehicle Operation – No;
    lviii. Archived Data – Yes;
    lix. Big Data – Yes;
    lx. Transportation Data Analytics – Yes;
    lxi. Performance Management – Yes;
    lxii. Event Management – Yes;
    lxiii. Wrong Way Driving Countermeasures – Yes; discussed the project Central Florida Expressway has funded.
    lxiv. Asset Management Database – Yes;
    lxv. Pedestrian Safety Systems – Yes;
    lxvi. Bicycle Warning Systems – Yes;
    lxvii. Innovative Intersection Design – Yes;

V. ITS Standards

a. Network, Data Sharing, Security
    i. Security – Cabinet access (i.e. Electronic Key)
b. Resource Sharing
    i. Network – Network Architect
    ii. Software (SunGuide, TSP, ATMS, DSS) - licensing
    iii. Operations Staffing
        1. Database – enter and check (QA/QC)
c. Demarcation Points for Operations and Maintenance
    i. M&O getting better, preparing for what is coming
d. Performance Measurement
e. Standard Drawings/Construction Configurations
    i. Limited; example going from Type 5 cabinet to Type 6 cabinet
f. Consistency with testing and acceptance
    i. Implementing them in contracts (for testing)
    ii. More consistent yields:
        1. Better performance

    2. Obtains synergy
    3. Testing is always the same

VI. **Link Planning with Operations**
  a. Incorporate TSM&O principles
  b. Determine funding requirements, including O&M, at the planning level
  c. Prioritize appropriately
  d. What is your involvement with your planning Department?
    i. Pam indicated that the MPO has had great experiences in working with the planning folks on evaluating TSM&O strategies.

VII. **Data and Information Request**
  a. Provided an overview of the list of information being requested. Requested that the information be provided within 2 weeks and that Chris Walsh be the point of contact for questions and/or providing the information.
    i. Pam Richmond asked for guidance relative to incorporation of TSM&O-related improvements into the LRTP.

VIII. **Closing**
  a. Cooperative effort to create Regional (Central Florida) Master Plan, not D5 Master Plan; document that reflects your opinions and goals.

FDOT District 5 – ITS Master Plan
Meet with Stakeholders: Meeting Minutes – Lake County
September 1, 2015 from 9:00AM – 11:00 AM

Attendees:

James Golbig	Lake County	☒	Manny Rodriguez	FDOT	☒
Denis Dietz	Lake County	☒	Dale Cody	Metric	☒
Sharon Lewis	Lake County	☒	Alex Mims	TEDS	☒

I. **Introductions**
   a. See list of attendees above
   b. Overview of what will be discussed, focusing on the what and not the how and why
      i. Determining how we communicate
      ii. What will this Master Plan look like and learning about strategies and what the future may hold, and why it is important to plan ahead

II. **Transportation Overview**
   a. People hope to get from A to B as quickly as possible, while connected, using a multimodal approach
      i. The method of transportation is flexible as long as it is easy and efficient (See Slide 1)
      ii. The goal is to provide information to enable people to make that determination… and one day to automate travel
         1. We are seeing a shift to automated ITS and now is the time to embrace it
   b. If this seems unlikely, consider the cell phone and computer (see Slide 2)
      i. The evolution of technology is ever changing, for instance the cellular phone started as a "bag phone" and then moved from Blackberry to iPhones. You can now make calls with a smart watch. The movement of technology continues to change, grow and push limits that we did not even fathom ten years ago
   c. … and finally transportation (See Slide 3)
      i. Transportation is moving exponentially faster and it is our goal to keep up with these changes

III. **Project Overview and Purpose**
   a. Goal of this Project
      i. Develop a Regional Master Plan with an eye towards Complete Connectivity (i.e. Connected Vehicles)
         1. Cooperative approach

a. What should each agencies' role be
2. Identify goals and needs (ITS Strategies)
3. Gather and use data to meet the goals and needs
4. How do we work together/integrate. Multiple agencies must cooperate to develop large scale ITS improvements.
5. NOT a deployment Plan: agencies will set protocols and agenda, masterplan will simply author their thoughts.

b. Maximize and identify needs for regional staff and resources
c. Identify Risks
d. Develop Regional ITS Standards, so that once legislature adopts new technology there is standards in place for quick implementation.
e. Regional partnerships help get grants as a level of cooperation is attractive to awarders of grants.

IV. ITS Strategies (See Attachment)

a. We go through strategies that you are interested in (Yes, No, Maybe)
   i. See Strategies Matrix for overall input
b. These answers along will all other stakeholders will be placed into an overall matrix in order to see a trend regionally
c. Below are strategies that had some comments or discussion:
   i. Active Arterial Management – Yes;
   ii. Dynamic Junction Control – Maybe;
   iii. Dynamic Lane Reversal – No; would take a large amount of resources to actually implement, and there are not many areas in the County where it would be beneficial.
   iv. Dynamic Lane Use Control – No; not now as this would be used on interstate predominantly
   v. Dynamic High Occupancy Vehicle and Managed Lanes – No;
   vi. Adaptive Ramp Metering – No;
   vii. Dynamic Merge Control – Maybe;
   viii. Dynamic Shoulder Lanes – No; not many adequate shoulders in the area.
   ix. Dynamic Routing – Maybe;
   x. Queue Warning – Maybe;
   xi. Dynamic Parking Guidance and Reservation – No;
   xii. Dynamically Priced Parking – Maybe;
   xiii. Dynamic Overflow Transit Parking – Maybe; Lake Express (public busses) routes are expanding and may need transit parking to support in future.
   xiv. Freight Parking – Yes;
   xv. Integrated Corridor Management – Yes;
   xvi. Predictive Traveler Information – Yes;

xvii. Pre-Trip Travel Information – Yes;
xviii. En Route Driver Information – Yes;
xix. Traveler Services Information – Yes;
xx. Route Guidance – Yes;
xxi. Dynamic Ridesharing – Yes;
xxii. Dynamic Wayfinding – Yes;
xxiii. Adaptive Signal Control – Yes;
xxiv. Transit Signal Priority – Maybe; County signal maintenance is somewhat resistive to this.
xxv. Incident Management – Yes;
xxvi. Travel Demand Management – Yes;
xxvii. Emissions Testing and Mitigation – No;
xxviii. Highway Rail Intersection – Yes;
xxix. Dynamic Transit Capacity Assignment – Yes;
xxx. Dynamic Fare Reduction – Yes;
xxxi. Transfer Connection Protection – Yes;
xxxii. Transit Traveler Information – Yes;
xxxiii. On Demand Transit – Yes;
xxxiv. Public Travel Security – Maybe;
xxxv. Regional Payment System – Yes;
xxxvi. Electronic Transit Ticketing – Yes;
xxxvii. Electronic Toll Collection – Yes;
xxxviii. Dynamic Pricing – Maybe;
xxxix. Demand Pricing – No;
xl. Corridor Pricing – Yes;
xli. Commercial Vehicle Electronic Clearance – Yes;
xlii. Automated Roadside Safety Inspection – Yes;
xliii. On-Board Safety and Security Monitoring – Yes;
xliv. Commercial Vehicle Administrative Processes – Yes;
xlv. Hazardous Materials Security and Incident Response – Yes;
xlvi. Freight Mobility – Maybe;
xlvii. Emergency Notification and Personal Security – Yes;
xlviii. Emergency Vehicle Management – Yes;
xlix. Disaster Response and Evacuation – Yes;
l. In-Vehicle Information – Yes;
li. Probe Vehicle Data – Yes;
lii. Longitudinal Collision Avoidance – No;
liii. Lateral Collision Avoidance – No;
liv. Intersection Collision Avoidance; Yes;
lv. Vision Enhancement for Crash Avoidance – No;

lvi. Pre-Crash Restraint Deployment – No;
lvii. Automated Vehicle Operation – No;
lviii. Archived Data – Yes;
lix. Big Data – Yes;
lx. Transportation Data Analytics – Yes;
lxi. Performance Management – Yes;
lxii. Event Management – Yes;
lxiii. Wrong Way Driving Countermeasures – Yes; County has seen crashes in the area caused by wrong way driving.
lxiv. Asset Management Database – Yes; County currently uses Cartigraph, but stated they are willing to look at other alternatives that are better or less costly.
lxv. Pedestrian Safety Systems – Yes;
lxvi. Bicycle Warning Systems – Yes;
lxvii. Innovative Intersection Design – Yes;

V. ITS Standards

a. Network, Data Sharing, Security
   i. Security – Cabinet access (i.e. Electronic Key) to increase security to replace standard #2 key as it is widely available
b. Resource Sharing
   i. Network – Network Architect; share between multiple areas to offset high costs of this person. Difficult for local IT people to sit back and look at the overall network, as they are caught up in day to day operation and maintenance.
   ii. Software (SunGuide, TSP, ATMS, DSS) – licensing; share cost of software over multiple agencies—for example the FDOT D5 RTMC could handle certain aspects for a large region.
      1. County currently uses Streetwise
      2. New ATMS software planned for next physical year
   iii. Operations Staffing
      1. Database – enter and check (QA/QC)
c. Demarcation Points for Operations and Maintenance
   i. M&O getting better, preparing for what is coming
d. Performance Measurement
e. Standard Drawings/Construction Configurations
   i. Limited; example going from Type 5 cabinet to Type 6 cabinet
f. Consistency with testing and acceptance
   i. Implementing them in contracts (for testing)

1. County expressed interest in developing better standard testing and acceptance measures.

ii. More consistent yields:
   1. Better performance
   2. Obtains synergy
   3. Testing is always the same

VI. Link Planning with Operations

a. Incorporate TSM&O principles
b. Determine funding requirements, including O&M, at the planning level
c. Prioritize appropriately
d. What is your involvement with your planning Department?

VII. Data and Information Request

a. County had completed a significant portion of the information request document, and provided it during the meeting.

VIII. Closing

a. Cooperative effort to create Regional (Central Florida) Master Plan, not D5 Master Plan; document that reflects your opinions and goals.

IX. Open Discussion

a. Through coordination with FDOT, both project below will now include fiber
   i. US 27 from Boggy Marsh Road to Lake Louisa
   ii. US 27 @ SR 50 should have fiber going North
b. County expressed wariness over signal timing projects, as they feel that the timings are being forever adjusted. County is somewhat hesitant to implement retiming changes on existing operational corridors.
c. County stated that some of the corridors in the area are in need of retiming.
d. Manny explained the MIMS system to the county as a potential alternative/replacement to Cartegraph. This would be free of charge to County as FDOT is the owner.
   i. County is looking at using IPAD devices in the field for technicians to track maintenance/inventory.
e. Manny explained that FDOT uses OSPInsight for fiber assets management, and ITSFM.
   i. County has some GIS records of fiber assets, but stated that it needs to be updated and expanded upon.
   ii. County currently has 62 intersection connected to Lake County TMC using a combination of fiber and wireless connectivity. Some backhaul is

leased fiber by the County to connect isolated network regions. For most backhaul, Lake County uses the Public Safety Microwave tower network. Use of the Public Safety Microwave tower network is a cooperative effort between Public Works Traffic Operations and Public Safety (no fees).

FDOT District 5 – ITS Master Plan
Meet with Stakeholders: Meeting Minutes – City of Ocala
September 2, 2015 from 8:30 AM – 10:00 AM

Attendees:

NJ Blizzard	Ocala	☒	Manny Rodriguez	FDOT	☒
Darren Park	Ocala	☒	Dale Cody	Metric	☒
Tom Casey	Ocala	☒	Chris Walsh	TEDS	☒
		☐			

I. **Introductions**
   a. See list of attendees above
   b. Overview of what will be discussed, focusing on the what and not the how and why
      i. Determining how we communicate
      ii. What will this Master Plan look like and learning about strategies and what will work for the Space Coast Region

II. **Transportation Overview**
   a. People hope to get from A to B as quickly as possible, while connected
      i. The method of transportation is flexible as long as it is easy and efficient (See Slide 1)
      ii. The goal is to provide information to enable people to make that determination… and one day to automate travel
         1. We are seeing a shift to automated ITS and now is the time to embrace it
   b. If this seems unlikely, consider the cell phone and computer (see Slide 2)
      i. The evolution of technology is ever changing, for instance the cellular phone started as a "bag phone" and then moved from Blackberry to iPhones. You can now make calls with a smart watch. The movement of technology continues to change, grow and push limits that we did not even fathom ten years ago
   c. … and finally transportation (See Slide 3)
      i. Transportation is moving exponentially faster and it is our goal to keep up with these changes

III. **Project Overview and Purpose**
   a. Goal of this Project
      i. Develop a Regional Master Plan with an eye towards Complete Connectivity (i.e. Connected Vehicles)

1. Cooperative approach
    a. What should each agencies' role be
2. Identify goals and needs (ITS Strategies)
3. Gather and use data to meet the goals and needs
4. How do we work together/integrate
5. NOT a deployment Plan

b. Maximize and identify needs for regional staff and resources
c. Identify Risks
d. Develop Regional ITS Standards

IV. ITS Strategies (See Attachment)

a. We go through strategies that you are interested in (Yes, No, Maybe)
    i. See Strategies Matrix for overall input
b. These answers along will all other stakeholders will be placed into an overall matrix in order to see a trend regionally
c. Below are strategies that had some comments or discussion:
    i. Active Arterial Management – Yes;
    ii. Dynamic Junction Control – Maybe; could be used for coming off interstate.
    iii. Dynamic Lane Reversal – Maybe;
    iv. Dynamic Lane Use Control – Maybe; not now as this would be used on interstate predominantly, but maybe as area grows.
    v. Dynamic High Occupancy Vehicle and Managed Lanes – Maybe; no current HOV lanes.
    vi. Adaptive Ramp Metering – No;
    vii. Dynamic Merge Control – Yes;
    viii. Dynamic Shoulder Lanes – Maybe; not many options today for application.
    ix. Dynamic Routing – Yes;
    x. Queue Warning – Yes;
    xi. Dynamic Parking Guidance and Reservation – Yes; just approved parking garage.
    xii. Dynamically Priced Parking – Yes; they are using this strategy now.
    xiii. Dynamic Overflow Transit Parking – Yes.
    xiv. Freight Parking – Maybe; issue with parking on SR 200 today and SR 326 truck stops.
    xv. Integrated Corridor Management – Yes; would like to direct motorists to US 441 to Ocala for example.
    xvi. Predictive Traveler Information – Yes;
    xvii. Pre-Trip Travel Information – Yes;

xviii. En Route Driver Information – Yes;
xix. Traveler Services Information – Yes;
xx. Route Guidance – Yes;
xxi. Dynamic Ridesharing – Yes;
xxii. Dynamic Wayfinding – Yes;
xxiii. Adaptive Signal Control – Yes; already have it at 13 to 15 intersections (recently deployed on SR 464).
xxiv. Transit Signal Priority – Yes; currently considering this strategy.
xxv. Incident Management – Yes;
xxvi. Travel Demand Management – Yes;
xxvii. Emissions Testing and Mitigation – Maybe;
xxviii. Highway Rail Intersection – Yes;
xxix. Dynamic Transit Capacity Assignment – Maybe;
xxx. Dynamic Fare Reduction – Yes;
xxxi. Transfer Connection Protection – Maybe;
xxxii. Transit Traveler Information – Yes;
xxxiii. On Demand Transit – Yes;
xxxiv. Public Travel Security – Yes; (cameras must be used for traffic reasons, not controlled by law enforcement)
xxxv. Regional Payment System – Yes;
xxxvi. Electronic Transit Ticketing – Yes;
xxxvii. Electronic Toll Collection – Yes;
xxxviii. Dynamic Pricing – Maybe;
xxxix. Demand Pricing – No;
xl. Corridor Pricing – Maybe;
xli. Commercial Vehicle Electronic Clearance – Maybe; could be used on US 441, SR 326, SR 200, etc.
xlii. Automated Roadside Safety Inspection – Maybe;
xliii. On-Board Safety and Security Monitoring – Yes;
xliv. Commercial Vehicle Administrative Processes – Yes;
xlv. Hazardous Materials Security and Incident Response – Yes;
xlvi. Freight Mobility – Maybe;
xlvii. Emergency Notification and Personal Security – Yes;
xlviii. Emergency Vehicle Management – Yes; they do not have pre-emption today as they had past issues with maintaining infrared. Financially expensive
    1. Example – Broward County spends $1.3 million ($200,000 per year)
xlix. Disaster Response and Evacuation – Yes;

l. In-Vehicle Information – Yes; discussion on connected vehicles - Not a question of "if," but "when" since connected vehicles are progressing.
    1. Transition to driver taking over vehicle
        a. How do we transition?
    2. Cellular based right now, needs more resiliency
    3. Security of connected vehicles
        a. Example – Ability to hack into a connected vehicle is doable, hence the example set by Chrysler

li. Probe Vehicle Data – Yes;
lii. Longitudinal Collision Avoidance – No;
liii. Lateral Collision Avoidance – No;
liv. Intersection Collision Avoidance; Yes;
lv. Vision Enhancement for Crash Avoidance – No;
lvi. Pre-Crash Restraint Deployment – No;
lvii. Automated Vehicle Operation – No;
lviii. Archived Data – Yes;
lix. Big Data – Yes;
lx. Transportation Data Analytics – Yes;
lxi. Performance Management – Yes;
lxii. Event Management – Yes;
lxiii. Wrong Way Driving Countermeasures – Yes;
lxiv. Asset Management Database – Yes;
lxv. Pedestrian Safety Systems – Yes;
lxvi. Bicycle Warning Systems – Yes;
lxvii. Innovative Intersection Design – Yes;

V. ITS Standards

a. Network, Data Sharing, Security
    i. Security – Cabinet access (i.e. Electronic Key)
b. Resource Sharing
    i. Network – Network Architect
    ii. Software (SunGuide, TSP, ATMS, DSS) - licensing
    iii. Operations Staffing
        1. Database – enter and check (QA/QC)
c. Demarcation Points for Operations and Maintenance
    i. M&O getting better, preparing for what is coming
d. Performance Measurement
e. Standard Drawings/Construction Configurations
    i. Limited; example going from Type 5 cabinet to Type 6 cabinet

f. Consistency with testing and acceptance
    i. Implementing them in contracts (for testing)
    ii. More consistent yields:
        1. Better performance
        2. Obtains synergy
        3. Testing is always the same

VI. Link Planning with Operations

a. Incorporate TSM&O principles
b. Determine funding requirements, including O&M, at the planning level
c. Prioritize appropriately
d. What is your involvement with your planning Department?

VII. Data and Information Request

a. Provided an overview of the list of information being requested. Requested that the information be provided within 2 weeks and that Chris Walsh be the point of contact for questions and/or providing the information.

VIII. Closing

a. Cooperative effort to create Regional (Central Florida) Master Plan, not D5 Master Plan; document that reflects your opinions and goals.

FDOT District 5 – ITS Master Plan
Meet with Stakeholders: Meeting Minutes – Marion County
September 2, 2015 from 11:00 AM – 1:00 PM

Attendees:

Brian Snyder	Marion County	☒	Manny Rodriguez	FDOT	☒
Stan Taylor	Marion County	☒	Dale Cody	Metric	☒
Masood Mirza	Marion County	☒	Chris Walsh	TEDS	☒

I. **Introductions**
   a. See list of attendees above
   b. Overview of what will be discussed, focusing on the what and not the how and why
      i. Determining how we communicate
      ii. What will this Master Plan look like and learning about strategies and what will work for the Region

II. **Transportation Overview**
   a. People hope to get from A to B as quickly as possible, while connected
      i. The method of transportation is flexible as long as it is easy and efficient (See Slide 1)
      ii. The goal is to provide information to enable people to make that determination… and one day to automate travel
         1. We are seeing a shift to automated ITS and now is the time to embrace it
   b. If this seems unlikely, consider the cell phone and computer (see Slide 2)
      i. The evolution of technology is ever changing, for instance the cellular phone started as a “bag phone” and then moved from Blackberry to iPhones. You can now make calls with a smart watch. The movement of technology continues to change, grow and push limits that we did not even fathom ten years ago
   c. … and finally transportation (See Slide 3)
      i. Transportation is moving exponentially faster and it is our goal to keep up with these changes

III. **Project Overview and Purpose**
   a. Goal of this Project
      i. Develop a Regional Master Plan with an eye towards Complete Connectivity (i.e. Connected Vehicles)
         1. Cooperative approach
            a. What should each agencies’ role be

2. Identify goals and needs (ITS Strategies)
3. Gather and use data to meet the goals and needs
4. How do we work together/integrate
5. NOT a deployment Plan

b. Maximize and identify needs for regional staff and resources
c. Identify Risks
d. Develop Regional ITS Standards

IV. ITS Strategies (See Attachment)

a. We go through strategies that you are interested in (Yes, No, Maybe)
    i. See Strategies Matrix for overall input
b. These answers along will all other stakeholders will be placed into an overall matrix in order to see a trend regionally
c. Below are strategies that had some comments or discussion:
    i. Active Arterial Management – Yes; major need. They have InSync adaptive signal system within the County. Light on staffing.
    ii. Dynamic Junction Control – No;
    iii. Dynamic Lane Reversal – No;
    iv. Dynamic Lane Use Control – No;
    v. Dynamic High Occupancy Vehicle and Managed Lanes – No;
    vi. Adaptive Ramp Metering – No;
    vii. Dynamic Merge Control – No;
    viii. Dynamic Shoulder Lanes – No;
    ix. Dynamic Routing – Yes; they do this now.
    x. Queue Warning – Maybe;
    xi. Dynamic Parking Guidance and Reservation – Yes;
    xii. Dynamically Priced Parking – No; they do not have parking meters.
    xiii. Dynamic Overflow Transit Parking – Yes; may be applicable for 35th Street expansion.
    xiv. Freight Parking – Maybe; may be applicable for 35th Street expansion.
    xv. Integrated Corridor Management – Yes;
    xvi. Predictive Traveler Information – Yes;
    xvii. Pre-Trip Travel Information – Yes;
    xviii. En Route Driver Information – Yes;
    xix. Traveler Services Information – Yes;
    xx. Route Guidance – Yes;
    xxi. Dynamic Ridesharing – Yes;
    xxii. Dynamic Wayfinding – Yes;
    xxiii. Adaptive Signal Control – Yes;
    xxiv. Transit Signal Priority – Yes;

xxv. Incident Management – Yes; already have a connection to the EOC.
xxvi. Travel Demand Management – Yes;
xxvii. Emissions Testing and Mitigation – Maybe;
xxviii. Highway Rail Intersection – Yes; they are currently doing quiet zones where they make the crossings safe so train horns are not needed.
xxix. Dynamic Transit Capacity Assignment – Maybe;
xxx. Dynamic Fare Reduction – Maybe;
xxxi. Transfer Connection Protection – Maybe;
xxxii. Transit Traveler Information – Yes;
xxxiii. On Demand Transit – Yes;
xxxiv. Public Travel Security – Maybe;
xxxv. Regional Payment System – Maybe;
xxxvi. Electronic Transit Ticketing – Maybe;
xxxvii. Electronic Toll Collection – Maybe;
xxxviii. Dynamic Pricing – Maybe;
xxxix. Demand Pricing – Maybe;
xl. Corridor Pricing – Maybe;
xli. Commercial Vehicle Electronic Clearance – Maybe;
xlii. Automated Roadside Safety Inspection – Maybe;
xliii. On-Board Safety and Security Monitoring – Yes;
xliv. Commercial Vehicle Administrative Processes – Maybe;
xlv. Hazardous Materials Security and Incident Response – Maybe;
xlvi. Freight Mobility – Yes;
xlvii. Emergency Notification and Personal Security – Yes;
xlviii. Emergency Vehicle Management – Yes; financially expensive
    1. Example – Broward County spends $1.3 million ($200,000 per year)
xlix. Disaster Response and Evacuation – Yes;
l. In-Vehicle Information – Yes; discussion on connected vehicles - Not a question of “if,” but “when” since connected vehicles are progressing.
    1. Transition to driver taking over vehicle
        a. How do we transition?
    2. Cellular based right now, needs more resiliency
    3. Security of connected vehicles
        a. Example – Ability to hack into a connected vehicle is doable, hence the example set by Chrysler
li. Probe Vehicle Data – Yes;
lii. Longitudinal Collision Avoidance – No;
liii. Lateral Collision Avoidance – No;
liv. Intersection Collision Avoidance; Yes;

lv. Vision Enhancement for Crash Avoidance – No;
lvi. Pre-Crash Restraint Deployment – No;
lvii. Automated Vehicle Operation – No;
lviii. Archived Data – Yes;
lix. Big Data – Yes;
lx. Transportation Data Analytics – Yes;
lxi. Performance Management – Yes; consider needs for urban areas versus rural areas.
lxii. Event Management – Yes;
lxiii. Wrong Way Driving Countermeasures – Maybe;
lxiv. Asset Management Database – Yes; could apply to signals as well. County currently has Cardigraph. Could discuss MIMS option at a future date.
lxv. Pedestrian Safety Systems – Yes;
lxvi. Bicycle Warning Systems – Yes; is there an application when bicyclists are in left-turn lanes?
lxvii. Innovative Intersection Design – Yes; these bring access management into the picture. Consider adding in urban interchange.

V. ITS Standards

a. Network, Data Sharing, Security
    i. Security – Cabinet access (i.e. Electronic Key)
b. Resource Sharing
    i. Network – Network Architect
    ii. Software (SunGuide, TSP, ATMS, DSS) - licensing
    iii. Operations Staffing
        1. Database – enter and check (QA/QC)
        2. Masood indicated that a consolidated effort may better position Florida.
c. Demarcation Points for Operations and Maintenance
    i. M&O getting better, preparing for what is coming
d. Performance Measurement
e. Standard Drawings/Construction Configurations
    i. Limited; example going from Type 5 cabinet to Type 6 cabinet
f. Consistency with testing and acceptance
    i. Implementing them in contracts (for testing)
    ii. More consistent yields:
        1. Better performance
        2. Obtains synergy
        3. Testing is always the same

VI. **Link Planning with Operations**

a. Incorporate TSM&O principles
b. Determine funding requirements, including O&M, at the planning level
c. Prioritize appropriately
    i. Masood want FDOT to propose an MOU to agencies, does not want a general plan that does not get used. Enforceability may be an issue.
d. What is your involvement with your planning Department?
    i. Masood indicated interagency needs, including FHP

VII. **Data and Information Request**

a. Provided an overview of the list of information being requested. Requested that the information be provided within 2 weeks and that Chris Walsh be the point of contact for questions and/or providing the information.

VIII. **Closing**

a. Cooperative effort to create Regional (Central Florida) Master Plan, not D5 Master Plan; document that reflects your opinions and goals.

FDOT District 5 – ITS Master Plan
Meet with Stakeholders: Meeting Minutes – SUNTRAN
October 1, 2015 from 9:00 AM – 11:00 AM

Attendees:

Gennie Garcia	SUNTRAN	☒	Dale Cody	Metric	☒
Garry Summers	SUNTRAN	☒	Jessica Moses	Metric	☒
Manny Rodriguez	FDOT	☒			☐

I. Introductions

a. See list of attendees above
   i. Stakeholder Names and Roles
      1. Gennie Garcia – General Manager for SunTran
      2. Garry Summers – Maintenance Director for SunTran

b. Overview of the story to define the goals of this project quickly
   i. What is the message? Trying to explain TSM&O/ITS on a day to day basis to non-technical individuals including commissioners, public and more
      1. Be consistent
      2. Be able to speak to Supervisors with expertise to relay the message and goals to garner interest and support
      3. Be able to communicate the new future of transportation that will be consistent with technology

II. Transportation Overview

a. People hope to get from A to B as quickly as possible, while connected
   i. The method of transportation is flexible as long as it is easy and efficient (See Slide 1)
   ii. The goal is to provide information to enable people to make that determination… and one day to automate travel
      1. A huge part is being able to use your smart phone to tell you what routes/modes should be taken to get to destinations

b. If this seems impossible, consider the cell phone and computer (see Slide 2)
   i. Have gone from "bag phone" and then moved from Blackberry to iPhones, and now tablets, smart watches and more – every year there is a new bigger, better gadget

c. … and finally transportation (See Slide 3)
   i. Technology is growing exponentially and impacts transportation significantly
      1. Google created an autonomous vehicle which led other manufacturers to compete to make these vehicles a reality, quicker

2. We as a region need to be prepared for this change
    a. Before, each agency grew up in different silos growing their ITS programs
    b. Now, we must look at where everyone is, where they want to be and combine commons goals while working together

ii. Question – What is TSM&O?

1. Primarily using technology to make transportation systems more efficient including all mode choices

III. Project Overview and Purpose

a. Goal of this Project
    i. Develop a Regional Master Plan with an eye towards Complete Connectivity (i.e. Connected Vehicles)
        1. Connect all agencies in general
        2. Cooperative approach
            a. Minimal "shall" statements
            b. Definitely a cooperative effort, Metric is just the author of the document
            c. What is the plan will only be dictated by the stakeholders collectively
            d. What should each agencies' role be
            e. Would like to know what role you see yourself having in the future.
        3. Identify goals and needs (ITS Strategies)
        4. Gather and use data to meet the goals and needs
            a. Signal Systems from the arterials
            b. ITS information from the freeways
            c. Transit Information
            d. Rail Information
            e. Etc.
        5. How do we work together/integrate
        6. NOT a deployment Plan
            a. Funds have been spent to build the regions infrastructure; how do we make it work for the best return on investment
b. Maximize and identify needs for regional staff and resources
c. Identify Risks
d. Develop Regional ITS Standards

IV. ITS Strategies (See Attachment)

a. We will go through strategies that you are interested in (Yes, No, Maybe)

i. See Strategies Matrix for overall input
ii. Should answer with the next 5, 10, 20 and even 40 years in mind

b. These answers along with all other stakeholders will be placed into an overall matrix in order to see a trend regionally
c. Below are strategies that had some comments or discussion:
    i. Dynamic Shoulders Lanes – Maybe; suggested as a resource for a possible transit lane for Gainesville football game events
    ii. Integrated Corridor Management – Yes; all roadway systems and all modes (important) including transit
        1. Between rail and transit – last few miles solution? How to connect the different modes efficiently and make it user-friendly for traveling public
    iii. Dynamic Ridesharing – in Dallas, they use Uber for the "last mile"
        1. Connected with Uber on a mobile application?
    iv. Transit Signal Priority (TSP) – Yes; Ocala is looking into it
        1. Results will depend on number of buses, normal daily conditions
            a. Because of variability – only fixes certain situations
                i. "Slow routes" in general probably will not see the benefit of TSP
        2. A tool in the tool box and sometimes is not the fix all
    v. Highway Rail Intersection – Maybe; due to the volume of riders on buses, a crash with rail would be catastrophic
        1. Great tool to let drivers know "train is coming, clear tracks"
        2. Lots of rails in the area but trying to get rid of at-grade crossings
    vi. Dynamic Fare Reduction – Maybe; seems unrealistic
    vii. Public Travel Security – Maybe; issue: HART does not want to send feed to police
    viii. Dynamic Pricing – Yes; should be noted that the profit from tolled lanes is not the result, congestion management is
    ix. On-Board Safety and Security Monitoring – Yes; for buses
    x. Emergency Notification and Personal Security – Yes; for buses
    xi. Connected Vehicles – Yes; however, does not want personnel to be laid off because drivers are no longer needed
        1. Connected Vehicles – needs the infrastructure side in order to speak back to vehicles
            a. On a cell network now but needs to be more reliable; think of having a call drop but now applied to a connected vehicle "speaking" to cars and the roadways

b. Important for everyone to be on board (both from a technological standpoint and multi-institutional cooperation)

xii. Lateral Collision Avoidance – Yes; Garry Summers designed a buzzer to avoid curbs to minimize buses hitting their wheels on curbs when turning (aka "curbing")

xiii. Automated Vehicle Operation – Maybe; safety concern for passengers

xiv. Event Management – Maybe; depends on Federal law – cannot be a charter bus due to providing a public service

xv. Innovative Intersection Design – Yes

1. Add Queue Jump Lane as a strategy

V. ITS Standards

a. Standardization is the next step once applicable strategies have been identified

b. Network, Data Sharing, Security

i. Security – Cabinet access (i.e. Electronic Key)

c. Resource Sharing

i. Network Architect

ii. Software (SunGuide, TSP, ATMS, DSS)

iii. Operations Staffing

d. Demarcation Points for Operations and Maintenance

i. Dispatchers are their Operations group

1. Possible for another agency to help – i.e. Lynx take over during off-peak hours?

e. Performance Measurement

f. Standard Drawings/Construction Configurations

g. Consistency with testing and acceptance

i. Consistency from one local region to another is key

VI. Link Planning with Operations

a. Incorporate TSM&O principles

b. Determine funding requirements, including O&M, at the planning level

c. Prioritize appropriately

d. What is your involvement with your planning Department?

VII. Data and Information Request

VIII. Open Discussion

a. Issues for SunTran

i. Funding

            1. Understand what is adequate funding for maintenance
            2. How many vehicles per technician? State average needs to be researched
   b. Transportation systems are improving and so should transit
   c. Transportation is sometimes slower because of funding
   d. Transit agencies could partner up for software?
      i. FTPA – Board meets quarterly
            1. Present the ITS Master Plan to them?

FDOT District 5 – ITS Master Plan
Meet with Stakeholders: Meeting Minutes – Ocala-Marion TPO
September 2, 2015 from 2:00 PM – 4:00 PM

Attendees:

Greg Slay	TPO	☒
Kellie Smith	FDOT (TPO Liaison)	☒
		☐

Manny Rodriguez	FDOT	☒
Dale Cody	Metric	☒
Chris Walsh	TEDS	☒

I. **Introductions**
   a. See list of attendees above
   b. Overview of what will be discussed, focusing on the what and not the how and why
      i. Determining how we communicate
      ii. What will this Master Plan look like and learning about strategies and what will work for the Region
         1. Greg indicated that the TPO did an ITS Master Plan 7 to 8 years ago of which 90% is now out-of-date.

II. **Transportation Overview**
   a. People hope to get from A to B as quickly as possible, while connected
      i. The method of transportation is flexible as long as it is easy and efficient (See Slide 1)
      ii. The goal is to provide information to enable people to make that determination… and one day to automate travel
         1. We are seeing a shift to automated ITS and now is the time to embrace it
   b. If this seems unlikely, consider the cell phone and computer (see Slide 2)
      i. The evolution of technology is ever changing, for instance the cellular phone started as a "bag phone" and then moved from Blackberry to iPhones. You can now make calls with a smart watch. The movement of technology continues to change, grow and push limits that we did not even fathom ten years ago
   c. … and finally transportation (See Slide 3)
      i. Transportation is moving exponentially faster and it is our goal to keep up with these changes

III. **Project Overview and Purpose**
   a. Goal of this Project

i. Develop a Regional Master Plan with an eye towards Complete Connectivity (i.e. Connected Vehicles)
    1. Cooperative approach
        a. What should each agencies' role be
    2. Identify goals and needs (ITS Strategies)
    3. Gather and use data to meet the goals and needs
    4. How do we work together/integrate
    5. NOT a deployment Plan

b. Maximize and identify needs for regional staff and resources
c. Identify Risks
d. Develop Regional ITS Standards

IV. ITS Strategies (See Attachment)

a. We go through strategies that you are interested in (Yes, No, Maybe)
    i. See Strategies Matrix for overall input
b. These answers along will all other stakeholders will be placed into an overall matrix in order to see a trend regionally
c. Below are strategies that had some comments or discussion:
    i. Active Arterial Management – Yes;
    ii. Dynamic Junction Control – Maybe;
    iii. Dynamic Lane Reversal – Maybe; long-range strategy.
    iv. Dynamic Lane Use Control – Maybe; Greg asked if this is an effective strategy. Metric to follow up with Virginia.
    v. Dynamic High Occupancy Vehicle and Managed Lanes – Maybe; not relevant today.
    vi. Adaptive Ramp Metering – Maybe;
    vii. Dynamic Merge Control – Yes;
    viii. Dynamic Shoulder Lanes – Yes; the TPO has talked about this strategy from a conceptual transit application.
    ix. Dynamic Routing – Yes;
    x. Queue Warning – Yes; there has been discussion about applications relating to railroad crossings.
    xi. Dynamic Parking Guidance and Reservation – Yes; there is a pilot project with the parker application in downtown Ocala.
    xii. Dynamically Priced Parking – Yes;
    xiii. Dynamic Overflow Transit Parking – Maybe;
    xiv. Freight Parking – Yes;
    xv. Integrated Corridor Management – Yes;
    xvi. Predictive Traveler Information – Yes;
    xvii. Pre-Trip Travel Information – Yes;

xviii. En Route Driver Information – Yes;
xix. Traveler Services Information – Yes;
xx. Route Guidance – Yes;
xxi. Dynamic Ridesharing – Yes;
xxii. Dynamic Wayfinding – Yes;
xxiii. Adaptive Signal Control – Yes; this is currently being utilized.
xxiv. Transit Signal Priority – Yes; they are working on evaluating/ implementing this strategy.
xxv. Incident Management – Yes;
xxvi. Travel Demand Management – Yes;
xxvii. Emissions Testing and Mitigation – Maybe; would consider this strategy should the area fall into a non-attainment zone.
xxviii. Highway Rail Intersection – Yes;
xxix. Dynamic Transit Capacity Assignment – Maybe;
xxx. Dynamic Fare Reduction – Maybe;
xxxi. Transfer Connection Protection – Yes; they have an ad-hoc version now.
xxxii. Transit Traveler Information – Yes; they are working on this strategy now.
xxxiii. On Demand Transit – Yes;
xxxiv. Public Travel Security – Yes;
xxxv. Regional Payment System – Yes;
xxxvi. Electronic Transit Ticketing – Yes;
xxxvii. Electronic Toll Collection – Maybe; no facilities today.
xxxviii. Dynamic Pricing – Maybe;
xxxix. Demand Pricing – Maybe;
xl. Corridor Pricing – Maybe;
xli. Commercial Vehicle Electronic Clearance – Yes; currently being done on SR 40.
xlii. Automated Roadside Safety Inspection – Yes;
xliii. On-Board Safety and Security Monitoring – Yes;
xliv. Commercial Vehicle Administrative Processes – Yes;
xlv. Hazardous Materials Security and Incident Response – Yes;
xlvi. Freight Mobility – Yes;
xlvii. Emergency Notification and Personal Security – Yes;
xlviii. Emergency Vehicle Management – Yes; financially expensive
    1. Example – Broward County spends $1.3 million ($200,000 per year)
xlix. Disaster Response and Evacuation – Yes;
l. In-Vehicle Information – Yes; discussion on connected vehicles - Not a question of “if,” but “when” since connected vehicles are progressing.
    1. Transition to driver taking over vehicle

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            a. How do we transition?
        2. Cellular based right now, needs more resiliency
        3. Security of connected vehicles
            a. Example – Ability to hack into a connected vehicle is doable, hence the example set by Chrysler

li. Probe Vehicle Data – Yes;
lii. Longitudinal Collision Avoidance – No;
liii. Lateral Collision Avoidance – No;
liv. Intersection Collision Avoidance; Yes;
lv. Vision Enhancement for Crash Avoidance – No;
lvi. Pre-Crash Restraint Deployment – No;
lvii. Automated Vehicle Operation – No;
lviii. Archived Data – Yes;
lix. Big Data – Yes;
lx. Transportation Data Analytics – Yes;
lxi. Performance Management – Yes;
lxii. Event Management – Yes;
lxiii. Wrong Way Driving Countermeasures – Yes;
lxiv. Asset Management Database – Yes;
lxv. Pedestrian Safety Systems – Yes;
lxvi. Bicycle Warning Systems – Yes;
lxvii. Innovative Intersection Design – Yes;

V. ITS Standards

a. Network, Data Sharing, Security
    i. Security – Cabinet access (i.e. Electronic Key)
b. Resource Sharing
    i. Network – Network Architect; this is a big issue for the TPO
    ii. Software (SunGuide, TSP, ATMS, DSS) - licensing
    iii. Operations Staffing
        1. Database – enter and check (QA/QC)
c. Demarcation Points for Operations and Maintenance
    i. M&O getting better, preparing for what is coming
d. Performance Measurement
e. Standard Drawings/Construction Configurations
    i. Limited; example going from Type 5 cabinet to Type 6 cabinet
f. Consistency with testing and acceptance
    i. Implementing them in contracts (for testing)
    ii. More consistent yields:
        1. Better performance

2. Obtains synergy
3. Testing is always the same

VI. Link Planning with Operations

a. Incorporate TSM&O principles
b. Determine funding requirements, including O&M, at the planning level
    i. The TPO only looks at widening from 2 to 4 lanes. Beyond that, they look at ITS and other traffic ops improvements to avoid 6 lanes.
c. Prioritize appropriately
d. What is your involvement with your planning Department?

VII. Closing

a. Cooperative effort to create Regional (Central Florida) Master Plan, not D5 Master Plan; document that reflects your opinions and goals.

FDOT District 5 – ITS Master Plan
Meet with Stakeholders: Meeting Minutes – Osceola County
August 7, 2015 from 1 PM – 3 PM

Attendees:

Matt Wilson	Osceola	☒	Rolando Ramirez	Metric	☒
Manny Rodriguez	FDOT	☒	Jessica Renfro	Metric	☒
Dale Cody	Metric	☒	Jessica Moses	Metric	☒

I. **Introductions**
   a. See list of attendees above
   b. Overview of the story to define the goals of this project quickly

II. **Transportation Overview – see presentation attached**
   a. People hope to get from A to B as quickly as possible, while connected
      i. The method of transportation is flexible as long as it is easy and efficient (See Slide 1)
      ii. The goal is to provide information to enable people to make that determination… and one day to automate travel (connected and/or autonomous vehicles)
         1. A huge part is being able to use your smart phone to tell you what routes/modes should be taken to get to destinations
   b. If this seems unlikely, consider the cell phone and computer (see Slide 2)
      i. Have gone from "bag phone" and then moved from Blackberry to iPhones, and now tablets, smart watches and more – every year there is a new bigger, better gadget
   c. … and finally transportation (See Slide 3)
      i. Transportation is growing exponentially and we as a region need to be prepared for that change
      ii. Metric will take a look at everyone's Master Plans within the region from the varying agencies and see what elements can be dealt with regionally – in order to share time, money and resources

III. **Project Overview and Purpose**
   a. Goal of this Project
      i. Develop a Regional Master Plan with an eye towards Complete Connectivity (i.e. Connected Vehicles)
         1. Cooperative approach
            a. What should each agencies' role be

2. Identify goals and needs (ITS Strategies – attached)
3. Gather and use data to meet the goals and needs
    a. Existing data is needed (master plans, priority lists, number of signals, operations staff levels, etc.) in order to establish a baseline
    b. 3 – 4 months to gather existing information from 30+ stakeholders
    c. Osceola is unique because of Disney
4. How do we work together/integrate
5. NOT a deployment Plan
    a. Maybe some deployments depending on what is needed regionally
        i. Maybe a firewall or security protocol implementation
        ii. Maybe IP addresses

b. Maximize and identify needs for regional staff and resources
c. Identify Risks
    i. Feel free to inform our Team throughout the entire process of possible risks
        1. A possible risk for stakeholders – how much will this mess with what my agency has going on? Is FDOT "telling" agencies to do a certain thing?
        2. A possible risk for the ITS Master Plan project – what if an agency simply does not want to cooperate, period?
d. Develop Regional ITS Standards
    i. Perhaps one license for the region and each stakeholder can be a user
        1. Osceola is strapped for funding – would stakeholders have to input funds for this?

IV. ITS Strategies (See Attachment)

a. We will go through strategies that you are interested in (Yes, No, Maybe)
    i. See Strategies Matrix for overall input
b. These answers along with all other stakeholders will be placed into an overall matrix in order to see a trend regionally
    i. Could be two levels:
        1. D5 and MPO/TPOs
        2. Northern (Ocala and freight) or Southern (Destinations/Tourism)
    ii. Prioritize these strategies – may be able to see patterns to start implementing these

1. Low hanging fruit – can be implemented fairly soon
2. Strategies applicable in 5 Years
3. Strategies applicable in 10+ Years

c. Below are the following strategies with some discussion:
   i. Dynamic High Occupancy Vehicle & Managed Lanes – No; not on an arterial
   ii. Adaptive Ramp Metering – Maybe; Turnpike and Osceola Parkway could be looked at for queue loops
   iii. Dynamic Shoulder Lanes – Maybe; US 192 maybe? During peak tourism traffic?
   iv. Queue Warning – Maybe; this limits secondary crashes. Could look at crash history for applicable locations
   v. Dynamic Routing – Yes; good option
   vi. Dynamic Parking Guidance & Reservation – Yes; City of Kissimmee could benefit and (maybe) Osceola Heritage.
   vii. Dynamically Priced Parking – No; not a single parking meter in Kissimmee
   viii. Dynamic Overflow Transit Parking – Maybe; once SunRail comes down to Osceola
   ix. Freight Parking – No; not big in freight. Heavy trucks are on Narcoossee as a cut through to SR 417
   x. Predictive Traveler Information – Yes; but a moot point since there is no options for John Young Parkway out of Poinciana
   xi. En Route Driver Information – Yes; WAZE goes into SunGuide and has information from FDOT
   xii. Highway Rail Intersection – Yes; Kissimmee has a bunch of crossings
   xiii. Dynamic Transit Capacity Assignment – Maybe; more of a Lynx application. Would need to stick to minimums and not exceed maximums
   xiv. Transfer Connection Protection – No; could be abused. Investigate how this works.
   xv. Public Travel Security – Maybe; big deal. Would need fixed cameras and Sheriff's office would need to be involved
   xvi. Note to add Demand Pricing under Electronic Toll Collection
   xvii. Commercial Vehicle Operations (as a whole) – Maybe to all; more Freeway than anything
   xviii. Connected Vehicles – Yes; Osceola is actually a test plot on John Young Parkway arterials (performed by Atkins for the USDOT)
   xix. Advanced Vehicle Safety Systems (as a whole) – Maybe; but the infrastructure needs to be in place in order to handle this
   xx. Archived Data – Yes; Osceola keeps up to three years' worth of data

xxi. Event Management – Yes; Osceola Heritage

V. **ITS Standards**

a. This should be on table if networks are going to end up touching each other, the security and consistency needs to be there
    i. The technology part is easy; need to work through the institutional boundaries
b. Network, Data Sharing, Security
    i. Security – Cabinet access (i.e. Electronic Key)
c. Resource Sharing
    i. Network
    ii. Software (SunGuide, TSP, ATMS, DSS)
    iii. Operations Staffing
        1. Regional contracts for staffing? Example: One Network Architect: allows for one person to look over a cohesive system and the fact that they are very expensive
d. Demarcation Points for Operations and Maintenance
    i. Agree on these – understand what they are and define them. Some agencies will have different tolerances for what is allowed
e. Performance Measurement
f. Standard Drawings/Construction Configurations
    i. Important as a region; an example is Departmental Specifications.
    ii. Always room for improvement
    iii. Example: everyone goes to a Type 6 cabinet in order to hold everything within ITS
        1. Kissimmee is going to Type 6 cabinet but has older cabinets out there as well because of insufficient funding to be able to replace
g. Consistency with testing and acceptance
    i. If agencies agree, use a supplemental agreement throughout the region and start including these specifications into individual contracts/RFPs
    ii. Fight less with contractors
    iii. Contractors/CEI understand better and test/accept jobs correctly
    iv. All about convenience, safety and increased capacity
h. If we standardize certain aspects that make sense as region, we will be prepared for when connected and/or autonomous vehicles becomes huge and be on the cutting edge as a region
    i. Be ready so when the time comes, we have input and control (instead of it going to a PPP and losing the opportunity)

VI. **Link Planning with Operations**

a. Incorporate TSM&O principles
   i. Initials thoughts were to get with PD&E groups to start planning for TSM&O initiatives – turns out PD&E gets a pretty strict scope from planning
   ii. Must start with planning because of this
b. Determine funding requirements, including O&M, at the planning level
   i. Get input from operations and maintenance staff to be planned for from the beginning
c. Prioritize appropriately

VII. **Open Discussion**

a. Osceola County concerns are safety and money – supportive of all strategies that improve safety and are relatively feasible when it comes to funding
b. Generally, Osceola thinks the region works together quite well
c. Cities maintain County signals

FDOT District 5 – ITS Master Plan
Stakeholder Meeting Minutes – Osceola County
November 17, 2015 from 2:00 PM – 4:30 PM

Attendees:

Mary Moskowitz	Osceola	☒	Melissa Dunklin	Osceola	☒
Erin Sterk	Osceola	☒	Levi Thomas	Osceola	☒
James Gugliotti	Osceola	☒	Manny Rodriguez	FDOT	☒
Joedel Zaballero	Osceola	☒	Dale Cody	Metric	☒
Jimmy Wells	Osceola	☒	Katie King	Metric	☒
Rich Lilyquist	Osceola	☒	Jessica Moses	Metric	☒

I. Introductions

a. Various agencies (Seminole, Osceola, etc.) all have separate ITS Master Plans
   i. Agencies grew up in isolated silos which abled them to build their ITS programs
   ii. Now, the region needs to coordinate between these various plans to have a comprehensive system overall
   iii. Regional Architecture has kept things fairly consistent, this plan looks further into reliable networks, security and data
b. Technology is converging with transportation; the Secretary says it is a "technology tsunami"
   i. District 5 wants to prepare for this
c. Overview of the story to define the goals of this project quickly
   i. What is the message? Trying to explain TSM&O/ITS on a day to day basis to non-technical individuals including commissioners, public and more
      1. Be consistent
      2. Be able to speak to Supervisors (or non-technical persons) to relay the message; the goal is to garner interest and support
      3. Be able to communicate the new future of transportation that will be consistent with technology
d. What is the Plan?
   i. Keep an eye on the Connected Vehicles prize (brass ring)
   ii. Unrealistic to get funding for initiatives that will take place in the next 20 years
      1. Identify low-hanging fruit that can implemented now, while working towards the end goal of Connected Vehicles
         a. Regional Cooperation is needed

II. Transportation Overview

a. People hope to get from A to B as quickly as possible, while connected
    i. The method of transportation is flexible as long as it is easy and efficient (See Slide 1)
    ii. The goal is to provide information to enable people to make that determination… and one day to automate travel
        1. A huge part is being able to use your smart phone to tell you what routes/modes should be taken to get to destinations
            a. Different mode choices is important
b. If this seems impossible, consider the cell phone and computer (see Slide 2)
    i. Have gone from “bag phone” and then moved from Blackberry to iPhones, and now tablets, smart watches and more – every year there is a new bigger, better gadget
    ii. Technology is growing exponentially and impacts transportation significantly
c. … and finally transportation (See Slide 3)
    i. Technology is tied into transportation and is changing how we design our systems
        1. Cars in the past had no power windows or automatic locks; now they have standard features such as screens that help you back up
        2. Think of 1920’s and Ford’s vehicle assembly line; then Eisenhower creating the interstate system in the 1940’s; Connected Vehicles is the game changer that will go down in history such as the two transportation “shifts” mentioned above
        3. We as a region need to be prepared for this change
            a. Before, each agency grew up in different silos growing their ITS programs
                i. ITS is now a tool within TSM&O
            b. Now, we must look at where everyone is, where they want to be and combine commons goals while working together

III. Project Overview and Purpose

a. Goal of this Project
    i. Develop a Regional Master Plan with an eye towards Complete Connectivity (i.e. Connected Vehicles)
        1. Improve transportation regionally with an eye on connectivity within the District (from a network and mode choice perspective)
        2. Cooperative approach
            a. Educate agencies on what can be done – stakeholders plan, Metric is the scribe

            b. What should each agencies' role be
            c. Would like to know what role you see yourself having in the future.
        3. Identify goals and needs (ITS Strategies)
            a. ITS Strategies are tools that may be able to be implemented now; 5 years; 25 years; 40+ years
        4. Gather and use data to meet the goals and needs – understand where each agency is at presently to know what resources are needed
            a. Signal Systems from the arterials
            b. ITS information from the freeways
            c. Transit Information
            d. Rail Information
            e. Etc.
        5. How do we work together/integrate
            a. Technology part is easy; Hard part is the regional inner cooperation
            b. Central Florida is a leader in transportation innovation but the region can do better
                i. Q: Meeting with Cities (St. Cloud, Kissimmee, etc.)?
                    1. A: Mostly dealing with agencies who are "operators and maintainers"
                        a. Need to be actionable
                        b. Most ITS is overseen by the Counties
                        c. Still need to meet with TIM Teams and First Responders
        6. NOT a deployment Plan
            a. Need to look at Operations & Maintenance at a higher level
            b. Q: What is the end game? Board approval?
                i. A: Create an MOU stating agencies identified in the Plan agree to work together regionally and create standards because they agree to do things that makes sense for the District
b. Maximize and identify needs for regional staff and resources
c. Identify Risks
d. Develop Regional ITS Standards
    i. Done after agencies collectively decide on which strategies to implement and what is agreed upon as far as standards are concerned

IV. ITS Strategies (See Attachment)

a. We will go through strategies that you are interested in (Yes, No, Maybe)
    i. See Strategies Matrix for overall input
b. These answers along will all other stakeholders will be placed into an overall matrix in order to see a trend regionally
c. Below are strategies that had some comments or discussion:
    i. Active Arterial Management – Yes; 532/I-4 a good candidate
    ii. Dynamic Lane Reversal – Yes; Pleasant Hill Road and 17-92 due to movements coming/going in the AM/PM peaks
    iii. Dynamic Shoulder Lanes – Maybe; could be a transit application
    iv. Dynamic Parking Guidance & Reservation – Yes; Heritage Park – great for Kissimmee
    v. Freight Parking – Maybe; public versus private situations
        1. One place, truckers get there early and sit on the shoulder prior to them being able to unload the trucks (first come, first served basis)
        2. Has a Freight Master Plan – designating areas for freight
    vi. Travel Demand Management – Yes; reThink does this; continue this relationship
    vii. Dynamic Fare Reduction – Maybe; will transit make money off of this strategy? Does it make sense?
    viii. Electronic Toll Collection (in general) – Yes; should be noted that Express Lanes is a congestion management strategy, not a toll revenue strategy – a mode choice within a freeway
        1. Revenue helps with the additional operational costs
    ix. Connected Vehicles – Yes
        1. Connected Vehicles – needs the infrastructure side in order to speak back to vehicles
            a. On a cell network now but needs to be more reliable; think of having a call drop but now applied to a connected vehicle "speaking" to cars and the roadways
            b. Important for everyone to be on board (both from a technological standpoint and multi-institutional cooperation)
            c. Q: What is guiding the standards for this?
                i. A: Private sector; can turn profits which is driving the Connected Vehicle race
            d. Osceola is a test pilot for USDOT
                i. Atkins – Contractor

ii. Possible locations – Poinciana Blvd; 17-92; Orange Blossom Trail; Osceola Parkway

x. Bicycle/Pedestrian Innovative ITS Solutions – Yes; could time crosswalks adaptively
   1. If someone uses the crosswalk and gets to the other side, the crosswalk time could be cut short to keep the vehicular traffic moving since no one is using it; same for pedestrians that need more time and would account for this time

d. Need a baseline to implement strategies – if others say yes and some say no – does this eliminate some strategies?
   i. In order to implement:
      1. "These need to occur…"
      2. "It will cost X, Y and Z…"
      3. Only if factors such as these are agreeable regionally

V. ITS Standards

a. Network, Data Sharing, Security – met with technical/network consortium recently and got their input
   i. Security – Cabinet access (i.e. Electronic Key)
b. Resource Sharing
   i. Network
   ii. Software (SunGuide, TSP, ATMS, DSS)
   iii. Operations Staffing
      1. RTMC take over during off-peak times as a possibility
c. Demarcation Points for Operations and Maintenance
d. Performance Measurement
e. Standard Drawings/Construction Configurations
f. Consistency with testing and acceptance
   i. Maintenance standards

VI. Link Planning with Operations

a. Incorporate TSM&O principles
   i. In the past, was just an add-on during planning; TSM&O should be an alternative up against other options (widening, new parallel routes, etc.)
b. Determine funding requirements, including O&M, at the planning level
c. Prioritize appropriately
d. What is your involvement with your planning Department?
e. Plan for Operations & Maintenance costs!

VII. Information & Data Request

VIII. Open Discussion

a. Q: Schedule for this?
    i. A: Cooperation – Now; Finalized Plan – June 2016; Commitments (Networks, Standards, Etc.) – sometime Spring 2016
b. Q: How does the implementation of some of these strategies affect urban planning? Extra traffic and no parking; frees up space for buildings
    i. A: Complete Streets but from a transportation perspective
        1. Usage/Cultural demographics need to be looked at
        2. Good point – what is the back end of these strategies?
c. Q: Next phase?
    i. Draft MOU – signed after the plan (to know what agencies are agreeing to)
    ii. Technical Memo for suggestions of standardization
        1. IT needs to review to make sure they make sense for each stakeholder collectively

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FDOT District 5 – ITS Master Plan
Meet with Stakeholders: Meeting Minutes – Seminole County
August 11, 2015 from 9:00 AM – 11:00 AM

Attendees:

Charlie Wetzel	Seminole	☒	Jessica Renfrow	Metric	☒
Chad Dickson	Seminole	☒	Jessica Moses	Metric	☒
David Muniz	Seminole	☒	Chris Walsh	TEDS	☒
Steven	Seminole	☒	Kevin Miller	Schneider	☒
Manny Rodriguez	FDOT	☒	Steve Corbin	Schneider	☒
Dale Cody	Metric	☒			

I. Introductions

a. See list of attendees above
b. Overview of the story to define the goals of this project quickly
    i. What is the message? Seminole's thoughts?
    ii. Be able to speak to Supervisors with expertise to relay the message and goals to garner interest and support
    iii. Be able to communicate the new future of transportation that will be consistent with technology
    iv. Create the framework for the ultimate goal: connected and/or autonomous vehicles

II. Transportation Overview – see presentation attached

a. People hope to get from A to B as quickly as possible, while connected
    i. The method of transportation is flexible as long as it is easy and efficient (See Slide 1)
    ii. The goal is to provide information to enable people to make that determination… and one day to automate travel (connected and/or autonomous vehicles)
        1. A huge part is being able to use your smart phone to tell you what routes/modes should be taken to get to destinations
b. If this seems unlikely, consider the cell phone and computer (see Slide 2)
    i. Have gone from "bag phone" and then moved from Blackberry to iPhones, and now tablets, smart watches and more – every year there is a new bigger, better gadget
c. … and finally transportation (See Slide 3)
    i. Transportation is growing exponentially and we as a region need to be prepared for that change
    ii. Rapid convergence of fiber, technology, cameras, etc.

iii. Transportation needs to do this as well

III. Project Overview and Purpose

a. Goal of this Project
    i. No “shall” statements that are not defined by the Stakeholders
    ii. Definitely a cooperative effort, Metric is just the author of the document
    iii. Develop a Regional Master Plan with an eye towards Complete Connectivity (i.e. Connected Vehicles)
        1. Cooperative approach
            a. What should each agencies’ role be
        2. Identify goals and needs (ITS Strategies – attached)
        3. Gather and use data to meet the goals and needs
            a. Existing data is needed (master plans, priority lists, number of signals, operations staff levels, etc.) in order to establish a baseline
            b. Metric will take a look at everyone’s Master Plans within the region from the varying agencies and see what elements can be dealt with regionally – in order to share time, money and resources
        4. How do we work together/integrate
        5. NOT a deployment Plan
            a. Maybe some deployments depending on what is needed regionally
                i. Maybe a firewall or security protocol implementation
                ii. Maybe IP addresses
b. Maximize and identify needs for regional staff and resources
    i. May have strong IT personnel but they are not able to go to the next level because they are busy themselves
c. Identify Risks
    i. Feel free to inform our Team throughout the entire process of possible risks
        1. A possible risk for stakeholders – how much will this mess with what my agency has going on? Is FDOT “telling” agencies to do a certain thing?
        2. A possible risk for the ITS Master Plan project – what if an agency simply does not want to cooperate, period?
d. Develop Regional ITS Standards

IV. ITS Strategies (See Attachment)

a. We will go through strategies that you are interested in (Yes, No, Maybe)
    i. See Strategies Matrix for overall input
b. These answers along with all other stakeholders will be placed into an overall matrix in order to see a trend regionally
c. Below are strategies that had some comments or discussion:
    i. Dynamic Junction Control – Yes; perhaps at Lake Mary and I-4 or Red Bug Lake and SR 436
    ii. Adaptive Ramp Metering – Maybe; Seminole does not have it and seems more of a Freeway application
    iii. Dynamic Shoulder Lanes, or "hard shoulder running" – No; Seminole has no shoulders
    iv. Predictive Traveler Information – Yes; for visitors, Travel Times are based on historical data. For example, when school lets out and corridors back up. Tie this to different modes
    v. Public Travel Security – Yes; Seminole wants to get this out of the plan – commissioners don't want cameras on County Roads. No one is willing to take it to the Board – address "why we need cameras"
    vi. Dynamic Pricing – No; how do we do signal phasing? How we can do this on arterials? Seminole does not have "pricing ability"
    vii. Commercial Vehicle Operations (as a whole) – No
    viii. Emergency Vehicle Management – Maybe; "not Seminole's dog to fight" – too expensive, too many options and too far down the road. Public Safety Needs to pay for GPS, etc. to make it work
        1. A goal is to get away from Opticom, identify corridors and change signals to help
        2. Requests for SPAT - a countdown to when a signal will turn red or green; example: 419 have a community with two driveways. Only signalize one of them and let them know how they would wait
    ix. Advanced Vehicle Safety Systems (as a whole) – No; needs the infrastructure component. Main concern: What do we need (equipment, costs, maintenance) to make this happen?
    x. Data Management – Yes; information is what you get out of the data
        1. Data management at Champions
    xi. Big Data – Yes; take a look at all platforms – how do we manage the data?

V. ITS Standards

a. This should be on table if networks are going to end up touching each other, the security and consistency needs to be there

i. The technology part is easy; need to work through the institutional boundaries

b. Network, Data Sharing, Security
    i. Security – Cabinet access (i.e. Electronic Key)
c. Resource Sharing
    i. Embrace data (need data expert to help region as a whole) – i.e. server expert or Network Architect
        1. Network
        2. Software (SunGuide, TSP, ATMS, DSS)
        3. Operations Staffing
            a. Regional contracts for staffing? Example: One Network Architect: allows for one person to look over a cohesive system and the fact that they are very expensive
d. Demarcation Points for Operations and Maintenance
    i. Agree on these – understand what they are and define them. Some agencies will have different tolerances for what is allowed
e. Performance Measurement
f. Standard Drawings/Construction Configurations
    i. Important as a region; an example is Departmental Specifications.
    ii. Always room for improvement
    iii. Example: everyone goes to a Type 6 cabinet in order to hold everything within ITS
        1. Kissimmee is going to Type 6 cabinet but has older cabinets out there as well because of insufficient funding to be able to replace
g. Consistency with testing and acceptance
    i. If agencies agree, use a supplemental agreement throughout the region and start including these specifications into individual contracts/RFPs
    ii. Fight less with contractors
    iii. Contractors/CEI understand better and test/accept jobs correctly
    iv. All about convenience, safety and increased capacity
h. If we standardize certain aspects that make sense as region, we will be prepared for when connected and/or autonomous vehicles becomes huge and be on the cutting edge as a region
    i. Be ready so when the time comes, we have input and control (instead of it going to a PPP and losing the opportunity)

VI. Link Planning with Operations

a. Incorporate TSM&O principles

        i. Initials thoughts were to get with PD&E groups to start planning for TSM&O initiatives – turns out PD&E gets a pretty strict scope from planning
        ii. Must start with planning because of this
        iii. Now instead of just considering capacity projects, they include ITS/TSM&O strategies
            1. If ITS/TSM&O is the way to go, apply O&M impacts to these decisions in the beginning
    b. Determine funding requirements, including O&M, at the planning level
    c. Prioritize appropriately
    d. What is your involvement with your planning Department?
        i. Planning process for Seminole is? Or planning is married to DOT?
            1. Call Brett or Shad with the County

VII. Open Discussion

    a. Maintenance (field work)
        i. Populating into the field
        ii. Splice Diagrams into ITSFM (required for funding)
            1. Funding depends on the amount of assets inputted into ITSFM
    b. Question from Seminole – will there be a lot of Operations discussion?
        i. Seminole has signal maintenance agreements and monitor signals now
            1. Cities make money for not doing anything
            2. What are the cost components to do that, that needs to be figured out
        ii. To be determined – Seminole to maintain outright and do away with agreements?

FDOT District 5 – ITS Master Plan
Meet with Stakeholders: Meeting Minutes – Orange County
August 11, 2015 from 1:00 PM – 3:00 PM

Attendees:

Hazem El-Assar	Orange	☒	Jessica Renfrow	Metric	☒
Hector Bertran	Orange	☒	Jessica Moses	Metric	☒
Manny Rodriguez	FDOT	☒	Kevin Miller	Schneider	☐
Dale Cody	Metric	☒	Steve Corbin	Schneider	☐

I. **Introductions**
   a. See list of attendees above
   b. Overview of the story to define the goals of this project quickly
      i. What is the message? Orange's thoughts?
   c. Move forward pushing the envelope and be comprehensive
      i. Connected vehicles is coming and our region needs to keep an "eye on the prize"

II. **Transportation Overview – see presentation attached**
   a. People hope to get from A to B as quickly as possible, while connected
      i. The method of transportation is flexible as long as it is easy and efficient (See Slide 1)
      ii. The goal is to provide information to enable people to make that determination… and one day to automate travel (connected and/or autonomous vehicles)
         1. A huge part is being able to use your smart phone to tell you what routes/modes should be taken to get to destinations
   b. If this seems unlikely, consider the cell phone and computer (see Slide 2)
      i. Have gone from "bag phone" and then moved from Blackberry to iPhones, and now tablets, smart watches and more – every year there is a new bigger, better gadget
   c. … and finally transportation (See Slide 3)
      i. Transportation is growing exponentially and we as a region need to be prepared for that change
      ii. Rapid convergence of fiber, technology, cameras, etc.
      iii. Transportation needs to do this as well
      iv. Aligning ourselves as a region could be advantageous for the entire region

III. Project Overview and Purpose

a. Goal of this Project
    i. Develop a Regional Master Plan with an eye towards Complete Connectivity (i.e. Connected Vehicles) – perhaps even sharing resources (networks, signals and staffing as applicable)
        1. Cooperative approach – this is the region's Master Plan. Metric is just the author.
            a. What should each agencies' role be
            b. Would like to know what role you see yourself having in the future – bridge strategies across various agencies
        2. Identify goals and needs (ITS Strategies – attached)
        3. Gather and use data to meet the goals and needs
        4. How do we work together/integrate
        5. NOT a deployment Plan
            a. Maybe some deployments depending on what is needed regionally
                i. Maybe a firewall or security protocol implementation
                ii. Maybe IP addresses
                iii. Orange County agrees to the idea of "efficiency for the whole region"

b. Maximize and identify needs for regional staff and resources
    i. Share a Regional Network Architect since they are so expensive?

c. Identify Risks
    i. Feel free to inform our Team throughout the entire process of possible risks
        1. A possible risk for stakeholders – how much will this mess with what my agency has going on? Is FDOT "telling" agencies to do a certain thing?
        2. A possible risk for the ITS Master Plan project – what if an agency simply does not want to cooperate, period?

d. Develop Regional ITS Standards

IV. ITS Strategies (See Attachment)

a. We will go through strategies that you are interested in (Yes, No, Maybe)
    i. See Strategies Matrix for overall input
b. These answers along with all other stakeholders will be placed into an overall matrix in order to see a trend regionally
    i. Prioritize these strategies – may be able to see patterns to start implementing these
        1. Low hanging fruit – can be implemented fairly soon
        2. Strategies applicable in 5 Years
        3. Strategies applicable in 10+ Years
c. Below are the following strategies with some discussion:
    i. General Note – Add Pedestrian/Bicycle ITS Safety Strategies
        1. Include all multi-modal
    ii. Dynamic Junction Control – Maybe; Case by Case – perhaps at OBT and Turnpike but very busy lanes
    iii. Advanced Parking Management (as a whole) – Convention Center, I-Drive and Universal are main concerns
    iv. Dynamic Priced Parking – Orange County does not have parking meters except for at the convention center
    v. Dynamic Overflow Transit Parking – Orange is adding transit lanes to I-Drive (BRT) from Westwood to Sand Lake Road
    vi. Dynamic Ridesharing – Maybe; seems more for the private sector. UBER and Tesla to join up to work towards autonomous vehicles
    vii. Incident Management – Maybe; staffing
    viii. Emissions Testing and Mitigation – No; unless required by law
    ix. Public Travel Security – Yes; important to guard infrastructure and keep traveling public safe. Already working Homeland Security/Sheriff's
    x. Demand Pricing – get within a radius and pay a toll to drive into a city (Orange County says maybe)
    xi. Commercial Vehicle Operations (as a whole) – Maybe
        1. What is Orange County's role? Minimal depending if freight becomes a huge deal
    xii. Freight Mobility – Maybe; Ties into FRATIS. Give no priority on already congested corridors, discourage truck movement instead of encouraging
    xiii. Emergency Notification and Personal Security – Maybe; as a supportive role, tied to network and give information to the police
    xiv. Emergency Vehicle Management – Maybe; software driven fairly expensive
    xv. Advanced Vehicle Safety Systems – Yes; definitely yes if it is related to safety

V. **ITS Standards**

a. Items that will be discussed later but start thinking about it throughout the process
b. Orange County comment: nice idea but Master Plan will be about O&M?
    i. Systems to help with the following?
        1. Maintenance
        2. Work Order
        3. Inventory
        4. Asset Management
    ii. Orange County has Maximo which is a generic work order ticketing system and not very tailored for what they need
        1. Was using paper to record tracking
    iii. Interest in MIMS?
        1. Tracks assets – what kind?
            a. Physical IP addressable assets
            b. Physical asset management
        2. Tracks work orders
        3. Does not track fiber
            a. Use ITSFM (required for funding) – a product of Nexus
        4. Not a networking monitoring system
            a. Has ITCDs that can connect solar winds
            b. Can create work orders
        5. All points to having one single system for all – can separate agency systems but are still under one umbrella (MIMS)
        6. Has aggressive performance module
        7. Can report on performance of staff – how long it takes to replace a traffic signal or fix a loop.
        8. Does not replace NMS System or fiber tracking system
        9. Does not build as-built
        10. Phone call to James Barbosa (IBI) for more information on MIMS
    iv. OSP vs MIMS?
        1. OSP Insight – tracking something that is there
        2. MIMS – tracks history
    v. Suggested: Regional Strategy for this – make a possible workshop to get agencies hands on various software
c. Network, Data Sharing, Security
    i. Security – Cabinet access (i.e. Electronic Key)
d. Resource Sharing
    i. Networks
    ii. Network Architect – expensive

iii. Servers and Databases

iv. Software (SunGuide, TSP, ATMS, DSS) – no SunGuide for Orange County

1. Dot wants to give SunGuide to everyone – in discussions with Central Office about a possible SunGuide deployment

v. Operations Staffing

1. Orange County does not operate signals 24/7

e. Demarcation Points for Operations and Maintenance

i. Agree on these – understand what they are and define them. Some agencies will have different tolerances for what is allowed

f. Performance Measurement

i. For compliance, MAP-21, etc.

g. Standard Drawings/Construction Configurations

i. Important as a region; an example is Departmental Specifications.

ii. Understand requirements – always room for improvement

iii. Example: everyone goes to a Type 6 cabinet in order to hold everything within ITS

h. Consistency with testing and acceptance

i. If agencies agree, use a supplemental agreement throughout the region and start including these specifications into individual contracts/RFPs

ii. Fight less with contractors

iii. Contractors/CEI understand better and test/accept jobs correctly

iv. If all projects are the same, construction industry moves more efficiently

1. All about convenience, safety and increased capacity

VI. Link Planning with Operations

a. Incorporate TSM&O principles

i. Initials thoughts were to get with PD&E groups to start planning for TSM&O initiatives – turns out PD&E gets a pretty strict scope from planning

ii. Must start with planning because of this

iii. Orange County comment: understand multi-modal versus TSM&O projects – different

1. Multi-Modal: Capacity with limited funding a part of it; 30% funding allocation

2. TSM&O: 20% funding allocation; If you add multi-modal, you do not get the ITS aspects

3. Dale Cody (Metric) to ask what pot of funding this comes from

b. Determine funding requirements, including O&M, at the planning level
    i. Get input from operations and maintenance staff to be planned for from the beginning
c. Prioritize appropriately

VII. Open Discussion

a. This is a cooperative effort where Metric wants to hear back from stakeholders
b. Let’s work together with the goal of connected vehicles in the back of our minds
    i. If Florida has the institutional structures in place, it makes Florida a viable option to be on the forefront of the technological transportation changes

FDOT District 5 – ITS Master Plan
Stakeholder Meeting Agenda – City of Maitland
September 29, 2015 from 9 AM – 11 AM

Attendees:

Noel Cooper	Maitland	☒	Dale Cody	Metric	☒
Christina Torrez Reyes	Maitland	☒	Jessica Renfrow	Metric	☒
Manny Rodriguez	FDOT	☒	Jessica Moses	Metric	☒

I. **Introductions**
   a. See list of attendees above
   b. Overview of the story to define the goals of this project quickly
      i. What is the message? Trying to explain TSM&O/ITS on a day to day basis to non-technical individuals including commissioners, public and more
      ii. The ultimate goal is to connect municipalities/regions

II. **Transportation Overview**
   a. People hope to get from A to B as quickly as possible, while connected
      i. The method of transportation is flexible as long as it is easy and efficient (See Slide 1)
      ii. The goal is to provide information to enable people to make that determination… and one day to automate travel
         1. A huge part is being able to use your smart phone to tell you what routes/modes should be taken to get to destinations
            a. Different mode choices is important
   b. If this seems impossible, consider the cell phone and computer (see Slide 2)
      i. Have gone from “bag phone” and then moved from Blackberry to iPhones, and now tablets, smart watches and more – every year there is a new bigger, better gadget
      ii. Technology is growing exponentially and impacts transportation significantly
   c. … and finally transportation (See Slide 3)
      i. Technology is tied into transportation and is changing how we design our systems
         1. We as a region need to be prepared for this change
            a. Before, each agency grew up in different silos growing their ITS programs
            b. Now, we must look at where everyone is, where they want to be and combine commons goals while working together

III. Project Overview and Purpose

a. Goal of this Project
    i. Develop a Regional Master Plan with an eye towards Complete Connectivity (i.e. Connected Vehicles)
        1. Connect all agencies in general
        2. Cooperative approach
            a. Minimal "shall" statements
            b. Definitely a cooperative effort, Metric is just the author of the document
            c. What is the plan will only be dictated by the stakeholders collectively
            d. What should each agencies' role be
            e. Would like to know what role you see yourself having in the future.
        3. Identify goals and needs (ITS Strategies)
            a. One goal is for better synergy for all mode choices
            b. District 5's Master Plan is an overall regional view on applicable strategies and how to bring institutional barriers; MetroPlan's will be more of a deployment
            c. Question: How will this connect with other District's in the State?
                i. Answer: District 5 is doing one first and the hope is other District's will follow and then be implemented into Statewide Initiatives through ITS and TSM&O practices
        4. Gather and use data to meet the goals and needs
            a. Signal Systems from the arterials
            b. ITS information from the freeways
            c. Transit Information
            d. Rail Information
            e. Etc.
        5. How do we work together/integrate
            a. Connectivity – Systems tied together
        6. NOT a deployment Plan

b. Maximize and identify needs for regional staff and resources

c. Identify Risks

d. Develop Regional ITS Standards

i. Standardization of strategies is important when needing to touch networks across the region

IV. ITS Strategies (See Attachment)

a. We will go through strategies that you are interested in (Yes, No, Maybe)
    i. See Strategies Matrix for overall input
    ii. Should answer with the next 5, 10, 20 and even 40 years in mind
b. These answers along with all other stakeholders will be placed into an overall matrix in order to see a trend regionally
c. Below are strategies that had some comments or discussion:
    i. Active Arterial Management (AAM) – Yes; explained what AAM is
    ii. Dynamic Overflow Transit Parking – Maybe; for SunRail hopefully
    iii. Traveler Information (in general) – Yes; Agency role is to pump travel time data to TMC and third party applications
    iv. Commercial Vehicle Operations (in general) – No/Maybe; not a lot of freight within Maitland
    v. Connected Vehicles – Yes
        1. Connected Vehicles – needs the infrastructure side in order to speak back to vehicles
            a. On a cell network now but needs to be more reliable
            b. Important for everyone to be on board (both from a technological standpoint and multi-institutional cooperation)

V. ITS Standards

a. Network, Data Sharing, Security
    i. Security – Cabinet access (i.e. Electronic Key)
    ii. Data – How do we organize it? District is also looking into Big Data
b. Resource Sharing
    i. Network
    ii. Software (SunGuide, TSP, ATMS, DSS)
        1. Purchase items together as a region (saves money!)
    iii. Operations Staffing
c. Demarcation Points for Operations and Maintenance
    i. Does the City of Maitland want a TMC?
        1. Either partner up with another agency or it can be within a small room with TV screens – both are feasible
d. Performance Measurement
e. Standard Drawings/Construction Configurations

f. Consistency with testing and acceptance

VI. **Link Planning with Operations**

a. Incorporate TSM&O principles
b. Determine funding requirements, including O&M, at the planning level
c. Prioritize appropriately
d. What is your involvement with your planning Department?

VII. **Information & Data Request**

VIII. **Open Discussion**

a. Reiterated the fact that the Master Plan is a cooperative approach
    i. Metric just takes the notes and facilitates the discussion between agencies and ultimately documents the results/decisions
    ii. Comment: Maitland has good program but they do not have the expertise and relies on consultants and District 5 to improve the program as a whole
b. Questions
    i. When are the deliverables for this Plan?
        1. Draft sections by the end of the year
        2. Ultimately, a comprehensive ITS Master Plan document
    ii. Time frame?
        1. Next July

FDOT District 5 – ITS Master Plan
Meet with Stakeholders: Meeting Minutes – City of Orlando
August 12, 2015 from 10:00 AM – 12:00 PM

Attendees:

Cade Braud	Orlando	☒	Dale Cody	Metric	☒
Christopher Tucker	Orlando	☒	Jessica Renfrow	Metric	☒
Steven Jones	Orlando	☒	Jessica Moses	Metric	☒
Benton Bonney	Orlando	☒	Kevin Miller	Schneider	☒
Manny Rodriguez	FDOT	☒	Steve Corbin	Schneider	☒

I. Introductions

a. See list of attendees above

b. Overview of the story to define the goals of this project quickly

  i. What is the message? Orlando's thoughts? Metric is just the author – it is the region's plan

  ii. Be able to speak to Supervisors with expertise to relay the message and goals to garner interest and support

  iii. Be able to communicate the new future of transportation that will be consistent with technology

c. Move forward pushing the envelope and be comprehensive

  i. Connected vehicles is coming and our region needs to keep an "eye on the prize"

  ii. Create the framework for the ultimate goal: connected and/or autonomous vehicles

II. Transportation Overview – see presentation attached

a. People hope to get from A to B as quickly as possible, while connected

  i. The method of transportation is flexible as long as it is easy and efficient (See Slide 1)

  ii. The goal is to provide information to enable people to make that determination… and one day to automate travel (connected and/or autonomous vehicles)

    1. A huge part is being able to use your smart phone to tell you what routes/modes should be taken to get to destinations

    2. People like options!

b. If this seems unlikely, consider the cell phone and computer (see Slide 2)

c. … and finally transportation (See Slide 3)

  i. Transportation is growing exponentially and we as a region need to be prepared for that change

ii. Rapid convergence of fiber, technology, cameras, etc.
iii. Transportation needs to do this as well

III. Project Overview and Purpose

a. Goal of this Project
    i. Develop a Regional Master Plan with an eye towards Complete Connectivity (i.e. Connected Vehicles)
        1. Cooperative approach
            a. What should each agencies' role be
        2. Identify goals and needs (ITS Strategies)
        3. Gather and use data to meet the goals and needs
        4. How do we work together/integrate
        5. NOT a deployment Plan
b. Maximize and identify needs for regional staff and resources
c. Identify Risks
    i. Feel free to inform our Team throughout the entire process of possible risks
        1. A possible risk for stakeholders – how much will this effect with what my agency has going on? Is FDOT "telling" agencies to do a certain thing?
        2. A possible risk for the ITS Master Plan project – what if an agency simply does not want to cooperate?
d. Develop Regional ITS Standards
    i. Operate Regionally, i.e. standards (software, networks) and what they could be – just as a thought for now – as a region, strategies must be identified first so we can make appropriate standards
    ii. Might as well start the conversation because soon various regions will start touching networks (Brevard County and City of Orlando for example)

IV. ITS Strategies (See Attachment)

a. We will go through strategies that you are interested in (Yes, No, Maybe)
    i. See Strategies Matrix for overall input
b. These answers along with all other stakeholders will be placed into an overall matrix in order to see a trend regionally
    i. Should always be moving towards connected vehicles, even if we deviate from it slightly, that is ok
    ii. In best interest to be a part of it and be prepared regionally

c. Below are strategies that had some comments or discussion:
    i. Active Arterial Management – Yes; strongly believe but with the thought "central planning, local operating"
        1. Orlando wants to operate locally. Does not want to call somewhere in Lake Mary or Deland to fix something in Orlando
        2. Strong yes with I-4 construction underway and systems need to talk
    ii. Dynamic Lane Use Control – Maybe; possibly for transit lanes
    iii. Dynamic HOV & Managed Lanes – Maybe; in terms of transit
    iv. Dynamic Merge Control – Maybe; when 6 lanes go to 4 lanes
    v. Dynamic Shoulder Lanes – No; don't see Orlando doing
    vi. Queue Warning – Yes; have this on Adventure Way (new signal at Cabana Bay). Queue loop with a signal flasher that extends the green band when traffic backs up
    vii. Dynamic Priced Parking – Yes; Orlando has new meters.
        1. Application that will give spaces available at the garage
        2. Some side spaces will have this component
    viii. Dynamic Overflow Transit Parking – Maybe; perhaps for the Winter Park Art Festivals? Let them park in Orlando and take the SunRail into Winter Park?
    ix. Freight Parking – Maybe; closes thing are buses that come in for major events
    x. Traveler Information (as a whole) – Yes; increase density of information
    xi. Dynamic Ridesharing – Maybe; in general it is a "yes" but if it has to do with UBER then a "no"
    xii. Transit Signal Priority (TSP) – Yes; need a regional concept for TSP
        1. Communication is the key
        2. TrafficWare has emergency TSP but not cost effective and proprietary
        3. A way to do TSP instead of Lynx, i.e. with events and MEARS buses
        4. Something with an interface that can be portable
    xiii. Travel Demand Management – Yes; Bike Share or Car Share Programs should be included
    xiv. Dynamic Transit Capacity Assignment – Yes; use a conditional TSP technique and only give priority to late buses
    xv. Public Travel Security – Yes; but hard enough to share video between transportation departments
    xvi. Electronic Toll Collection (as a whole) – No; for arterials
    xvii. Commercial Vehicle Operations (as a whole) – No; Orlando does not see their role but they support it

xviii. Commercial Vehicle Electronic Clearance – Maybe; could see this for the inspection of vehicles during NBA or special events
xix. Hazardous Materials Security and Incident Response – Yes; Fire Department does this now
xx. Emergency Notification and Personal Security – Yes; support through the network
xxi. Disaster Response and Evacuation – Yes; should be more uniform as an Integrated Corridor Management approach and technology dependent.
xxii. Advanced Vehicle Safety Systems (as a whole) – Yes; but the infrastructure needs to be in place in order to handle this
    1. Need to be able to get to 99.999999% rating in order to implement; 99% is okay on a test but not when 1 of 100 cars get into a crash (unacceptable)

V. ITS Standards

a. Network, Data Sharing, Security
    i. Security – Cabinet access (i.e. Electronic Key)
b. Resource Sharing
    i. Network
        1. Regional contracts for staffing? Example: One Network Architect: allows for one person to look over a cohesive system and mitigate regional costs
    ii. Software (SunGuide, TSP, ATMS, DSS)
        1. Licensing – Buy a regional license and have individual agencies as users that have access
    iii. Operations Staffing
c. Demarcation Points for Operations and Maintenance
d. Performance Measurement
e. Standard Drawings/Construction Configurations
    i. Important as a region
    ii. Always room for improvement
    iii. Example: everyone goes to a Type 6 cabinet in order to hold everything for ITS within the cabinet
f. Consistency with testing and acceptance
    i. Learn from each other
    ii. Region only has four to six contractors
    iii. Contractors/CEI understand better and test/accept jobs correctly
    iv. All about convenience, consistency, safety and increased capacity

VI. **Link Planning with Operations**

a. Incorporate TSM&O principles
   i. Initials thoughts were to get with PD&E groups to start planning for TSM&O initiatives – turns out PD&E gets a pretty strict scope from planning
   ii. Must start with planning because of this
   iii. Complete Streets is a big deal – incorporates ITS and TSM&O
b. Determine funding requirements, including O&M, at the planning level
   i. Get input from operations and maintenance staff to be planned for from the beginning
c. Prioritize appropriately

VII. **Data and Information Request**

a. Fred (TEDS) – has plans for the police information
b. Pay Orlando some for ITS reimbursement – address this.

VIII. **Open Discussion**

a. Asset Management is important
   i. Fiber Management System is needed for conduit, circuits and fiber
      1. Expensive to do: maintaining and updating, etc.
      2. How to keep it maintained? A regional resource?
         a. How to communicate changes from the field quickly and easily to send to staff maintaining the database
b. Transit, FTA and ITS Projects
   i. Not in contract to have the same equipment
   ii. Projects need to be in the regional architecture, SEMP and ConOps
   iii. Talk to Lynx
c. Closing Remarks to City of Orlando
   i. This is a cooperative effort where Metric wants to hear back from stakeholders
   ii. Let's work together with the goal of connected vehicles in the back of our minds
      1. If Florida has the institutional structures in place, it makes Florida a viable option to be on the forefront of the technological transportation changes

FDOT District 5 – ITS Master Plan
Meet with Stakeholders: Meeting Minutes – City of Winter Park
October 16, 2015 from 9:00 AM – 11:00 AM

Attendees:

Butch Margraf	Winter Park	☒	Dale Cody	Metric	☒
Troy Attaway	Winter Park	☒	Jessica Moses	Metric	☒
Dori Stone	Winter Park	☒	Jessica Moses	Metric	☒
Don Marcotte	Winter Park	☒	Kevin Miller	Schneider-Electric	☒
Manny Rodriguez	FDOT	☒			

I. Introductions

- a. See list of attendees above
  - i. Stakeholder Names and Roles
    1. Butch Margraf – Traffic Manager
    2. Troy – Public Works Director
    3. Dori Stone – Director of Planning/Community Development
    4. Don Marcotte – Assistant Director/City Engineer
- b. Overview of the story to define the goals of this project quickly
  - i. What is the message? Trying to explain TSM&O/ITS on a day to day basis to non-technical individuals including commissioners, public and more
    1. Be consistent
    2. Be able to speak to Supervisors with expertise to relay the message and goals to garner interest and support
    3. Be able to communicate the new future of transportation that will be consistent with technology

II. Transportation Overview

- a. People hope to get from A to B as quickly as possible, while connected
  - i. The method of transportation is flexible as long as it is easy and efficient (See Slide 1)
  - ii. The goal is to provide information to enable people to make that determination… and one day to automate travel
    1. A huge part is being able to use your smart phone to tell you what routes/modes should be taken to get to destinations
       - a. Different mode choices is important
- b. If this seems impossible, consider the cell phone and computer (see Slide 2)
  - i. Have gone from "bag phone" and then moved from Blackberry to iPhones, and now tablets, smart watches and more – every year there is a new bigger, better gadget

ii. Technology is growing exponentially and impacts transportation significantly

c. … and finally transportation (See Slide 3)
    i. Technology is tied into transportation and is changing how we design our systems
        1. Driverless vehicles by 2020 – Tesla upgraded firmware that allows autopilot in 2014 and beyond models
        2. Google created an autonomous vehicle which led other manufacturers to compete to make these vehicles a reality, quicker
            a. Private sector will drive what transportation side does
        3. We as a region need to be prepared for this change
            a. Before, each agency grew up in different silos growing their ITS programs
                i. ITS is now a tool within TSM&O
            b. Now, we must look at where everyone is, where they want to be and combine commons goals while working together

III. Project Overview and Purpose

a. Goal of this Project
    i. Connect the various silos, but why?
        1. To provide value to the investments in infrastructure we have already made
    ii. Develop a Regional Master Plan with an eye towards Complete Connectivity (i.e. Connected Vehicles)
        1. Cooperative approach
            a. Minimal "shall" statements
            b. Definitely a cooperative effort, Metric is just the author of the document
            c. What is the plan will only be dictated by the stakeholders collectively
                i. Metric is here to facilitate the conversation and document the decisions made from this
            d. What should each agencies' role be
            e. Would like to know what role you see yourself having in the future.
        2. Identify goals and needs (ITS Strategies)
        3. Gather and use data to meet the goals and needs
            a. Signal Systems from the arterials
            b. ITS information from the freeways

c. Transit Information
d. Rail Information
e. Etc.
4. How do we work together/integrate
5. NOT a deployment Plan
a. May be some just for security (firewalls)
b. The Master Plan really only outlines the goals of the region building off what they have done individually and setting up a blue print to interconnect systems and work together
b. Maximize and identify needs for regional staff and resources
i. Operations and Maintenance will be addressed – critical component
c. Identify Risks
d. Develop Regional ITS Standards

IV. ITS Strategies (See Attachment)

a. We will go through strategies that you are interested in (Yes, No, Maybe)
i. See Strategies Matrix for overall input
ii. Should answer with the next 5, 10, 20 and even 40 years in mind
iii. Question: Implementation Plan? Funding?
1. Answer: MetroPlan's ITS Master Plan will be an implementation/ deployment plan while District's ITS Master Plan cover Operations & Maintenance funding and act as a guideline of regional goals and how to meet those goals
b. These answers along with all other stakeholders will be placed into an overall matrix in order to see a trend regionally
c. Below are strategies that had some comments or discussion:
i. Dynamic Lane Reversal – Yes; Aloma Ave. or US 17-92
ii. Dynamic Merge Control – No; Restrictive Left Turn EB at Denning possibly?
iii. Adaptive Ramp Metering – No; Would clog arterials potentially
iv. Dynamic Shoulder Lanes – No; Winter Park does not have this opportunity
v. Dynamic Overflow Transit Parking – Yes; for Art Festivals
vi. Dynamically Priced Parking – Maybe; if a new garage opens, good opportunity to implement
vii. Traveler Information (in general) – Yes; Agency role is to pump travel time data to TMC and third party applications and receive data for operations
viii. Transit Traveler Information – Yes; tie into Uber-like company for first/last mile

ix. Pedestrian Safety Systems – Yes; includes sensors letting the signal know when pedestrians have cleared the crosswalk
x. Connected Vehicles
    1. Difference between Connected Vehicles & Autonomous Vehicles
        a. Connected – communicates with other cars and the infrastructure
            i. Needs the infrastructure side in order to speak back to vehicles
                1. On a cell network now but needs to be more reliable
        b. Autonomous – drives for you without driver using their hands at all
            i. Autonomous vehicles will not be on the road until 99.999999% accurate
            ii. Once it is, capacity will triple and the driver experience will improve significantly
        c. Important for everyone to be on board (both from a technological standpoint and multi-institutional cooperation)
            i. If there is not a synergy, funding could go away
    2. Question regarding Connected Vehicles: There will be committed lanes for Connected/Automated only?
        a. Answer: Probably; most likely will start in Express Lanes because of the limited facility aspect but the region must be prepared (agreements in place and standardization)
    3. Comment: Concern over proprietary information.
        a. Answer: Not necessarily; concern is over how to package the data for efficient use. An ATMS is more proprietary.

V. ITS Standards

a. Network, Data Sharing, Security
    i. Security – Cabinet access (i.e. Electronic Key)
b. Resource Sharing
    i. Network
    ii. Software (SunGuide, TSP, ATMS, DSS)
    iii. Operations Staffing
c. Demarcation Points for Operations and Maintenance
d. Performance Measurement
e. Standard Drawings/Construction Configurations
    i. I.e. Type 6 Cabinets

f. Consistency with testing and acceptance
    i. Presently varies from project to project but can be streamlined to let the industry know what is expected every time
        1. Some projects will need further specification but at least get a base for the majority of projects

VI. Link Planning with Operations

a. Incorporate TSM&O principles
    i. Use to add cameras and DMS after the fact; now look at TSM&O as an option next to capacity improvements
        1. If TSM&O is viable, Operations and Maintenance must be accounted for before finalizing a decision on which alternative to proceed with
b. Determine funding requirements, including O&M, at the planning level
c. Prioritize appropriately
d. What is your involvement with your planning Department?

VII. Information and Data Request

VIII. Open Discussion

ITS Master Plan

FDOT District 5 | Contract 15561 | FPID 436351-1-22-01

MEETING MINUTES

July 16, 2015 | 3:00 PM – 4:00 PM

MetroPlan Orlando: 315 East Robinson Street #355, Orlando, FL 32801

Attendees:

Manny Rodriguez – FDOT District 5
Dale Cody – Metric Engineering
Bob McQueen – 0Cash Company
Eric Hill – MetroPlan Orlando (MPO)
Anthony Washington – MetroPlan Orlando (MPO)
Jessica Moses – Metric Engineering

I. Introductions

Dale Cody introduced team members, as follows:

Dale Cody – Project Manager

Rolando Ramirez – Deputy Project Manager

Bob McQueen – Liaison with MetroPlan for the project team

- It was noted that Dale and Bob will deal directly with MetroPlan and Rolando may follow up with any pending requests.
- What are MetroPlan's initial thoughts about what this project is?
  - MPO: Read the Scope and went to the TSM&O presentation….this study is to provide a plan to capture all agencies roles/plans. Compared to the MPO where we are tactical (deployment, evaluations, evolve into projects) vs. D5's ITS Master Plan which is strategic (roles and what the region is doing as a whole)

II. Transportation Overview

- Need various transportation options as a commuter
- Get to a certain place as quickly as possible while staying connected
- Important: connectivity
- Goal: Automate that decision
  - Gather data and present it to the public in an easy to understand method for the traveling public to make an informed decision
- Everything is accelerating forward with technology; soon transportation will include Connected Vehicles

III. Project Overview and Purpose

a. Goal of this Project

- **Develop a Regional Master Plan with an eye towards Complete Connectivity (i.e. Connected Vehicles)**
- Work together regionally to create institutional relationships always keeping the overall goal in sight while working together towards it.
- Includes the technology we deploy, infrastructure that goes in the ground and regional cooperation.

- D1/D7 can be included in the future; right now D5 is organizing in-house before branching to neighboring Districts
- Question from MPO: Will D5 set mandates to MPOs/local agencies?
    - Standards for data sharing will be set in order to be able to share that information with all in the future
    - In general this Master Plan will provide guidance to direction more than mandates
    - One of the goals for this project is to define roles and where demarcation points are
- Question to MPO: What is MetroPlan's role as an organization?
    - Whatever the Federal Government allows; they serve as an advocate for ITS through their planning process.
    - Jurisdictions bring projects to the MPO and the MPO prioritizes and funds; they do no operate

b. Cooperative approach

c. Identify goals and needs (ITS Strategies)

- Comments from MPO:
    - Retiming can be defined jurisdictionally
    - Most ITS Strategies do not act by jurisdictions but regionally – plans should reflect the regions wants and stakeholders decide where to go
- Comments to MPO:
    - Brevard County ITS Master Plan example: they have a regional committee with the TPO/MPO providing oversight.

d. Maximize and identify needs for regional staff and resources

- Comments from MPO:
    - Have looked at getting into O&M since a trip to San Diego (MPO manages San Diego's HOV lanes and decides where those funds go)
    - Until the Federal Government is ok with this, we can't and won't
    - Need regional cooperation
    - Need to identify the value of data – start using operations data for planning

e. Identify Risks

f. Develop Regional ITS Standards

IV. ITS Strategies (TO BE UPDATED BASED ON INDIVIDUAL AGENCY NEED)

a. Overview of strategies. What types of strategies and techniques has your agency explored?
Ultimately, the MPO supports all the strategies below as options to be explored:

- **Data Management (i.e. Data fusion and Data Quality)**
- **Connected Vehicles**
- **Integrated Corridor Management (ICM)**
- **Incident Management, Parking Management and Event Management**
- **Value Pricing**

  - No go for the MPO in general
  - Staff supports – see 3 different reports mentioning MPO history with value pricing from website
  - Change name to "value" pricing or just pricing
- **Active Arterial Management (AAM)**
- **Transit Signal Priority (TSP)**
- **Dynamic HOV/Managed Lanes**
- **Ramp Metering/Adaptive**
  - Will have with I-4 Ultimate
- **Adaptive Signal Control**
- **Hard Shoulder Running**
  - Looking at this for the sections where I-4 Ultimate will end – going from 5+ lanes to 3 lanes will cause a "bottle neck" and this is a strategy to mitigate
  - Only part-time during peak hours
  - MPO comment: will need education and/or signals letting public know when "open" or "closed"
- **Incident Management**
- **Parking Management**
- **Event Management**
- **Freight Parking/FRATIS**
- **Pre-trip Travel Information/En-route Driver Information/Route Guidance**
- **Signal Retiming**

b. Some Atypical examples may include:
Yes to all – MPO supports anything to do with technology utilized with transportation; that includes ITS strategies within their planning process:

Active Demand Management	Active Traffic Management Strategies	Active Parking Management Strategies
Dynamic Fare Reduction	Adaptive Ramp Metering	Dynamic Overflow Transit Parking
Dynamic Pricing	Dynamic Junction Control	Dynamic Parking Reservation
Dynamic Ride Sharing	Dynamic Lane Reversal	Dynamic Wayfinding
Dynamic Routing	Dynamic Lane Use Control	Dynamically Priced Parking
Dynamic Transit Capacity Assign.	Dynamic Merge Control	
On-Demand Transit	Dynamic Shoulder Lanes	
Predictive Traveler Information	Queue Warning	
Transfer Connection Protection		
Travel Demand Management		

c. Connected Vehicles

- **Requirements are very dynamic**
- **Determine what makes sense to do now**
- **Potential Roles**
  - **Roadside**
  - **Operations and Maintenance**
- **Recommend Future Deployment Requirements**

d. What types of strategies do you feel your counties or cities could benefit the most from?

e. What constraints does your agency have?
Comments from MPO:

- Funds for capital – why MPOs where created
- Federal Legislation:

    - No change, doesn't allow for change when they just extend
    - Extended to December
- Funding – don't know how to fund due to fuel efficiency and inflation
- (Some) Vision – value pricing as an example: had no desire to risk it and no local support
- Need more money

f. How is TSM&O currently being handled within your agency?

Comments from MPO:

- UPWB – planning document
- LRTP – legislative driven
- Transportation Improvement Program (TIP)
- Get $4.2M for TSM&O initiatives (went up to due I-4 Ultimate taking Road Rangers and MPO getting back those funds)
- MetroPlan ITS Master Plan is important for the return on investment (ROI) of ITS
    - Within the plan, we want to able to use data within the model and overlay results/benefits
    - Able to say "here are the projects, here is the ROI and here are cost-to-benefits
    - Create positive stories within the media regarding transportation investments
- Retiming and Transit Signal Priority (TSP) has their limits → where TSM&O comes into play
    - Used to retiming
    - Need something new to make impacts
    - MetroPlan ITS Master Plan will move into the TIP document
    - DOT projects technical have to be within the MetroPlan TIP

V. ITS Standards

Comments from MPO:

- If we operate regionally (example: AAM) – can happen between two or more agencies
- Different agencies have various tolerances/demarcations points
- Where does the regional effort stop and the individual agencies start?
- Prioritize fund capital; staff is open to O&M
- All jurisdictions recognize MPO has funds
    - Allocated based on number of traffic signals
    - "Horse trading" meetings
        - Each agency sits together and ranks projects to include TIP according to importance and funding
        - Some agencies will give up a certain project to make sure they have funds towards another project/initiative
        - Formula allows everyone to see how the funds are distributed/percentages allocated in real-time
        - Signal Retiming funds considered a "regional" fund (which is divvied up)

- AAM will provide more funds for other projects since it will O&M some parts of the region and incur those costs

Comments to MPO:

- O&M
    - DOT will operate as much as agencies allow
        - Either give timing plans to be implemented as an option or agencies allow full control
    - DOT pays for Signal Engineer and an Operator
- One TMC versus connecting all TMCs
    - Multiple TMCs with multiple software licenses – maybe we can have one regional software license with access for all agencies and can report for everyone
    - O&M funds is smaller since only paying for one license
    - Turn reporting over to one regional entity (DOT) – lowers costs as well
    - Beginning of DSS Study – do we buy off the shelf or write our own software that makes sense for D5 region, which the D5 ITS Master Plan will take into account
- Board Approval
    - Regional Cooperation
    - Benefit – direct versus indirect

VI. Link Planning with Operations

Consider as an option; some MPOs try to incorporate O&M funds – for MetroPlan, it is off the table since it is simply what they don't do

- MPO has raised the question about it but not really heard back about it
- *Some* discussion about O&M funds regarding transit
- The linkage from Planning to Operation occurs in the Congested Management Process
    - Identifies facilities and then lists alternatives (ITS is an alternative)
    - Go to MetroPlan website, search "Congested Management Process" for more information
- **Determine funding requirements, including O&M, at the planning level**
    - For MPO, they are strictly capital
- **Prioritize appropriately**

MPO will send all information requested within Sections VII, VIII and IX – including providing documents or links to documents (LRTP, TIP), etc.:

VII. Information Request - Existing Plans (Master Plans, Priority Lists, Other Planning Documents, etc.) – TO BE REVIEWED AND PROVIDED AFTER THE MEETING

a. **What existing plans do you have (can copies be provided)?**
b. **Can you provide plans for existing deployments?**
c. **Do you have any projects currently in development? Can you please provide a list and description?**
d. **How many Traffic Signals do you maintain?**
e. **How many ITS devices do you maintain? What type?**

f. **How many of these traffic signals are interconnected?**
g. **What type of communication is used for the interconnection (fiber, copper, or wireless)? How many miles of interconnection do you have by type.**
h. **What type of network is used? Please describe the topology and types of devices.**
i. **Are any/all of your traffic signals connected back to an operations center?**
j. **In the big scheme of things in your County or City, how are traffic Signals and ITS viewed by the administration?**
k. **Do you have any GPS/Shape File information for any of the above referenced information?**

VIII. Information Request - Operations and Maintenance – TO BE REVIEWED AND PROVIDED AFTER THE MEETING

a. **Do you maintain traffic signals and interconnect in-house or via contract?**
b. **If you maintain in-house, what is your dedicated staff for responsibilities (quantity and qualifications)?**
c. **If you operate signals/signal system from the operations center, what is your dedicated staff for this responsibility (quantity and qualifications)?**
d. **What is your annual traffic signal/signal system budget for maintenance and operations?**
e. **What is the source of your annual maintenance and operations budget?**
f. **For you to succeed and advance with traffic signal maintenance and traffic signal system operations, what is your greatest barrier and what is needed to overcome?**

IX. Information Request – Staffing – TO BE REVIEWED AND PROVIDED AFTER THE MEETING

a. **How many people operate your traffic/ITS system? What level is each staff member (i.e. engineer, tech., etc.)?**
    - **Signals?**
    - **ITS?**
b. **Who or how many people maintain the network? What level is each staff member (i.e. engineer, tech., etc.)?**
c. **Please provide an overview of what positions are employed by the agency and how many hours/week? (Please provide salary if possible).**
d. **Please provide an overview of what positions are provided by contract and how many hours/week? (Please provide salary if possible).**

X. Open Discussion

- Will look at everything for every agency including Lynx, SunRail, MPO level, etc. – what will make sense for everyone?
- Once we have spoken with everyone, the list of strategies can be tailored down
- Check back with everyone to make sure the end list is copasetic
- MPO selling point: Grouping into a region for SEMP forms – then everyone can fall under it and local agencies can adopt
    - All needs/corridors would need to be within the form in order to cover any projects that would be adopted

- RTVM is a difficult process for most

FDOT District 5 – ITS Master Plan
Meet with Stakeholders: Meeting Minutes – Central Florida Expressway Authority
August 12, 2015 from 2:00 PM – 4:30 PM

Attendees:

Corey Quinn	CFX	☒	Jessica Moses	Metric	☒
Manny Rodriguez	FDOT	☒	Kevin Miller	Schneider	☒
Dale Cody	Metric	☒	Steve Corbin	Schneider	☒
Jessica Renfrow	Metric	☒			☐

I. **Introductions**
   a. See list of attendees above
   b. Overview of the story to define the goals of this project quickly
      i. What is the message? What are the Authority's thoughts?
         1. CFX understands the purpose of this project
         2. There is fear of being told what to do – make sure there is voluntary language
   c. Move forward pushing the envelope and be comprehensive
      i. Connected vehicles is coming and our region needs to keep an "eye on the prize"
      ii. Create the framework for the ultimate goal: connected and/or autonomous vehicles

II. **Transportation Overview – see presentation attached**
   a. People hope to get from A to B as quickly as possible, while connected
      i. The method of transportation is flexible as long as it is easy and efficient (See Slide 1)
      ii. The goal is to provide information to enable people to make that determination… and one day to automate travel (connected and/or autonomous vehicles)
         1. A huge part is being able to use your smart phone to tell you what routes/modes should be taken to get to destinations
   b. If this seems unlikely, consider the cell phone and computer (see Slide 2)
      i. Have gone from "bag phones" to Blackberry to iPhones and now tablets, smart watches and more – every year there is a new bigger, better gadget

c. … and finally transportation (See Slide 3)
    i. Transportation is growing exponentially and we as a region need to be prepared for that change
    ii. Rapid convergence of fiber, technology, cameras, etc.
    iii. Transportation needs to do this as well
d. CFX comments
    i. Getting into the rail business – legislature leaves the option open now
    ii. Agree to the message – as a region we don't see boundaries between agencies as travelers
    iii. Data – how to use for decision making, calculating Benefit-To-Cost (B/C) Ratio, presenting this information to the public
        1. New roads get ribbon cutting ceremonies and the public can see the outcome of invested dollars. However, ITS deployments get better return on investments and there is "nothing to show" to the public – which is why we need performance measures like the B/C Ratio to present
        2. CFX could do better at this and would like to see this within the ITS Master Plan

III. Project Overview and Purpose

a. Goal of this Project
    i. Develop a Regional Master Plan with an eye towards Complete Connectivity (i.e. Connected Vehicles)
        1. Cooperative approach
            a. What should each agencies' role be
        2. Identify goals and needs (ITS Strategies)
        3. Gather and use data to meet the goals and needs
        4. How do we work together/integrate
        5. NOT a deployment Plan
b. Maximize and identify needs for regional staff and resources
c. Identify Risks
d. Develop Regional ITS Standards

IV. ITS Strategies (See Attachment)

a. We will go through strategies that are you interested in (Yes, No, Maybe)
    i. See Strategies Matrix for overall input
b. These answers along with all other stakeholders will be placed into an overall matrix in order to see a trend regionally

c. Below are strategies that had some comments or discussion:
    i. Dynamic Junction Control – Maybe; can't see it right now but if a situation came up then possibly depending on traffic volumes
    ii. Dynamic Lane Use Control – Maybe; have a minor version on system now to let people know which lanes are available
    iii. Dynamic HOV & Managed Lanes – Maybe; for the Expressway probably "no" but if it was used in a BRT application for bus transit then "yes"
    iv. Adaptive Ramp Metering – Maybe; still building the system so possibly. SR 408 is at full capacity
    v. Queue Warning – Yes; green sign on SR 408 near Andes. CFX also putting on SR 429 approaching 535
    vi. Dynamic Routing – Yes; CFX has always wanted to partner with DOT since the I-4/SR 408 interchange is a huge convergence of traffic from each system
    vii. Freight Parking – Maybe; previous Board talked about a service center – this could apply
    viii. Integrated Corridor Management – Yes; again with the I-4/SR 408 interchanges
        1. Good example could be at SR 417/I-4 interchanges – specifically during I-4 Ultimate construction
        2. SR 50/SR 408 a good candidate but would need Rick's (FDOT) approval
            a. Perhaps SR 408 PD&E can look into travel times to decide if CFX can live with the answer (information presented to the public be favorable or place them in a bad lighting?)
            b. Overall if arterials are good then CFX is good because traffic is being moved to them (more customers)
    ix. Dynamic Ridesharing – Maybe; if CFX went into the rail business, good tool when needing to go to a final destination
    x. Traffic Control (as a whole) – No; CFX does not have signals really
    xi. Emissions Testing and Mitigation – No; has not been discussed. CFX's goal is to keep the traveling public moving which means less emissions overall
    xii. Highway Rail Intersection – Maybe; if CFX went into the rail business in the future
    xiii. Public Travel Security – Yes; CFX does this already in a minor way
        1. If contractors do not have labels on their trucks, they spot it and respond accordingly
        2. Any broken down cars, CFX notifies Road Rangers

- xiv. Electronic Toll Collection – Yes; what CFX does
    1. Dynamic, Demand and Corridor Pricing – No; CFX applies one straightforward price for tolls – does not want to get into dynamically changing them
- xv. Lateral Collision Avoidance – Maybe; Corey (CFX) to look into
- xvi. Add Wrong Way Driving to ITS Strategies
    1. CFX prefers flashers to LED
    2. Use in conjunction with already established ITS Devices
    3. Does this in some locations already
- xvii. Event Management – Yes; get involved with City events since travelers use CFX facilities to get to and from events
    1. CFX is developing an ICM approach "playbook"

V. ITS Standards

- a. Network, Data Sharing, Security
    - i. Security – Cabinet access (i.e. Electronic Key)
- b. Resource Sharing
    - i. CFX tried to share with Turnpike
        1. Prefers to go through MetroPlan
            - a. Leverage with funding and they have say over all agencies
    - ii. Network
        1. CFX signals are maintained by County/DOT/City and CFX does not tell them how they should be maintained
            - a. Wants video monitoring vs. loops
    - iii. Software (SunGuide, TSP, ATMS, DSS)
        1. CFX has SunGuide
        2. Makes sense for agencies to have access. All roads connect but can't talk correctly
    - iv. Operations Staffing
- c. Demarcation Points for Operations and Maintenance
    - i. Agree on these – understand what they are and define them. Some agencies will have different tolerances for what is allowed
    - ii. Quality level now is high – anyone new would need to be qualified/certified
- d. Performance Measurement
- e. Standard Drawings/Construction Configurations
    - i. Type 6 cabinets
- f. Consistency with testing and acceptance
    - i. Good; as part of building data

VI. **Link Planning with Operations**

a. Incorporate TSM&O principles
b. Determine funding requirements, including O&M, at the planning level
    i. Capital is less but O&M is huge
    ii. Learning process for both
    iii. Great idea to plan with planners including all funds associates with projects (O&M)
c. Prioritize appropriately
d. What is your involvement with your planning Department?
    i. No planning department because CFX is a small agency

VII. **Open Discussion**

FDOT District 5 – ITS Master Plan
Meet with Stakeholders: Meeting Minutes – I-4 Ultimate Team
September 24, 2015 from 10:30 AM – 12:30 PM

Attendees:

Richard Monahan	I-4 Mobility Partners	☒	Brent Poole	TCD	☒
Dwayne Kile	SGL	☒	Anand Jujare	Schneider	☒
Jon Walker	SGL	☒	Ron Pati	Schneider	☒
Geoffrey Doyle	SGL	☒	Manny Rodriguez	FDOT	☒
Mark Askins	SGL	☒	Dale Cody	Metric	☒
Aaron Zhou	HDR	☒	Jessica Renfrow	Metric	☒
Bijan Behzadi	HDR	☒	Jessica Moses	Metric	
Bob Ledford	TCD	☒			

I. Introductions

a. See list of attendees above
   i. Included Name, Firm and Role
      1. Richard Monahan – I-4 Mobility Partners, Technical Director
      2. Bob Ledford – TCD, Program Manager
      3. Brent Poole – TCD, Operations & Maintenance Manager
      4. Jon Walker – SGL, Project Manager
      5. Dwayne Kile – SGL, Roadway/Systemwide Design-Build Manager
      6. Geoffrey Doyle – SGL, ITS Manager
      7. Mark Askins – SGL, ITS Design-Build Coordinator
      8. Bijan Behzadi – HDR, Traffic Lead
      9. Aaron Zhou – HDR, ITS
      10. Ron Pati – Schneider Electric, Area 4 ITS Lead
      11. Anand Jujare – Schneider Electric, Area 4 ITS
      12. Manny Rodriguez – FDOT, Project Manager for ITS Master Plan
      13. Dale Cody – Metric, Consultant Project Manager for ITS Master Plan
      14. Jessica Renfrow – Metric, Project Engineer for ITS Master Plan

b. The ITS Master Plan is using a soft approach to look at the region as a whole
   i. Discuss strategies with all stakeholders within the region
   ii. Know what we want as a region
   iii. I-4 Mobility Partners and the I-4 Ultimate project is a unique stakeholder because it represents a major part of the region for the next 40 years
      1. This plan will not affect the $2B job
      2. Looks substantially at Operations and Maintenance as a whole

c. In dealing with commissioners, public, bosses and more on a day-to-day basis – we as a region need to have a clear message about what this Plan is and what we can get out of it
    i. Difficult to articulate a message with ITS/TSM&O elements
    ii. If we agree to the same message, we as a region will be consistent and have common goals

II. Transportation Overview

a. People hope to get from A to B as quickly as possible, while connected
    i. The method of transportation is flexible as long as it is easy and efficient (See Slide 1)
    ii. The goal is to provide information to enable people to make that determination… and one day to automate travel (connected and/or autonomous vehicles)
        1. A huge part is being able to use your smart phone to tell you what routes/modes should be taken to get to destinations
        2. People want choices! Managed Lanes, Bike, Car, Bus, etc.

b. If this seems unlikely, consider the cell phone and computer (see Slide 2)
    i. Have gone from "bag phone" and then moved from Blackberry to iPhones, and now tablets, smart watches and more – every year there is a new bigger, better gadget

c. … and finally transportation (See Slide 3)
    i. Transportation is growing exponentially and we as a region need to be prepared for that change
        1. Automated cars have screens instead of windows (be looking at Maui instead of what is actually surrounding)
    ii. Rapid convergence of fiber, technology, cameras, etc.
    iii. Transportation needs to do this as well
    iv. Aligning ourselves as a region could be advantageous for the entire region

d. Again, this plan does not produce any additional scope and budget for the I-4 Ultimate project – just important for the PPP to be aware of what is happening within the region over the next 40 years

III. Project Overview and Purpose

a. Goal of this Project
    i. Develop a Regional Master Plan with an eye towards Complete Connectivity (i.e. Connected Vehicles)
        1. Cooperative approach
            a. What should each agencies' role be

b. Would like to know what role you see yourself having in the future.

2. Identify goals and needs (ITS Strategies)
3. Gather and use data to meet the goals and needs
    a. Signal Systems from the arterials
    b. ITS information from the freeways
    c. Transit Information
    d. Rail Information
    e. Etc.
4. How do we work together/integrate
5. NOT a deployment Plan
    a. Plenty of Master Plans from many stakeholders – this Master Plan brings all of those together and makes them consistent

b. Maximize and identify needs for regional staff and resources
c. Identify Risks
d. Develop Regional ITS Standards – dictated by stakeholders; what is feasible?

IV. ITS Strategies (See Attachment)

a. Question: Will strategies be implemented with rigid standards?
    i. Answer: Important to identify what the region is willing to do and accept
        1. Applicable and agreed upon strategies will define the standards
        2. Need to remove the institutional barriers and miscommunication between agencies
b. Comment/Concern: How to handle Big Data due to Connected Vehicles
    i. Answer: FDOT does have Big Data project(s) in the works in order to look further into this
c. Below are the following strategies with some discussion:
    i. Dynamic HOV Lanes & Managed Lanes – Maybe; Managed Lanes is a logical place for Connected Vehicles facilities
        1. 35 to 40 years – augmenting systems to accommodate Connected Vehicles
        2. Important to note Connected Vehicles will triple the capacity of a roadway (instead of 2 or 3 car lengths behind, it would be a few feet), lowering crashes and improving driver experience
        3. Agencies need to work together to say YES when the time comes
    ii. Adaptive Ramp Metering – Yes; a part of I-4 Ultimate
    iii. Freight Parking – Yes; I-4 Ultimate does have Rest Areas; freight parking will help with managing this as it relates to Operations & Maintenance as well

iv. Incident Corridor Management – Yes; long overdue within the region. It is important to balance the system appropriately
    1. Schneider is doing ICM in Dallas
v. Travel Information (as a whole) – Yes; data used with the TMC into Waze and other applications
vi. Commercial Vehicle Operations – Maybe; DOT is regulating trucks entering Managed Lanes depending on weights – some of these strategies makes sense in this application
vii. Advanced Vehicle Safety Systems (as a whole) – No; the transportation industry has not been told what the infrastructure side will need to be to have fully capable Connected Vehicles on the road. However, once this has been identified, this is a Yes.
viii. Wrong Way Driving Countermeasures – Yes.

V. ITS Standards

a. Look at these regionally
b. Network, Data Sharing, Security
    i. Security – Cabinet access (i.e. Electronic Key)
c. Resource Sharing
    i. Network Architect is one idea
        1. Engineers cannot look at the regional architecture because they are handling a network day to day
    ii. Software (SunGuide, TSP, ATMS, DSS)
    iii. Operations Staffing
        1. Route access/information to a 24 hour TMC? An idea
d. Demarcation Points for Operations and Maintenance
e. Performance Measurement
    i. Be consistent
    ii. Performance Measures to show Benefit/Cost to get more funding
        1. I-4 Ultimate is unique due to the fact that they have strict Performance Measures within their contract
            a. Will be cautious to give access to the backbone because others could mess up their performance measures
f. Standard Drawings/Construction Configurations
g. Consistency with testing and acceptance
    i. Miami Tunnel – RTVM for test plans
        1. No performance measure for the entire system
    ii. SEMP – why we built this document, what we need from it and ultimately designing from it
    iii. There is no systems test – which needs to be developed

1. Testing is pretty much the same for up to 80% of jobs (20% may have unique factors)
    a. Comment: This is good; since contractors do not design systems but build it – needs to be standardized

VI. **Link Planning with Operations**

a. Incorporate TSM&O principles
b. Determine funding requirements, including O&M, at the planning level
c. Prioritize appropriately
    i. What makes sense?
    ii. TSM&O Consortium has heard about the project and strategies
    iii. What standards should happen to make TSM&O/ITS strategies a reality
        1. Once we brainstorm regionally at stakeholder meetings and get down to the details, we will find that some strategies just won't work
d. What is your involvement with your planning Department?

VII. **Information and Data Request**

VIII. **Open Discussion**

FDOT District 5 – ITS Master Plan
Stakeholder Meeting Agenda – VOTRAN
October 1, 2015 from 1:30 PM – 3:30 PM

Attendees:

Elizabeth Suchsland	VOTRAN	☒	Manny Rodriguez	FDOT	☒
Heather Blanck	VOTRAN	☒	Dale Cody	Metric	☒
Steven Sherrer	VOTRAN	☒	Jessica Moses	Metric	☒
Bill Mayer	VOTRAN	☒			

I. **Introductions**
   a. Overview of the story to define the goals of this project quickly
      i. What is the message? Trying to explain TSM&O/ITS on a day to day basis to non-technical individuals including commissioners, public and more
         1. Be consistent
         2. Be able to speak to Supervisors with expertise to relay the message and goals to garner interest and support
         3. Be able to communicate the new future of transportation that will be consistent with technology

II. **Transportation Overview**
   a. People hope to get from A to B as quickly as possible, while connected
      i. The method of transportation is flexible as long as it is easy and efficient (See Slide 1)
      ii. The goal is to provide information to enable people to make that determination… and one day to automate travel
         1. A huge part is being able to use your smart phone to tell you what routes/modes should be taken to get to destinations
            a. Different mode choices is important
   b. If this seems impossible, consider the cell phone and computer (see Slide 2)
      i. Have gone from "bag phone" and then moved from Blackberry to iPhones, and now tablets, smart watches and more – every year there is a new bigger, better gadget
      ii. Technology is growing exponentially and impacts transportation significantly
   c. … and finally transportation (See Slide 3)
      i. Technology is tied into transportation and is changing how we design our systems
         1. Driverless vehicles by 2020

2. Google created an autonomous vehicle which led other manufacturers to compete to make these vehicles a reality, quicker
    a. Private sector will drive what transportation side does
3. We as a region need to be prepared for this change
    a. Before, each agency grew up in different silos growing their ITS programs
    b. Now, we must look at where everyone is, where they want to be and combine commons goals while working together

III. Project Overview and Purpose

a. Goal of this Project
    i. Connect the various silos, but why?
        1. To provide value to the investments in infrastructure we have already made
    ii. Develop a Regional Master Plan with an eye towards Complete Connectivity (i.e. Connected Vehicles)
        1. Cooperative approach
            a. Minimal "shall" statements
            b. Definitely a cooperative effort, Metric is just the author of the document
            c. What is the plan will only be dictated by the stakeholders collectively
                i. Metric is here to facilitate the conversation and document the decisions made from this
            d. What should each agencies' role be
            e. Would like to know what role you see yourself having in the future.
        2. Identify goals and needs (ITS Strategies)
        3. Gather and use data to meet the goals and needs
            a. Signal Systems from the arterials
            b. ITS information from the freeways
            c. Transit Information
            d. Rail Information
            e. Etc.
        4. How do we work together/integrate
        5. NOT a deployment Plan
b. Maximize and identify needs for regional staff and resources
c. Identify Risks
d. Develop Regional ITS Standards

IV. ITS Strategies (See Attachment)

a. We will go through strategies that you are interested in (Yes, No, Maybe)
   i. See Strategies Matrix for overall input
   ii. Should answer with the next 5, 10, 20 and even 40 years in mind
b. These answers along with all other stakeholders will be placed into an overall matrix in order to see a trend regionally
c. Below are strategies that had some comments or discussion:
   i. Dynamic Shoulder Lanes – Yes; "Double Yes"
   ii. Traveler Information (in general) – Yes; Agency role is to pump travel time data to TMC and third party applications
   iii. Dynamic Ridesharing – in Dallas, they use Uber for the "last mile"
      1. Local taxi companies are also developing applications to be competitive with this idea
   iv. Highway Rail Intersections – Maybe; Votran is closer to the coast and therefore deals with boats going through the bridges.
   v. Dynamic Fare Reduction – Maybe; County drives the cost of fares but is an option to be considered
   vi. Public Travel Security – Yes; "Loves the concept"
   vii. On-Board Safety and Security Monitoring – Yes; for buses
   viii. Emergency Notification and Personal Security – Yes; for buses
   ix. Connected Vehicles – Yes
      1. Connected Vehicles – needs the infrastructure side in order to speak back to vehicles
         a. On a cell network now but needs to be more reliable
         b. Important for everyone to be on board (both from a technological standpoint and multi-institutional cooperation)
   x. Lateral Collision Avoidance – Yes; for buses
   xi. Innovative Intersection Designs – Yes; but no to roundabouts due to crashes involving pedestrians

V. ITS Standards

a. Network, Data Sharing, Security
   i. Security – Cabinet access (i.e. Electronic Key)
b. Resource Sharing
   i. Network
   ii. Software (SunGuide, TSP, ATMS, DSS)
   iii. Operations Staffing
c. Demarcation Points for Operations and Maintenance

            i. Make sure we planning funds for Operations and Maintenance

   d. Performance Measurement
   e. Standard Drawings/Construction Configurations
   f. Consistency with testing and acceptance

VI. Link Planning with Operations

   a. Incorporate TSM&O principles
   b. Determine funding requirements, including O&M, at the planning level
   c. Prioritize appropriately
   d. What is your involvement with your planning Department?

VII. Information and Data Request

VIII. Open Discussion

   a. Ultimately, strategies discussed are "tools in the toolbox"
      i. The region must pick what is applicable and select them carefully
      ii. Even great strategies can have negative effects sometimes
         1. Calculate all factors and choose the best one for each specific and unique situation

FDOT District 5 – ITS Master Plan
Meet with Stakeholders: Meeting Minutes – City of Palm Coast
August 21, 2015 from 10:30 AM – 12:00 PM

Attendees:

Sean Castello	Palm Coast	☒	Manny Rodriguez	FDOT	☒
Bob Keeth	TPO	☒	Dale Cody	Metric	☒
Jessica Renfrow	Metric	☒	Chris Walsh	TEDS	☒

I. **Introductions**
   a. See list of attendees above
   b. Overview of what will be discussed, focusing on the what and not the how and why
      i. Determining how we communicate
      ii. What will this Master Plan look like and learning about strategies and what will work for the Region

II. **Transportation Overview**
   a. People hope to get from A to B as quickly as possible, while connected
      i. The method of transportation is flexible as long as it is easy and efficient (See Slide 1)
      ii. The goal is to provide information to enable people to make that determination… and one day to automate travel
         1. We are seeing a shift to automated ITS and now is the time to embrace it
   b. If this seems unlikely, consider the cell phone and computer (see Slide 2)
      i. The evolution of technology is ever changing, for instance the cellular phone started as a "bag phone" and then moved from Blackberry to iPhones. You can now make calls with a smart watch. The movement of technology continues to change, grow and push limits that we did not even fathom ten years ago
   c. … and finally transportation (See Slide 3)
      i. Transportation is moving exponentially faster and it is our goal to keep up with these changes

III. **Project Overview and Purpose**
   a. Goal of this Project
      i. Develop a Regional Master Plan with an eye towards Complete Connectivity (i.e. Connected Vehicles)

1. Cooperative approach
    a. What should each agencies' role be
2. Identify goals and needs (ITS Strategies)
3. Gather and use data to meet the goals and needs
4. How do we work together/integrate
5. NOT a deployment Plan

b. Maximize and identify needs for regional staff and resources
c. Identify Risks
d. Develop Regional ITS Standards

IV. ITS Strategies (See Attachment)

a. We go through strategies that you are interested in (Yes, No, Maybe)
    i. See Strategies Matrix for overall input
b. These answers along will all other stakeholders will be placed into an overall matrix in order to see a trend regionally
c. Below are strategies that had some comments or discussion. While there was a representative from the River to Sea TPO, the positions below are those stated by Sean Castello of Palm Coast:
    i. Active Arterial Management – Yes; City is trying to accomplish now.
    ii. Dynamic Junction Control – Maybe; Interested with regard to southbound commuting on I-95.
    iii. Dynamic Lane Reversal – No;
    iv. Dynamic Lane Use Control – No;
    v. Dynamic High Occupancy Vehicle and Managed Lanes – No;
    vi. Adaptive Ramp Metering – Maybe;
    vii. Dynamic Merge Control – No; currently removing a similar treatment from an existing facility.
    viii. Dynamic Shoulder Lanes – No;
    ix. Dynamic Routing – Yes;
    x. Queue Warning – Yes;
    xi. Dynamic Parking Guidance and Reservation – Maybe; Downtown area is starting to grow so may be a future strategy.
    xii. Dynamically Priced Parking – No;
    xiii. Dynamic Overflow Transit Parking – No;
    xiv. Freight Parking – Yes;
    xv. Integrated Corridor Management – Yes;
    xvi. Predictive Traveler Information – Yes; Would be useful recognizing the fluctuation in traffic patterns (certain weeks are busier than others)
    xvii. Pre-Trip Travel Information – Yes;
    xviii. En Route Driver Information – Yes;

xix. Traveler Services Information – Yes;
xx. Route Guidance – Yes;
xxi. Dynamic Ridesharing – Yes;
xxii. Dynamic Wayfinding – Yes;
xxiii. Adaptive Signal Control – Maybe;
xxiv. Transit Signal Priority – Maybe;
xxv. Incident Management – Yes;
xxvi. Travel Demand Management – Yes;
xxvii. Emissions Testing and Mitigation – Maybe;
xxviii. Highway Rail Intersection – No; No crossings in the City
xxix. Dynamic Transit Capacity Assignment – Maybe; No current fixed-routes in the City. Recently completed the Transit Development Plan, so fixed-routes may materialize in 4 to 5 years.
xxx. Dynamic Fare Reduction – Yes;
xxxi. Transfer Connection Protection – Maybe;
xxxii. Transit Traveler Information – Yes;
xxxiii. On Demand Transit – Yes; currently using this strategy.
xxxiv. Public Travel Security – Yes;
xxxv. Regional Payment System – Yes; Palm Coast Parkway bridge is privately owned.
xxxvi. Electronic Transit Ticketing – Maybe;
xxxvii. Electronic Toll Collection – Yes;
xxxviii. Dynamic Pricing – Yes;
xxxix. Demand Pricing – Maybe;
xl. Corridor Pricing – Maybe;
xli. Commercial Vehicle Electronic Clearance – Yes; have weigh stations on US 1 and Palm Coast Parkway.
xlii. Automated Roadside Safety Inspection – Yes;
xliii. On-Board Safety and Security Monitoring – Yes;
xliv. Commercial Vehicle Administrative Processes – Yes;
xlv. Hazardous Materials Security and Incident Response – Yes;
xlvi. Freight Mobility – Yes;
xlvii. Emergency Notification and Personal Security – Yes;
xlviii. Emergency Vehicle Management – Yes; financially expensive
    1. Example – Broward County spends $1.3 million ($200,000 per year)
xlix. Disaster Response and Evacuation – Yes;
l. In-Vehicle Information – Yes; discussion on connected vehicles - Not a question of "if," but "when" since connected vehicles are progressing.
    1. Transition to driver taking over vehicle

a. How do we transition?
2. Cellular based right now, needs more resiliency
3. Security of connected vehicles
a. Example – Ability to hack into a connected vehicle is doable, hence the example set by Chrysler

li. Probe Vehicle Data – Yes;
lii. Longitudinal Collision Avoidance – No;
liii. Lateral Collision Avoidance – No;
liv. Intersection Collision Avoidance; Yes;
lv. Vision Enhancement for Crash Avoidance – No;
lvi. Pre-Crash Restraint Deployment – No;
lvii. Automated Vehicle Operation – No;
lviii. Archived Data – Yes;
lix. Big Data – Yes;
lx. Transportation Data Analytics – Yes;
lxi. Performance Management – Yes;
lxii. Event Management – Yes;
lxiii. Wrong Way Driving Countermeasures – Yes;
lxiv. Asset Management Database – Yes;
lxv. Pedestrian Safety Systems – Yes;
lxvi. Bicycle Warning Systems – Yes;
lxvii. Innovative Intersection Design – Yes;

V. ITS Standards

a. Network, Data Sharing, Security
i. Security – Cabinet access (i.e. Electronic Key)
b. Resource Sharing
i. Network – Network Architect
ii. Software (SunGuide, TSP, ATMS, DSS) - licensing
iii. Operations Staffing
1. Database – enter and check (QA/QC)
c. Demarcation Points for Operations and Maintenance
i. M&O getting better, preparing for what is coming
d. Performance Measurement
e. Standard Drawings/Construction Configurations
i. Limited; example going from Type 5 cabinet to Type 6 cabinet
f. Consistency with testing and acceptance
i. Implementing them in contracts (for testing)
ii. More consistent yields:
1. Better performance

2. Obtains synergy
3. Testing is always the same

VI. Link Planning with Operations

a. Incorporate TSM&O principles
b. Determine funding requirements, including O&M, at the planning level
c. Prioritize appropriately
d. What is your involvement with your planning Department?

VII. Data and Information Request

a. Provided an overview of the list of information being requested. Requested that the information be provided within 2 weeks and that Chris Walsh be the point of contact for questions and/or providing the information.

VIII. Closing

a. Cooperative effort to create Regional (Central Florida) Master Plan, not D5 Master Plan; document that reflects your opinions and goals.

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FDOT District 5 – ITS Master Plan
Meet with Stakeholders: Meeting Minutes – City of Daytona Beach
August 21, 2015 from 8:00 AM – 9:30 AM

Attendees:

Mike Marcum	Daytona Beach	☒
Darren Greer	Daytona Beach	☒
Jessica Renfrow	Metric	☒
Manny Rodriguez	FDOT	☒
Dale Cody	Metric	☒
Chris Walsh	TEDS	☒

I. **Introductions**
   a. See list of attendees above
   b. Overview of what will be discussed, focusing on the what and not the how and why
      i. Determining how we communicate
      ii. What will this Master Plan look like and learning about strategies and what will work for the Region

II. **Transportation Overview**
   a. People hope to get from A to B as quickly as possible, while connected
      i. The method of transportation is flexible as long as it is easy and efficient (See Slide 1)
      ii. The goal is to provide information to enable people to make that determination… and one day to automate travel
         1. We are seeing a shift to automated ITS and now is the time to embrace it
   b. If this seems unlikely, consider the cell phone and computer (see Slide 2)
      i. The evolution of technology is ever changing, for instance the cellular phone started as a “bag phone” and then moved from Blackberry to iPhones. You can now make calls with a smart watch. The movement of technology continues to change, grow and push limits that we did not even fathom ten years ago
   c. … and finally transportation (See Slide 3)
      i. Transportation is moving exponentially faster and it is our goal to keep up with these changes

III. **Project Overview and Purpose**
   a. Goal of this Project
      i. Develop a Regional Master Plan with an eye towards Complete Connectivity (i.e. Connected Vehicles)

1. Cooperative approach
    a. What should each agencies' role be
2. Identify goals and needs (ITS Strategies)
3. Gather and use data to meet the goals and needs
4. How do we work together/integrate
5. NOT a deployment Plan

b. Maximize and identify needs for regional staff and resources
c. Identify Risks
d. Develop Regional ITS Standards

IV. ITS Strategies (See Attachment)

a. We go through strategies that you are interested in (Yes, No, Maybe)
    i. See Strategies Matrix for overall input
b. These answers along will all other stakeholders will be placed into an overall matrix in order to see a trend regionally
c. Below are strategies that had some comments or discussion:
    i. Active Arterial Management – Yes;
        1. Discussion was held regarding where else the strategy is employed (Orlando and FDOT AAM contracts which are addressing traffic control during the I-4 construction).
        2. Mike indicated that they need staffing assistance in their TMC.
    ii. Dynamic Junction Control – Yes; could be used for I-95 NB to go east on the arterials.
    iii. Dynamic Lane Reversal – No;
    iv. Dynamic Lane Use Control – No;
    v. Dynamic High Occupancy Vehicle and Managed Lanes – No;
    vi. Adaptive Ramp Metering – No;
    vii. Dynamic Merge Control – Maybe; Darren suggested this strategy could be combined with Dynamic Junction Control
    viii. Dynamic Shoulder Lanes – Maybe;
    ix. Dynamic Routing – Yes;
    x. Queue Warning – Yes;
    xi. Dynamic Parking Guidance and Reservation – Yes;
    xii. Dynamically Priced Parking – Yes;
    xiii. Dynamic Overflow Transit Parking – Maybe;
    xiv. Freight Parking – Maybe;
    xv. Integrated Corridor Management – Yes;
    xvi. Predictive Traveler Information – Yes;
    xvii. Pre-Trip Travel Information – Yes;
    xviii. En Route Driver Information – Yes;

xix. Traveler Services Information – Yes;
xx. Route Guidance – Yes;
xxi. Dynamic Ridesharing – Maybe;
xxii. Dynamic Wayfinding – Yes;
xxiii. Adaptive Signal Control – Maybe;
xxiv. Transit Signal Priority – Maybe;
xxv. Incident Management – Yes;
xxvi. Travel Demand Management – Yes;
xxvii. Emissions Testing and Mitigation – Yes;
xxviii. Highway Rail Intersection – Yes;
xxix. Dynamic Transit Capacity Assignment – Yes;
xxx. Dynamic Fare Reduction – Yes;
xxxi. Transfer Connection Protection – No;
xxxii. Transit Traveler Information – No; Mike discussed issues with lack of funding for transit.
xxxiii. On Demand Transit – Maybe;
xxxiv. Public Travel Security – Yes;
xxxv. Regional Payment System – Yes;
xxxvi. Electronic Transit Ticketing – Yes;
xxxvii. Electronic Toll Collection – Yes;
xxxviii. Dynamic Pricing – Yes;
xxxix. Demand Pricing – Maybe;
xl. Corridor Pricing – Yes;
xli. Commercial Vehicle Electronic Clearance – Yes;
xlii. Automated Roadside Safety Inspection – Yes;
xliii. On-Board Safety and Security Monitoring – Yes;
xliv. Commercial Vehicle Administrative Processes – Yes;
xlv. Hazardous Materials Security and Incident Response – Yes;
xlvi. Freight Mobility – Maybe; Mike questioned if this strategy was realistic.
xlvii. Emergency Notification and Personal Security – Yes;
xlviii. Emergency Vehicle Management – Yes; financially expensive
    1. Example – Broward County spends $1.3 million ($200,000 per year)
xlix. Disaster Response and Evacuation – Yes;
l. In-Vehicle Information – Yes; discussion on connected vehicles - Not a question of “if,” but “when” since connected vehicles are progressing.
    1. Transition to driver taking over vehicle
        a. How do we transition?
    2. Cellular based right now, needs more resiliency
    3. Security of connected vehicles

a. Example – Ability to hack into a connected vehicle is doable, hence the example set by Chrysler

li. Probe Vehicle Data – Yes;
lii. Longitudinal Collision Avoidance – No;
liii. Lateral Collision Avoidance – No;
liv. Intersection Collision Avoidance; Yes;
lv. Vision Enhancement for Crash Avoidance – No;
lvi. Pre-Crash Restraint Deployment – No;
lvii. Automated Vehicle Operation – No;
lviii. Archived Data – Maybe;
lix. Big Data – Maybe;
lx. Transportation Data Analytics – Maybe;
lxi. Performance Management – Yes;
lxii. Event Management – Yes;
lxiii. Wrong Way Driving Countermeasures – Yes; good application would be the Seabreeze/Oakridge bridges.
lxiv. Asset Management Database – Yes;
lxv. Pedestrian Safety Systems – Yes;
lxvi. Bicycle Warning Systems – Yes;
lxvii. Innovative Intersection Design – Yes;

V. ITS Standards

a. Network, Data Sharing, Security
    i. Security – Cabinet access (i.e. Electronic Key)
b. Resource Sharing
    i. Network – Network Architect
    ii. Software (SunGuide, TSP, ATMS, DSS) - licensing
    iii. Operations Staffing
        1. Database – enter and check (QA/QC)
c. Demarcation Points for Operations and Maintenance
    i. M&O getting better, preparing for what is coming
d. Performance Measurement
e. Standard Drawings/Construction Configurations
    i. Limited; example going from Type 5 cabinet to Type 6 cabinet
f. Consistency with testing and acceptance
    i. Implementing them in contracts (for testing)
    ii. More consistent yields:
        1. Better performance
        2. Obtains synergy
        3. Testing is always the same

VI. **Link Planning with Operations**

a. Incorporate TSM&O principles
b. Determine funding requirements, including O&M, at the planning level
c. Prioritize appropriately
d. What is your involvement with your planning Department?

VII. **Data and Information Request**

a. Provided an overview of the list of information being requested. Requested that the information be provided within 2 weeks and that Chris Walsh be the point of contact for questions and/or providing the information.

VIII. **Closing**

a. Cooperative effort to create Regional (Central Florida) Master Plan, not D5 Master Plan; document that reflects your opinions and goals.

FDOT District 5 – ITS Master Plan
Meet with Stakeholders: Meeting Minutes – Brevard County/ Space Coast TPO/ City of Melbourne
August 14, 2015 from 10:00 AM – 12:00 PM

Attendees:

Corrina Gumm	Brevard	☒
Steven Bostel	SCTPO	☒
Jenni Lamb	Melbourne	☒
Scott Arnold	Melbourne	☒
Brandon Collins	Melbourne	☒

Manny Rodriguez	FDOT	☒
Dale Cody	Metric	☒
Jessica Renfrow	Metric	☒
Corrine DiSanto	Metric	☒

I. **Introductions**
   a. See list of attendees above
   b. Overview of what will be discussed, focusing on the what and not the how and why
      i. Determining how we communicate
      ii. What will this Master Plan look like and learning about strategies and what will work for the Space Coast Region

II. **Transportation Overview**
   a. People hope to get from A to B as quickly as possible, while connected
      i. The method of transportation is flexible as long as it is easy and efficient (See Slide 1)
      ii. The goal is to provide information to enable people to make that determination… and one day to automate travel
         1. We are seeing a shift to automated ITS and now is the time to embrace it
   b. If this seems unlikely, consider the cell phone and computer (see Slide 2)
      i. The evolution of technology is ever changing, for instance the cellular phone started as a "bag phone" and then moved from Blackberry to iPhones. You can now make calls with a smart watch. The movement of technology continues to change, grow and push limits that we did not even fathom ten years ago
   c. … and finally transportation (See Slide 3)
      i. Transportation is moving exponentially faster and it is our goal to keep up with these changes
   d. Comments:
      i. Similar to long range plan
      ii. Consistent theme and figuring out how we get it to the public
      iii. Major differences in transportation today

1. We have Google that can give us real time traffic
2. Uber – a growing transportation service with younger generation of today

iv. Maximizing Resources

III. Project Overview and Purpose

a. Goal of this Project
   i. Develop a Regional Master Plan with an eye towards Complete Connectivity (i.e. Connected Vehicles)
      1. Cooperative approach
         a. What should each agencies' role be
      2. Identify goals and needs (ITS Strategies)
      3. Gather and use data to meet the goals and needs
      4. How do we work together/integrate
      5. NOT a deployment Plan

b. Maximize and identify needs for regional staff and resources
c. Identify Risks
d. Develop Regional ITS Standards

IV. ITS Strategies (See Attachment)

a. We go through strategies that you are interested in (Yes, No, Maybe)
   i. See Strategies Matrix for overall input
b. These answers along will all other stakeholders will be placed into an overall matrix in order to see a trend regionally
c. Below are strategies that had some comments or discussion:
   i. Dynamic Junction Control – Yes; unique situation that can possibly be used at an I-95 interchange or during a launch.
   ii. Dynamic Lane Reversal – No; for now, roads have a lot of medians
   iii. Dynamic Lane Use Control – Yes; for I-95 ramps for morning and evening rush hours or used for reoccurring crashes/secondary crashes
   iv. Adaptive Ramp Metering – No; not applicable. Challenges there: extend ramp capacity, add an acceleration lane.
   v. Dynamic Merge Control – No; not applicable. Used in cases of allot of weaving, less merging
   vi. Dynamic Shoulder Lanes – Maybe; could be used at I-95 and 66th, I-95 and Wickham, or Piney and Wickham
   vii. Queue Warning – Yes; permanent installation
   viii. Dynamic Parking Guidance and Reservation – Yes; some variation will be needed, but could be used in downtown Melbourne and for events (i.e. air shows)

ix. Dynamic Overflow Transit Parking – Maybe; possibly to be used in ten years
x. Freight Parking – Yes; Cocoa only had a few truck stops that create problems. Shortage of places for trucks to stop
    1. Example – Volusia only has one gas station on US 1
xi. Integrated Corridor Management – Yes; but a long term idea down the road
xii. Dynamic Ridesharing – Yes; more regulated, especially for automated vehicles
xiii. Traffic Control – Yes; not used everywhere, but a "tool in the tool box"
xiv. Travel Demand Management – Yes; being able to influence choices
xv. Emissions Testing and Mitigation – Maybe; part of a long term plan and have later down the road. Space Coast is already monitoring a bit. Possibly open door for funding, environmental grants?
xvi. Highway Rail Intersection – Yes; especially at high crash locations, have notifications via DMS signs.
    1. Example – At SR 520 gridlock occurs around 3:30pm
xvii. Dynamic Fare Reduction – Maybe; part of possibly long range plan, but not now. Possibly lower fares on I-95
xviii. Transfer Connection Protection – Maybe; connection buses that are running late, how many times can one do this? It's live, not static
xix. Public Travel Security – No; but more information is needed. Some concerns include:
    1. Privacy vs. Security
    2. To collaborate with Sheriff's Office?
    3. More cameras/recording?
    4. Where to store data?
    5. Hiring the staff to monitor, will more be needed?
    6. Possible locations:
        a. Under bridges
        b. Launch area
        c. Bus stops
    7. Too many "what ifs"
xx. Add Demand Pricing to ITS Strategies
    1. Space Coast/Brevard - No
xxi. Dynamic Pricing – Maybe; part of long range plan
xxii. Corridor Pricing – Maybe; part of long range plan
xxiii. Hazardous Materials Security and Incident Response – Yes; to support first responders. Who will use/maintain database?

xxiv. Emergency Vehicle Management – Yes; makes sense to have, but financially expensive
    1. Example – Broward County spends $1.3 million ($200,000 per year)

xxv. Connected Vehicles – Yes; possibly early 2020s, depending upon the synergy between agencies. Not a question of "if," but "when" since connected vehicles are progressing.
    1. Transition to driver taking over vehicle
        a. How do we transition?
    2. Cellular based right now, needs more resiliency
    3. Security of connected vehicles
        a. Example – Ability to hack into a connected vehicle is doable, hence the example of Chrysler

xxvi. Add Wrong Way Driving to ITS Strategies

xxvii. Add Innovative Intersection Design to ITS Strategies

V. ITS Standards

a. Network, Data Sharing, Security
    i. Security – Cabinet access (i.e. Electronic Key)

b. Resource Sharing
    i. Network – Network Architect
    ii. Software (SunGuide, TSP, ATMS, DSS) - licensing
    iii. Operations Staffing
        1. Database – enter and check (QA/QC)
        2. Combining different resources can create issues
            a. Example that was brought up is Virginia's DOT and their program "Serco" which monitors everything from switches to IP addresses, and can see exact issue and history, also used statewide.
            b. Difference is that Florida is larger than Virginia

c. Demarcation Points for Operations and Maintenance
    i. M&O getting better, preparing for what is coming

d. Performance Measurement

e. Standard Drawings/Construction Configurations
    i. Limited; example going from Type 5 cabinet to Type 6 cabinet

f. Consistency with testing and acceptance
    i. Implementing them in contracts (for testing)
    ii. More consistent yields:
        1. Better performance

2. Obtains synergy
3. Testing is always the same

VI. Link Planning with Operations

a. Incorporate TSM&O principles
b. Determine funding requirements, including O&M, at the planning level
    i. Space Coast is curious about budgets and funding for others
c. Prioritize appropriately

VII. Closing

a. Cooperative effort to create Regional (Central Florida) Master Plan, not D5 Master Plan; document that reflects your opinions and goals.

FDOT District 5 – ITS Master Plan
Stakeholder Meeting Minutes – City of Titusville
January 15, 2016 from 9 AM – 11 AM

Attendees:

Joey Arena	Titusville	☒	Katie King	Metric	☒
Manny Rodriguez	FDOT	☒	Jessica Moses	Metric	☒
Dale Cody	Metric	☒			

I. Introductions

a. All the regional agencies have separate ITS Master Plans
   i. Agencies grew up in isolated silos which abled them to build their ITS programs
   ii. Now, the region needs to coordinate between these various plans to have a comprehensive system overall
   iii. Regional Architecture has kept things fairly consistent, this plan looks further into reliable networks, security and data

b. Overview of the story to define the goals of this project quickly
   i. What is the message? Trying to explain TSM&O/ITS on a day to day basis to non-technical individuals including commissioners, public and more
      1. Be consistent
      2. Be able to speak to Supervisors (or non-technical persons) to relay the message; the goal is to garner interest and support
      3. Be able to communicate the new future of transportation that will be consistent with technology

c. What is the Plan?
   i. Keep an eye on the Connected Vehicles prize (brass ring)
   ii. Unrealistic to get funding for initiatives that will take place in the next 20 years
      1. Identify low-hanging fruit that can implemented now, while working towards the end goal of Connected Vehicles
         a. Regional Cooperation is needed

II. Transportation Overview

a. People hope to get from A to B as quickly as possible, while connected
   i. The method of transportation is flexible as long as it is easy and efficient (See Slide 1)
   ii. The goal is to provide information to enable people to make that determination… and one day to automate travel

1. A huge part is being able to use your smart phone to tell you what routes/modes should be taken to get to destinations
   a. Different mode choices is important

b. If this seems impossible, consider the cell phone and computer (see Slide 2)
   i. Have gone from "bag phone" and then moved from Blackberry to iPhones, and now tablets, smart watches and more – every year there is a new bigger, better gadget
   ii. Technology is growing exponentially and impacts transportation significantly

c. … and finally transportation (See Slide 3)
   i. Technology is more powerful than ever and impacting how we do transportation
   ii. Maximize resources, manage the system while working towards Connected Vehicles

III. Project Overview and Purpose

a. Goal of this Project
   i. Develop a Regional Master Plan with an eye towards Complete Connectivity (i.e. Connected Vehicles)
      1. Connectivity as in communicating with neighboring agencies (Daytona and Orlando) since traffic is a ripple effect
      2. Cooperative approach
         a. What should each agencies' role be
         b. Would like to know what role you see yourself having in the future.
      3. Identify goals and needs (ITS Strategies)
      4. Gather and use data to meet the goals and needs
         a. Signal Systems from the arterials
         b. ITS information from the freeways
         c. Transit Information
         d. Rail Information
         e. Etc.
      5. How do we work together/integrate
      6. NOT a deployment Plan
         a. How do we look at maintenance, training and operations
         b. May include supportive contracts but will not define actual deployments

b. Maximize and identify needs for regional staff and resources

c. Identify Risks

d. Develop Regional ITS Standards

IV. ITS Strategies (See Attachment)

a. We go through strategies that you are interested in (Yes, No, Maybe)
    i. Only say "Yes" if Titusville will have an active role
    ii. See Strategies Matrix for overall input
b. These answers along will all other stakeholders will be placed into an overall matrix in order to see a trend regionally
c. Below are strategies that had some comments or discussion:
    i. Dynamic Lane Reversal – Yes; Possibly Garden & SR 50
    ii. Freight Parking – Yes; Garden Street's Publix gets freight parking and intersection on SR 50 by Wal-Mart; truck stop in the area recently closed
    iii. Connected Vehicles – Yes
        1. Autonomous versus Automated versus Connected:
            a. Connected – can communicate with other cars and infrastructure informing drivers of potential hazards
            b. Automated – Same was connected but will make decision and brake for the driver is hazards are seen and can be avoided (taking control for the driver at certain times)
            c. Autonomous – Self-driving and will transport driver without their involvement
        2. Connected Vehicles – needs the infrastructure side in order to speak back to vehicles
            a. On a cell network now but needs to be more reliable; think of having a call drop but now applied to a connected vehicle "speaking" to cars and the roadways
            b. Infrastructure is important to realize this
                i. Not able to see humans versus objects
                ii. Most likely will start in Express Lanes because of the limited facility aspect
            c. Important for everyone to be on board (both from a technological standpoint and multi-institutional cooperation)
    iv. Advanced Vehicle Safety Systems (in general) – No (overall); however once the car industry tells the transportation industry what is needed to communicate, then yes
    v. Wrong Way Driving Countermeasures – Yes; it does happen Downtown

V. **ITS Standards**

a. Network, Data Sharing, Security
   i. Security – Cabinet access (i.e. Electronic Key)
b. Resource Sharing – large piece of this plan
   i. Network Architect, regional licenses, ATMS systems, etc.
   ii. Network
      1. IT document will go out for review to discuss data sharing; important for IT people to review and provide input
   iii. Software (SunGuide, TSP, ATMS, DSS)
   iv. Operations Staffing
c. Demarcation Points for Operations and Maintenance
d. Performance Measurement
e. Standard Drawings/Construction Configurations
f. Consistency with testing and acceptance
   i. Need systems acceptance guidelines

VI. **Link Planning with Operations**

a. Incorporate TSM&O principles
b. Determine funding requirements, including O&M, at the planning level
   i. Receiving input from the operational people to do side by side comparisons
      1. Cannot add 30 more strategies regionally if Operations & Maintenance is not maintained adequately right now
c. Prioritize appropriately
d. What is your involvement with your planning Department?

VII. **Data and Information Request**

a. As-built(s)
b. Master Plans
c. What kind of data would Titusville want?

VIII. **Open Discussion**

a. Titusville has very little fiber
b. Downtown Re-Development: just conduit, no fiber
c. Yes to SR 50/US-1 in Space Coast Master Plan to put in fiber
d. Titusville maintains their own 43 signals
e. Titusville basically follows Brevard County's lead – bought into Naztec software like Brevard to save money

FDOT District 5 – ITS Master Plan
Stakeholder Meeting Minutes – City of Kissimmee
February 16, 2016 from 10 AM – 12 PM

Attendees:

Jim Arsenault	Kissimmee	☒	Dale Cody	Metric	☒
Nabil Muhaisen	Kissimmee	☒	Katie King	Metric	☒
Dale Cody	Metric	☒	Jessica Moses	Metric	☒

I. Introductions

a. Kissimmee maintains: Osceola County, DOT, City of St. Cloud, City of Kissimmee with the exception of Reedy Creek Improvement District
    i. Any retiming – Kissimmee jurisdiction
    ii. Martin oversees the signals
    iii. ATMS System: owned and maintained by Osceola County
b. Overview of the story to define the goals of this project quickly
    i. What is the message? Trying to explain TSM&O/ITS on a day to day basis to non-technical individuals including commissioners, public and more
        1. Be consistent
        2. Be able to speak to Supervisors (or non-technical persons) to relay the message; the goal is to garner interest and support
        3. Be able to communicate the new future of transportation that will be consistent with technology

II. Transportation Overview

a. People hope to get from A to B as quickly as possible, while connected
    i. The method of transportation is flexible as long as it is easy and efficient (See Slide 1)
    ii. The goal is to provide information to enable people to make that determination… and one day to automate travel
        1. A huge part is being able to use your smart phone to tell you what routes/modes should be taken to get to destinations
            a. Different mode choices is important
        2. There is a need for an intelligent transportation system that is in demand – can give mode choices, calculate trip fees, handles the payment and smart phones takes you from A to B effortlessly

b. If this seems impossible, consider the cell phone and computer (see Slide 2)
    i. Have gone from “bag phone” and then moved from Blackberry to iPhones, and now tablets, smart watches and more – every year there is a new bigger, better gadget
    ii. Technology is growing exponentially and impacts transportation significantly
c. … and finally transportation (See Slide 3)
    i. Technology is more powerful than ever and impacting how we do transportation
    ii. Maximize resources, manage the system while working towards Connected Vehicles

III. Project Overview and Purpose

a. Goal of this Project
    i. Work with MPO to stay interconnected with the County and region; so many different regional networks/transportation systems
        1. Plan is about taking a look to integrate the various systems
    ii. Develop a Regional Master Plan with an eye towards Complete Connectivity (i.e. Connected Vehicles)
        1. Systems talking and data sharing – MPO will have MPO Plan that will incorporate region’s work but will also be in charge of deployments
        2. Cooperative approach – Metric here to transcribe decisions; not dictate
            a. What should each agencies’ role be
            b. Would like to know what role you see yourself having in the future.
        3. Identify goals and needs (ITS Strategies)
        4. Gather and use data to meet the goals and needs
            a. Signal Systems from the arterials
            b. ITS information from the freeways
            c. Transit Information
            d. Rail Information
            e. Etc.
        5. How do we work together/integrate
        6. NOT a deployment Plan
b. Maximize and identify needs for regional staff and resources

c. Identify Risks
    i. Comment: Major issues are:
        1. Institutional boundaries – some agencies may not have developed relationships
        2. ATMS Locations – forcing agencies to go along with one center of management when agencies have their own way of doing things
        3. Politics – between policies and Federal funding, make change tough; the technical day-to-day people are fine with implementing a regional plan
        4. Security – gaining access can be a major an issue
        5. Adaptive Systems – seems to have a lot of issues? Error messages going to people who manage it when it's off; need a secondary system?
            a. Answer: May not be the right tool for every job; need to be careful and manage expectations
        6. InSync – programming and set up seems to be a resource taker

d. Develop Regional ITS Standards

IV. ITS Strategies (See Attachment)

a. We go through strategies that you are interested in (Yes, No, Maybe)
    i. Only say "Yes" if Kissimmee will have an active role
    ii. See Strategies Matrix for overall input

b. These answers along will all other stakeholders will be placed into an overall matrix in order to see a trend regionally

c. Below are strategies that had some comments or discussion:
    i. Connected Vehicles – Yes
        1. Autonomous versus Automated versus Connected:
            a. Connected – Information is given to make informed decisions
            b. Automated – Information is received and cars are able to make decisions on behalf of the driver
            c. Autonomous – Completely driverless
            d. Constant data sharing to make these a reality which is why a cohesive system is needed
    ii. Highway Rail Intersection – Yes; lots of rails through the City – 12 or 13 total; on Phase II of SunRail (Osceola County involved with SunRail)

V. **ITS Standards**

a. Network, Data Sharing, Security
   i. Security – Cabinet access (i.e. Electronic Key)
b. Resource Sharing – large piece of this plan
   i. Network Architect, regional licenses, ATMS systems, etc.
   ii. Network
      1. IT document will go out for review to discuss data sharing; important for IT people to review and provide input
   iii. Software (SunGuide, TSP, ATMS, DSS)
   iv. Operations Staffing
c. Demarcation Points for Operations and Maintenance
d. Performance Measurement
e. Standard Drawings/Construction Configurations
   i. Yes
f. Consistency with testing and acceptance

VI. **Link Planning with Operations**

a. Incorporate TSM&O principles
b. Determine funding requirements, including O&M, at the planning level
   i. Drafting an agreement for operations and maintenance plan
c. Prioritize appropriately
d. What is your involvement with your planning Department?

VII. **Information & Data Request**

VIII. **Open Discussion**

a. Some areas have need for directional lanes
b. Need grade separation
c. Standards fitting our regional vision need to be made for later

FDOT District 5 – ITS Master Plan
Stakeholder Meeting Minutes – Melbourne Airport Authority
January 5, 2016 from 1:30 PM – 3:30 PM

Attendees:

Cliff Graham	Melbourne Airport Authority	☒
Patrick McCarthough	Melbourne Airport Authority	☒
David Lyon	Melbourne Airport Authority	☒
Don Calpaldo	Melbourne Airport Authority	☒

Manny Rodriguez	FDOT	☒
Dale Cody	Metric	☒
Katie King	Metric	☒
Jessica Moses	Metric	☒

I. Introductions

a. Melbourne International Airport staff and roles
    i. Cliff Graham – Director of Operations & Maintenance
    ii. Don Capaldo – Airfield & Commercial Business Center Supervisor
    iii. David Lyon – Grants Administrator
b. Various agencies (Seminole, Osceola, etc.) all have separate ITS Master Plans
    i. Agencies grew up in isolated silos which abled them to build their ITS programs
    ii. Now, the region needs to coordinate between these various plans to have a comprehensive system overall
    iii. Regional Architecture has kept things fairly consistent, this plan looks further into reliable networks, security and data
c. Technology is converging with transportation; the Secretary says it is a "technology tsunami"
    i. District 5 wants to prepare for this
d. Overview of the story to define the goals of this project quickly
    i. What is the message? Trying to explain TSM&O/ITS on a day to day basis to non-technical individuals including commissioners, public and more
        1. Be consistent
        2. Be able to speak to Supervisors (or non-technical persons) to relay the message; the goal is to garner interest and support
        3. Be able to communicate the new future of transportation that will be consistent with technology
e. What is the Plan?
    i. Keep an eye on the Connected Vehicles prize (brass ring)
        1. Identify low-hanging fruit that can implemented now, while working towards the end goal of Connected Vehicles
        2. Inform traveling public including mode choice
            a. Regional Cooperation is needed

II. Transportation Overview

a. People hope to get from A to B as quickly as possible, while connected
    i. The method of transportation is flexible as long as it is easy and efficient (See Slide 1)
    ii. The goal is to provide information to enable people to make that determination… and one day to automate travel
        1. A huge part is being able to use your smart phone to tell you what routes/modes should be taken to get to destinations
            a. Different mode choices is important – Mobile application needs: different modes, how much time it will take and how much will it cost
                i. Need multi-modal Google maps which is why data sharing and regional consistency is important

b. If this seems impossible, consider the cell phone and computer (see Slide 2)
    i. Have gone from “bag phone” and then moved from Blackberry to iPhones, and now tablets, smart watches and more – every year there is a new bigger, better gadget
    ii. Technology is growing exponentially and impacts transportation significantly

c. … and finally transportation (See Slide 3)
    i. Technology is tied into transportation and is changing how we design our systems
        1. We as a region need to be prepared for this change
            a. Before, each agency grew up in different silos growing their ITS programs
                i. ITS is now a tool within TSM&O
            b. Now, we must look at where everyone is, where they want to be and combine commons goals while working together
    ii. Lots of data sources to share and work towards Connected Vehicles
        1. Agency to agency, mode to mode, jurisdiction to jurisdiction
        2. How can we work together – ITS Master Plan defines

III. Project Overview and Purpose

a. Goal of this Project
    i. Develop a Regional Master Plan with an eye towards Complete Connectivity (i.e. Connected Vehicles)

1. Autonomous versus Automated versus Connected:
    a. Connected – can communicate with other cars and infrastructure informing drivers of potential hazards
    b. Automated – Same was connected but will make decision and brake for the driver is hazards are seen and can be avoided (taking control for the driver at certain times)
    c. Autonomous – Self-driving and will transport driver without their involvement

ii. Also connect transportation and social media/mobile applications
1. Cooperative approach
    a. What should each agencies' role be
    b. Would like to know what role you see yourself having in the future.
2. Identify goals and needs (ITS Strategies)
3. Gather and use data to meet the goals and needs
    a. Signal Systems from the arterials
    b. ITS information from the freeways
    c. Transit Information
    d. Rail Information
    e. Etc.
4. How do we work together/integrate
5. NOT a deployment Plan
    a. Makes sure District 5 agencies can communicate and work together regionally

b. Maximize and identify needs for regional staff and resources
c. Identify Risks
d. Develop Regional ITS Standards

IV. ITS Strategies (See Attachment)

a. We go through strategies that you are interested in (Yes, No, Maybe)
    i. See Strategies Matrix for overall input
b. Q: Advantage this system of strategies from an airport standpoint?
    i. A: People flying in from, for example Atlanta, can let them know how to get to locations in Melbourne locally. Inform them of best routes and where car rental area is, etc.
        1. Intermodal within Florida, airports and boats usually not involved in Master Plans, but this one it is because they are also part of an overall transportation system (mode choices)

ii. Melbourne International Airports "sell" is travelers can be on an airplane from parking to seated in 10 to 40 minutes
c. These answers along will all other stakeholders will be placed into an overall matrix in order to see a trend regionally
d. Below are strategies that had some comments or discussion:
   i. Dynamic Parking Guidance & Reservation – Yes; already use temporary message boards for Air Space Shows
   ii. Highway Rail Intersection – Maybe; Florida East Coast Rail does go through Airport property but no crossings
      1. One crossing outside of property near Airport
   iii. Hazardous Materials Security & Incident Response – Yes; Hazmat with airplanes and rail
   iv. Asset Management Database – Yes; City of Melbourne does this for the Airport

V. ITS Standards

a. Network, Data Sharing, Security
   i. Security – Cabinet access (i.e. Electronic Key)
   ii. Data – needs to be formatted in such way so that it can be shared
      1. IT document will go out for review to discuss data sharing; important for IT people to review and provide input
b. Resource Sharing
   i. Network
   ii. Software (SunGuide, TSP, ATMS, DSS)
      1. Perhaps Asset Management Melbourne is already doing for them
   iii. Operations Staffing
      1. I.e., One sight for off-peak hours
c. Demarcation Points for Operations and Maintenance
d. Performance Measurement
e. Standard Drawings/Construction Configurations
f. Consistency with testing and acceptance

VI. Link Planning with Operations

a. Incorporate TSM&O principles
b. Determine funding requirements, including O&M, at the planning level
   i. All options/strategies are considered during planning
c. Prioritize appropriately
d. What is your involvement with your planning Department?

VII. Data and Information Request

VIII. Open Discussion

a. Through regional coordination, able to know about road closures to inform incoming travelers is a great idea

FDOT District 5 – ITS Master Plan
Stakeholder Meeting Minutes – LYNX
January 5, 2016 from 9 AM – 11 AM

Attendees:

Doug Jamison	Lynx	☒	Dale Cody	Metric	☒
Mira Bourova	Lynx	☒	Katie King	Metric	☒
Doug Robinson	Lynx	☒	Jessica Moses	Metric	☒
Tony Rodriguez	Lynx	☒			

I. Introductions

a. Lynx Staff & Roles:
   i. Doug Jamison – Senior ITS Developer
   ii. Mira Bourova, GISP – GIS Coordinator
   iii. Doug Robinson – Manager of Strategic Planning
   iv. Tony Rodriguez – Service Planning Manager
b. Have met with two transit agencies and one airport – different perspectives when looking at the ITS Master Plan through their lens
c. Will talk through strategies as they apply to Lynx
d. Overview of the story to define the goals of this project quickly
   i. What is the message? Trying to explain TSM&O/ITS on a day to day basis to non-technical individuals including commissioners, public and more
      1. Be consistent
      2. Be able to speak to Supervisors (or non-technical persons) to relay the message; the goal is to garner interest and support
      3. Be able to communicate the new future of transportation that will be consistent with technology

II. Transportation Overview

a. People hope to get from A to B as quickly as possible, while connected
   i. The method of transportation is flexible as long as it is easy and efficient (See Slide 1)
   ii. The goal is to provide information to enable people to make that determination… and one day to automate travel
   iii. Method of transportation is less important than it is to be efficient and connected the whole time
      1. Transportation needs to be more intelligent

b. If this seems impossible, consider the cell phone and computer (see Slide 2)
    i. Have gone from "bag phone" and then moved from Blackberry to iPhones, and now tablets, smart watches and more – every year there is a new bigger, better gadget
    ii. Technology is growing exponentially and impacts transportation significantly
c. … and finally transportation (See Slide 3)
    i. Technology is tied into transportation and is changing how we design our systems
        1. Google created an autonomous vehicle which led Mercedes and BMW to compete to make these vehicles a reality, quicker
            a. Private sector will drive what transportation side does
        2. We as a region need to be prepared for this change
            a. Before, each agency grew up in different silos growing their ITS programs
                i. ITS is now a tool within TSM&O
            b. Now, we must look at where everyone is, where they want to be and combine commons goals while working together

III. Project Overview and Purpose

a. Goal of this Project
    i. Develop a Regional Master Plan with an eye towards Complete Connectivity (i.e. Connected Vehicles (CV))
        1. Not just Connectivity as CV but also communication between the City of Orlando and Lynx
        2. Cooperative approach
            a. What should each agencies' role be – how many "shall" statements determined by the regional agencies
            b. Would like to know what role you see yourself having in the future.
        3. Identify goals and needs (ITS Strategies)
            a. If regional trends are formed, may include some standardization to implement those strategies
        4. Gather and use data to meet the goals and needs
            a. Signal Systems from the arterials
            b. ITS information from the freeways
            c. Transit Information
            d. Rail Information
            e. Etc.

5. How do we work together/integrate
6. NOT a deployment Plan – MetroPlan's ITS Master Plan will have fiber and CCTV deployments
    a. District 5's ITS Master Plan is more of how we will work together as a region

b. Maximize and identify needs for regional staff and resources
c. Identify Risks – make sure we have enough operations and maintenance before adding more strategies
d. Develop Regional ITS Standards

IV. ITS Strategies (See Attachment)

a. We go through strategies that you are interested in (Yes, No, Maybe)
    i. See Strategies Matrix for overall input
b. These answers along will all other stakeholders will be placed into an overall matrix in order to see a trend regionally
c. Below are strategies that had some comments or discussion:
    i. Active Arterial Management – Yes; Lynx has an emergency TMC with dispatchers that can monitor and facilitate the operations of the buses
        1. Supervisors there that can make important calls when to add more buses
        2. Important for Lynx to know about incidents and what is actually affected; when and how traffic back up – all allows them to provide better customer service to their users
    ii. Dynamic Shoulder Lanes – Yes; consider for buses
    iii. Queue Warning – Maybe; recurring problem for buses: rear ends when buses stop and create queue lines behind them
    iv. Incident Management – Yes; buses have three external cameras, could be used to get better ideas of incidents or for asset management
    v. Dynamic Transit Capacity Assignment – Yes; full buses versus empty buses – pre-trip itineraries can help buses plan routes better
    vi. Transfer Connection Protection – Yes; waits for SunRail within reason
    vii. Public Travel Security – Yes; Lynx plans to connect cameras to Orlando Police Department; records up to 21 days; incidents are archived
    viii. Demand Pricing – Yes; exceptions for disabled, transit, etc.
    ix. On-Board Safety & Security Monitoring – Yes; All drivers have SOS button application
    x. Disaster Response and Evacuation – Yes; EOC needs to communicate to buses

1. Lynx supports disaster responses by busing people out – needs coordination always

xi. Advanced Vehicle Safety Systems – Yes

1. Connected Vehicles – needs the infrastructure side in order to speak back to vehicles
2. Transit is ideal for probe vehicle fleet

xii. Asset Management Database – Yes; using buses as probes for assets while driving corridors

xiii. Innovative Intersection Design – No; adequate turning radius is needed; pedestrians must be accounted for always

V. ITS Standards

a. Certain strategies will require certain standards

b. Network, Data Sharing, Security

i. Security – Cabinet access (i.e. Electronic Key)

c. Resource Sharing

i. Network – Network Architect for regional expertise and guidance

1. IT document will go out for review to discuss data sharing; important for IT people to review and provide input

ii. Software (SunGuide, TSP, ATMS, DSS)

iii. Operations Staffing

iv. Sharing infrastructure – agreements to be in place

1. MOU for commitments in the Plan
2. Plan is dynamic; voting within the TSM&O consortium meetings

d. Demarcation Points for Operations and Maintenance

e. Performance Measurement

f. Standard Drawings/Construction Configurations

g. Consistency with testing and acceptance

i. Define what systems testing/acceptance is

VI. Link Planning with Operations

a. Incorporate TSM&O principles

b. Determine funding requirements, including O&M, at the planning level

c. Prioritize appropriately

d. What is your involvement with your planning Department?

VII. Data and Information Request

a. Q: Anything GIS-related that can be provided?

i. A: Anything infrastructure related: wireless, cameras, fiber, DMS

VIII. Open Discussion

APPENDIX B

Data Request Information

Sumter County Data Request Information

FDOT District 5 – ITS Master Plan
Data and Information Request for Sept. 15, 2015 Stakeholder Meeting

Sumter County Response
August 24, 2015

I. Information Request – Existing Plans (Master Plans, Priority Lists, Other Planning Documents, etc.).

a. **What existing plans do you have (can copies be provided)? –**
   i. In 2013 Sumter County Public Works Division authorized an initial ITS Master Plan Study. This study, *Sumter County Advanced Traffic Management System (ATMS) Master Plan*, was completed in May, 2014 by VIBEngineering, Inc. (Jay Calhoun, PE, jcalhoun@vibengineering.com, 727-317-4967). This plan was prepared to identify and make recommendations for locations for signal upgrades and the deployment of standard ATMS components such as CCTV cameras, dynamic message signs, communication equipment, detection, etc. This study was to document the need for a Countywide ITS Study that would be funded by FDOT (see item iii below).
   ii. In spring, 2015, the Sumter County, FL, ITS Architecture Planned Data Flow Connections document was completed and approved by FDOT. This document was prepared jointly by Volkert, Inc. (Brian Kanely, PE, brian.kanely@volkert.com, 352-240-7459) and VIBEngineering, Jay Calhoun. FDOT required that the ITS Architecture document be completed as a component leading to approval of a Countywide ITS Study (see item iii below).
   iii. Sumter County Countywide ITS Development Study - This study is in the FDOT Five Year Work Program, Item #436365-1, funded in FY 2016 at $100,000. This study would be the first step in the design and construction of a Countywide ITS System and operations center in Sumter County.
   iv. Copies of the ATMS Master Plan and ITS Architecture are attached. FDOT D5 (Manny Rodriguez) should have copies of these documents on file.

b. **Can you provide plans for existing deployments? –** There are no existing ITS deployments in the County.

c. **Do you have any projects currently in development? –** There are no projects currently in development.

d. **How many traffic signals do you maintain? –** Sumter County maintains 46 traffic signals; 23 on state roads and 23 on county roads. There are 3 signals on state roads not maintained by Sumter County; 2 in Bushnell and 1 in Coleman. The number and type of controllers for the 49 signals in Sumter County are shown below. Per Control Specialists, County contractor for signal maintenance, the Siemens controllers are the County controller specification.
   i. Eagle – 24
   ii. Peek – 11
   iii. Siemens – 12

iv. Under construction – 2 (Will be Siemens controllers when construction is completed)
v. Additional information on the existing traffic signal controllers is contained in the attachment titled *FDOT Sumter County Controllers.*

e. **How many ITS devices do you maintain?** None currently installed.
f. **How many of these traffic signals are interconnected?** None.
g. **What type of communication is used for the interconnection?** There are areas in The Villages where fiber optic cable is currently installed but it is not in use. When construction starts on the ATMS, there is a good chance the current fiber cable may need to be replaced with the fiber cable selected for the countywide ITS system.
h. **What type of network is used? –** There is no ITS/ATMS network in place.
i. **Are any/all of your traffic signals connected back to an operations center? –** There is no current ITS/ATMS and operations center in Sumter County. The ITS plans for Sumter County would include an operations center with all signals and ITS equipment linked to the operations center. The Sumter County ITS would include a link to the FDOT D5 Regional TMC and the Florida Turnpike TMC.
j. **In the big scheme of things in your County/City, how are traffic signals and ITS viewed by the administration?** – The Sumter County Board of County Commissioners, County Administrator, and the Lake-Sumter MPO strongly support the planning and implementation of an ATMS in Sumter County.
k. **Do you have any GPS/Shape File information for any of the above referenced information? –** No.

II. Information Request – Operations and Maintenance

a) **Do you maintain traffic signals and interconnect in-house or via contract?** All signal activity is contracted out to Control Specialists, Inc.
b) **If you maintain in-house, what is your dedicated staff for responsibilities?** N/A.
c) **If you operate signals/signal system from the operations center, what is your dedicated staff for this responsibility? –** N/A.
d) **What is your annual traffic signal/signal system budget for maintenance and operations? –** The County's contract with Control Specialists is $180,000 for FY 15 and is $200,000 for FY 16. The contract is renewed on an annual basis.
e) **What is the source of your annual maintenance and operations budget**? - The contract with Control Specialists is funded through the 103 County Transportation Trust Fund (CTTF).
f) **For you to succeed and advance with traffic signal maintenance and traffic signal systems operations, what is your greatest barrier and what is needed to overcome?** There are two barriers to overcome:
   i. Funding for design and construction of the Countywide ITS/ATMS (request is for FDOT to fund).
   ii. Ongoing/annual funding for the Operations Center and staffing to operate/maintain the ATMS once it is built.
g) **What type of security standards to you have**? – All cabinets require a #2 key for access. There are no special access codes or requirements. The issue of security and access to

the signal cabinets/controllers will be explored as a component of the FDOT Countywide ITS Development Study.

III. **Information Request – Staffing** – N/A, signal maintenance/operations is currently contracted out to Control Specialists.

IV. **Information Request – Transportation Data**

a) **What kind of current transportation data is useful to the departments in your agency?** Current data that is useful is traffic counts and data contained in the Long Range Transportation Plan (projected traffic volumes, projected travel lane needs and socio-economic data).

b) **What kind of transportation data would be useful in the future to the departments in your agency?** Future data that is useful is traffic counts and data contained the Long Range Transportation Plan (projected traffic volumes, projected travel lane needs and socio-economic data).

c) **Do you currently have or use any transportation models, either for planning, or signal timing?** Transportation planning models would be accessed through the Lake-Sumter MPO. Signal timing models are not currently used; signals operate as isolated locations with no interconnect.

Lake County Data Request Information

FDOT District 5 – ITS Master Plan
Stakeholder Meeting – Data and Information Request

Please provide the following. If you feel the following are not applicable, please notate as such. THANK YOU!!

I. Information Request - Existing Plans (Master Plans, Priority Lists, Other Planning Documents, etc.)

a. What existing plans do you have (can copies be provided)? We have draft LC Master Plan information. 1) Stakeholders, 2) Key Elements of Advance Traffic Management Master Plan
b. Can you provide plans for existing deployments? Not actually separate ITS plan.
c. Do you have any projects currently in development? Can you please provide a list and description? See "Current Project List"
d. How many Traffic Signals do you maintain? 198
    i. Which controllers do you currently have deployed (type (i.e. 170, 2080), manufacturer (i.e. Peek, Naztec), version)? Naztec Do you have plans to replace any of the existing controllers? Always upgrading to Naztec ATC Is so, to what? Do you have a standard controller specification? Naztec controllers with Ethernet
e. How many ITS devices do you maintain? 62 Ethernet switches (Dell & ITS Express) and 14 Cameras (Bosch)What type?
f. How many of these traffic signals are interconnected? 74
g. What type of communication is used for the interconnection (fiber, copper, or wireless)? Fiber optic and one wireless connection. Some backhauled by microwave radio system through LC Public Safety. How many miles of interconnection do you have by type. Approximately 27.73 miles of fiber installed by FDOT on the FDOT system through road and signal projects. Approximately 5.53 miles of Lake County Fiber installed through signal projects. Approximately 9.79 miles of leased fiber.
h. What type of network is used? Please describe the topology and types of devices. ITS Express bypass switches, some left over Dell switches. Bosch cameras.
i. Are any/all of your traffic signals connected back to an operations center? 62 Traffic signalized intersections.
    i. Do you have a central software system to control the traffic signals? Yes Which vendor and version to you currently use? Trafficware Streetwise.

Are there any plans for upgrades? Plans to upgrade to Trafficware ATMS.now.

j. In the big scheme of things in your County or City, how are traffic Signals and ITS viewed by the administration? Moderately involved.

k. Do you have any GIS/Shape File information for any of the above referenced information? Very limited.

II. Information Request - Operations and Maintenance

a. Do you maintain traffic signals and interconnect in-house or via contract? Routine maintenance in-house, major repairs via contractor.

b. If you maintain in-house, what is your dedicated staff for responsibilities (quantity and qualifications)? Three IMSA Level 3 Field, Two IMSA Level 2 Field and one Supervisor, Level 3 Bench, Level 2 Field.

c. If you operate signals/signal system from the operations center, what is your dedicated staff for this responsibility (quantity and qualifications)? Monitored by a Supervisor.

d. What is your annual traffic signal/signal system budget for maintenance and operations? $342,365

e. What is the source of your annual maintenance and operations budget? Gas Tax & Sales Tax

f. For you to succeed and advance with traffic signal maintenance and traffic signal system operations, what is your greatest barrier and what is needed to overcome? Manpower & expertise in certain fields. Dedicated Traffic Engineer.

g. What type of security standards do you have? How do you manage cabinet access? Standard number 2 key. Are you open to a standard outside of a No. 2 key? Yes if funding is available.

III. Information Request - Staffing

a. How many people operate your traffic/ITS system? What level is each staff member (i.e. engineer, tech., etc.)?
   i. Signals? Three IMSA Level 3 Field, Two IMSA Level 2 Field and one Supervisor, Level 3 Bench, Level 2 Field.
   ii. ITS? Just job experience no formal training.

b. Who or how many people maintain the network? What level is each staff member (i.e. engineer, tech., etc.)? Network is maintained by Public Safety Communication Technology personnel with network training and experience, Lake County IT personnel with network training and experience, Traffic Operations Signal supervisor with network experience and some training and signal technicians with some experience and little training.

c. Please provide an overview of what positions are employed by the agency and how many hours/week? (Please provide salary if possible). The positions are for ITS and Traffic Signal maintenance only. All personnel are full time 40 hours per week. Five traffic signal technicians average rate $15 per hour. Assistant Traffic Operations Supervisor average around $19.98 per hour.

d. Please provide an overview of what positions are provided by contract and how many hours/week? (Please provide salary if possible). Lake County has a traffic signal maintenance contract with Traffic Control Devices for major repairs that are beyond routine maintenance including loop replacement.

IV. Information Request – Transportation Data

a. What kind of current transportation data (i.e. all modes) is useful to the departments (i.e. Planning, Transportation, Events, Transit, etc.) in your agency? Volume and speed counts using traffic counters and capacity evaluations,

b. What kind of transportation data (i.e. all modes) would be useful in the future to the departments (i.e. Planning, Transportation, Events, Transit, etc.) in your agency? Volume counts, corridors transition times and delays, turning movement counts and pedestrian counts.

c. Do you currently have or use any transportation models, either for planning, or signal timing? Yes, Sharon Lewis with Lake County Public Works Engineering conducts the modeling for capacity, trip generations etc.

City of Ocala Data Request Information

FDOT District 5 – ITS Master Plan
Stakeholder Meeting – Data and Information Request

Please provide the following. If you feel the following are not applicable, please notate as such. THANK YOU!!

I. Information Request - Existing Plans (Master Plans, Priority Lists, Other Planning Documents, etc.)

a. What existing plans do you have As builds (can copies be provided)? Yes
b. Can you provide plans for existing deployments? Yes
c. Do you have any projects currently in development? Can you please provide a list and description? SR 40 & MLK (Mast Arm complete upgrade)
d. How many Traffic Signals do you maintain? 128
    i. Which controllers do you currently have deployed (type (i.e. 170, 2080), manufacturer (i.e. Peek, Naztec), version)? Naztec 980 TS2 Type 1 Do you have plans to replace any of the existing controllers? Not at this time Is so, to what? Do you have a standard controller specification? Yes
e. How many ITS devices do you maintain? What type? (37) ITS Camera's,
f. (14) Insync Adaptive Control Intersections, (7) Dynamic Message Signs
g. How many of these traffic signals are interconnected? All 128
h. What type of communication is used for the interconnection (fiber, copper, or wireless)? How many miles of interconnection do you have by type. All Fiber
i. What type of network is used? Flat Layer 2 Ethernet Please describe the topology and types of devices. Layer 2 Ethernet switch ITS Express 8020
j. Are any/all of your traffic signals connected back to an operations center? Yes
    i. Do you have a central software system to control the traffic signals? Yes Which vendor and version to you currently use? Naztec ATMS.Now 2.3 Are there any plans for upgrades? Just upgraded 9/3/15
k. In the big scheme of things in your County or City, how are traffic Signals and ITS viewed by the administration? In Emergency situations at the Traffic Management Center
l. Do you have any GIS/Shape File information for any of the above referenced information? Yes

II. Information Request - Operations and Maintenance

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a. Do you maintain traffic signals and interconnect in-house or via contract? Yes Traffic Signals in house with our Signal personnel and Interconnect with the city owned utility Telecom Department
b. If you maintain in-house, what is your dedicated staff for responsibilities (quantity and qualifications)? (5) Total 1-Traffic System Manager, 1- Signal Lead Technician, 2- Level II technicians and 1- Level I technician
c. If you operate signals/signal system from the operations center, what is your dedicated staff for this responsibility (quantity and qualifications)? None
d. What is your annual traffic signal/signal system budget for maintenance and operations? About $905,000
e. What is the source of your annual maintenance and operations budget? FDOT Reimbursement, Gas tax Funds
f. For you to succeed and advance with traffic signal maintenance and traffic signal system operations, what is your greatest barrier and what is needed to overcome? Quality trained personnel
g. What type of security standards do you have? Limited How do you manage cabinet access? No.2 Key Are you open to a standard outside of a No. 2 key? Yes

III. Information Request - Staffing

a. How many people operate your traffic/ITS system? What level is each staff member (i.e. engineer, tech., etc.)?
   i. Signals?
   ii. ITS? .)? (5) Total 1-Traffic System Manager, 1- Signal Lead Technician, 2- Level II technicians and 1- Level I technician
b. Who or how many people maintain the network? What level is each staff member (i.e. engineer, tech., etc The City of Ocala Telecommunications Dept. maintains the network with 10 positions. There personnel consists of the following: 1- Telecom Manager, 3- Telecom Broadband System Engineers, 2- Telecom Fiber Network Specialist, 1- Fiber Design Technician, 1- Voice Systems Technician, 1- Admin Coordinator and 1- Admin Specialist
c.
d. Please provide an overview of what positions are employed by the agency and how many hours/week? (Please provide salary if possible). (5) Total
e. Traffic System Manager (50-60 hours) Loaded Salary $113,264.07
f. Signal Lead Technician (40-hours) Loaded Salary $91,060.31
g. Signal Level II technician (40-hours) Loaded Salary $90,015.00
h. Signal Level II technician(40-hours) Loaded Salary $52,016.27
i. Signal Level I technician (40-hours) Loaded Salary $46,341.49

j. Please provide an overview of what positions are provided by contract and how many hours/week? (Please provide salary if possible). None

IV. Information Request – Transportation Data

a. What kind of current transportation data (i.e. all modes) is useful to the departments (i.e. Planning, Transportation, Events, Transit, etc.) in your agency? All Four
b. What kind of transportation data (i.e. all modes) would be useful in the future to the departments (i.e. Planning, Transportation, Events, Transit, etc.) in your agency? All Four
c. Do you currently have or use any transportation models, either for planning, or signal timing? Synchro, Auto-Turn

Marion County Data Request Information

(To be included in the next submittal)

SUNTRAN Data Request Information

FDOT District 5 – ITS Master Plan
Stakeholder Meeting – Data and Information Request

Please provide the following. If you feel the following are not applicable, please notate as such. THANK YOU!!

I. Information Request - Existing Plans (Master Plans, Priority Lists, Other Planning Documents, etc.)

a. What existing plans do you have (can copies be provided)? NA
b. Can you provide plans for existing deployments? NA
c. Do you have any projects currently in development? Can you please provide a list and description? NA
d. How many Traffic Signals do you maintain?
    i. Which controllers do you currently have deployed (type (i.e. 170, 2080), manufacturer (i.e. Peek, Naztec), version)? Do you have plans to replace any of the existing controllers? Is so, to what? Do you have a standard controller specification? NA
e. How many ITS devices do you maintain? What type? NA
f. How many of these traffic signals are interconnected? NA
g. What type of communication is used for the interconnection (fiber, copper, or wireless)? How many miles of interconnection do you have by type. NA
h. What type of network is used? Please describe the topology and types of devices. NA
i. Are any/all of your traffic signals connected back to an operations center?
    i. Do you have a central software system to control the traffic signals? Which vendor and version to you currently use? Are there any plans for upgrades? NA
j. In the big scheme of things in your County or City, how are traffic Signals and ITS viewed by the administration? NA
k. Do you have any GPS/Shape File information for any of the above referenced information? NA

II. Information Request - Operations and Maintenance

a. Do you maintain traffic signals and interconnect in-house or via contract? NA
b. If you maintain in-house, what is your dedicated staff for responsibilities (quantity and qualifications)? NA

c. If you operate signals/signal system from the operations center, what is your dedicated staff for this responsibility (quantity and qualifications)? NA
d. What is your annual traffic signal/signal system budget for maintenance and operations? NA
e. What is the source of your annual maintenance and operations budget? NA
f. For you to succeed and advance with traffic signal maintenance and traffic signal system operations, what is your greatest barrier and what is needed to overcome? NA
g. What type of security standards do you have? How do you manage cabinet access? Are you open to a standard outside of a No. 2 key? NA

III. Information Request - Staffing

a. How many people operate your traffic/ITS system? What level is each staff member (i.e. engineer, tech., etc.)? NA
    i. Signals?
    ii. ITS?
b. Who or how many people maintain the network? What level is each staff member (i.e. engineer, tech., etc.)? NA
c. Please provide an overview of what positions are employed by the agency and how many hours/week? (Please provide salary if possible). NA
d. Please provide an overview of what positions are provided by contract and how many hours/week? (Please provide salary if possible). NA

IV. Information Request – Transportation Data

a. What kind of current transportation data (i.e. all modes) is useful to the departments (i.e. Planning, Transportation, Events, Transit, etc.) in your agency? Current data from technology installed on buses, such as APC, AVL. This data is useful for route planning, scheduling, and dispatching.
b. What kind of transportation data (i.e. all modes) would be useful in the future to the departments (i.e. Planning, Transportation, Events, Transit, etc.) in your agency? Access to local travel trends would be beneficial in transit planning.
c. Do you currently have or use any transportation models, either for planning, or signal timing? NA-TPO/City of Ocala would have access to this information.

Katherine King

From:	Gennie Garcia <GGarcia@Ocalafl.org>
Sent:	Monday, January 25, 2016 11:43 AM
To:	Katherine King
Subject:	RE: D5 ITS Master Plan Information Request

Katie,

We do not have an internal TMC. Our operations manager will review video other than that our vendors maintain any issues or software via contract.

Thanks,
Gennie

From: Katherine King [mailto:KKing@metriceng.com]
Sent: Tuesday, January 19, 2016 6:22 PM
To: Gennie Garcia
Subject: RE: D5 ITS Master Plan Information Request

Thanks Gennie! I have a question for you looking at what you sent. Do you have an internal TMC that is used to for the operations and maintenance of your ITS End Devices, for example monitoring the 50 CCTVs and transmitting data for the CAD? If so could you tell me the number of employees per week and their job titles?

KATIE KING, P.E.
ITS/Traffic Engineer

METRIC ENGINEERING

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From: Gennie Garcia [mailto:GGarcia@Ocalafl.org]
Sent: Tuesday, January 19, 2016 6:12 PM
To: Katherine King
Subject: RE: D5 ITS Master Plan Information Request

Katie,

Attached is the Data and Information Request. Unfortunately, I am unable to provide much feedback. The City of Ocala and the Transportation Planning Organization (TPO) are the leads on majority of all ITS planning. Please let me know if you need any further information.

Thanks,
Gennie

From: Katherine King [mailto:KKing@metriceng.com]
Sent: Tuesday, January 19, 2016 11:22 AM
To: Gennie Garcia
Cc: Dale Cody; Rolando Ramirez; Manny.Rodriguez@dot.state.fl.us
Subject: RE: D5 ITS Master Plan Information Request

Summary of Transit ITS End Devices Maintained						
STAKEHOLDER	Total Transit ITS Devices	CAD	CCTV	APC	AVL	TSP
LYNX	1391	486	174	111	486	134
SCAT	SN	SN	SN	SN	SN	SN
SUNTRAN	84	12	50	10	12	0
SUNRAIL	SN	SN	SN	SN	SN	SN
VOTRAN	SN	SN	SN	SN	SN	SN

Gennie,

Here is the update table for Task 2 that we just discussed on the phone that shows transit ITS end devices. If there are any additional types of transit ITS devices that you have, not mentioned in the table above, please let me know and I can add a line for them.

Thanks!

KATIE KING, P.E.
ITS/Traffic Engineer

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From: Katherine King
Sent: Friday, December 18, 2015 11:03 AM
To: 'ggarcia@ocalafl.org'
Cc: Dale Cody; Rolando Ramirez; 'Manny.Rodriguez@dot.state.fl.us'
Subject: D5 ITS Master Plan Information Request

Gennie,

As part of the D5 ITS Master Plan, we are working on technical memorandums for Task 1 through Task 3 of the FDOT ITS Master Plan that summarize the existing ITS systems for all the stakeholders involved. At this point, it does not appear that we have received the following information from you. Please let us know if the below information is available by filling out the charts below by Task. If available, please provide the information as soon as possible. We are more than happy to assist, if possible:

TASK 1

The purpose of Task 1 is to document any existing planning information, including:

- ITS/ATMS Master Plan
- Project Priority List
- The FDOT District 5 ITS Master Plan Data and Information Request Form
- Other Planning Documents

EXISTING PLANNING DOCUMENTS				
Y= Yes Document Provided, N = Document Not Available, SN = Still Needed, (XXXX) = Year				
STAKEHOLDER	ITS/ATMS Master Plan	Priority List	FDOT District 5 ITS Master Plan Data and Information Request Form	Other Planning Documents
SUNTRAN	NA			

TASK 2

The purpose of task 2 is to document and summarize existing and future device deployments, including:

- Existing ITS Plans
- Existing Signal System Data
- Future ITS/Signal Deployments (Already Funded)
- Existing GIS Files

Existing and Future Device Deployment Plans Yes (Y), No (N), Still Needed (SN), Not Applicable (NA)				
STAKEHOLDER	Existing ITS Device Plans Provided	Existing Signal System Data Provided	Future ITS/Signal Deployment Plans Provided	Existing GIS Shape Files Provided
SUNTRAN				

- Miles of FOC
- Total Number of ITS devices maintained
- Number of CCTV maintained
- Number of DMS maintained
- Number of MVDS maintained
- Number of Bluetooth maintained

Summary of ITS Devices Maintained						
STAKEHOLDER	Miles of Fiber Optic Cable	Total ITS Devices	CCTV	DMS	MVDSs	Bluetooth

SUNTRAN							

TASK 3

The purpose of task 3 is to document and existing O&M staffing (includes in-house or consultant).

- Network Maintenance
- Existing Traffic Signal Maintenance
- TMC Staffing

Existing Traffic Signal Maintenance and TMC Staffing							
STAKEHOLDER	Traffic Engineering Operations Manager	Senior Traffic Signal Engineer	Traffic Signal Engineer	Traffic Signal Analysts / Technician	Network Engineer	TMC Manager / ITS Engineer	Traffic Signal Maintenance / ITS Fiber Technician
SUNTRAN							

If you have any questions please give me a call.

Thanks,

KATIE KING, P.E.
ITS/Traffic Engineer

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Osceola County Data Request Information

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FDOT District 5 – ITS Master Plan
Stakeholder Meeting – Data and Information Request

Please provide the following. If you feel the following are not applicable, please notate as such. THANK YOU!!

I. Information Request - Existing Plans (Master Plans, Priority Lists, Other Planning Documents, etc.)

a. What existing plans do you have (can copies be provided)? Copies can be provided
b. Can you provide plans for existing deployments? Yes.
c. Do you have any projects currently in development? Can you please provide a list and description? ATMS Phase IV. Application is currently submitted to Metroplan Orlando. Please see attachments
d. How many Traffic Signals do you maintain?
   i. Which controllers do you currently have deployed (type (i.e. 170, 2080), manufacturer (i.e. Peek, Naztec), version)? Do you have plans to replace any of the existing controllers? Is so, to what? Do you have a standard controller specification? The county uses Econolite controllers. ASC3 type. There are no plans to upgrade the controllers to a different manufacturer.
e. How many ITS devices do you maintain? What type? Please see attached spreadsheet.
f. How many of these traffic signals are interconnected? 108 are on fiber
g. What type of communication is used for the interconnection (fiber, copper, or wireless)? How many miles of interconnection do you have by type. Fiber.
h. What type of network is used? Please describe the topology and types of devices. MFES: Etherwan and very few Ruggedcom, DMS: Daktronics, Layer 3: Garrettcom and Juniper, Jupiter video wall, impath encoders, Vicon CCTV cameras
i. Are any/all of your traffic signals connected back to an operations center? The ones on fiber are (108).
   i. Do you have a central software system to control the traffic signals? Which vendor and version to you currently use? Are there any plans for upgrades? The county uses Centracs (latest version, it just got upgraded).

If SunGuide is provided free of cost, the County will consider upgrading. Other than that, no plans for upgrade.

j. In the big scheme of things in your County or City, how are traffic Signals and ITS viewed by the administration? In terms of moving traffic, it is favorably viewed.
k. Do you have any GPS/Shape File information for any of the above referenced information? Yes.

II. Information Request - Operations and Maintenance

a. Do you maintain traffic signals and interconnect in-house or via contract? Contract. Signals: City of Kissimmee, network: Metric eng.
b. If you maintain in-house, what is your dedicated staff for responsibilities (quantity and qualifications)? N/A
c. If you operate signals/signal system from the operations center, what is your dedicated staff for this responsibility (quantity and qualifications)? TMC supervisor and TMC operator. Please see attached job descriptions.
d. What is your annual traffic signal/signal system budget for maintenance and operations? Current FY is $742,000 for maintenance and operation.
e. What is the source of your annual maintenance and operations budget? Transportation Trust Fund
f. For you to succeed and advance with traffic signal maintenance and traffic signal system operations, what is your greatest barrier and what is needed to overcome?
g. What type of security standards do you have? How do you manage cabinet access? Are you open to a standard outside of a No. 2 key?

III. Information Request - Staffing

a. How many people operate your traffic/ITS system? What level is each staff member (i.e. engineer, tech., etc.)?
   i. Signals? IMSA Level 3 field-signals/Level 2 for signal-inspector.
   ii. ITS? Technician
b. Who or how many people maintain the network? What level is each staff member (i.e. engineer, tech., etc.)? Four personnel through Metric. Qualifications:
c. Please provide an overview of what positions are employed by the agency and how many hours/week? (Please provide salary if possible). Traffic Operations Engineer: 40 hr/wk, Sr Traffic Engineer: 40 hr/wk, TMC Supervisor: 40 hr/wk, TMC Operator: 20 hr/wk.
d. Please provide an overview of what positions are provided by contract and how many hours/week? (Please provide salary if possible).

IV. Information Request – Transportation Data

a. What kind of current transportation data (i.e. all modes) is useful to the departments (i.e. Planning, Transportation, Events, Transit, etc.) in your agency? Planning, Transportation, Event, Transit, Pedestrian and Bike

b. What kind of transportation data (i.e. all modes) would be useful in the future to the departments (i.e. Planning, Transportation, Events, Transit, etc.) in your agency? Planning, Transportation, Event, Transit, Pedestrian and Bike

c. Do you currently have or use any transportation models, either for planning, or signal timing? SYNCHRO

Seminole County Data Request Information

Katherine King

From: Wetzel, Charles <cwetzel@seminolecountyfl.gov>
Sent: Friday, January 22, 2016 12:50 PM
To: Katherine King
Cc: Dale Cody; Rolando Ramirez; Manny.Rodriguez@dot.state.fl.us; Muniz, David
Subject: RE: D5 ITS Master Plan Information Request
Attachments: Traffic Projects FY 14 15.xlsx; Traffic Projects FY 15 16 revised 9 21 15.xlsx; NODE LIST.xls

Katie,

See data and comments below. Sorry for the delay in getting this to you.

Thank you and please contact me with any questions.

Charlie

Charles R. Wetzel, P.E., PTOE
County Traffic Engineer
Seminole County Public Works / Traffic Engineering
140 Bush Loop
Sanford, FL 32773
Office (407) 665-5686
Fax (407) 665-5623
cwetzel@seminolecountyfl.gov

From: Katherine King [mailto:KKing@metriceng.com]
Sent: Friday, December 18, 2015 11:14 AM
To: Wetzel, Charles <cwetzel@seminolecountyfl.gov>
Cc: Dale Cody <DCody@metriceng.com>; Rolando Ramirez <rramirez@metriceng.com>; Manny.Rodriguez@dot.state.fl.us
Subject: D5 ITS Master Plan Information Request

Charlie,

As part of the D5 ITS Master Plan, we are working on technical memorandums for Task 1 through Task 3 of the FDOT ITS Master Plan that summarize the existing ITS systems for all the stakeholders involved. We have filled out the charts below by task with the information that we have received to date. Please let us know if the information missing below is available by filling out the charts below by Task. If available, please provide the information as soon as possible. We are more than happy to assist, if possible:

TASK 1

The purpose of Task 1 is to document any existing planning information, including:

- ITS/ATMS Master Plan – We had an ITS Feasibility Study done in 2000
- Project Priority List – there is MetroPlan's list, as well as our annual sales tax projects lists (FY 14/15 and FY 15/16 attached)
- The FDOT District 5 ITS Master Plan Data and Information Request Form - ?
- Other Planning Documents – ATMS Phase II SE documentation

EXISTING PLANNING DOCUMENTS				
Y= Yes Document Provided, N = Document Not Available, SN = Still Needed, (XXXX) = Year				
STAKEHOLDER	ITS/ATMS Master Plan	Priority List	FDOT District 5 ITS Master Plan Data and Information Request Form	Other Planning Documents
Seminole County	Y (2000)			Seminole County ATMS Phase II – Systems Engineering Document (2012)

TASK 2

The purpose of task 2 is to document and summarize existing and future device deployments, including:

- Existing ITS Plans (We have received BlueTOAD locations) – see below for GIS files
- Existing Signal System Data – what specific data is needed? Attached is node list showing all our signals.
- Future ITS/Signal Deployments (Already Funded) – see sales tax project lists (FY 16/17 still in development)
- Existing GIS Files – contact Tony Harrison (407-665-5683) and he will email whatever GIS files you need

Existing and Future Device Deployment Plans Yes (Y), No (N), Still Needed (SN), Not Applicable (NA)				
STAKEHOLDER	Existing ITS Device Plans Provided	Existing Signal System Data Provided	Future ITS/Signal Deployment Plans Provided	Existing GIS Shape Files Provided
Seminole County	Y			

- Miles of FOC – 400+
- Total Number of ITS devices maintained – 1621? (not sure where this # came from – what devices does it include?)
- Number of CCTV maintained – 192 (not sure where this # came from, thought we were around 180, but 192 is close enough)
- Number of DMS maintained - 29
- Number of MVDS maintained - 0
- Number of Bluetooth maintained - 82

Summary of ITS Devices Maintained						
STAKEHOLDER	Miles of Fiber Optic Cable	Total ITS Devices	CCTV	DMS	MVDSs	Bluetooth
Seminole County	400+	1621	192	29	0	82

- Number of Signals Maintained - 382
- Number of Signals interconnected - 281
- Type of Communication – fiber (369 signals), radio (12 signals), 1 signal not connected
- Type of Network Used – Juniper equipment, 10 Gig core ring, 1 Gig to devices

- Central Software System – ATMS.Now (Trafficware)
- Type of Signal Controller – Trafficware ATC and 980

Existing Signal System Summary						
STAKEHOLDER	Number of Signals Maintained	Number of Signals Interconnected	Type of Communication for Interconnection	Type of Network Used	Central Software System	Type Contr
Seminole County	382	281	Fiber, Radio	Juniper, 10G core, 1G to devices	ATMS.Now	ATC,

TASK 3

The purpose of task 3 is to document and existing O&M staffing (includes in-house or consultant).

- Network Maintenance – 7 for ITS/ATMS, fiber and locates
- Existing Traffic Signal Maintenance – 9 technicians for signals, 2 engineers (Steve Douglas and Charlie Wetzel) over both signals and ATMS/ITS/fiber
- TMC Staffing – No dedicated operator at this time – in the process of hiring one

Existing Traffic Signal Maintenance and TMC Staffing							
STAKEHOLDER	Traffic Engineering Operations Manager	Senior Traffic Signal Engineer	Traffic Signal Engineer	Traffic Signal Analysts / Technician	Network Engineer	TMC Manager / ITS Engineer	Traffic Signal Maintenance / ITS Fiber Technician
Seminole County	1	1	0	2	2	0	12

If you have any questions please give me a call.

Thanks,

KATIE KING, P.E.
ITS/Traffic Engineer

METRIC ENGINEERING

615 Crescent Executive Court Suite 524
Lake Mary, Florida 32746
Office: (407) 644-1898
Cell: (407) 924-8401
Fax: (407) 644-2376
Email: kking@metriceng.com
www.metriceng.com

Orange County Data Request Information

FDOT District 5 – ITS Master Plan
Stakeholder Meeting – Data and Information Request

Please provide the following. If you feel the following are not applicable, please notate as such. THANK YOU!!

I. **Information Request - Existing Plans (Master Plans, Priority Lists, Other Planning Documents, etc.)**
   a. What existing plans do you have (can copies be provided)? A**: None**
   b. Can you provide plans for existing deployments? A: **SCOOT in the I-Drive Area and UCF Campus; INSYNC in the Florida Mall (SR 482 & US 441) and Disney Area (SR535). No plans available.**
   c. Do you have any projects currently in development? Can you please provide a list and description? A: **ATMS 3 - INSYNC system on the east side of County(University Bv, Alafaya Tl, Lake Underhill Rd, and Aloma Bv), TMC video wall upgrade, bringing 100 controllers from serial to ethernet communication, and connecting 20 locations via wireless communication; CCTV Camera installations on OBT.**
   d. How many Traffic Signals do you maintain? A: **591**
      i. Which controllers do you currently have deployed (type (i.e. 170, 2080), manufacturer (i.e. Peek, Naztec), version)? Do you have plans to replace any of the existing controllers? Is so, to what? Do you have a standard controller specification? **A: Siemens/Eagle model M03, M04, M10, M40, M42, and M52**.
   e. How many ITS devices do you maintain? What type? A: **Over 2200 devices, Switches, controllers, IDU, CCTV cameras, Video Detection cameras, DMS Signs, Servers, Adaptive Equipment, MMU**
   f. How many of these traffic signals are interconnected? A: **457**
   g. What type of communication is used for the interconnection (fiber, copper, or wireless)? How many miles of interconnection do you have by type. A**: 218 miles of fiber and approximately 20 intersections communicate wireless.**
   h. What type of network is used? Please describe the topology and types of devices. A: **Local area network, server based, connected via Ethernet at about 100 mb/s with a juniper switch**
   i. Are any/all of your traffic signals connected back to an operations center? A: **Yes, 457 of the 591 signals that we maintain communicate to Tactics**.

i. Do you have a central software system to control the traffic signals? Which vendor and version to you currently use? Are there any plans for upgrades? A: **Tactics Central System Guide, Version 2.2.8**

j. In the big scheme of things in your County or City, how are traffic Signals and ITS viewed by the administration? A: **It is considered important part of operations and support.**

k. Do you have any GPS/Shape File information for any of the above referenced information? A: **Yes, currently there is GIS database containing this information**.

II. Information Request - Operations and Maintenance

a. Do you maintain traffic signals and interconnect in-house or via contract? A: **Both but primarily in-house.**

b. If you maintain in-house, what is your dedicated staff for responsibilities (quantity and qualifications)? A: 1 **- IMSA level 3 Assistant Project Manager, 3- IMSA level 3 Signal Foreman, 3 - IMSA Level 2 Technicians, 9 IMSA Level 1 Technicians, 2 IMSA Level 2 Senior Technician (Interconnect Staff).**

c. If you operate signals/signal system from the operations center, what is your dedicated staff for this responsibility (quantity and qualifications)? A: **1- Chief Engineer PE(this position manages all operations), 1 - Project Manager PE, 2- Senior Traffic Signal Technicians, 2- IT Network Technicians.**

d. What is your annual traffic signal/signal system budget for maintenance and operations? A:

e. What is the source of your annual maintenance and operations budget? A: **Taxes, impact fees, and grants**.

f. For you to succeed and advance with traffic signal maintenance and traffic signal system operations, what is your greatest barrier and what is needed to overcome? A: **Attracting and keeping qualified technical staff, budget.**

g. What type of security standards do you have? How do you manage cabinet access? Are you open to a standard outside of a No. 2 key? A: **We use padlocks.**

III. Information Request - Staffing

a. How many people operate your traffic/ITS system? What level is each staff member (i.e. engineer, tech., etc.)?

   i. Signals? A: **See II.b above.**

   ii. ITS? A: **See II.c above.**

b. Who or how many people maintain the network? What level is each staff member (i.e. engineer, tech., etc.)? A: **2 IT Technicians and 2 – IMSA Level 2 Senior Traffic Signal technicians.**

c. Please provide an overview of what positions are employed by the agency and how many hours/week? (Please provide salary if possible). A: **See position levels in II.b and II.c. Normal 40 hour work week with exception of standby and after hours calls.**
d. Please provide an overview of what positions are provided by contract and how many hours/week? (Please provide salary if possible). A: **There are no contracted positions.**

IV. Information Request – Transportation Data

a. What kind of current transportation data (i.e. all modes) is useful to the departments (i.e. Planning, Transportation, Events, Transit, etc.) in your agency? A: **AADT, traffic movement, travel time, vehicle class, speed studies, delay, crash data.**
b. What kind of transportation data (i.e. all modes) would be useful in the future to the departments (i.e. Planning, Transportation, Events, Transit, etc.) in your agency?
c. Do you currently have or use any transportation models, either for planning, or signal timing? A: **FSUTMS and VISSIM.**

Katherine King

From:	Hazem.El-Assar@ocfl.net
Sent:	Friday, December 18, 2015 10:44 AM
To:	Katherine King
Cc:	Dale Cody; Rolando Ramirez; Manny.Rodriguez@dot.state.fl.us; Celeste.Murdock@ocfl.net
Subject:	RE: D5 ITS Master Plan Information Request
Attachments:	Scope.pdf; ATMS 3 Final Scope.pdf

Kathie,

Below is the information you requested. I made changes to Task 1 responses in reference to our 2002 ATMS Feasibility Study & Implementation Plan, which acts as our existing ITS master plan. Information related to our ongoing projects is attached and a copy of this e-mail is being sent to Celeste Murdock to provide the GIS information you requested.

Thanks.

Hazem El-Assar, P.E.
Chief Engineer
Orange County Traffic Engineering
407-836-7866

From: Katherine King [mailto:KKing@metriceng.com]
Sent: Thursday, December 17, 2015 4:15 PM
To: El-Assar, Hazem
Cc: Dale Cody; Rolando Ramirez; Manny.Rodriguez@dot.state.fl.us
Subject: D5 ITS Master Plan Information Request

Hazem,

As part of the D5 ITS Master Plan, we are working on technical memorandums for Task 1 through Task 3 of the FDOT ITS Master Plan that summarize the existing ITS systems for all the stakeholders involved. We have filled out the charts below by task with the information that we have received to date. Please let us know if the information missing below is available by filling out the charts below by Task. If available, please provide the information as soon as possible. We are more than happy to assist, if possible:

TASK 1

The purpose of Task 1 is to document any existing planning information, including:

- ITS/ATMS Master Plan
- Project Priority List
- The FDOT District 5 ITS Master Plan Data and Information Request Form
- Other Planning Documents

EXISTING PLANNING DOCUMENTS
Y= Yes Document Provided, N = Document Not Available, SN = Still Needed, (XXXX) = Year

STAKEHOLDER	ITS/ATMS Master Plan	Priority List	FDOT District 5 ITS Master Plan Data and Information Request Form	Other Planning Documents
Orange County	Y	Y	Y (2015)	

TASK 2

The purpose of task 2 is to document and summarize existing and future device deployments, including:

- Existing ITS Plans
- Existing Signal System Data
- Future ITS/Signal Deployments (Already Funded)
- Existing GIS Files

Existing and Future Device Deployment Plans Yes (Y), No (N), Still Needed (SN), Not Applicable (NA)				
STAKEHOLDER	Existing ITS Device Plans Provided	Existing Signal System Data Provided	Future ITS/Signal Deployment Plans Provided	Existing GIS Shape Files Provided
Orange County	Y	Y		Y

- Miles of FOC
- Total Number of ITS devices maintained
- Number of CCTV maintained
- Number of DMS maintained
- Number of MVDS maintained
- Number of Bluetooth maintained

Summary of ITS Devices Maintained						
STAKEHOLDER	Miles of Fiber Optic Cable	Total ITS Devices	CCTV	DMS	MVDSs	Bluetooth
Orange County	218	2200	107	13	158	28

- Number of Signals Maintained
- Number of Signals interconnected
- Type of Communication
- Type of Network Used
- Central Software System
- Type of Signal Controller

Existing Signal System Summary

STAKEHOLDER	Number of Signals Maintained	Number of Signals Interconnected	Type of Communication for Interconnection	Type of Network Used	Central Software System	Type Contr
Orange County	591	457	Fiber and a few wireless locations	Local area network, server based, connected via Ethernet at about 100 mb/s with a juniper switch	Tactics Central System Guide (Version 2.2.8)	Siemens (Model M04, M4 and M

TASK 3

The purpose of task 3 is to document and existing O&M staffing (includes in-house or consultant).

- Network Maintenance
- Existing Traffic Signal Maintenance
- TMC Staffing

Existing Traffic Signal Maintenance and TMC Staffing							
STAKEHOLDER	Traffic Engineering Operations Manager	Senior Traffic Signal Engineer	Traffic Signal Engineer	Traffic Signal Analysts / Technician	Network Engineer	TMC Manager / ITS Engineer	Traffic Signal Maintenance / ITS Fiber Technician
Orange County	1	1		5			14

In the Stakeholder Meeting – Data and Information request form that you guys filled out for us, you mentioned several ITS deployments currently in development, are the plans available for the deployments listed below and if so can we have a copy of them?

Do you have any projects currently in development? Can you please provide a list and description? A: ***ATMS 3 - INSYNC system on the east side of County(University Bv, Alafaya Tl, Lake Underhill Rd, and Aloma Bv), TMC video wall upgrade, bringing 100 controllers from serial to ethernet communication, and connecting 20 locations via wireless communication; CCTV Camera installations on OBT.***

Also, we are working on a GIS database as a part of the overall project and you mentioned that you have a GIS data base for some of the signal and ITS information reference could we get a copy of what you have to incorporate into ours?

If you have any questions please give me a call.

Thanks,

KATIE KING, P.E.
ITS/Traffic Engineer

METRIC ENGINEERING

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City of Maitland Data Request Information

FDOT District 5 – ITS Master Plan
Stakeholder Meeting – Data and Information Request

Please provide the following. If you feel the following are not applicable, please notate as such. THANK YOU!!

I. Information Request - Existing Plans (Master Plans, Priority Lists, Other Planning Documents, etc.)

a. What existing plans do you have (can copies be provided)?
b. Can you provide plans for existing deployments?
c. Do you have any projects currently in development? Can you please provide a list and description?
d. How many Traffic Signals do you maintain? – 29
    i. Which controllers do you currently have deployed (type (i.e. 170, 2080), manufacturer (i.e. Peek, Naztec), version)? Do you have plans to replace any of the existing controllers? Is so, to what? Do you have a standard controller specification? – The City of Maitland has a variation of signal controllers (Peek 1880EL, Eagle M03, M40, M50).
e. How many ITS devices do you maintain? What type? – None
f. How many of these traffic signals are interconnected? – We have communications on Orlando Avenue (US 17/92) from Park Avenue to Mayo Avenue/Greenwood Drive (8 signals); it is a combination of fiber and copper. Maitland Boulevard (SR 414) at Maitland Avenue has a Master Controller that communicates with Maitland Avenue at Marion Way and Maitland Avenue at Sandspur Road.
g. What type of communication is used for the interconnection (fiber, copper, or wireless)? How many miles of interconnection do you have by type. – A combination of fiber and copper on US 17/92 (a total distance of approximately 1.75 miles).
h. What type of network is used? Please describe the topology and types of devices.
i. Are any/all of your traffic signals connected back to an operations center? – No
    i. Do you have a central software system to control the traffic signals? – No Which vendor and version to you currently use? Are there any plans for upgrades?
j. In the big scheme of things in your County or City, how are traffic Signals and ITS viewed by the administration? – Administration recognizes the importance of

traffic signals being properly timed and maintained. Our goal is for the administration to support the financial planning for ITS.

k. Do you have any GPS/Shape File information for any of the above referenced information?

II. Information Request - Operations and Maintenance

a. Do you maintain traffic signals and interconnect in-house or via contract? – Contract
b. If you maintain in-house, what is your dedicated staff for responsibilities (quantity and qualifications)? – N/A
c. If you operate signals/signal system from the operations center, what is your dedicated staff for this responsibility (quantity and qualifications)? – N/A
d. What is your annual traffic signal/signal system budget for maintenance and operations? – $129,400 (FY 2016)
e. What is the source of your annual maintenance and operations budget? – General fund
f. For you to succeed and advance with traffic signal maintenance and traffic signal system operations, what is your greatest barrier and what is needed to overcome? – Staffing, the need for new technology and software, lack of communication along US 17/92 between Maitland and Winter Park signals. Funding and support from administration are needed to overcome these barriers.
g. What type of security standards do you have? How do you manage cabinet access? Are you open to a standard outside of a No. 2 key? – Police has access to police door/panel. Consultants coordinate access with signal maintenance contractor. City Transportation Engineer uses No. 2 key. The City is open to a standard outside of a No. 2 key.

III. Information Request - Staffing

a. How many people operate your traffic/ITS system? What level is each staff member (i.e. engineer, tech., etc.)? – Engineer (1) and Signal Contractor (2 Techs)
    i. Signals? – Engineer (1) and Signal Contractor (2 Techs)
    ii. ITS?
b. Who or how many people maintain the network? What level is each staff member (i.e. engineer, tech., etc.)? – Engineer (1) and Signal Contractor (2 Techs)
c. Please provide an overview of what positions are employed by the agency and how many hours/week? (Please provide salary if possible). – Engineer (1), 40 hours per week
d. Please provide an overview of what positions are provided by contract and how many hours/week? (Please provide salary if possible). – Signal Contractor (2 Techs), number of hours per week varies

IV. Information Request – Transportation Data

a. What kind of current transportation data (i.e. all modes) is useful to the departments (i.e. Planning, Transportation, Events, Transit, etc.) in your agency? – Turning movement counts (TMC), traffic volume counts, speed, delay, travel times, crash data, transit schedules, SunRail ridership, pedestrian accessibility and safety.

b. What kind of transportation data (i.e. all modes) would be useful in the future to the departments (i.e. Planning, Transportation, Events, Transit, etc.) in your agency? – Data sharing between transportation agencies to optimize the use of data, feedback on and assessment of performance measures, emergency response times.

c. Do you currently have or use any transportation models, either for planning, or signal timing? – City is in the process of buying Synchro software.

City of Orlando Data Request Information

FDOT District 5 – ITS Master Plan
Stakeholder Meeting – Data and Information Request

Please provide the following. If you feel the following are not applicable, please notate as such. THANK YOU!!

I. **Information Request - Existing Plans (Master Plans, Priority Lists, Other Planning Documents, etc.)**

a. What existing plans do you have (can copies be provided)?

We have as-built plans for three projects (ITS Phase I, ITS Phase II, and Miscellaneous Fiber) that built out most of the City's existing communication infrastructure.

b. Can you provide plans for existing deployments?

If copies of the above mentioned plans are desired, provide a FTP link.

c. Do you have any projects currently in development? Can you please provide a list and description?

The City has an internal project currently in deployment that is providing additional upgrades beyond that covered in the three above mentioned projects. A list of intersections is available and could be provided upon request by the Traffic Signal Maintenance shop.

d. How many Traffic Signals do you maintain?

By my count as of today – we maintain 537 traffic signals.

i. Which controllers do you currently have deployed (type (i.e. 170, 2080), manufacturer (i.e. Peek, Naztec), version)? Do you have plans to replace any of the existing controllers? Is so, to what? Do you have a standard controller specification?

All Naztec controllers (mix of serial, NEMA, and soon to have ATC). Current signalization general notes call for all new controllers to be latest version of the Naztec 980 ATC Type 1 controller with full Ethernet functionality.

e. How many ITS devices do you maintain? What type?

CCTV's – 101

DMS's - 11

f. How many of these traffic signals are interconnected?

By my count as of today – we communicate with 85% of the traffic signals within our ATMS.now system.

g. What type of communication is used for the interconnection (fiber, copper, or wireless)? How many miles of interconnection do you have by type.

We communicate mostly through fiber but still have some legacy copper systems and radio systems (around the Orlando International Airport).

The City does not have an up to date inventory that would easily be able to identify the number of miles of interconnection.

h. What type of network is used? Please describe the topology and types of devices.

The City has both a Layer 3 (Hub switches) and Layer 2 (signal cabinet switches) network. The Hub switches are Juniper and the Layer 2 switches are a mix of ITS Express and Dell.

i. Are any/all of your traffic signals connected back to an operations center?

From the Traffic Management Center, we communicate with 85% of our traffic signals.

    i. Do you have a central software system to control the traffic signals? Which vendor and version to you currently use? Are there any plans for upgrades?

Trafficware's ATMS.now (Version 1). In discussions with Trafficware about upgrading to latest version (2.x).

j. In the big scheme of things in your County or City, how are traffic Signals and ITS viewed by the administration?

With a high degree of importance as reflected by the City of Orlando having the only local agency that operates a TMC on a 24/7 basis and an Event Management Center during the management of certain downtown events such as Orlando Magic games.

k. Do you have any GIS/Shape File information for any of the above referenced information?

The City has a GIS layer showing location of traffic signals, school flashers, and flashing beacons. The symbology for this layer is currently being updated by our GIS group.

There is a layer for communications infrastructure but it is not up to date.

II. Information Request - Operations and Maintenance

a. Do you maintain traffic signals and interconnect in-house or via contract?

Both

b. If you maintain in-house, what is your dedicated staff for responsibilities (quantity and qualifications)?

The City's signal shop has one manager, two supervisors (one of which pulls double duty and acts as our ITS network layer three technician), one locator, and six existing technicians that are crossed trained to maintain all of our traffic signals ITS devices and perform traffic signal inspections. Two additional technicians are in the process of being hired. We do not currently have designated technicians for ITS or networking. We do not maintain street lighting.

c. If you operate signals/signal system from the operations center, what is your dedicated staff for this responsibility (quantity and qualifications)?

The City's 24/7 TMC has one full-time Manager, one full-time Re-timing Engineer, and five full time operators. Two additional operators are in the process of being hired.

d. What is your annual traffic signal/signal system budget for maintenance and operations?

Last fiscal year, Traffic Signal Maintenance had an annual budget of $1,067,584.00 and the Traffic Management Center had an annual budget of $705,678.00.

e. What is the source of your annual maintenance and operations budget?

City of Orlando General fund and annual maintenance contracts with FDOT, Greater Orlando Aviation Authority, and CFX. In addition, the signal shop gets some revenue from the Orlando Fire Department for maintenance of Opticom equipment at intersections.

f. For you to succeed and advance with traffic signal maintenance and traffic signal system operations, what is your greatest barrier and what is needed to overcome?

Additional funding and staffing.

g. What type of security standards do you have? How do you manage cabinet access? Are you open to a standard outside of a No. 2 key?

The City's cabinets have both No. 2 key locks as well as pad locks. The policy of the City of Orlando Transportation Engineering Division is a City traffic signal technician must be present whenever a contractor or consultant opens any traffic signal cabinet. Exceptions to this are locations where a portable security camera has been installed inside of a cabinet to monitor the activities of the contractor.

The signal shop has expressed an interest in cyber locks.

III. Information Request - Staffing

a. How many people operate your traffic/ITS system? What level is each staff member (i.e. engineer, tech., etc.)?
    i. Signals? See answer to II.b above
    ii. ITS? See answer to II.b above
b. Who or how many people maintain the network? What level is each staff member (i.e. engineer, tech., etc.)? See answer to II.b above
c. Please provide an overview of what positions are employed by the agency and how many hours/week? (Please provide salary if possible). See answer to II.b above. All listed staff work 40 hours/week.
d. Please provide an overview of what positions are provided by contract and how many hours/week? (Please provide salary if possible). No positions at either the signal shop or TMC are provided by contract.

IV. Information Request – Transportation Data

a. What kind of current transportation data (i.e. all modes) is useful to the departments (i.e. Planning, Transportation, Events, Transit, etc.) in your agency?

All data listed is good to have but only useful if the staff is available to review and make management and operations decisions from.

b. What kind of transportation data (i.e. all modes) would be useful in the future to the departments (i.e. Planning, Transportation, Events, Transit, etc.) in your agency?

See above answer.

c. Do you currently have or use any transportation models, either for planning, or signal timing?

The City has existing Synchro models for a number of existing corridors and Networks (e.g., Downtown).

City of Winter Park Data Request Information

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FOOT District 5 -ITS Master Plan
Stakeholder Meeting -Data and Information Request

Please provide the following. If you feel the following are not applicable, please notate as such. THANK YOU!!

I. Information Request - Existing Plans (Master Plans, Priority lists, Other Planning Documents, etc.)

a. What existing plans do you have (can copies be provided)?
Comprehensive Plan (available on City website)
1792 Master Plan and Lee Road Extension

b. Can you provide plans for existing deployments? **YES. 1792 Master Plan and Lee Road Extension**

c. Do you have any projects currently in development? Can you please provide a list and description? **YES. Lee Road extension east of 1792 is part of a Whole Foods development. The 1792 Lee Road signal will be modified from an existing 3 way intersection to a 4 way intersection. At the east end of the Lee Road extension a new 3 way traffic signal is being constructed at Webster Ave. The Ravaudage development also at Lee Road and 1792 is proposing two new traffic signals, one at Bennett Road and Lee Road, the other on 1792 at or near Glendon Parkway.**

d. How many Traffic Signals do you maintain? **The City maintains 47 traffic signals.**
   1. Which controllers do you currently have deployed (type (i.e. 170, 2080), manufacturer (i.e. Peek, Naztec), version)? **Eagle EPAC M50**. Do you have plans to replace any of the existing controllers? **NO** Is so, to what? Do you have a standard controller specification? **YES, Eagle EPAC M50 NEMA**

e. How many ITS devices do you maintain? **7 ITS devices**
What type? **Master controllers**

f. How many of these traffic signals are interconnected?
25 signals in 7 separate closed loop systems

g. What type of communication is used for the interconnection (fiber, **copper**, or wireless)? How many miles of interconnection do you have by type? **3.28 miles copper**

h. What type of network is used? Please describe the topology and types of devices. **N/A**

i. Are any/all of your traffic signals connected back to an operations center? **NO**
   1. Do you have a central software system to control the traffic signals? **NO**
   Which vendor and version to you currently use? Are there any plans for upgrades? **N/A**

j. In the big scheme of things in your County or City, how are traffic Signals and ITS viewed by the administration? **The City would accept any technology to improve traffic flow.**

k. Do you have any GPS/Shape File information for any of the above referenced information? **YES, traffic signal locations.**

II. Information Request - Operations and Maintenance

a. Do you maintain traffic signals and interconnect in-house or via contract? **The City maintains traffic signals in-house.**

b. If you maintain in-house, what is your dedicated staff for responsibilities (quantity and qualifications)? **1 Traffic Signal Technician – full time, 1 Traffic Signal Technician – part time, 1 Traffic Signal Maintenance contractor – annual Continuing Services contract for backup**

c. If you operate signals/signal system from the operations center, what is your dedicated staff for this responsibility (quantity and qualifications)? **NO**

d. What is your annual traffic signal/signal system budget for maintenance and operations? **CIP $55k, Maintenance $25k, Salaries $100k**

e. What is the source of your annual maintenance and operations budget? **City General Fund**

f. For you to succeed and advance with traffic signal maintenance and traffic signal system operations, what is your greatest barrier and what is needed to overcome? **Funding for planning, design, and construction.**

g. What type of security standards do you have? How do you manage cabinet access? Are you open to a standard outside of a No. 2 key? **The City cabinets open with the standard key. We would consider more security with less access.**

III. Information Request - Staffing

a. How many people operate your traffic/ITS system? What level is each staff member (i.e. engineer, tech., etc.)?

1. Signals? **1 Traffic Manager and 1-1/2 Traffic Signal Technicians**
2. ITS? **1 Traffic Manager and 1-1/2 Traffic Signal Technicians**

b. Who or how many people maintain the network? What level is each staff member (i.e. engineer, tech., etc.)? **1 Traffic Manager and 1-1/2 Traffic Signal Technicians**

c. Please provide an overview of what positions are employed by the agency and how many hours/week? (Please provide salary if possible). **1 Traffic Manager and 1-1/2 Traffic Signal Technicians**

d. Please provide an overview of what positions are provided by contract and how many hours/week? (Please provide salary if possible). **1 annual Continuing Services Traffic Signal Contractor**

IV. Information Request -Transportation Data

a. What kind of current transportation data (i.e. all modes) is useful to the departments (i.e. Planning, Transportation, Events, Transit, etc.) in your agency? **Traffic counts conducted on a regular basis that include: 24 hour volume counts, speeds, direction, 15 minute increment numbers, vehicle types, 85^{th} percentile speeds, peak hour factors.**

b. What kind of transportation data (i.e. all modes) would be useful in the future to the departments (i.e. Planning, Transportation, Events, Transit, etc.) in your agency? **Traffic counts conducted on a regular basis that include: 24 hour volume counts, speeds, direction, 15 minute increment numbers, vehicle types, 85^{th} percentile speeds, peak hour factors.**

c. Do you currently have or use any transportation models, either for planning, or signal timing? **YES. 1) Synchro for signal timing. 2) OUATS (Orlando Urban Area Transportation Study. 3) FSUTMS (Florida Standard Urban Transportation Modeling Structure)**

CITY OF CULTURE AND HERITAGE

City of Winter Park
401 South Park Ave.
Winter Park, FL. 32789
cityofwinterpark.org

Wayne (Butch) Margraf
Traffic Manager
Public Works/Engineering

407.599.3411

CFX Data Request Information

FDOT District 5 – ITS Master Plan
Stakeholder Meeting – Data and Information Request

Please provide the following. If you feel the following are not applicable, please notate as such. THANK YOU!!

I. Information Request - Existing Plans (Master Plans, Priority Lists, Other Planning Documents, etc.)

a. What existing plans do you have (can copies be provided)? Upgrade of single-line DMS at mainline toll plazas, deployment of wrong-way driving detection at additional selected ramps. Plans for specific projects can be provided upon request.
b. Can you provide plans for existing deployments? Plans for specific projects can be provided upon request.
c. Do you have any projects currently in development? Can you please provide a list and description? See list of upcoming projects at the end of the document.
d. How many Traffic Signals do you maintain? N/A
    i. Which controllers do you currently have deployed (type (i.e. 170, 2080), manufacturer (i.e. Peek, Naztec), version)? Do you have plans to replace any of the existing controllers? Is so, to what? Do you have a standard controller specification?
e. How many ITS devices do you maintain? What type?
    i. Approx. 178 Cohu analog dome cameras (replacing with HD cameras on a rolling basis)
    ii. Approx. 162 Sirit 6204 AVI readers
    iii. Approx. 36 Skyline 66 mm amber 3-line DMS
    iv. Approx. 5 Daktronics 20 mm color DMS
    v. 52 Skyline 66 mm amber 1-line DMS (to be replaced with Daktronics 20 mm color in 2016)
    vi. Approx. 400 Wavetronix HD
f. How many of these traffic signals are interconnected? N/A
g. What type of communication is used for the interconnection (**fiber**, copper, or wireless)? How many miles of interconnection do you have by type. Approx. 200 miles.

h. What type of network is used? Please describe the topology and types of devices. Gigabit Ethernet ring topology. Ruggedcom edge switches, Extreme Networks core switches.
i. Are any/all of your traffic signals connected back to an operations center? Video and ITS devices are controlled at the FDOT D5 RTMC. Secondary control available at CFX HQ.
    i. Do you have a central software system to control the traffic signals? Which vendor and version to you currently use? Are there any plans for upgrades? SunGuide 6.1.
j. In the big scheme of things in your County or City, how are traffic Signals and ITS viewed by the administration? Favorably.
k. Do you have any GPS/Shape File information for any of the above referenced information? Yes.

II. Information Request - Operations and Maintenance

a. Do you maintain traffic signals and interconnect in-house or via contract? Via contract.
b. If you maintain in-house, what is your dedicated staff for responsibilities (quantity and qualifications)? N/A
c. If you operate signals/signal system from the operations center, what is your dedicated staff for this responsibility (quantity and qualifications)? Primarily managed by general engineering consultant.
d. What is your annual traffic signal/signal system budget for maintenance and operations? $2M
e. What is the source of your annual maintenance and operations budget? Toll revenue.
f. For you to succeed and advance with traffic signal maintenance and traffic signal system operations, what is your greatest barrier and what is needed to overcome?
g. What type of security standards do you have? How do you manage cabinet access? Are you open to a standard outside of a No. 2 key? Mixture of physical security and network security strategies. CFX will be deploying electronic locks on field cabinets in 2016.

III. Information Request – Staffing primarily managed by general engineering consultant

a. How many people operate your traffic/ITS system? What level is each staff member (i.e. engineer, tech., etc.)?
    i. Signals?
    ii. ITS?

b. Who or how many people maintain the network? What level is each staff member (i.e. engineer, tech., etc.)?
c. Please provide an overview of what positions are employed by the agency and how many hours/week? (Please provide salary if possible).
d. Please provide an overview of what positions are provided by contract and how many hours/week? (Please provide salary if possible).

IV. Information Request – Transportation Data

a. What kind of current transportation data (i.e. all modes) is useful to the departments (i.e. Planning, Transportation, Events, Transit, etc.) in your agency?
Link travel times, link speeds, spot speeds, volumes.
b. What kind of transportation data (i.e. all modes) would be useful in the future to the departments (i.e. Planning, Transportation, Events, Transit, etc.) in your agency?
c. Do you currently have or use any transportation models, either for planning, or signal timing?

Upcoming Projects (see five year work plan for details):

- ITS Network Upgrade (Phase II)
- Wekiva Parkway CCTV Deployment (sections 1A and 1B)
- Wekiva Parkway CCTV Deployment (sections 2A, 2B, and 2C)
- Supplemental DCS and CCTV Deployment
- Wrong-Way Driving Countermeasures
- Connected Vehicles Pilot Project
- Single-Line DMS Upgrade
- CCTV Camera Upgrades
- Systemwide Tone Wire Upgrades

I-4 Mobility Partners Data Request Information

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FDOT District 5 – ITS Master Plan
Stakeholder Meeting – Data and Information Request

Please provide the following. If you feel the following are not applicable, please notate as such. THANK YOU!!

I. Information Request - Existing Plans (Master Plans, Priority Lists, Other Planning Documents, etc.)

a. What existing plans do you have (can copies be provided)? All proposed I-4 plans have been made available to MEI via FDOT review process.
b. Can you provide plans for existing deployments? N/A
c. Do you have any projects currently in development? Can you please provide a list and description? N/A
d. How many Traffic Signals do you maintain? N/A
    i. Which controllers do you currently have deployed (type (i.e. 170, 2080), manufacturer (i.e. Peek, Naztec), version)? Do you have plans to replace any of the existing controllers? Is so, to what? Do you have a standard controller specification?
e. How many ITS devices do you maintain? What type? Anticipate installation of the following (as of 12/29/15):

MVDS	185
DMS (walk in)	30
DMS (front access)	120
CCTV	130
Switches	TBD – some debate about this currently.

All devices to be maintained by I4MP with exception of ~20 new CCTVs to be installed for the City of Orlando (not accounted for in the figure above). Also does not include devices to be installed on SR-408. Quantities not finalized & may be subject to change.

f. How many of these traffic signals are interconnected? N/A
g. What type of communication is used for the interconnection (fiber, copper, or wireless)? How many miles of interconnection do you have by type. Estimated

100+ miles of fiber to be installed between trunkline, drops, & composite feeder cables to media cabinets. Does not include non-FDOT fiber.

h. What type of network is used? Please describe the topology and types of devices. Can't tell you yet.
i. Are any/all of your traffic signals connected back to an operations center? N/A
    i. Do you have a central software system to control the traffic signals? Which vendor and version to you currently use? Are there any plans for upgrades?
j. In the big scheme of things in your County or City, how are traffic Signals and ITS viewed by the administration? N/A
k. Do you have any GPS/Shape File information for any of the above referenced information? N/A

II. Information Request - Operations and Maintenance

a. Do you maintain traffic signals and interconnect in-house or via contract? N/A
b. If you maintain in-house, what is your dedicated staff for responsibilities (quantity and qualifications)? N/A
c. If you operate signals/signal system from the operations center, what is your dedicated staff for this responsibility (quantity and qualifications)? N/A
d. What is your annual traffic signal/signal system budget for maintenance and operations? N/A
e. What is the source of your annual maintenance and operations budget? N/A
f. For you to succeed and advance with traffic signal maintenance and traffic signal system operations, what is your greatest barrier and what is needed to overcome? N/A
g. What type of security standards do you have? How do you manage cabinet access? Are you open to a standard outside of a No. 2 key? N/A

III. Information Request - Staffing

a. How many people operate your traffic/ITS system? What level is each staff member (i.e. engineer, tech., etc.)?
    i. Signals? N/A
    ii. ITS? N/A – to be operated by FDOT
b. Who or how many people maintain the network? What level is each staff member (i.e. engineer, tech., etc.)? N/A
c. Please provide an overview of what positions are employed by the agency and how many hours/week? (Please provide salary if possible). N/A
d. Please provide an overview of what positions are provided by contract and how many hours/week? (Please provide salary if possible). N/A

IV. Information Request – Transportation Data

a. What kind of current transportation data (i.e. all modes) is useful to the departments (i.e. Planning, Transportation, Events, Transit, etc.) in your agency? N/A

b. What kind of transportation data (i.e. all modes) would be useful in the future to the departments (i.e. Planning, Transportation, Events, Transit, etc.) in your agency? N/A

c. Do you currently have or use any transportation models, either for planning, or signal timing? N/A

VOTRAN Data Request Information

Katherine King

From: Heather Blanck <hblanck@volusia.org>
Sent: Friday, January 29, 2016 1:37 PM
To: Katherine King
Subject: Re: D5 ITS Master Plan - VOTRAN

Katie - I have responded to the best of my ability. I noticed that you marked MDP, when it should be MDT for mobile data terminal.

TASK 1

The purpose of Task 1 is to document any existing planning information, including:
Do you have an existing ITS Master Plan or a list of prioritized transit projects coming up? If yes can we please get a copy.
Although there is not an ITS master plan, the list of prioritized transit projects is in our current TDP http://www.votran.org/core/fileparse.php/5218/urlt/FinalTDP.pdf

TASK 2

The purpose of task 2 is to document and summarize existing and future device deployments, including:

- Total Number of Transit ITS devices maintained. (I left Lynx in as an example for you.)
- Number of CAD/MDT maintained (Does MDP belong with Computer Aided Dispatch or Automated Vehicle Locator? It sounded like a combination this morning.)
- Number of DMS maintained
- Number of CCTV maintained - *security cameras on each revenue vehicle: 53 paratransit vehicles each have 4 cameras and 71 fixed route vehicles each have 6 cameras*
- Number of AVL maintained - *each revenue vehicle has a AVL*
- Number of APC maintained - *each fixed route vehicle has APC equipment consisting of front door and back door sensors*
- Number of TSP maintained (I put 0 in the TSP based on our conversation this morning. If any categories don't apply please put 0.)
- Do you have any As-Built plans available in PDF for any of your transit ITS deployments and any existing GIS files. Could we please get a copy of any available? *Votran does not have as built plans. GIS files for our route maps are posted at* *http://www.votran.org/about-us/data.stml*

Summary of Transit ITS End Devices Maintained						
STAKEHOLDER	Total Transit ITS Devices	CAD/MDT	CCTV	APC	AVL	TSP
LYNX	1391	486	174	111	486	134
VOTRAN	948	124	638	62	124	0

TASK 3

The purpose of task 3 is to document and existing O&M staffing (# of full time employee includes in-house or consultant). Based on our conversation earlier this morning, could you tell us more about your staffing for:

- Maintenance of your Transit ITS devices on buses our in your office (MDT, - *The maintenance of Transit ITS devices is a contracted activity.*

- # of employees monitoring the MDT system for your real-time and recorded history data *The number of employees include all active drivers, dispatchers, supervisors and maintenance staff current estimate is 200 employees.*

Of course if you have any questions about these responses please let me know, Heather

Heather Blanck
Assistant General Manager of Planning,
Marketing, and Customer Service
Votran
950 Big Tree Road, South Daytona, FL 32119-8815
386-756-7496 ext. 4112
fax 386-756-7487
http://www.votran.org

>>> On 1/25/2016 at 11:08 AM, in message
<A1A491697E993541B8E88B39EE2D355311BB161C15@metmail3.miami.metriceng.com>, Katherine King
<KKing@metriceng.com> wrote:

Heather,
Thanks for giving me a call. Here's a revised information request based on transit related ITS devices as we discussed this morning.

TASK 1

The purpose of Task 1 is to document any existing planning information, including:
Do you have an existing ITS Master Plan or a list of prioritized transit projects coming up? If yes can we please get a copy.

TASK 2

The purpose of task 2 is to document and summarize existing and future device deployments, including:

- Total Number of Transit ITS devices maintained. (I left Lynx in as an example for you.)
- Number of CAD/MDP maintained (Does MDP belong with Computer Aided Dispatch or Automated Vehicle Locator? It sounded like a combination this morning.)
- Number of DMS maintained
- Number of CCTV maintained
- Number of AVL maintained
- Number of APC maintained
- Number of TSP maintained (I put 0 in the TSP based on our conversation this morning. If any categories don't apply please put 0.)
- Do you have any As-Built plans available in PDF for any of your transit ITS deployments and any existing GIS files. Could we please get a copy of any available?

Summary of Transit ITS End Devices Maintained

STAKEHOLDER	Total Transit ITS Devices	CAD/MDP	CCTV	APC	AVL	TSP
LYNX	1391	486	174	111	486	134
VOTRAN						0

TASK 3

The purpose of task 3 is to document and existing O&M staffing (# of full time employee includes in-house or consultant). Based on our conversation earlier this morning, could you tell us more about your staffing for:

- Maintenance of your Transit ITS devices on buses our in your office (MDP,
- # of employees monitoring the MDP system for your real-time and recorded history data

If you have any questions please give me a call.

Thanks,

KATIE KING, P.E.
ITS/Traffic Engineer

615 Crescent Executive Court Suite 524
Lake Mary, Florida 32746
Office: (407) 644-1898
Cell: (407) 924-8401
Fax: (407) 644-2376
Email: kking@metriceng.com
www.metriceng.com

River to Sea Data Request Information

FDOT District 5 – ITS Master Plan
Stakeholder Meeting – Data and Information Request

Please provide the following. If you feel the following are not applicable, please notate as such. THANK YOU!!

I. **Information Request - Existing Plans (Master Plans, Priority Lists, Other Planning Documents, etc.)**

   a. What existing plans do you have (can copies be provided)?

      The current adopted Unified Planning Work Program (UPWP) includes Task 3.11 – Intelligent Transportation System Planning (see attached). The fundamental objective of this task is to encourage and support the implementation of cost-effective Intelligent Transportation System (ITS) technologies. Only about $75,000 is currently allocated for this task.

      Our List of Priority Projects includes the New Smyrna Beach Traffic Signal Preemption Project (23 intersections). It had previously included advanced traffic signal control along the SR 40 corridor from Tymber Creek Rd to SR A1A. We expect the county will request that it be added back to the List.

   b. Can you provide plans for existing deployments? *Not applicable.*
   c. Do you have any projects currently in development? *No.* Can you please provide a list and description?
   d. How many Traffic Signals do you maintain? *Not applicable*
      i. Which controllers do you currently have deployed (type (i.e. 170, 2080), manufacturer (i.e. Peek, Naztec), version)? Do you have plans to replace any of the existing controllers? Is so, to what? Do you have a standard controller specification?
   e. How many ITS devices do you maintain? What type? *Not applicable.*
   f. How many of these traffic signals are interconnected? *Not applicable.*
   g. What type of communication is used for the interconnection (fiber, copper, or wireless)? How many miles of interconnection do you have by type. *Not applicable.*
   h. What type of network is used? Please describe the topology and types of devices. *Not applicable.*

i. Are any/all of your traffic signals connected back to an operations center? *Not applicable.*
    i. Do you have a central software system to control the traffic signals? Which vendor and version to you currently use? Are there any plans for upgrades?
j. In the big scheme of things in your County or City, how are traffic Signals and ITS viewed by the administration? *Generally ITS is viewed favorably, but is, perhaps, not well understood. There are no obvious ITS champions among policy makers and upper-level managers.*
k. Do you have any GPS/Shape File information for any of the above referenced information? *Not applicable.*

II. Information Request - Operations and Maintenance

a. Do you maintain traffic signals and interconnect in-house or via contract? *Not applicable.*
b. If you maintain in-house, what is your dedicated staff for responsibilities (quantity and qualifications)? *Not applicable.*
c. If you operate signals/signal system from the operations center, what is your dedicated staff for this responsibility (quantity and qualifications)? *Not applicable.*
d. What is your annual traffic signal/signal system budget for maintenance and operations? *Not applicable.*
e. What is the source of your annual maintenance and operations budget? *Not applicable.*
f. For you to succeed and advance with traffic signal maintenance and traffic signal system operations, what is your greatest barrier and what is needed to overcome? *Not applicable.*
g. What type of security standards do you have? How do you manage cabinet access? Are you open to a standard outside of a No. 2 key? *Not applicable.*

III. Information Request - Staffing

a. How many people operate your traffic/ITS system? *Not applicable.* What level is each staff member (i.e. engineer, tech., etc.)? *Not applicable.*
    i. Signals?
    ii. ITS?
b. Who or how many people maintain the network? What level is each staff member (i.e. engineer, tech., etc.)? *Not applicable.*
c. Please provide an overview of what positions are employed by the agency and how many hours/week? (Please provide salary if possible). *Not applicable.*

d. Please provide an overview of what positions are provided by contract and how many hours/week? (Please provide salary if possible). *Not applicable.*

IV. Information Request – Transportation Data

a. What kind of current transportation data (i.e. all modes) is useful to the departments (i.e. Planning, Transportation, Events, Transit, etc.) in your agency? *Traffic volume, trip time-of-day/day-of-week/day-of-year, percent truck traffic, bicyclist/pedestrian volume, transit boardings/deboardings by location/time-of-day/day-of-week/day-of-year.*
b. What kind of transportation data (i.e. all modes) would be useful in the future to the departments (i.e. Planning, Transportation, Events, Transit, etc.) in your agency? *Travel speed, travel time/distance, trip length, trip origin/destination.*
c. Do you currently have or use any transportation models, either for planning, or signal timing? *We use the Central Florida Regional Planning Model, but rely on FDOT and consultants to run it.*

Volusia County Data Request Information

(To be included in the next submittal)

City of Palm Coast Data Request Information

Katherine King

From: Chris Walsh <cwalsh@teds-fl.com>
Sent: Thursday, January 28, 2016 11:11 AM
To: Katherine King
Subject: FW: FDOT ITS Master Plan
Attachments: Palm Coast Signal Optimization Study November 2015.pdf

Good morning Katie,

Here is an email of information I just received from the City of Palm Coast.

Chris

Chris J. Walsh, PE
Senior Transportation Engineer

Traffic Engineering Data Solutions, Inc.
80 Spring Vista Drive
DeBary, Florida 32713
386.753.0558 (o) 386.801.5682 (c)
cwalsh@teds-fl.com
www.teds-fl.com

From: Sean Castello [mailto:SCastello@palmcoastgov.com]
Sent: Thursday, January 28, 2016 11:05 AM
To: 'cwalsh@TEDS-fl.com' <cwalsh@TEDS-fl.com>
Subject: FW: FDOT ITS Master Plan

TASK 1

The purpose of Task 1 is to document any existing planning information, including:

- ITS/ATMS Master Plan – **No but we have a Concept of Operations Report completed in December 2015**
- Project Priority List – **Priority Signals in Concept of Operations Report**
- The FDOT District 5 ITS Master Plan Data and Information Request Form – **No**
- Other Planning Documents

EXISTING PLANNING DOCUMENTS				
Y= Yes Document Provided, N = Document Not Available, SN = Still Needed, (XXXX) = Year				
STAKEHOLDER	ITS/ATMS Master Plan	Priority List	FDOT District 5 ITS Master Plan Data and Information Request Form	Other Planning Documents
Palm Coast	Y (2015)	Y	SN	N

TASK 2

The purpose of task 2 is to document and summarize existing and future device deployments, including:

- Existing ITS Plans – **Concept of Operations Report completed in December 2015**
- Existing Signal System Data – **No**
- Future ITS/Signal Deployments (Already Funded) – **No**
- Existing GIS Files – **Fiber Only**

Existing and Future Device Deployment Plans Yes (Y), No (N), Still Needed (SN), Not Applicable (NA)				
STAKEHOLDER	Existing ITS Device Plans Provided	Existing Signal System Data Provided	Future ITS/Signal Deployment Plans Provided	Existing GIS Shape Files Provided
Palm Coast	Y	N	N	Y

- Miles of FOC
- Total Number of ITS devices maintained
- Number of CCTV maintained – **installed but not functional yet**
- Number of DMS maintained
- Number of MVDS maintained
- Number of Bluetooth maintained

Summary of ITS Devices Maintained						
STAKEHOLDER	Miles of Fiber Optic Cable	Total ITS Devices	CCTV	DMS	MVDSs	Bluetooth
Palm Coast	40	0	7	0	0	0

- Number of Signals Maintained
- Number of Signals interconnected
- Type of Communication
- Type of Network Used
- Central Software System
- Type of Signal Controller

Existing Signal System Summary						
STAKEHOLDER	Number of Signals Maintained	Number of Signals Interconnected	Type of Communication for Interconnection	Type of Network Used	Central Software System	Type Contr
Palm Coast	50	0	Fiber in the Future	NA	NA	Traffic W Peek 3 TRANSYT

TASK 3

The purpose of task 3 is to document and existing O&M staffing (includes in-house or consultant).

- Network Maintenance
- Existing Traffic Signal Maintenance

- TMC Staffing

Existing Traffic Signal Maintenance and TMC Staffing							
STAKEHOLDER	Traffic Engineering Operations Manager	Senior Traffic Signal Engineer	Traffic Signal Engineer	Traffic Signal Analysts / Technician	Network Engineer	TMC Manager / ITS Engineer	Traffic Signal Maintenance / ITS Fiber Technician
Palm Coast	1	0	0	2	0	0	0

Sean CastelloP.E.
Traffic Engineer
City of Palm Coast
160 Lake Avenue
Palm Coast, FL 32164
Tel: 386-986-4758
www.palmcoastgov.com

From: Chris Walsh [mailto:cwalsh@teds-fl.com]
Sent: Tuesday, January 05, 2016 8:46 AM
To: Sean Castello
Subject: RE: FDOT ITS Master Plan

Good morning Sean,

As part of the D5 ITS Master Plan, we are working on technical memorandums for Task 1 through Task 3 of the FDOT ITS Master Plan that summarize the existing ITS systems for all the stakeholders involved. We have not received any information from the City as of you yet. Can you please assist us with filling out the charts below by task, as soon as possible. Please note that below is a sample of information from Orange County to help you better understand what we are looking for (create a new row in each table with your information). We are more than happy to assist, if possible:

In the Stakeholder Meeting – Data and Information request, we had requested copies of any plans, GIS databases, etc. If you have copies of any of this information, it would also be great (as discussed at our meeting, if uncertain whether or not we may want a copy of something, go ahead and provide a copy….we can filter through anything you provide).

If you have any questions please give me a call.

Thank you,

Chris

Chris J. Walsh, PE

Senior Transportation Engineer

Traffic Engineering Data Solutions, Inc.
80 Spring Vista Drive
DeBary, Florida 32713
386.753.0558 (o) 386.801.5682 (c)
cwalsh@teds-fl.com
www.teds-fl.com

From: Chris Walsh [mailto:cwalsh@teds-fl.com]
Sent: Monday, November 09, 2015 8:22 AM
To: 'Sean Castello' <SCastello@palmcoastgov.com>
Subject: RE: FDOT ITS Master Plan

Good morning Sean,

Here's the information request form we provided.

Chris

Chris J. Walsh, PE
Senior Transportation Engineer

Traffic Engineering Data Solutions, Inc.
80 Spring Vista Drive
DeBary, Florida 32713
386.753.0558 (o) 386.801.5682 (c)
cwalsh@teds-fl.com
www.teds-fl.com

From: Sean Castello [mailto:SCastello@palmcoastgov.com]
Sent: Friday, November 06, 2015 4:38 PM
To: 'Chris Walsh' <cwalsh@teds-fl.com>
Subject: RE: FDOT ITS Master Plan

Chris,

Can you please resend it to me? I will begin filling it out once I get it.

Sean Castello P.E.
Traffic Engineer
City of Palm Coast
160 Lake Avenue
Palm Coast, FL 32164
Tel: 386-986-4758
www.palmcoastgov.com

From: Chris Walsh [mailto:cwalsh@teds-fl.com]
Sent: Friday, October 30, 2015 4:03 PM
To: Sean Castello
Subject: FDOT ITS Master Plan

Good afternoon Sean,

I wanted to follow up to see when you think you will be able to pull the information together that we had requested at our meeting regarding the FDOT ITS Master Plan. As a reminder, the information desired was conveyed on one of the forms we provided at the meeting (that form should also be included on your calendar as an attachment to the meeting appointment).

Have a great weekend!

Chris

Chris J. Walsh, PE
Senior Transportation Engineer

Traffic Engineering Data Solutions, Inc.
80 Spring Vista Drive
DeBary, Florida 32713
386.753.0558 (o) 386.801.5682 (c)
cwalsh@teds-fl.com
www.teds-fl.com

City of Daytona Beach Data Request Information

Katherine King

From: Chris Walsh <cwalsh@teds-fl.com>
Sent: Friday, September 11, 2015 10:03 AM
To: Dale Cody
Cc: Jessica Renfrow; Jessica Moses; fferrell@teds-fl.com
Subject: FW: FDOT D5 - ITS Master Plan Data & Information Request

Dale,

We received the following from Daytona Beach. I am going to follow up with Darren to see if we can get the existing plans, descriptions of projects under I. c., expand on item 1g., and see if they have salary information. Also, with regard to item IV, can you please clarify what it is we are looking to understand for items a. and b. Also, under item c. regarding the model, what do you classify as a model? Typically I would think of Cube/FSUTMS…but do you think of Synchro to time a corridor as a model?

Thanks

Chris J. Walsh, PE
Senior Transportation Engineer

Traffic Engineering Data Solutions, Inc.
80 Spring Vista Drive
DeBary, Florida 32713
386.753.0558 (o) 386.801.5682 (c)
cwalsh@teds-fl.com
www.teds-fl.com

From: Greer, Darren [mailto:greerd@codb.us]
Sent: Thursday, September 10, 2015 1:00 PM
To: 'Walsh, Chris'
Subject: FDOT D5 - ITS Master Plan Data & Information Request

Chris,
See below for the answers to the questionnaire. Sorry for not getting this to you on the 9th

I. Information - Existing Plans
  a. Some plans are available
  b. Would provide any plans that we have available
  c.
    i. Orange Av Mast Arm project in progress
    ii. ATC Controller conversion ongoing
    iii. Fiber Backbone / Ring Orange Av in progress
    iv. Video Detection
  d. 125 Signalized intersections
    Trafficware (Naztec)
    i. 980 Version 61 Controllers
    ii. 980 Version 76 ATC Controllers
    iii. Gradual phasing out of Version 61 to Version 76 ATC Ethernet

iv. Type 6 TS2 ATC with LCD / Ethernet

e. ITS Type & Quantity

i. CCTV Approx. 60

1. Pelco Cameras with Bosch Encoders (Phasing Out)
2. Series 300 Bosch Cameras
3. Series 500 Bosch Cameras
4. Series 7000 Bosch Cameras

ii. Iteris Video Detection Currently 1 full Intersection + 8 intersections in progress & 4 intersections in planning

iii. Wavetronix Radar Detection Currently 4 full Intersections + 5 intersections in progress this type is primarily being utilized on beachside intersections

iv. Sensys Magnetometer detection 1 full intersection and a single approach at second intersection system still being reviewed for reliability before further deployment

v. Wireless Bridge communication to one intersection

vi. Wireless Bridge in planning for two CCTV locations on new Daytona Speedway Towers (possibly utilizing 4.9 Ghz Band)

vii. Insync Adaptive Coordination in progress along 22 intersections of International Speedway Blvd (SR600)

1. FDOT / Rhythm 2 year Contract to Maintain & Monitor System Performance

viii. Layer II Network Switches at connected intersections

ix. Central System / TMC

1. Trafficware ATMS.now
2. Video System is currently VIDOS replacement of VIDOS to Genetec Core Video System is currently in progress

f. 93 intersections currently connected to TMC

g. 1 wireless bridge the rest are fiber interconnect

h. Primarily a Star topology utilizing

i. Yes, Trafficware ATMS Version 2.1 currently set to upgrade to version 2.3

j. Favorable

k. Not at this time

II. Information – M & O

a. In-house

b. Staff Information

i. Traffic Division Administrator, Admin, TMC Operations as needed

ii. 1 - Sr. Signal Technician IMSA Level III, Licensed Journeyman Electrician Daily Administrative work, Plans review, communication w/ FDOT and Contractors, Primary TMC operator, performs other technician M & O duties as needed

iii. 1 - Traffic Signal Technician IMSA Level III, IMSA Signal Inspection, Licensed Journeyman Electrician, Daily Traffic Signal, Streetlight & ITS System M & O, including minor fiber work, Backup TMC Operator

iv. 1 – Traffic Signal Technician IMSA Level II, Daily Traffic Signal & ITS systems M & O, including network Switch and CCTV device M & O and fiber work

v. 1 – Traffic Signal Technician IMSA Level II, Primary duties - response to public requests / complaints, Traffic Speed & Count data collection, performs Traffic Signal M & O as available, Experienced Fiber technician

c. TMC operations consist mainly of Special Events & Incident Management and performed as noted above.
d. 2.1 M for entire Traffic Division Sign, Markings, Signal, Lighting M & O, etc…
e. City General Fund
f. Budget & Staff
g. Security
    i. City I.T. Department actively monitors and evaluates network access and security. Currently I.T. has one staff member conducting security audit of network and all connected devices.
    ii. Traffic Signal Division currently operates with #2 Key access but has recently started exploring use of Cyber Key Access Management measures (FDOT is using this technology)

III. Staffing
    a. See Section II – b for this information

IV. Transportation Data
    The City does not currently have a Traffic Engineer so planning and timing changes are dependent on persons & sources qualified to make those decisions and changes outside of the division.

If you have any questions please feel free to contact me,

Darren Greer
Sr Traffic Signal Technician
City of Daytona Beach
950 Bellevue Av.
Daytona Beach FL, 32114
O (386) 671-8659
C (386) 235-4977
greerd@codb.us

Brevard County Data Request Information

FDOT District 5 – ITS Master Plan

I. a. We currently have an ITS strategic planning map, that can be provided.

b. We can provide detailed plans of the ITS county wide project specifically the adaptive portion. We don't have detailed fiber mapping for all corridors.

c. We have a fiber project on Minton Rd. from Helen to Eber that is currently being finalized. It will allow for communication to seven intersections.

We also have a construction project along Lake Andrew that will be furnishing fiber communication to five intersections.

I am currently planning a project for the connectivity of SR 46 from I-95 to US-1.

d. We maintain 111 FDOT signals, 124 Brevard County Signals, 97 City intersections. We are currently using a mixture of controllers (Naztec 980 Series and Naztec ATC Series). We would like to have all ATC controllers in the future but have no specific plans to upgrade all of them at this time. As budget allows. Our standard is the Naztec ATC controller with adaptive control capabilities.

e. I have calculated a rough estimate for these network devices; I show 651 IP addressable devices on our network. (Video Detection 88, CCTV 80, Layer II switches 150, Layer III switches/Hubs 14, Traffic Signals 149, Sensys 126, and Bluetoad 50)

f. We have 149 signals online. By March 2016 another five will come online.

g. We are utilizing fiber optic to communicate with all our network equipment, either by county fiber or joint use fiber with FDOT. It varies from 144 count, 72 count and 24-12 hybrid cable as well.

h. We are managing a Routed / Distributed Network containing Physical / Virtual lands. The layer II edge devices are segmented logically to maintain spanning tree limitations.

I. All of our online Traffic Signals are monitored back at the TMC and they are also monitored at our traffic operations maintenance yard.

We use Naztec/Traffic ware ATMS.now version 2.4 to manage our online signals. We just completed a countywide ATMS upgrade to 112 signals for adaptive control.

j. The county supports ITS signal management as well as the local cities as we can cut cost by monitoring, trouble shooting and managing signal issues remotely.

k. I am not aware of any GPS files for our ITS infrastructure, we are in the process of data collection for ITS FM. Once the data is collected we will have to complete the data entry, this has been a difficult task as staffing is very overwhelmed already.

II. a. We maintain our network in house to a certain extent; if the network issue is a structural problem then we would use one of our two maintenance contractors to have the repairs done. We try to repair all issues in house prior to calling a contractor.

b. We currently have an ITS Coordinator position and ITS technician. We also use signal staff to assist with ITS issues as needed.

c. We currently do not have staffing dedicated to just monitoring our TMC, we have joint efforts from engineers to signal staff monitoring as needed. The level III systems tech currently manages and monitors the ATMS.now, the level III systems tech has a level III signals certification and is also certified in fiber optic design, install, troubleshooting and splicing/terminating.

d. See annual budget.

e. See County Budget.

f. Staffing, budget.

g. We have a managed gateway for vendors to access their specific products or servers. The network devices have user name and passwords to access configurations/settings. We currently do not have special cabinet keys in use; all our cabinets are number two keys. I would however like to change that but it would take extra funding that we currently do not have. I would like to go with a number nine or seven key.

III. a. We have three people managing the ITS network (Transportation Engineer, ITS tech, and Level III systems tech.)

Signals -7, ITS -2, Engineer -1

b. Repeative question.

c. Positions county funded = 7, Positions state funded = 2

d. We have no contracted positions.

IIII. a.

LYNX Data Request Information

METRIC ENGINEERING
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Centennial FDOT 1915★2015

FDOT District 5 – ITS Master Plan
Stakeholder Meeting – Data and Information Request

Please provide the following. If you feel the following are not applicable, please notate as such. THANK YOU!!

I. **Information Request - Existing Plans (Master Plans, Priority Lists, Other Planning Documents, etc.)**
   a. What existing plans do you have (can copies be provided)?
      i. 2011 ITS Strategy Plan (provided)
      ii. 2012 GIS Strategic Plan (provided)
   b. Can you provide plans for existing deployments?
      i. Transit Signal Priority – All LYMMO buses on Orange and Grapefruit lines are equipped and using TSP with City of Orlando signals
   c. Do you have any projects currently in development? Can you please provide a list and description?
      i. Transit Signal Priority for fixed route (scheduled by FDOT) – Install TSP equipment (OPTICOM GPS 2101 transmitters) on 83 buses that support SunRail services in Seminole and Orange Counties in Phase 1, install on an additional 80+ buses in 2016 in Seminole and Orange Counties in Phase 2, install on an undetermined number of buses in Orange and Osceola Counties in 2017 in Phase 3 (also involve Votran buses). Note that all LYMMO buses have installation existing as part of a separate project. All new buses are ordered with the equipment separate from this deployment.
      ii. Transit Signal Priority for bus rapid transit – scheduled for 2016 – buses have Opticom GPS 2101 transmitters installed, traffic signals will be upgraded as part of Lime line expansion
      iii. Real-time Information
         1. Signage at LYNX Central Station – 2nd Quarter 2017 – install dynamic message signs at each bay to display real-time information, potentially to include video
         2. Signage at Transfer Centers – 2nd Quarter 2017 – install dynamic message signs at each bay to display real-time information
         3. Plans for real-time application or mobile friendly website are being discussed, no timeline yet for deployment

iv. NeighborLink Real-time Reservations – currently in testing, expected to deploy early 2016 – Allows customers to directly schedule on-demand demand-response trips in real-time, includes real-time updates on vehicle arrival via smartphone application

d. How many Traffic Signals do you maintain? None. TSP equipment on the buses communicate with traffic signals installed and maintained by others.
    i. Which controllers do you currently have deployed (type (i.e. 170, 2080), manufacturer (i.e. Peek, Naztec), version)? Do you have plans to replace any of the existing controllers? Is so, to what? Do you have a standard controller specification?
e. How many ITS devices do you maintain? What type? Need discussion as this is dependent upon the definition.
    i. 301 fixed route buses with computer aided dispatch, and automatic vehicle location
    ii. 118 fixed route buses with transit signal priority (sub-set of 301 buses)
    iii. Approximately 95 fixed route buses with automatic passenger counters (sub-set of 301 buses)
    iv. 16 bus rapid transit (LYMMO) buses with transit signal priority and automatic passenger counters (sub-set of 301 buses)
    v. 185 paratransit vehicles with computer aided dispatch and automatic vehicle location
    vi. 174 CCTV Cameras (only some LYMMO cameras show lanes)
        1. 52 – LYNX Central Station
        2. 35 – LYNX Operations Center
        3. 55 – LYMMO lanes and shelters
        4. 32 – Superstops (transfer stations)
f. How many of these traffic signals are interconnected? No traffic signals
g. What type of communication is used for the interconnection (fiber, copper, or wireless)? How many miles of interconnection do you have by type. Connected to City of Orlando fiber (LYNX Central Station) and FDOT fiber (LYNX Operations Center), all maintained by others
h. What type of network is used? Please describe the topology and types of devices.
i. Are any/all of your traffic signals connected back to an operations center? No traffic signals
    i. Do you have a central software system to control the traffic signals? Which vendor and version to you currently use? Are there any plans for upgrades?

j. In the big scheme of things in your County or City, how are traffic Signals and ITS viewed by the administration?
k. Do you have any GPS/Shape File information for any of the above referenced information? GIS Shape files exist for:
    i. LYNX Bus Routes
    ii. LYNX Bus Stops
    iii. LYNX NeighborLink Service Areas
    iv. Transit Centers
    v. Park and Rides (owned by others)
    vi. LYMMO BRT Routes
    vii. Future LYNX Bus Routes
    viii. USGS Infrastructure Points of Interest

II. Information Request - Operations and Maintenance

a. Do you maintain traffic signals and interconnect in-house or via contract? Do not maintain traffic signals
b. If you maintain in-house, what is your dedicated staff for responsibilities (quantity and qualifications)?
c. If you operate signals/signal system from the operations center, what is your dedicated staff for this responsibility (quantity and qualifications)?
d. What is your annual traffic signal/signal system budget for maintenance and operations?
e. What is the source of your annual maintenance and operations budget?
f. For you to succeed and advance with traffic signal maintenance and traffic signal system operations, what is your greatest barrier and what is needed to overcome?
g. What type of security standards do you have? How do you manage cabinet access? Are you open to a standard outside of a No. 2 key?

III. Information Request - Staffing

a. How many people operate your traffic/ITS system? What level is each staff member (i.e. engineer, tech., etc.)?
    i. Signals?
    ii. ITS?
        1. Senior ITS Developer – 1
        2. Geographic Information Systems – 3 (1 GIS Coordinator, 1 GIS Planning Technician, 1 GIS Analyst)
b. Who or how many people maintain the network? What level is each staff member (i.e. engineer, tech., etc.)?

1. Information Technology – 8 (1 Director, 1 Network Engineer, 1 Network Administrator, 2 Network Support Specialists, 1 Programmer, 1 Applications Analyst, 1 Telecommunication Tech Analyst)

c. Please provide an overview of what positions are employed by the agency and how many hours/week? (Please provide salary if possible). Positions are listed above, all are full-time

d. Please provide an overview of what positions are provided by contract and how many hours/week? (Please provide salary if possible). No dedicated positions by contract, support as needed for ITS, IT, and GIS

IV. Information Request – Transportation Data

a. What kind of current transportation data (i.e. all modes) is useful to the departments (i.e. Planning, Transportation, Events, Transit, etc.) in your agency?
   i. Road closures (currently pulled from FL511)
   ii. Traffic delays and incidents (currently pulled from FL511 and FHP)
   iii. Detours and construction (currently pulled from FL511)
   iv. FDOT camera video (currently received at LYNX Operations Center)

b. What kind of transportation data (i.e. all modes) would be useful in the future to the departments (i.e. Planning, Transportation, Events, Transit, etc.) in your agency?
   i. Dynamic real-time weather conditions on a corridor or bus stop basis
   ii. Real-time SunRail train locations and estimated arrivals
   iii. Emergency evacuation information (LYNX is emergency support function 1 in the Emergency Operation Centers)

c. Do you currently have or use any transportation models, either for planning, or signal timing?
   i. TBEST – ridership estimation (used for Transit Development Plan development)

City of Kissimmee Data Request Information

Katherine King

From: JAMES ARSENAULT <JARSENAULT@kissimmee.org>
Sent: Wednesday, February 17, 2016 1:04 PM
To: Katherine King
Subject: ITS master plan questions.
Attachments: INT_KIS RPL.xls; CABINET INFO - Grant Rev3 w Type VI.xlsx; Traffic Org Chart fy14-15.ppt; SKMBT_C36016021614410.pdf

Katie,

As requested below are our responses to the attached questions (SKMBT). I attached the info requested as well.

1a. We have no ITS plan for the City at this time but have requested and ATMS system to be funded through METROPLAN in the future.
1b. We have no plans so we have nothing to provide.
1c. We currently have a project in construction to replace 39 existing signal cabinets within the City limits with new ones.
1d. We currently have 15 signals in the City of Kissimmee that we maintain and we maintain the County, Saint Cloud and FDOT signals in Osceola County as well.
We are currently using a Econolite controller system. Jurisdiction – 30 COK/ 149 County / 7 Saint Cloud.
1e. We do not currently maintain any ITS devices.
1.f We have 80 signals interconnected.
1.g Interconnection by type (fiber – 72 single mode, copper, 12 SM drops to signal cabinets, length unknown)
1.h Our type of network used is Ethernet
1.i The signals connected back to the operations center through 110 ITS system locations, 70 CCTV Surveillance, 6 DMS, 34 UPS (signal cabinet).
i. The central software system is Econolite Centrax and it maintained by Osceola County.
1j. ITS is viewed by the administration as a great tool we would like to have more use of.

2a. WE maintain the signals for the entire County in house. The interconnect system is maintained by the County at this time.
2b. All staff play a part in that division. They have certifications as required and have equipment on hand as well for use.
2c. Osceola County maintains the operations center at this time. We only have a satellite location with limited ability to view only.
2d. Traffic signal system budget is unkown - Osceola County procures funds from FDOT.
2e. The budget is paid for by Osceola County, Saint Cloud, FDOT and City of Kissimmee general funds and some gas tax money as well.
2f. The greatest barrier to overcome in succeed and advance in signal maintenance is funding for maintenance staff & system improvements (design/build).
2g. Currently we use standard key #2 to open the cabinets.

3a. We do not maintain any ITS system at this time but for signals we have a staff of 11.
3c/d. For positions in the division please see attached. If you need salaries you can look at the annual budget online.

4a/b. All forms of data are/would helpful to the traffic division.
4c. We only use the transportation models set out by METROPLAN Orlando.

Hope this helps…

James Arsenault, PE
Asst. PW Dir/ City Engineer
City of Kissimmee
101 Church Street/ Suite 301
Kissimmee, FL 34741
Phone 407-518- 2177
Fax 407-518-2165

APPENDIX C

ITS Strategies

Active Traffic Management:

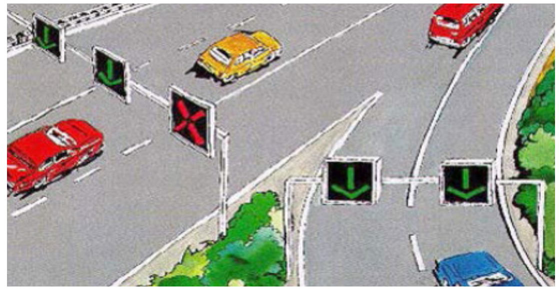
ACTIVE ARTERIAL MANAGEMENT

☐ YES ☐ NO ☐ MAYBE

Description: The use of sensors and advanced traffic signal control on major arterials. Sensors are used to collect traffic flow and travel time data, while advanced traffic signal control (TMC Operations) provides the ability to adapt signal timings to prevailing traffic conditions. A lower-cost version of active arterial management involves the use of a more limited range of sensors and less sophisticated traffic control, supported by the technical resources with a focus on maintaining traffic signal timings on a regular basis.
Implementation: FDOT District 5 has two current projects involving active arterial management.
Relevance to D5: The regional arterial network is critical to the efficient operation of the regional transportation system.

DYNAMIC JUNCTION CONTROL

☐ YES ☐ NO ☐ MAYBE



Description: A Freeway & Expressway application where Lane assignments are controlled and dynamically assigned according to traffic conditions. For example Lane access on the mainline could be varied to favor traffic joining the freeway. Similarly Lane access on ramps coming onto the freeway could also be dynamically assigned to support the prevailing traffic conditions. Sensors installed in the ramps and mainline would be used to determine traffic conditions and algorithms used to assign lanes appropriately.
Implementation: Has been applied as part of active traffic management projects on I-66 in Northern Virginia and the Washington state smarter highways project in Washington state.
Relevance to D5: Can be used to improve the operation of Freeways and Expressways by better matching demand and capacity on mainline and ramps. Relevant to I-4 and the regions toll roads.

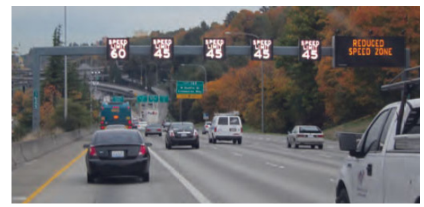
DYNAMIC LANE REVERSAL

☐ YES ☐ NO ☐ MAYBE

Description: Freeway, Expressway and arterial application. To take account of an imbalance in directional flows during the morning peak hours in the evening peak hours, lanes are dynamically reassigned using overhead variable message signs. This maximizes available capacity to the dominant traffic flow direction.
Implementation: No current implementations identified so far.
Relevance to D5: This strategy has the ability to maximize available capacity and better match to the demand for freeway and Expressway travel.

DYNAMIC LANE USE CONTROL

☐ YES ☐ NO ☐ MAYBE



Description: Making use of overhead variable message signs that are lane specific; lanes can be opened or closed depending on the location of an incident. Traffic can also be slowed down in increments in advance of the incident and directed to change lanes.
Implementation: Has been applied as part of active traffic management projects on I-66 in Northern Virginia and the Washington state smarter highways project.
Relevance to D5: This strategy has the ability to maximize available capacity and better match to the demand for freeway and Expressway travel.

DYNAMIC HIGH OCCUPANCY VEHICLE & MANAGED LANES

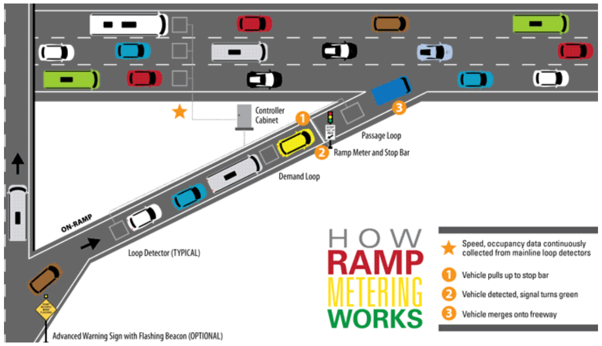
☐ YES ☐ NO ☐ MAYBE

Description: This strategy involves dynamically changing the qualifications for driving in a high-occupancy vehicle (HOV) lane(s). HOV lanes (also known as car pool lanes or diamond lanes) are restricted traffic lanes reserved at peak travel times or longer for exclusive use of vehicles with a driver and one or more passengers, including carpools, vanpools and transit buses. The normal minimum occupancy level is 2 or 3 occupants. Many agencies exempt other vehicles, including motorcycles, charter buses, emergency and law enforcement vehicles, low emission vehicles, and/or single-occupancy vehicles paying a toll. In an Active Transportation and Demand Management (ATDM) approach, the HOV lane qualifications are dynamically changed based on real-time or anticipated conditions on both the HOV and general purpose lanes. Qualifications that can potentially be dynamically adjusted include the number of occupants (e.g., from 2 to 3 occupants), the hours of operation, and the exemptions (e.g., change from typical HOV operation to buses only). Alternatively, the HOV restrictions could be dynamically removed allowing general use of the previously managed lane.
Implementation: US 290 Northwest Freeway in Houston, Texas.
Relevance to D5: This strategy has the ability to maximize available capacity and better match to the demand for freeway and Expressway travel.

Active Traffic Management (continued):

ADAPTIVE RAMP METERING

☐ YES ☐ NO ☐ MAYBE



Description: Ramp metering involves the installation of traffic signals at the end of entrance ramps to freeways and expressways. Sensors on the mainline detect prevailing traffic conditions and specially developed algorithms are used to meter traffic from the on ramp onto the mainline. This minimizes the disruption to mainline traffic flow caused by additional traffic entering at on ramps. A further evolution of this strategy involves the use of adaptive traffic signal control techniques to identify bottlenecks, automatically detect incidents and integrate the ramp meters with adjacent arterial traffic signal operations.
Implementation: Extensively on the West Coast, particularly in California by Caltrans (generally recognized as pioneers in the field); also incorporated as part of the I-4 Ultimate project in CFL, Miami-Dade and ITS projects in Los Angeles, Minneapolis, Portland and Houston.
Relevance to D5: This can optimize the operational efficiency of freeways and expressways. As traffic volumes grow across the region this strategy would be relevant as part of an overall active traffic management approach to increasing operational effectiveness and minimizing delays.

DYNAMIC MERGE CONTROL

☐ YES ☐ NO ☐ MAYBE

Description: Also known as dynamic late merger or dynamic early emerge, this technique makes use of dynamic message signs or lane control signs approaching the merge point. The signs show advisory messages that encourage motorists to display direct and cooperative merging behaviors. It is typically applied on a part-time basis during congested conditions.
Implementation: Has been implemented in the Washington state smarter highways project and I-66 active traffic management system in Northern Virginia.
Relevance to D5: Improving merging behavior will have a significant influence on intersection capacity and could be used to improve the effectiveness of traffic management on the region's freeways and arterials.

DYNAMIC SHOULDER LANES

☐ YES ☐ NO ☐ MAYBE

Description: Also known as hard shoulder running or temporary shoulder use. Sensors in the highway continuously monitor traffic conditions to determine when the hard shoulders should be brought into operation. This provides the ability for a highway to act as a high-speed facility with a safety shoulder or a lower speed, higher capacity facility, with the shoulder used as a running lane. Implementation of this strategy may also require dynamic speed control.
Implementation: Chicago Illinois has incorporated this strategy on the I-55 bus on shoulder demonstration project. This strategy is also being considered on I-4
Relevance to D5: This strategy would provide regional freeway and Expressway operators with additional flexibility to match supply and demand during peak periods.

DYNAMIC ROUTING

☐ YES ☐ NO ☐ MAYBE

Description: Can make use of roadside variable message signs to direct traffic around an incident on the mainline of freeways and arterials. Traffic sensors in the highway can also be used to detect prevailing traffic conditions on the mainline and also in diversion rights and an algorithm can be used, or manual operator intervention to dynamically change routing instructions based on congestion levels. Dynamic routing can also be achieved through the use of in vehicle information systems. In this case individual drivers can be given different rerouting instructions. Typically the private sector would provide the in vehicle equipment and the information content to be delivered to the driver. Examples of this include WAZE and recent versions of Google maps with traffic conditions information.
Implementation: Dynamic routing using variable message signs has been implemented extensively across the country in major traffic management centers controlling freeways and expressways. The private sector in vehicle version of dynamic routing also has a fairly significant market penetration nationwide.
Relevance to D5: Use of dynamic routing can significantly improve the effectiveness of incident management plans, especially for instance of regional significance. The regions transportation partners can take full advantage of this by partnering with the private sector information providers for in vehicle systems.

QUEUE WARNING

☐ YES ☐ NO ☐ MAYBE

Description: Dynamic message signs and flashing lights are used to inform motorists of queues with significant slowdowns ahead. Sensors in the highway detect traffic speeds and flows and these are passed to a specially developed algorithm that determines what messages should be displayed on various parts of the highway. This strategy might also be combined with the use of a variable speed limit system to reduce severe acceleration and deceleration on the approach to a bottleneck.
Implementation: As part of the Washington state smarter highways project, the I-66 active traffic management system in Northern Virginia and using variable speed limits on the I-285 top-end in Atlanta.
Relevance to D5: Slowdowns and bottlenecks are well documented to increase the probability of rear end collisions, particularly in nonrecurring situations. The region could adopt a strategy as a way of smoothing traffic flow and reducing the number of rear end collisions on freeways and expressways.

Advanced Parking Management:

DYNAMIC PARKING GUIDANCE AND RESERVATION

☐ *YES* ☐ *NO* ☐ *MAYBE*

Description: Sensors in both off street and on street parking slots are used to determine if the slot are available or occupied. This information is transmitted to a central back office which then transmits the information to motorists looking for a parking space. The information to the motorist could be delivered via dynamic message signs at the entrances, to parking structures, or through the use of in vehicle information technologies or smart phones. A more advanced mesh version of dynamic parking reservation would also enable motorists to make advance reservation of parking spaces for an additional fee. Motorists can also be offered guidance to navigate to available slots.
Implementation: In a number of cities across the US most notably the San Francisco Park project.
Relevance to D5: The City of Orlando has a particular challenge with respect to multiple events and the proximity of event venues to the freeway network. There is a continuing need for excellence and event management and event parking. There is also significant demand for commuter parking to service the downtown area. The City recently completed a study on this topic. This strategy can be used to improve event management to an even higher level while supporting more effective commuter parking provision.

DYNAMIC OVERFLOW TRANSIT PARKING

☐ *YES* ☐ *NO* ☐ *MAYBE*

Description: Sensors are used to monitor the availability of parking around transit facilities and park-and-ride locations. When the sensors indicate that this parking is nearing capacity, dynamic message signs and other information delivery techniques are used to guide drivers to overflow parking locations.
Implementation: No current implementations identified so far.
Relevance to D5: The strategy would improve attractiveness of public transit to regional travelers by making it easier to find a parking space convenient to transit facility. This would be particularly relevant to the SunRail project and transit partners.

FREIGHT PARKING

☐ *YES* ☐ *NO* ☐ *MAYBE*

Description: Information management systems are used to make the acquisition of a freight parking permit more efficient and effective and to provide guidance to truckers on suitable parking locations and the availability of freight parking slots.
Implementation: Being implemented on I-5 and SR 99 by Caltrans in California and on the I-95 by the I-95 corridor coalition. These implementations are being supported by a private sector information provider called ParkingCarma.
Relevance to D5: Freight movement is an important part of the CFL transportation system. The demand for freight travel generated by Florida imports will increase as the Panama Canal is widened providing direct access from the Asia-Pacific markets to the East Coast.

DYNAMICALLY PRICED PARKING

☐ *YES* ☐ *NO* ☐ *MAYBE*

Description: Making use of smart parking meter technology and communications between parking meters in a central back office, parking rates are varied according to the demand for parking. Typically the rates will be varied to achieve an occupancy rate of between 60% and 80%, which is regarded as optimum to service parking demand while minimizing the time taken to find a space.
Implementation: In San Francisco as part of the SF Park project, New York as part of the park smart project, Los Angeles as part of the express park project and San Diego as part of the quick park project.
Relevance to D5: The strategy can have a dual effect on downtown parking. In the first instance, it becomes easier to find a parking space and to maximize the utilization of parking spaces. In the second instance, this strategy will support zeroing out of parking meters when the occupant leaves, requiring the next document to pay the full price. This can have a significant impact on parking revenue.

Integrated Corridor Management:

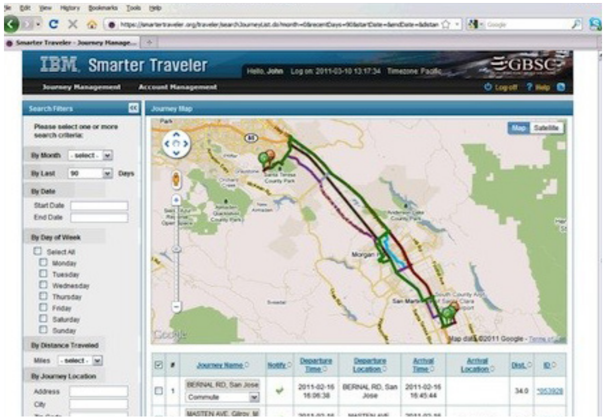
☐ *YES* ☐ *NO* ☐ *MAYBE*

Description: Involves an integrated approach to transportation along a specific designated corridor. Multiple agencies and multiple modes would be coordinated through the use of shared back office systems and the adoption of compatible strategies. Multiple roadway types within the corridor as well as transit facilities would be managed in a coordinated fashion to try to optimize transportation service delivery and align agency strategies.
Implementation: Has been implemented in San Diego, Dallas, Minneapolis. Will also be implemented in a further wave of the federal highway administration's integrated corridor management program. A locally funded integrated corridor management program is also underway in CFL under the leadership of District 5.
Relevance to D5: This strategy provides the ability to treat transportation as a single system, increase the operational efficiency of the whole transportation network and maximize the effect of transportation investments.

Traveler Information:

PREDICTIVE TRAVELER INFORMATION

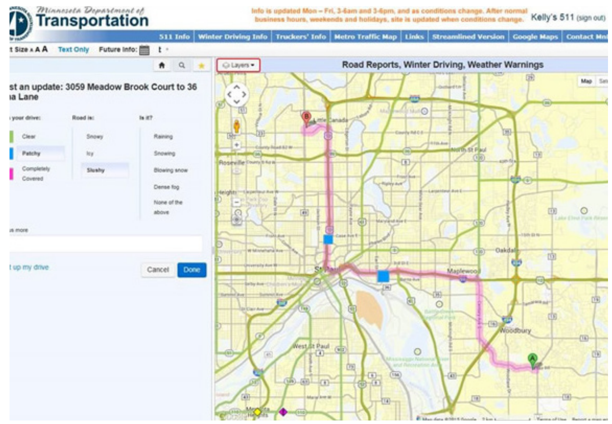
☐ *YES* ☐ *NO* ☐ *MAYBE*



Description: Data from multiple sources is fused together to create a comprehensive picture of current traffic conditions. A special purpose algorithm is then used to make short-term predictions regarding future traffic conditions. This information is supplied to drivers through a variety of information delivery techniques including roadside dynamic message signs and in vehicle information systems.
Implementation: Has been implemented by the land transport authority in Singapore using a specially developed algorithm from IBM.
Relevance to D5: This strategy improves the effectiveness of traveler information by informing drivers of conditions they are likely to encounter further along the highway, providing time for diversion and behavior adaption. The extra time bought by predictions may also improve the performance of incident management systems.

PRE-TRIP TRAVEL INFORMATION

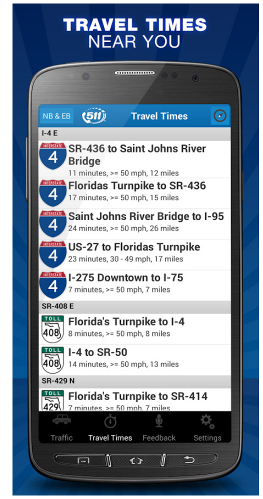
☐ *YES* ☐ *NO* ☐ *MAYBE*



Description: Data from multiple sources is used together to create a comprehensive picture of current traffic conditions. A range of information delivery techniques is then used to deliver information to regional travelers. In this particular instance, smart phones, interactive voice response and web-based systems are used to provide information before travel.
Implementation: According to FHWA pretrip traveler information is being provided within the context of 511 system deployments in more than 30 states. In addition, third parties are also providing this service to some level.
Relevance to D5: Delivering quality traveler information at the pre-trip stage allows maximum flexibility in terms of travel choice of route, mode and timing of the journey. This significantly improves traveler decision-making, making the best use of current transportation capacity in the region.

EN ROUTE DRIVER INFORMATION

☐ *YES* ☐ *NO* ☐ *MAYBE*



Description: Smart phones or in vehicle information systems are used to provide driver information during the course of the journey. Roadside dynamic message signs can also provide en route driver information to a more limited extent. The driver information is based on data from multiple sources fused together into a central database. This data is entered into information and delivered to drivers. There is significant private sector involvement in the delivery of information to drivers in vehicle and this forms part of the connected vehicle program.
Implementation: According to FHWA en route traveler information is being provided within the context of 511 system deployments in more than 30 states across the USA. Private sector entities including WAZE and Google also provide en routeinformation via smart phones on a nationwide basis.
Relevance to D5: Delivering quality traveler information en route allows drivers to improve decision making. This would optimize use of the transportation network, making the best use of current transportation capacity in the region.

ROUTE GUIDANCE

☐ *YES* ☐ *NO* ☐ *MAYBE*

Description: Smart phones and in vehicle information systems are used to provide turn by turn driving directions to enable drivers to get from origin to destination. Guidance is based on a centralized navigation database, digital maps and often takes account of current and prevailing traffic conditions.

TRAVELER SERVICES INFORMATION

☐ *YES* ☐ *NO* ☐ *MAYBE*

Description: Makes use of information management systems to create a centralized database of traveler services and reservation opportunities. This information is made available to the traveler via a range of information delivery techniques such as kiosks, smart phones and the web.
Implementation: Traveler services information is made available in more than 30 US states as part of the 511 deployments. It is also a significant activity for private sector companies such as Google.
Relevance to D5: The availability of relevant traveler services information improves the user experience and can enhance the CFL travel experience for both residents and visitors.

Dynamic Ridesharing:

☐ YES ☐ NO ☐ MAYBE

Description: Makes use of information management systems to precisely match the supply of rides to the demand for rides This enables travelers who wish to ride share to gain access to information on the possibilities.
Implementation: There are numerous examples of ridesharing systems supported by the public sector across the major cities in the USA. These include the commuter project in San Francisco, the Los Angeles smart traveler project in Los Angeles, the Bellevue smart traveler project in Washington state and the Sacramento area real-time ridesharing matching project in Sacramento. There is also significant private sector activity in this area the most prominent example of which is UBER.
Relevance to D5: Dynamic ridesharing helps with the challenge of providing cost-effective transit in major US cities including Orlando. By increasing vehicle occupancy more highway capacity can be utilized and by minimizing the number of duplicate trips being made by single occupancy vehicles, demand can be managed. This could be of particular relevance during the construction period for the I-4 ultimate project.

Dynamic Wayfinding:

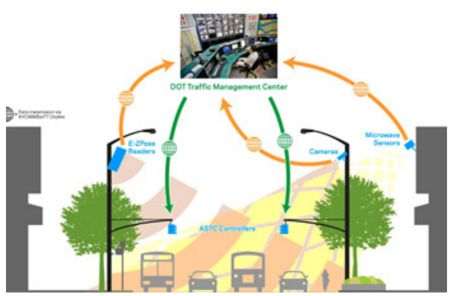
☐ YES ☐ NO ☐ MAYBE

Description: Using smart phone technology dynamic wayfinding icons and information can be superimposed on the smart phone screen enabling the user to access information regarding service possibilities in the locale or to be provided with navigation instructions to get to a specific destination.
Implementation: Typically implemented in large convention centers hotels and hospitals, the systems are used to optimize user experience.
Relevance to D5: This strategy can be integrated with other route guidance and navigation strategies to provide a comprehensive end-to-end solution to guide and support travelers from original origin to final destination. This would help to make our cities, smart cities, and improve the visitor experience.

Traffic Control:

ADAPTIVE SIGNAL CONTROL

☐ YES ☐ NO ☐ MAYBE



Description: Sensors and arterial roadways are used to measure prevailing traffic conditions. Specially developed algorithms then take this data and develop signal timings that are customized to the prevailing conditions. Traffic signal timings adapt continuously to the changes and fluctuations in traffic flows, optimizing the control of traffic that major arterial intersections.
Implementation: According to NCHRP synthesis 403 “adaptive traffic control systems: domestic and foreign state of practice” there are more than 25 major implementations of adaptive traffic signal control in the US. These include Orange County, Seminole County and Volusia County in Florida, Pinellas County in Florida and Oakland County in Michigan.
Relevance to D5: The CFL region leans heavily on arterial traffic flow as a significant part of the overall transportation network in the region. The adoption of this strategy could significantly improve traffic flow along major arterials providing benefits in time and fuel savings and an enhanced user experience.

TRANSIT SIGNAL PRIORITY

☐ YES ☐ NO ☐ MAYBE

Description: Additional sensors are installed at traffic signals that sense the presence of transit vehicles. These transit vehicles are given priority to pass through the signalized intersection. Such systems can also take a count of the number of people on board the transit vehicle and the current schedule status of the transit vehicle before deciding if priority should be granted some systems require the installation of an in vehicle unit on the transit vehicle.
Implementation: CFL, as well as in a large number of major US cities including Baltimore, Miami, Sacramento, Houston and Los Angeles.
Relevance to D5: Transit signal priority increases the attractiveness of transit to regional travelers. Widescale adoption of this strategy can increase trip time reliability for transit vehicles. This influences travelers decision-making with respect to mode of travel.

Incident Management:

☐ *YES* ☐ *NO* ☐ *MAYBE*

Description: Supports the detection, verification, clearance and traffic management associated with incidents on freeways and expressways. Makes use of CCTV, traffic sensors, telecommunications and centralized command to control a regional traffic management center.
Implementation: Incident management has been extensively implemented in Florida as well as in major US cities including San Antonio, Houston, Los Angeles, Miami and CFL.
Relevance to D5: Incident management has a significant effect on the operational efficiency of freeways and expressways. Continued adoption of this strategy will be critical to the management of both recurring and

Travel Demand Management:

☐ *YES* ☐ *NO* ☐ *MAYBE*

Description: Encompasses a range of techniques designed to influence traveler behavior by either reducing the demand for travel or spreading the demand in space and time. Travel demand management techniques include congestion pricing, ridesharing, development of transit alternatives, promotion of nonmotorized transportation such as cycling and pedestrian activities, telecommuting and land use management.
Implementation: In most major US urban areas usually under the auspices of the Metropolitan planning organization.
Relevance to D5: In order to accommodate future growth and transportation demand it will be necessary to consider travel demand management strategies in addition to capital investment programs.

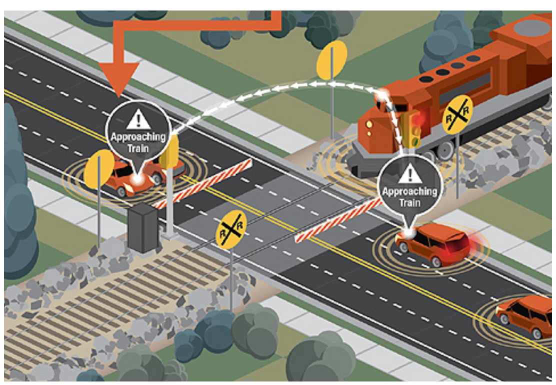
Emissions Testing and Mitigation:

☐ *YES* ☐ *NO* ☐ *MAYBE*

Description: Uses traffic and emissions sensors to determine traffic conditions and emissions levels in the vicinity of roads and highways. Based on this data algorithms are used to reroute traffic, change traffic signal timings and assist in distributing emissions. Systems can also identify high emitting vehicles and provide information to fleet operators to enable them to tune the fleet.
Implementation: Pinellas County, Florida has implemented air quality management as part of their advanced traffic management system (ATMS).
Relevance to D5: Emissions and fuel consumption are inseparable, ways in which to measure the effects of traffic particularly on arterials where acceleration and deceleration are more variable, will provide the CFL region with a more effective arterial traffic management system.

Highway Rail Intersection:

☐ *YES* ☐ *NO* ☐ *MAYBE*

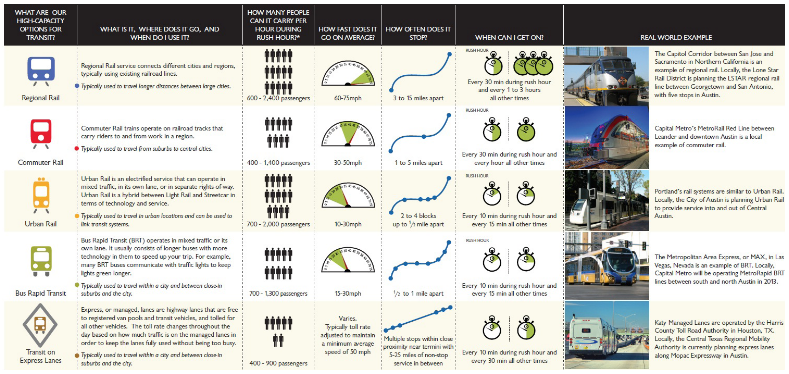


Description: The application of advanced technologies to improve safety at grade highway intersections. This strategy incorporates a number of techniques to improve the safety of the interface between the railroad and a highway. For example an automated enforcement system using sensor technology and high-resolution CCTV cameras can be used to apply enforcement when the barriers are closed. Vehicle proximity alert systems can also be used to warn drivers about the impending arrival of a train. Positive train separation techniques can also be used to automatically detect obstacles ahead of the train and apply brakes automatically. Variable message signs can also be used to warn drivers that a second train is approaching.
Implementation: Minnesota DOT, the Los Angeles County Metropolitan Transportation Authority and by the Colorado transportation technology Center.
Relevance to D5: The strategy has particular relevance to the SunRail project which encompasses a considerable number of at grade crossings. The safety of these at grade crossings could be improved by the application of the techniques encompassed by this strategy.

Public Transportation Management:

DYNAMIC TRANSIT CAPACITY ASSIGNMENT

☐ YES ☐ NO ☐ MAYBE



Description: Data is collected regarding the performance of the transit fleet and real-time demand for transit. Information management systems are then used to optimize schedules and assignment of transit vehicles based on current transit demand. This enables the transit operator to reconfigure the assignment of vehicles and drivers to address the areas of the network with peak demand, while maximizing the number of passengers on each vehicle.
Implementation: No current implementations identified so far.
Relevance to D5: This would help regional transit operators to optimize the use of vehicles and operators to reduce operating costs and maximize the user experience.

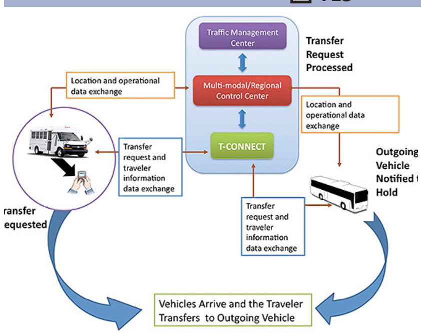
DYNAMIC FARE REDUCTION

☐ YES ☐ NO ☐ MAYBE

Description: Sensors are used to monitor traffic and transportation conditions along the corridor. In times of high congestion for private vehicle traffic, the transit fares along the corridor are reduced to encourage a switch from private vehicles to transit. Traveler information systems would communicate the fair change to the traveling public. Passenger counters and other sensors are used to establish the occupancy of transit vehicles to ensure that sufficient spare capacity exists to accommodate the anticipated shift.
Implementation: No current implementations identified so far.
Relevance to D5: As part of an integrated corridor management implementation this strategy would make transit more attractive along regional corridors in CFL. It would also provide transit operators with the flexibility to adjust vehicle and operate assignments to optimize operations and costs.

TRANSFER CONNECTION PROTECTION

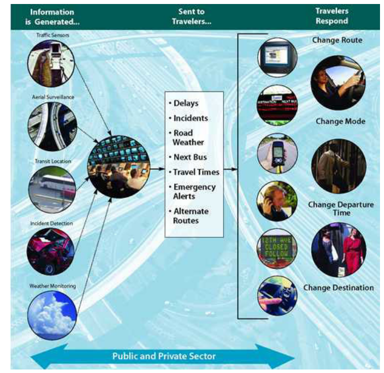
☐ YES ☐ NO ☐ MAYBE



Description: Helps to bring transit operations together as a single system by recognizing the need for travelers to make connections between routes. Travelers can request protection for their connection either using a smart phone or using onboard equipment on a personal automobile or a transit vehicle. Fleet information systems are then used to ensure that if the prior service is running late than the subsequent services are delayed to allow the travelers to make the connection successfully.
Implementation: By the Dallas area rapid transit authority in Texas.
Relevance to D5: The strategy also increases the attractiveness of transit use and could influence the model split in favor transit in the CFL region.

TRANSIT TRAVELER INFORMATION

☐ YES ☐ NO ☐ MAYBE

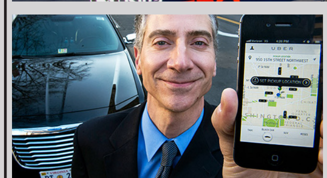


Description: Equipment on board the transit vehicle enables travelers to gain access to information regarding the current transit stop, upcoming transit stops and real-time transit schedule information. The system can also be extended to provide traveler information at bus stops and for pre-trip through use of kiosks or web-based delivery systems.
Implementation: By the Dallas area rapid transit authority in Texas.
Relevance to D5: The strategy also increases the attractiveness of transit use and could influence the model split in favor transit in the CFL region.

Personalized Public Transit:

ON DEMAND TRANSIT

☐ YES ☐ NO ☐ MAYBE



Description: Vehicles do not follow fixed routes and passenger trips are generated by reservations from passengers to the transit operator who then dispatches a vehicle. The transit operator will make use of information management systems to attempt to optimize the number of passengers picked up on each trip. Passengers may use telephone, web-based or smart phone applications to make reservations and request for travel. This strategy is particularly relevant to passengers not able to use conventional transit systems such as elderly travelers traveling to medical appointments. Private services such as SuperShuttle and Uber can be considered as on-demand transportation services.
Implementation: SuperShuttle and Uber are available nationwide. On-demand transportation or paratransit is offered in most major cities. Notable examples are pace bus Chicago and Metro access by King County Metro in Washington state.
Relevance to D5: The strategy could be useful for off-peak transit services in the CFL region. While transit operators already operate paratransit services these could be extended to wider application.

Public Travel Security:

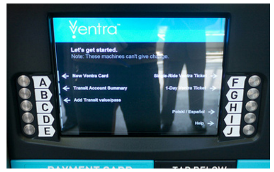
☐ *YES* ☐ *NO* ☐ *MAYBE*

Description: Using sensors, telecommunications and command-and-control, this strategy provides an increased level of travel security for the traveling public. Sensors monitor transit facilities, transit vehicles, transit stations, parking lots, bus stops and generate alarms either automatically or manually when necessary. Systems can also monitor key infrastructure such as railroad tracks, bridges and tunnels.
Implementation: By transit agencies in many major cities including the Metropolitan transit system in San Diego, CA. In addition, a security system is being upgraded to monitor the St. John's River Bridge.
Relevance to D5: The strategy addresses one of travelers concerns with respect to security on public and shared use transportation systems.

Electronic Payment Services:

REGIONAL PAYMENT SYSTEM

☐ *YES* ☐ *NO* ☐ *MAYBE*



Description: Enables regional travelers to pay for transit tickets, tolls and parking fees without the use of cash. Electronic payment devices such as smart cards or smart phone apps enable travelers to pay for a range of transportation services. The electronic payment services are managed by a central back office that manages the transactions and also handles clearance to ensure that the service provider receives the appropriate fee.
Implementation: Chicago is implementing a regional payment system for Chicago Transit Authority, Pace Bus and Metro. SunPass is also currently used for this in a limited capacity.
Relevance to D5:A regional electronic payment system would provide travelers in the CFL area with a seamless experience and a high level of convenience and paying for transit fares, parking fees and tolls. System could also allow visitors to the area to gain access to services.

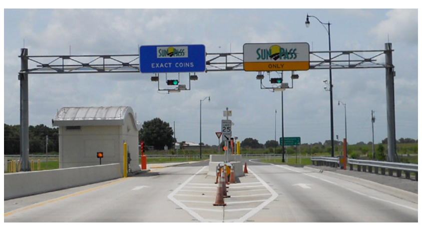
ELECTRONIC TRANSIT TICKETING

☐ *YES* ☐ *NO* ☐ *MAYBE*

Description: Enables transit travelers to pay for transit tickets without cash. The transit tickets can be on a one by one basis, weekly or monthly passes. Travelers are able to pay using a special smart card, credit card or smart phone.
Implementation: In many major cities in the US. A notable example is the Houston Metro system in Houston, TX.
Relevance to D5: Electronic transit ticketing would provide travelers in the CFL area with a higher level of convenience and customer service.

ELECTRONIC TOLL COLLECTION

☐ *YES* ☐ *NO* ☐ *MAYBE*



Description: Regional toll road users can pay for tolls without the use of cash and without the need to stop at a toll plaza. Electronic toll collection system users establish a prepaid account with the relevant toll road operator and have a specially designed transponder installed on the windshield of the vehicle. Vehicles can then pass through express lanes at toll plaza's obviating the need to stop. The prepaid account is linked to a credit card and automatic transfers are made by the back office. Alternatively, users can visit a customer service location and add cash to the prepaid account.
Implementation: Electronic toll collection has been implemented extensively in the CFL region through the SunPass system on both Florida's Turnpike Enterprise and the CFL Expressway.
Relevance to D5: Extensive deployment of electronic toll collection in the CFL region has reduced operating costs and provided a higher level of customer experience.

DYNAMIC PRICING

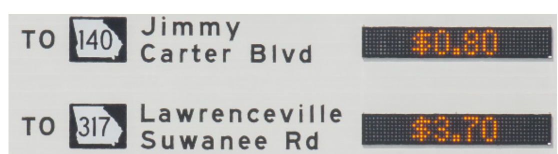
☐ *YES* ☐ *NO* ☐ *MAYBE*

Description: Electronic toll collection technologies enable the use of dynamic pricing on toll roads in the region. Pricing can vary dynamically based on time of day or sensors can be used to establish prevailing traffic conditions to drive the variation in tolls. In most cases the objective of this strategy is to maintain the target level of service on the toll road.
Implementation: Major US cities: Seattle, Atlanta, Houston, Miami and will be a part of the I-4 Ultimate project in CFL.
Relevance to D5: Provides an additional demand management tool that helps with operational efficiency and preserving customer experience.

DEMAND PRICING

☐ *YES* ☐ *NO* ☐ *MAYBE*

Description: Demand pricing is a fee or tax paid by users to enter a restricted area, usually within a city center, as part of a demand management strategy to relieve congestion within that area. In most cases, the objective of this strategy is to relieve congestion within the restricted area not only for traffic but for parking as well.
Implementation: Demand pricing can be found in London, Singapore, and Stockholm.
Relevance to D5: This strategy could be used to deter drivers from entering metropolitan areas during major events or during peak hours of the day. It would encourage users to park and ride into these restricted areas.



CORRIDOR PRICING

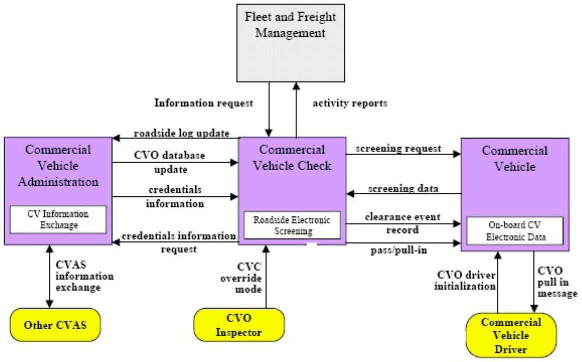
☐ *YES* ☐ *NO* ☐ *MAYBE*

Description: Dynamic pricing can also be extended to cover other modes of transportation along the corridor. In addition to tolls being varied by time of day or by prevailing traffic conditions, transit fares could also be varied and parking fees could be varied in order to conduct demand management.
Implementation: No current implementations identified so far.
Relevance to D5: Strategy provides the ability to create the balanced approach to operations and management of corridor facilities across multiple modes. It also helps to ensure that the users or travelers get the maximum value for money by supporting optimize transportation operations.

Commercial Vehicle Operations:

COMMERCIAL VEHICLE ELECTRONIC CLEARANCE

☐ YES ☐ NO ☐ MAYBE



Description: Prescreened truck drivers are entitled to equip their vehicles with an electronic transponder. This allows enforcement personnel to automatically check safety, credentials, size and weight of the vehicle prior to inspection site locations.
Implementation: A commercial vehicle electronic clearance program known as pre-pass is currently available at more than 300 facilities in 30 states.
Relevance to D5: This strategy reduces operating costs for truck companies while reducing the resources required for enforcement. Given the strategic importance of freight movement within the state of Florida, the strategy would be relevant in assisting more cost-effective freight operations.

AUTOMATED ROADSIDE SAFETY INSPECTION

☐ YES ☐ NO ☐ MAYBE

Description: Making use of data from the commercial vehicle electronic clearance strategy, this enables more selective and rapid inspections of freight vehicles and goods. Sensors and diagnostic equipment are used to check vehicle systems and driver requirements.
Implementation: No current implementations identified so far.
Relevance to D5: This strategy reduces operating costs for truck companies while reducing the resources required for inspection. Given the strategic importance of freight movement within the state of Florida, the strategy would be relevant in assisting more cost-effective freight operations.

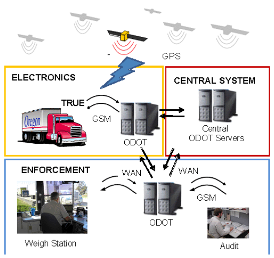
ON-BOARD SAFETY AND SECURITY MONITORING

☐ YES ☐ NO ☐ MAYBE

Description: Informs a truck driver if an unsafe situation arises during operation of the vehicle. This could include driver fatigue, problems with vehicle systems or issues related to the cargo on board the vehicle.
Implementation: No current implementations identified so far.
Relevance to D5: This strategy reduces operating costs for truck companies through accident and incident reduction. Given the strategic importance of freight movement within the state of Florida, the strategy would be relevant in assisting more cost-effective freight operations. However the major role would lie with truck operators and not local transportation agencies.

COMMERCIAL VEHICLE ADMINISTRATIVE PROCESSES

☐ YES ☐ NO ☐ MAYBE



Description: Information management systems are used to streamline the processes through which carriers purchase credentials. It also allows carriers to report fuel and mileage tax information electronically.
Implementation: FDOT is implementing as a part of their commercial vehicle information systems and networks program.
Relevance to D5: This strategy reduces operating costs for truck companies while reducing the resources required for commercial vehicle administration. Given the strategic importance of freight movement within the state of Florida, the strategy would be relevant in assisting more cost-effective freight operations.

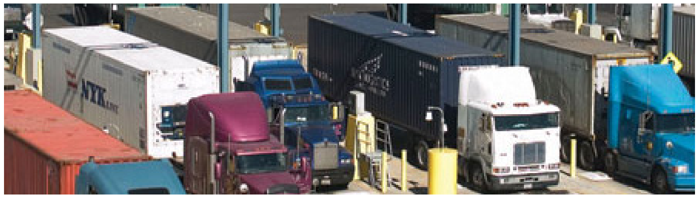
HAZARDOUS MATERIALS SECURITY AND INCIDENT RESPONSE

☐ YES ☐ NO ☐ MAYBE

Description: Through the establishment and management of a centralized hazardous materials database, this strategy enables emergency personnel at the scene of a hazardous materials incident to gain access to appropriate information on the hazardous materials involved. The strategy can also incorporate tracking of sensitive security hazardous materials shipments.
Implementation: The Hazardous Materials Information Resource System (HMIRS) is a Department of Defense (DoD) automated system developed and maintained by the Defense Logistics Agency. HMIRS is the central repository for Material Safety Data Sheets (MSDS) for the United States Government military services and civil agencies. It also contains value-added information input by the service/agency focal points.
Relevance to D5: This strategy supports more effective incident management when hazardous materials are involved. Given the level of freight movement across the state this strategy has great relevance to CFL.

FREIGHT MOBILITY

☐ YES ☐ NO ☐ MAYBE



Description: Connects drivers, dispatchers and intermodal transportation providers to enable them to take advantage of real-time traffic information, vehicle and load location, in order to optimize operations.
Implementation: It is being implemented in many states in the US that have a significant freight movement pattern. In Florida the office of freight, logistics and passenger operations has led the development of a freight mobility and trade plan for the state.
Relevance to D5: Freight mobility has an extremely high impact on the efficient operation of freight activities. The state has significant freight activity emanating from the ports forming a significant component in the state economy. Freight mobility has great relevance as a consequence.

Emergency Management:

EMERGENCY NOTIFICATION AND PERSONAL SECURITY

☐ *YES* ☐ *NO* ☐ *MAYBE*

Description: Enables travelers to notify appropriate response personnel regarding the need for assistance due to emergency or non-emergency situations. Notifications can be initiated manually or automatically based on data. This strategy also includes threat alerts secure areas and wide-area alerts to inform the public in the case of an emergency.
Implementation: Emergency notifications and private security systems have been implemented in many locations across the US. The most notable implementation come from the private sector in the form of the General Motors OnStar system. This enables drivers of suitably equipped vehicles to summon assistance in the event of an emergency and obtain access to concierge information services in non-emergency situations.
Relevance to D5: Is particularly relevant to CFL given the number of visitors with little or no knowledge of the area. CFL is also subject to severe weather and the strategy would include severe weather alerts.

EMERGENCY VEHICLE MANAGEMENT

☐ *YES* ☐ *NO* ☐ *MAYBE*

Description: Reduces the response time to incidents for emergency resources by making use of automated vehicle location and computer-aided dispatching technologies.
Implementation: Has been implemented by a large number of fire, police and ambulance services across the country. An example is the system implemented by the STAT EMS service in Michigan.
Relevance to D5: This strategy would form part of an overall incident management program for the region. The CFL region already has an incident management coalition and the activities of this group could be reinforced by emergency vehicle management systems that improve the efficiency of emergency management services in vehicle dispatch.

DISASTER RESPONSE AND EVACUATION

☐ *YES* ☐ *NO* ☐ *MAYBE*

Description: Uses ITS to enhance the ability of the surface transportation system to respond to disasters. The user service provides enhanced access to the scene for incident response personnel and resources. Provides better information about the transportation system in the vicinity of the disaster and provides more efficient and safer evacuations for the general public if needed. In addition, the transportation system includes a wealth of trained professionals and resources that constitute a portion of the disaster response. Use of ITS to prioritize, allocate and track these personnel and resources provides a more effective response to disasters.
Implementation: No current implementations identified so far.
Relevance to D5: If disaster response or recovery were needed due to a natural disaster, this strategy would help minimize confusion

Advanced Vehicle Safety Systems:

CONNECTED VEHICLES

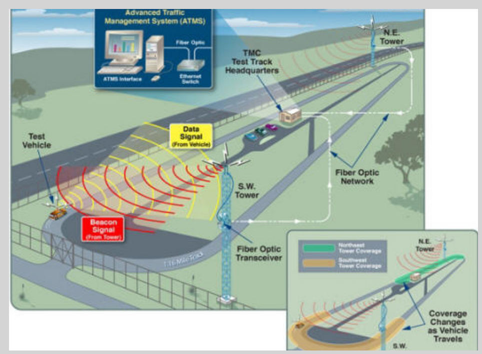
IN-VEHICLE INFORMATION

☐ *YES* ☐ *NO* ☐ *MAYBE*

Description: This strategy involves the provision of in vehicle information to drivers using connected vehicle technologies. The connected vehicle technologies could either be dedicated short range communications between the vehicle and roadside or wide-area cellular wireless technologies. The information content delivered to the driver is likely to come from private sector information providers working in cooperation with automotive suppliers. In vehicle information allows different messages to individual drivers and enables drivers to have decision quality information regarding traffic condition, routes and other service availabilities.
Implementation: Every major vehicle manufacturer with a presence in the US market is currently working on development programs for connected vehicle technologies.
Relevance to D5: Connected vehicle technologies will mainly be driven by the automotive manufacturers and their electronic suppliers. However, due to the usefulness of probe vehicle data to improve local agency understanding of traffic conditions and the ability to deliver personalized in vehicle information, make this strategy extremely relevant to CFL. It is likely that local transportation agencies will play a supporting role by encouraging automotive adoption of connected vehicle technologies, making use of data emanating from connected vehicle systems and providing additional contextual data that cannot be derived from the probe vehicle.

PROBE VEHICLE DATA

☐ *YES* ☐ *NO* ☐ *MAYBE*

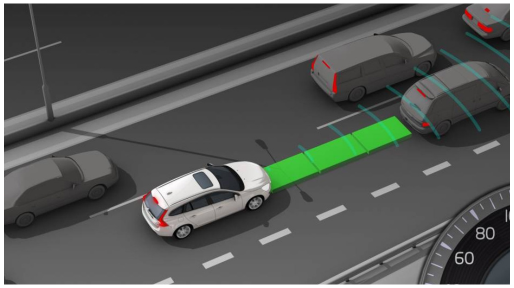


Description: This makes use of connected vehicle technology to extract data from the carrier network and make it available to a central location. The data can range from instantaneous vehicle speed, vehicle location and vehicle identification to extremely detailed information regarding the performance of the engine, the vehicle and the driver.
Implementation: Every major vehicle manufacturers with a presence in the US market is currently working on development programs for connected vehicle technologies.
Relevance to D5: Connected vehicle technologies will mainly be driven by the automotive manufacturers and their electronic suppliers. However due the usefulness of probe vehicle data to improve local agency understanding of traffic conditions and the ability to deliver personalized in vehicle information, make this strategy extremely relevant to CFL. It is likely that local transportation agencies will play a support role by encouraging automotive adoption of connected vehicle technologies, making use of data emanating from connected vehicle systems and providing additional contextual data that cannot be derived from the probe vehicle.

Advanced Vehicle Safety Systems (continued):

LONGITUDINAL COLLISION AVOIDANCE

☐ YES ☐ NO ☐ MAYBE



Description: Also known as adaptive cruise control. This strategy employs sensors on board the vehicle to detect the current speed and the distance between the vehicle and the vehicle ahead. The system can either generate an alert or automatically apply the brakes to maintain a safe distance.

LATERAL COLLISION AVOIDANCE

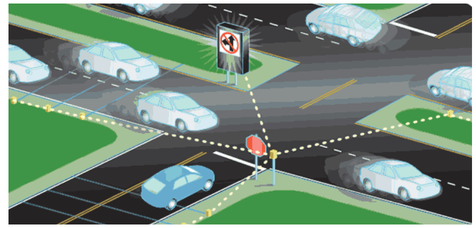
☐ YES ☐ NO ☐ MAYBE

Description: This strategy utilizes technology on board the vehicle to warn the driver of a Lane departure that might lead to a collision. Sensors on board the vehicle detect the Lane and detect the presence of other vehicles. Alerts can take the form of an audible tone or vibration of the steering wheel.

Implementation: Every major vehicle manufacturer with a presence in the US market is currently working on development programs for connected vehicle technologies.
Relevance to D5: Connected vehicle technologies will mainly be driven by the automotive manufacturers and their electronic suppliers. However due the usefulness of probe vehicle data to improve local agency understanding of traffic conditions and the ability to deliver personalized in vehicle information, make this strategy extremely relevant to CFL. It is likely that local transportation agencies will play a supporting role by encouraging automotive adoption of connected vehicle technologies, making use of data emanating from connected vehicle systems and providing additional data that cannot be derived from the probe vehicle.

INTERSECTION COLLISION AVOIDANCE

☐ YES ☐ NO ☐ MAYBE



Description: Employs high-speed wireless communications, roadside and on vehicle technology to warn drivers of any potential conflict at intersections. For example, a driver approaching an intersection too fast to stop as the light turns red can be detected and an appropriate accident mitigation strategy can be implemented such as turning the lights all red or extending the green for the drivers approach.
Implementation: This strategy is the subject of a research program currently funded by the FHA.
Relevance to D5: This strategy is particularly relevant to arterial traffic management, which is an important element in the CFL transportation network. Due to the need for cooperation between roadside equipment for traffic control and onboard vehicle equipment it will be necessary for local agencies to work together with automotive suppliers and manufacturers.

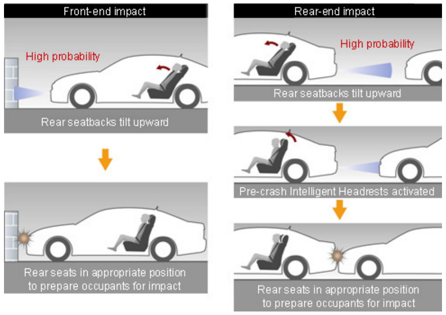
VISION ENHANCEMENT FOR CRASH AVOIDANCE

☐ YES ☐ NO ☐ MAYBE

Description: Employs night vision and heads-up displays to improve driver vision by technological enhancement.

PRE-CRASH RESTRAINT DEPLOYMENT

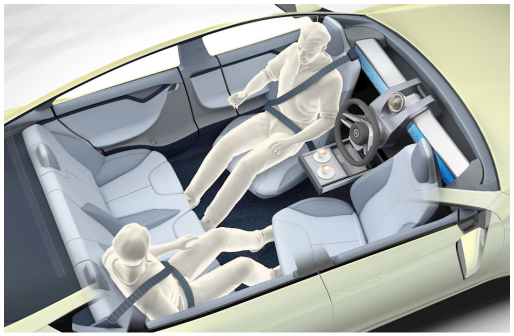
☐ YES ☐ NO ☐ MAYBE



Description: Makes use of on board sensors to anticipate vehicle crashes by measuring the angle of the steering wheel, vehicle wheels and the status of the brakes. If the crash cannot be avoided then actuators will automatically deploy additional restraints to mitigate damage to the vehicle and the passengers.

AUTOMATED VEHICLE OPERATION

☐ YES ☐ NO ☐ MAYBE



Description: Enables vehicles to be operated autonomously with no intervention from a human. This would enable autonomous demand actuated transportation services using a fleet of atonement vehicles.
Implementation: Every major vehicle manufacturer with a presence in the US market is currently working on autonomous vehicle program as well as Apple and Google. An autonomous vehicle testbed is being established on a Tampa Hillsborough County Expressway Authority toll road.
Relevance to D5: Although this will be driven by the automotive manufacturers, the potential impact of autonomous vehicles, safety efficiency and user experience make this a strategy that should be monitored closely by CFL transportation agencies.

Information Management:

ARCHIVED DATA

☐ *YES* ☐ *NO* ☐ *MAYBE*

Description: This strategy recognizes the value of data that can be generated by ITS. In particular, data from transportation operations can be brought to a centralized location and used for performance management that can be repurposed for future planning. Data is likely to be generated by multiple sources, including freeway management, traffic signal control, transit ticketing and electronic toll collection systems, among others.
Implementation: Archived data management systems have been implemented by 10 departments of transportation under a federally funded program. A notable element in this program is the system developed by Minnesota DOT.
Relevance to D5: The volume of data available to CFL transportation agencies is growing in leaps and bounds, while advances in data science help to reduce the cost of data storage and management. The region is also under continued pressure to conduct performance management on transportation and develop results driven investment programs.

DATA MANAGEMENT

BIG DATA

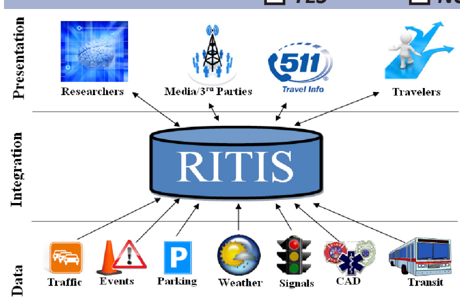
☐ *YES* ☐ *NO* ☐ *MAYBE*

Description: This strategy makes use of big data and data analytics. Techniques have been developed beyond transportation to handle the emerging big data sets that transportation systems will generate. The strategy involves data platform technology to bring together multiple disparate data sets into a common format and location. It also involves the use of discovery tools to understand patterns and trends from within the data and develop new analytics for performance management and results driven investment programs.

Implementation: The use of big data and transportation data analytics techniques is currently being studied by FDOT Central Office and by FDOT District 5.
Relevance to D5: The information that can be derived from big data holds the power to revolutionize traffic operations and transportation planning. It holds the potential for the future adoption of scientific approaches to traffic engineering and transportation management.

TRANSPORTATION DATA ANALYTICS

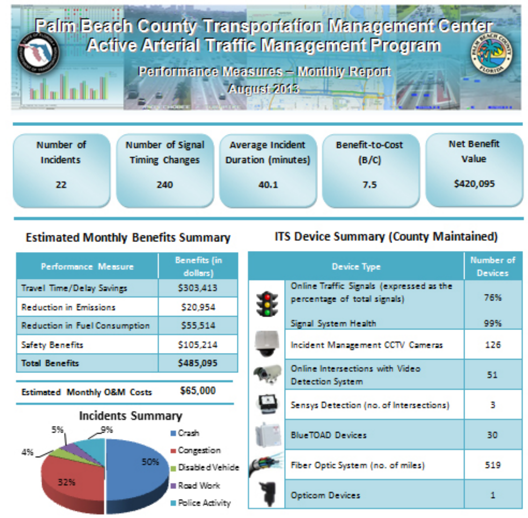
☐ *YES* ☐ *NO* ☐ *MAYBE*



Description: By taking advantage of big data handling techniques, it is possible to identify transportation data analytics that can be used to guide effective operations and planning within a region.

PERFORMANCE MANAGEMENT

☐ *YES* ☐ *NO* ☐ *MAYBE*


Palm Beach County Transportation Management Center
Active Arterial Traffic Management Program
Performance Measures – Monthly Report
August 2013

Number of Incidents	Number of Signal Timing Changes	Average Incident Duration (minutes)	Benefit-to-Cost (B/C)	Net Benefit Value
22	240	40.1	7.5	$420,095

Estimated Monthly Benefits Summary

Performance Measure	Benefits (in dollars)
Travel Time/Delay Savings	$303,413
Reduction in Emissions	$20,954
Reduction in Fuel Consumption	$55,514
Safety Benefits	$105,214
Total Benefits	$485,095

Estimated Monthly O&M Costs $65,000

Incidents Summary

Crash 50%; Congestion 32%; Disabled Vehicle 4%; Road Work 5%; Police Activity 9%

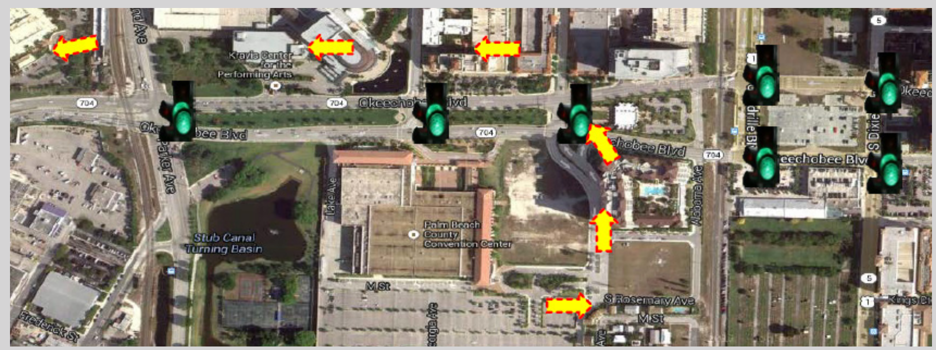
ITS Device Summary (County Maintained)

Device Type	Number of Devices
Online Traffic Signals (expressed as the percentage of total signals)	76%
Signal System Health	99%
Incident Management CCTV Cameras	126
Online Intersections with Video Detection System	51
Sensys Detection (no. of Intersections)	3
BlueTOAD Devices	30
Fiber Optic System (no. of miles)	519
Opticom Devices	1

Description: this strategy employs sensors to collect data regarding transportation system performance and a back office system to analyze performance, create reports and analytics.
Implementation: All DOT's across the US are currently planning or implementing performance management systems in reaction to the requirements of the MAP 21 legislation.
Relevance to D5: The CFL region has considerable need to maintain the efficiency and effectiveness of the transportation network. New data is becoming available that when managed correctly and converted to information, can have a significant impact on operational effectiveness and future planning.

Event Management:

☐ *YES* ☐ *NO* ☐ *MAYBE*



Description: Uses a combination of traffic control and traveler information techniques with parking management to manage the flow of transportation during major events. Typically, this will involve a traffic management center and an extensive communication network, link to sensors on the transportation network and staff directing traffic.
Implementation: The City of Orlando has a special purpose event management center in addition to the city traffic management center. For special events such as Orlando Magic games. The event management center is staffed and acts as a point of coordination to manage traffic control and traveler information.
Relevance to D5: The City of Orlando has a particular challenge with respect to multiple events and the proximity of event venues to the freeway network. There is a continues need for excellence in event management and event parking.

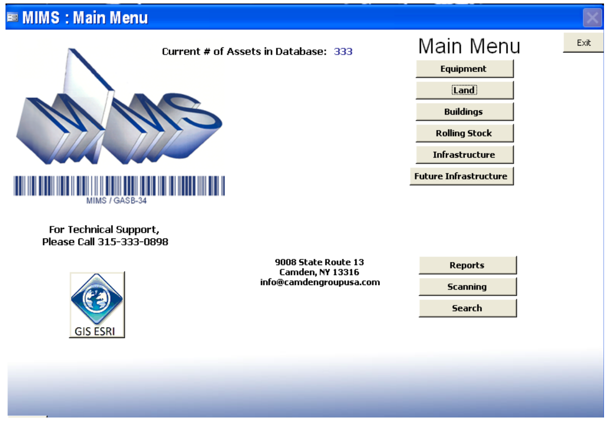
Wrong Way Driving Countermeasures:

☐ *YES* ☐ *NO* ☐ *MAYBE*

Description: Wrong way driving countermeasures use intelligent solutions like LED WRONG WAY signs on the ramps to grab the attention of wrong way drivers prior to entering the mainline. Other countermeasures include using microwave vehicle detection systems to detect wrong way drivers and alert traffic management centers and highway patrol immediately.
Implementation: Major deployments can be found in Texas, Florida, California, New Mexico, and Washington.
Relevance to D5: This strategy could be used to protect drivers of major Freeways and Expressways from wrong way drivers. Wrong way crashes, while they do not occur as often, 50% of wrong way driving crashes result in incapacitation or death, much higher than the average crash.

Asset Management Database:

☐ *YES* ☐ *NO* ☐ *MAYBE*

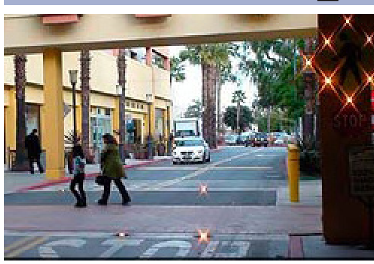


Description: ITS systems are comprised a complex network of fiber optic cable, electrical cable, wireless communications, and an array of field devices. Keeping track of the constantly changing system, whether it is expansion, maintenance, and/or upgrades is imperative. An asset management database tool would help manage the overall ITS system.
Implementation: Major deployments can be found across many US State DOTs.
Relevance to D5: An asset management database would help operate and maintain ITS deployments throughout the region.

Bicycle and Pedestrian Innovative ITS Solutions:

PEDESTRIAN SAFETY SYSTEMS

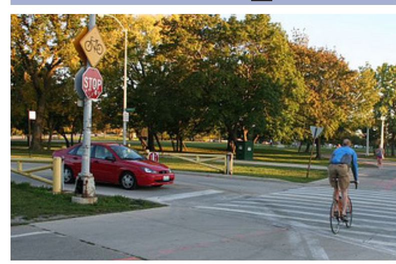
☐ *YES* ☐ *NO* ☐ *MAYBE*



Description: Bicycle and Pedestrian innovative ITS solutions focus on the safety of the users. Pedestrian Safety Systems can help protect pedestrians by activating in-pavement lighting to alert drivers as pedestrians enter crosswalks. The countdown pedestrian signal is common now, but can help let motorists and pedestrians know how much time remains to cross. Other innovative solutions include: infrared detectors or microwave detectors, which can talk back to the controller and minimize or extend clearance times, illuminated pushbuttons, accessible pedestrian signals that produce a sound, vibration, or both during the walk interval.

BICYCLE WARNING SYSTEM

☐ *YES* ☐ *NO* ☐ *MAYBE*

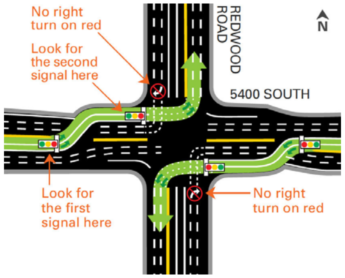


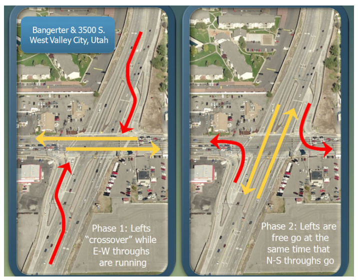
Description: Bicycle and Pedestrian innovative ITS solutions focus on the safety of the users. Bicycle warning systems can use detectors and electronic signs to identify bicycle traffic and notify motorists when a cyclist is in an upcoming segment. Other solutions include: GIS/GPS bike route mapping, bicycle safe rumble strips, trail-roadway intersections, and automated bicycle parking.

Implementation: These safety driven innovative solutions can be found in Boulder, CO; Chelan, WA; Washington D.C.; and other major cities.
Relevance to D5: Complete streets is an important legislative decision that entails planning, designing, operating, and maintaining transportation projects and systems, while keeping in mind all users – motorists, bicyclists, pedestrians, and transit. With that in mind, implementing options to ensure safety of all users is imperative.

Examples of Innovative Intersection Designs:

CONTINOUS FLOW INTERSECTIONS



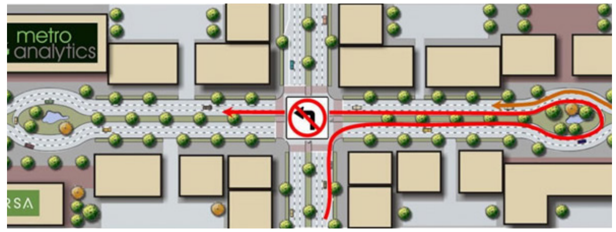


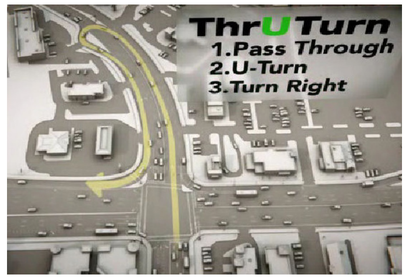
How they work: At a traditional intersection, through traffic must wait while left turns get their "arrow." The magic of a CFI is that it allows opposing lefts and throughs to occur at the same time using one signal at the main intersection, and up to four interconnected mid-block signals (one for each leg that has the CFI strategy). For example, while east-west traffic is moving, lefts on the north-south street cross-over oncoming traffic at a mid-block intersection. Then when north-south signals turn green, both through and left movements can go at the same time, because lefts are already on the opposite side of the throughs. It looks complex, but has proven simple for drivers to understand. Controlled simulations suggest that CFIs can reduce intersection delay between 20-90%, depending upon conditions at the site. Capacity or throughput also increases by 15-30% or more. Costs are expected to be about 25-50% higher than building a traditional intersection, excluding right of way costs.

TOWN CENTER INTERSECTIONS

How they work: The TCI, also known as a Split Intersection, is an intersection where one or both of the streets involved are a one-way street. Where two major arterials come together and would have normally formed a single massive, unwieldy intersection, the Town Center concept instead separates each arterial into one-way couplets, creating four small, efficient, easily manageable intersections of one-way streets that merge back to a two-way street a block or two upstream. A TCI can also involve a "triplet", which is an alignment between the couplets, perhaps used as a pedestrian mall or for transit, bikes, and on-street angle parking.

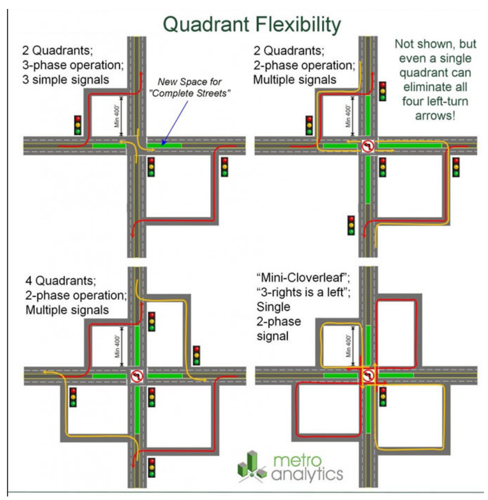
THRU-TURN INTERSECTIONS





How they work: In the diagrams, some lefts are completed as "right-U-through." Others are "through-U-right." Either way, the result is that the former left turn pocket is no longer needed, so fill it with a transitway, or whatever Place-Making architects can dream up! And since there are no left-turn arrows, the intersection can handle more traffic with significantly less delay, and it is also much easier for pedestrians to cross.

QUADRANT INTERSECTIONS



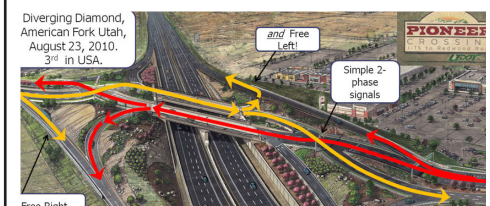
How they work: Quadrants make it easier and safer for pedestrians to cross, and they also make it possible for cars to access buildings from the back street, so you can eliminate driveways. Advantages are: Up to 40% more capacity; Level of Service B-D rather than E-F; former lefts reclaimed for center-running transit; pedestrian refuge, etc.; safer for both autos and pedestrians; expands grid connectivity; enhances and motivates TOD; often very low cost; easy access to retail; back-side auto access; compatible with traditional signals. Disadvantages: Initial confusion for drivers; resistance when adding traffic to existing residential backway; potential out of direction travel.

Innovative Intersection Design:

☐ YES ☐ NO ☐ MAYBE

Description: Innovative intersection designs are often able to reduce traffic congestion and safety concerns. There are numerous types of innovative intersection designs, some of the most commonly used are displaced left turn intersections, restricted crossing U-turn intersections, median U-turn intersections, and diverging diamond intersections at interchanges.
Implementation: Many of these designs can be found in Maryland, New York, Michigan, Louisiana, Florida, and North Carolina. Florida is currently working on installing their first diverging diamond interchange.
Relevance to D5: With mobility needs and population increasing and limited resources and right-of-way, regions need to be more creative. These intersections offer alternative ways to reduce congestion as opposed to just widening the roadways.

DIVERGING DIAMOND INTERCHANGES

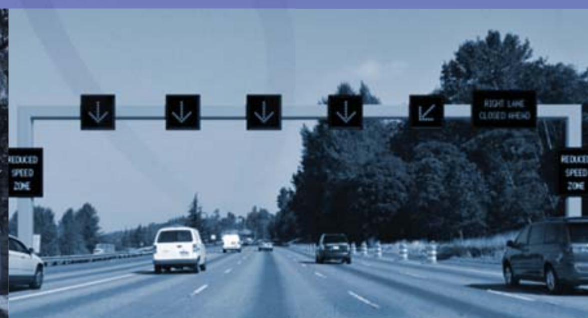


How they work: The Diverging Diamond is based on the idea that if you can eliminate the need for left-turn arrows, then signals will have maximum efficiency, fewer conflict points, and be able to serve more traffic with better safety and less congestion.

MODERN ROUNDABOUTS

How they work: The first few modern roundabouts were able to solve awkward intersections that were previously unsolvable, helping them earn a great reputation. With planters and monuments, they are attractive and help create a sense of place. They also calm oncoming traffic, which combined with far fewer conflict points, and have helped them prove to be very safe intersections for both vehicles and pedestrians.

FINAL

INTELLIGENT TRANSPORTATION SYSTEMS (ITS) MASTER PLAN