FLORIDA DEPARTMENT OF TRANSPORTATION

# TSM&O DISSEMINATOR

TRANSPORTATION SYSTEMS MANAGEMENT & OPERATIONS

March - April 2021


## LiDAR: The End-All Sensor

## FDOT District Six TSM&O Looks Back On 2020 and Sets Goals for 2021

FLORIDA DEPARTMENT OF TRANSPORTATION'S
TRAFFIC ENGINEERING AND OPERATIONS PUBLICATION

FDOT TSM&O
Transportation Systems Management & Operations

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# FDOT TRAFFIC ENGINEERING AND OPERATIONS MISSION AND VISION STATEMENTS

## MISSION

**Provide leadership and serve as a catalyst in becoming the national leader in mobility.**

## VISION

**Provide support and expertise in the application of Traffic Engineering principles and practices to improve safety and mobility.**

## Looking to be a Contributor for the Next Issue of the TSM&O Disseminator?

Email Jennifer Langford (Jennifer.Langford@dot.state.fl.us) with your story subject and title.

We would love to have your contribution be a part of the next edition.

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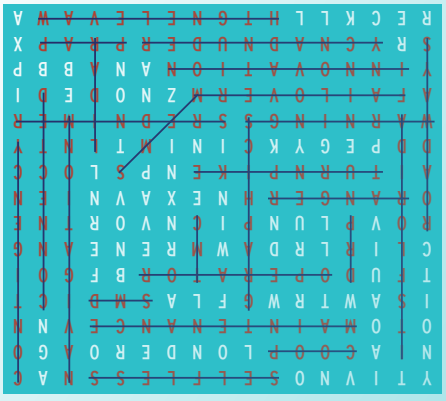


# ITS Florida Awards Road Ranger of the Year and TMC Operator of the Year to District Six Staff

*By Javier Rodriguez, District Six TSM&O Program Engineer, FDOT*

***The Intelligent Transportation Society of Florida (ITS Florida) recognized two District Six staffers with their inaugural Road Ranger of the Year and TMC Operator of the Year Awards.***

ITS Florida is one of the state's premier organizations that promotes the advancement of our industry. It hosts major conferences and recognizes the practice leaders who are moving the transportation needle forward. In 2020 the organization introduced three award categories to recognize the front-line staff that keep our roadways moving. The three award categories were Road Ranger of the Year, TMC Operator of the Year, and ITS Field Technician of the Year. Districts from across the state submitted their nominations, and District Six won two of the three categories. District Six consultant staff members Yoel Banobre and Bryan Salcedo were recognized with the Road Ranger and TMC Operator Awards, respectively.

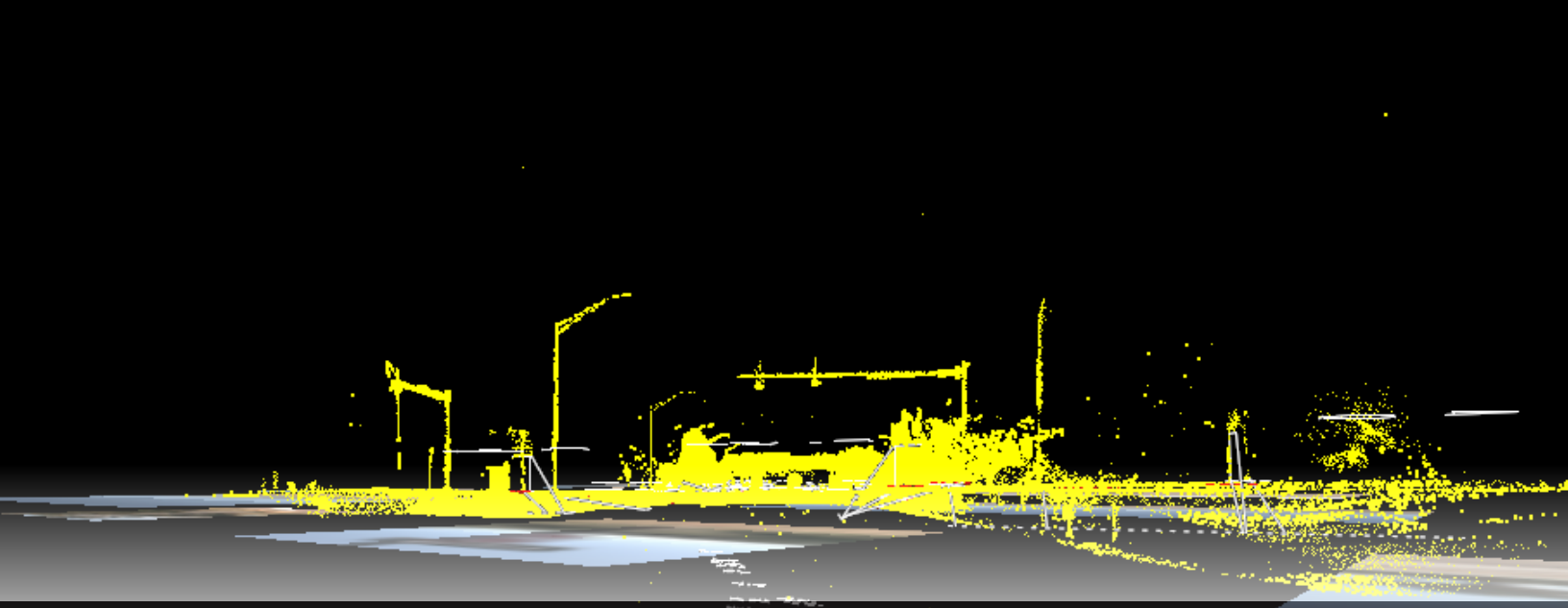
Yoel Banobre is a 21-year incident management veteran whose contributions helped to shape the fleet that services Miami-Dade County. He played a key role implementing new Road Ranger services and was part of the team that managed Florida's first express lanes pilot project. He currently oversees Florida's first Road Ranger heavy duty wrecker program and continues his education to improve his industry knowledge and management skills. He received his emergency medical technician (EMT) certification to help folks in distress and earned his hazardous materials (HAZMAT) and maintenance of traffic (MOT) certifications. Additionally, he completed the emergency vehicle operator course (EVOC), and obtained his commercial driver's license (CDL) to operate the heavy-duty wreckers.

Mr. Banobre has excelled in his position since the start and has served as a mentor and leader to all the members of his team. His extensive experience in the field, combined with his specialized knowledge, led to him obtaining several key management positions that have shaped the Road Ranger contractor services provided to the District. He is the Lead Trainer for existing and new employees and was named Assistant Project Manager on the contractor side. In this respect, he oversees the largest Road Ranger fleet in the state.

Bryan Salcedo was also recognized for his contributions to our industry. As a TMC operator, he was an early standout from the beginning of his career. Having moved to Miami from Boston, Mr. Salcedo familiarized himself with the local roadways and took immediate ownership of his role. He began educating himself on the industry and took courses to elevate his traffic operations and overall management skills. He completed police academy training and became HAZMAT, MOT, and incident management certified. His education combined with his excellent leadership qualities paid off and he was promoted to the role of 95 Express Lanes Supervisor in 2018. He has excelled in this position using his leadership skills and ability to remain calm under stressful situations.

Mr. Banobre and Mr. Salcedo have been a great value to the community for many years. They are selfless individuals who put in the daily work without ever expecting to be recognized. They are driven by their passion for helping others and for keeping our roadways safe. District Six is happy for both gentlemen and pleased they are being recognized at the state level by ITS Florida. Recognition programs like these improve employee morale and help to advance the industry from the ground up. District Six supports all organizations that promote the FDOT's mission of safe and reliable roadways and will continue to look for opportunities that support this cause.

*For more information, please contact Javier Rodriguez at (305) 640-7307 or by email at Javier.Rodriguez2@dot.state.fl.us.*

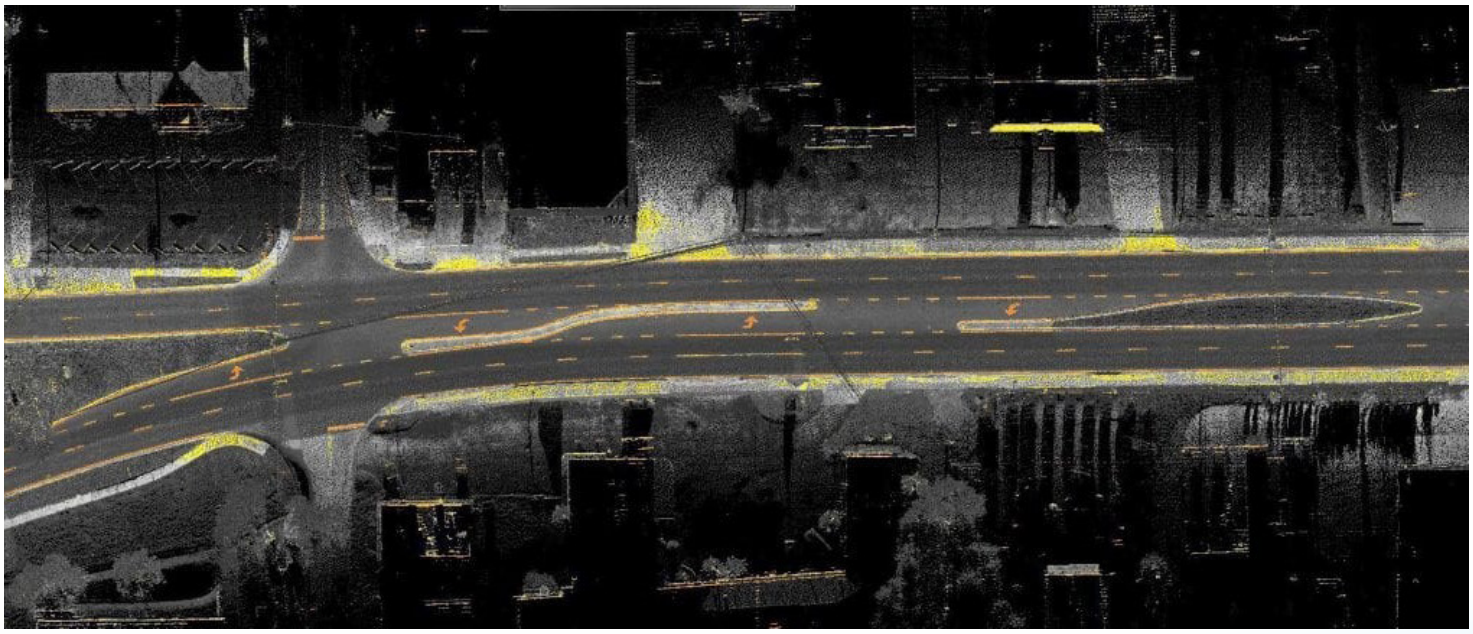


# LiDAR: The End-All Sensor

*By Adam Storm, District Two ITS/Traffic Engineer, Atkins*

Consider the following: drones, iPhone, warehouse automation, and self-driving cars. Not only do these topics make up the bulk of technology headlines these days, but they are all increasingly involved with a hardware technology called LiDAR. LiDAR is an acronym for "light detection and ranging," where sensors use the time of flight of reflected laser pulses to analyze real-world objects and produce highly accurate spatial data. Like most transportation efforts, surveyors were first to the scene and have been using LiDAR technology for years. It evolved from airborne LiDAR on planes and satellites for developing digital elevation and surface models. LiDAR has since been applied to stationary terrestrial scanning on tripods for conventional topography and to mobile LiDAR on moving vehicles paired with GPS/GNSS and cameras to survey streets, utility poles, bridges, and trees.

Once the value of LiDAR data was realized, the push for smaller, more affordable units began. High-resolution, small form factor, and scalable LiDAR sensors are currently in the innovation/early adoption phase, but the majority of the technology's market share is yet to come. For some time the technology has been disregarded as too expensive or unnecessary, especially when considered against cameras or in the context of self-driving cars. But due to recent advancements in LiDAR technology, detailed and reliable spatial data is now available at relatively low costs.

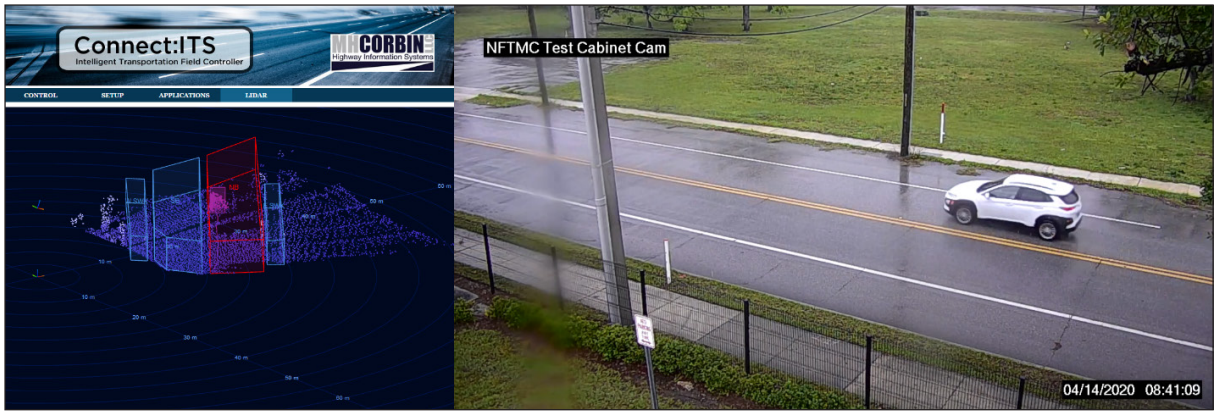


*Point cloud from a mobile LiDAR survey of US 92 in Plant City (LiDAR Magazine).*

## LiDAR: The End-All Sensor, continued from page 4

The standard LiDAR type used by terrestrial surveyors produces a scanning effect by means of an electromechanical spindle. It rotates about a vertical axis to give a 360-degree view. This method is expensive to manufacture and maintain, and the devices are quite bulky. Another type is flash LiDAR which spreads a flash of light and collects the signal that bounces back to the sensor all at once. Flash LiDAR is even more expensive due to the optical power required. However, the form that is quickly gaining intrigue in the transportation industry is solid-state. These devices typically use either microelectromechanical mirrors (MEMS) which are not completely solid-state but provide an advantageous form factor, or optical phased arrays which use a technique similar to radar. While solid-state may be emerging as the optimal solution for roadside (and automotive) sensors, the technology is still evolving and the "best" approach to LiDAR in transportation has yet to be determined. Other noteworthy technical specifications to consider include range, field of view, resolution, frequency, and wavelength.

District Two's foray into LiDAR includes a partnership with a vendor that provides a roadside edge device that can process data from various ITS devices and push outputs to dynamic message signs, beacons, web relays, or connected vehicle communications. After successful evaluation of this system using CCTV cameras, District Two acquired a LiDAR application kit to test the abilities of a roadside LiDAR system, at our technology test bed. We have since tested multiple use cases for LiDAR systems on District roads (wrong-way vehicle detection on I-295 and vulnerable road user detection and notification at a pedestrian signal) and we are excited to implement additional LiDAR technology in near-term Smart City partnerships and TSM&O projects throughout the District.




*Screen capture of the test bed LiDAR and CCTV.*

Detection technology such as cameras and radar has been used on Florida roadways for decades now, and data supplied by these sensors has become increasingly invaluable as the TSM&O Program pursues improved safety and enhanced mobility. The FDOT's successful implementation of these technologies came after great strides in innovation by outside industries. As a result, CCTV and MVDS have earned their place on every ITS deployment in Florida. LiDAR may not have reached the same level of industry advancement outside of transportation just yet, but it has the potential to replace cameras and radar for the detection applications highlighted above as well as some newer use-cases still in development around the state:

- District One plans to implement LiDAR technology for passive pedestrian detection on the US 41 FRAME project. District One is also experimenting with LiDAR for wildlife detection applications.
- District Two is further looking into LiDAR for rail detection as part of their partnership with the North Florida TPO and the City of Jacksonville to address concerns with railway crossings that block ambulances rushing to a nearby hospital.
- District Five has partnered with the University of Central Florida on a couple of projects utilizing LiDAR technology. One is an interstate research project to see how LiDAR sensors compare to video analytics and traditional radar detection to obtain traffic data like volume, occupancy, and speed. The other is the PedSafe project which further explores how pedestrian location, bearing, and speed can be communicated to connected vehicles along a corridor.
- Florida's Turnpike is evaluating the use of LiDAR for curve speed warnings, queue detection, and wrong-way vehicle detection.
- Other FDOT partners like the Central Florida Expressway, Jacksonville Transit Authority, and the University of Florida are also doing their own independent testing of LiDAR technology and how it will impact the future of TSM&O.

While Silicon Valley will continue to push the envelope on the LiDAR industry, we can play a significant role in adding "safe and sustainable infrastructure" to the list of LiDAR technologies that are making a great impact on the future of safety, mobility, and innovation.

*For more information, please contact Pete Vega at (904) 360-5463 or by email at Peter.Vega@dot.fl.state.us.*

# Strengthening Through Planning

## *An Experience with Tabletop Exercises*

*By Chrissie Collins, District One FMS/AMS Specialist IV, FDOT*

Continuity of operations is critical to the mission for intelligent transportation systems (ITS). For example, an unexpected lack of visibility on a roadway can cause delay in sending first responders to the scene of an incident, therefore jeopardizing public safety. Proper planning with a continuity of operations plan (COOP) and a disaster recovery plan (DRP) helps to lay out methods for responding to incidents, crises, and disasters, provided they are kept up-to-date and refreshed routinely with any newly added technology, people, and services.

District One Transportation Systems Management and Operations (TSM&O) ITS performed its first tabletop exercise early in 2021 using possible scenarios with the intention of identifying weaknesses not only in the existing planning documentation, but to also highlight the need for new processes or procedures needed for streamlining continuity or recovery.

Participants and stakeholders were included in the engagement not only from information technology (IT), but also from in-house and field operations, managers, supervisors, and operators. Everyone received copies of the latest versions of the COOP, DRP, and the Computer Security Incident Response Plan (CSIRP) ahead of time to review and refer to during the engagement.

The engagement started by laying out the rules, Rule #1 being, "There are no rules." The desire of the engagement was to keep the conversation as fluid as possible by letting the participants know that all questions, ideas, and suggestions were welcome. To help get the conversation started and to lay the foundation of the exercise, questions were asked such as, "What devices, software, and hardware are considered critical to operations?" and "Name some low-level, moderate, high-level, and critical systems."

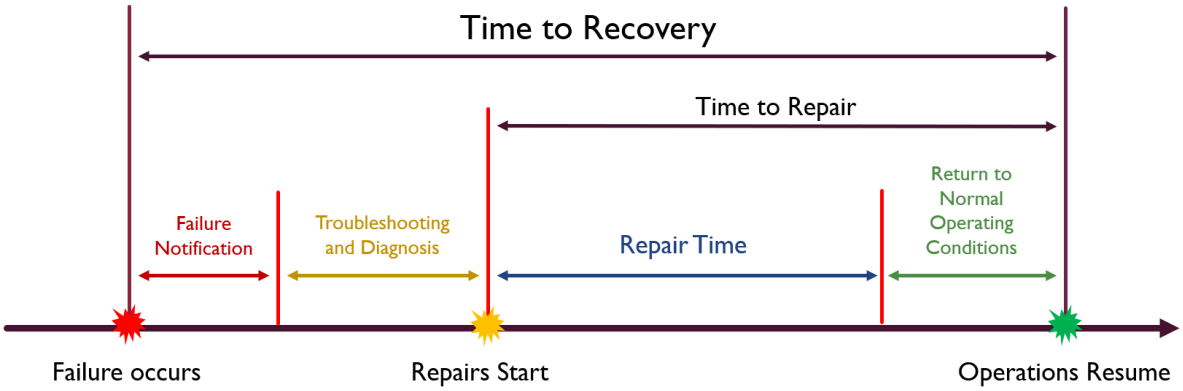
Next came a discussion about what is tolerable for the length of time between failure and recovery. If a disaster occurs that may take several hours or even days to recover from, what alternative plans exist that enable the operators to continue performing their jobs until operations are able to fully resume?

### Scenario #1

District One Florida Department of Transportation (FDOT) has two Traffic Management Centers (TMC) located approximately 100 miles apart. Redundancy and a failover plan from one center to the other are designed to continue operations but a fiber cut at a weak location could cause an issue. Some questions posed to the participants were:

- What can we do to be more proactive to prevent disruption in operations?
- What impact will there be for the satellite TMC operators for the use of SunGuide?
- Will the field devices be available to the satellite TMC users?
- Does this impact partner agencies?
- What is the contingency plan if visibility for the operators is not easily restored?

## Strengthening Through Planning: An Experience with Tabletop Exercises, cont. from page 6




Several action items came from this scenario including the need for documented processes for accessing certain devices through a web browser and the use of a VideoLAN Client (VLC), configuring virtual private network (VPN) connections for backup routes, and noting which partner agencies may be affected.

## Scenario #2

A catastrophic event such as a building fire would have a long-term effect on operations. This second scenario involved total destruction of the main TMC's building. Failover planning is executed yearly for testing failover from one facility to the other. In a real-life situation, there are other considerations such as the placement of staff and equipment. A few of the questions to start the conversation were:

- What are the first steps to take to resume operations?
- Considering this to be a long-term event, how will operators continue to perform their duties?
- How does this impact communication with Road Rangers?

The discussion led to the possibility of placing staff and equipment at the headquarters or another TMC, which posed an issue with long distances for travel. Fortunately, the recent pandemic forced the TMCs to temporarily telework and therefore, show that operators can continue performing their jobs from home during an unusual crisis. An action item came from this scenario to make sure that the alternate TMC has up-to-date contact information for Road Rangers. Another suggestion was to update the COOP to include the placement of operators and equipment.

## Scenario #3

Of all the servers, hardware and network infrastructure, SunGuide is considered critical for operations. This scenario included a perfect storm where the SunGuide database became corrupted and replicated to the database located at a satellite TMC, which then led to unforeseen issues causing a delay in restoring the system from backup. Questions leading into the conversation were:

- What is the contingency plan to monitor the roadways while recovery takes place?
- What is a tolerable level of data loss?
- What timeframe is a tolerable level between corruption and recovery?
- What are some of the steps needed to recover?

The IT staff led the discussion about the current frequency of transaction log replication and nightly backups and what operations finds acceptable for a recovery point objective (RPO). Action items like updating an existing standard operating procedure (SOP) for manually managing dynamic message signs (DMS) and closed-circuit television (CCTV) were added to the list.

## Conclusion

The exercise proved to be successful with almost a dozen action items to complete prior to a follow up meeting scheduled six weeks afterwards. Minor action items like updating SOPs, the COOP, frequency of exercises, etc., were documented with the most important follow up item being the configuration of the virtual private network (VPN) between the two centers so that either center could run seamlessly during a fiber cut. Only an hour was allotted for this event, which overflowed into an hour and a half due to the level of interaction and information shared. Lessons learned included scheduling a longer meeting and to include additional stakeholders.

*For more information, please contact Chrissie Collins at (863) 519-2262 or by email at Chrissie.Collins@dot.state.fl.us.*

# Turnpike Dynamic Message Signs Get "Graphic"

*By Mary Lou Veroline, TSM&O Technical Writer and Cherie Phillips, ITS Systems Analyst, Florida's Turnpike Enterprise*

***"Click it or Ticket", "Put it Down", "If You Drink, Don't Drive" ... all great messages! However, in today's world of communicating through emojis and memes, do drivers, especially the tech-savvy, younger ones, still "see" text on a sign? What if a colorful image was added alongside the message similar to the cone in the photo below? A little more attention-grabbing? Yes!***

Graphic-enabled signs are certainly not new to the transportation industry, but at an average materials cost of approximately $200,000 per unit, phasing them in across an entire district is not going to be a quick upgrade. Consider the numbers. Florida's Turnpike Enterprise has 213 dynamic message signs across nearly 500 miles of system roadways. Among those DMS units, many variations exist, whether in the color capability (full-color versus monochrome technology) or sign dimensions (full-size displays versus smaller displays for arterial roads and toll information).

As full-color, graphic-enabled signs are becoming more commonplace around the state, the library of images approved for use on them is also growing. From travel time advisories, to incident warnings, to safety reminders, color and images help a message leap off the sign.

Florida Turnpike leadership remains committed to upgrading its sign inventory as opportunities arise. In recent years, DMS replacements have been performed


*Graphic-enabled DMS on the Turnpike Mainline supporting an FDOT work zone awareness campaign in February 2021.*


*Travel time message on a graphic-enabled sign on FTE's Sawgrass Expressway (SR 869) in Broward County.*

## Turnpike Dynamic Message Signs Get "Graphic", continued from page 8


on the Mainline and Mainline Extension (SRs 91 and 821), Sawgrass Expressway (SR 869), Beachline Expressway (SR 528), Southern Connector/Seminole Expressway (SR 417), Veterans Expressway/Suncoast Parkway (SR 589), and Polk Parkway (SR 570). DMS replacements are also being incorporated into all future construction projects within the work program.

In 2020, the FDOT Central Office authorized the use of approved creative messaging on dynamic message signs across the state, incorporating catchy slogans aligned with holidays and special events into its traditional message library. In addition to the upgrade in verbiage, new graphic icons were also approved to accompany safety messages supporting distracted driving, speed awareness, impaired driving and work zone safety.

The images were created and tested by Turnpike personnel to ensure proper size, resolution and color palette for a variety of sign types. In creating DMS graphics, it is preferred to start with a transparent image larger than 1000 pixels to ensure a high quality finished product. For example, the speed awareness image above was created at a size of 1802x1383 and resolution of 299 pixels per inch.

The image is then resized in two variations for SunGuide, 54 pixels high and 96 pixels high to accommodate different sign dimensions. This allows TMC Operators to simply apply a message to a list of signs in SunGuide knowing that the system will select the graphic size that is best suited for each device.

The Turnpike team is currently working on a second wave of graphic icons for presentation to Central Office with the hopes of enhancing the visibility and awareness of basic life-saving safety practices. Images in development would support campaigns related to motorcycles, large trucks, emergency vehicles, and child car seats.

If your agency would like to receive the approved image files (current or future) for use on your own DMS devices, please let us know.

*For more information, please contact John Easterling at (954) 934-1620 or by email at John.Easterling@dot.state.fl.us.*

*Photo Winner for 2021 ITS Florida Calendar Cover*

# Photo Contest for ITS Florida 2022 Calendar

*By Russell Allen, Atkins and ITS Florida*

***ITS Florida is calling all members to be creative and submit photos for its award-winning calendar! ITS Florida is having its annual photo contest to select the best in Florida to be used in the 2022 ITS Florida Calendar. The calendars will be distributed by December 2021.***

## How to Enter

Please submit photographs in high-resolution, landscape* format (.jpg or .png) and a document identifying each photo with a short caption that can be used in the calendar. Please also include contact information for the submitter of the photo(s) should ITS Florida have any questions. Photos should be submitted on CD/DVD via mail delivery. The mailing address to submit photos is below. To setup an alternate means for digital submittal, please coordinate with Sandy Beck (email addresses listed below).

- Photos submitted in last year's contest may be resubmitted for consideration. ITS Florida will not automatically include any photos submitted last year into this year's contest. To be considered for this year's contest, they must be resubmitted.
- For questions, please feel free to contact Mr. Jonathan Tursky at Jonathan.Tursky@TransCore.com or Ms. Sandy Beck (contact information listed to the right).

*Photos in the Portrait format may be used as an insert only as this format does not fit the cover or monthly layout.

*Please note that all photos submitted to ITS Florida for the calendar photo contest shall become property of ITS Florida. No copyrighted photos will be accepted.

Ms. Sandy Beck
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Email: itsflorida@itsflorida.org
or
SandyBeck@tampabay.rr.com

**Deadline for submittals is Friday, July 30, 2021 by 5:00 p.m.**

# Save the Date! Transpo 2021

*By Russell Allen, Atkins and ITS Florida*

***In September of 2021, the Intelligent Transportation Society of Florida (ITS Florida) and the Florida Section of the Institute of Transportation Engineers (FSITE) will come together for a joint annual meeting.***

The six-day event will be filled with many opportunities for participants to learn and share their knowledge about all things ITS, as well as to network with fellow conference attendees. A series of sessions will be offered featuring informative presentations and challenging discussions.

Industry experts will share best practices, lessons learned, and new strategies to ensure further success of ITS and TSM&O for the Southeast. In addition, training and professional tours will be available to provide participants with the knowledge and tools necessary to effectively plan and deploy ITS technologies in their own jurisdictions.

*For more information on ITS Florida, please check the ITS Florida website at www.ITSFlorida.org or contact Ms. Sandy Beck, Chapter Administrator, at ITSFlorida@ITSFlorida.org.*

***The conference will be held September 25-30, 2021 at the Hyatt Regency Coconut Point in Bonita Springs, FL.***

***REGISTRATION COMING SOON!***

# Break Time

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DMS
TURNPIKE
GRAPHICS
WARNINGS
REMINDERS
ITS FLORIDA
RANGER
SELFLESS
OPERATOR
TMC
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MEMS
WAVELENGTH
INNOVATION
PRAP
CONNECTED
ROADWAYS
MAINTENANCE
NAVIGATION
COOP
DRP
CONTINGENCY
REDUNDANCY
FAILOVER


**"He never heard the Prius coming."**

# FDOT District Six TSM&O Looks Back On 2020 and Sets Goals for 2021

*By Javier Rodriguez, District Six TSM&O Program Engineer, FDOT*

***In 2020, the District Six Transportation Systems Management and Operations (TSM&O) Office adapted its operations to meet the unique challenges imposed by the global COVID-19 pandemic in South Florida.***

***The District began the year like any other. TSM&O staff began work on the projects outlined in their respective plans with the goal to complete another successful year. However, as news of the pandemic spread in the U.S. and Florida issued stay at home orders, it became clear 2020 would not go as planned. Despite the challenges faced in 2020, District Six achieved many of its milestones and is looking forward to another productive year in 2021.***

## Looking Back on 2020

The District Six TSM&O Office has made strides in improving operations amid the pandemic. Immediately following the first signs of the pandemic, the Department implemented a Pandemic Response Action Plan (PRAP) that included provisions for adapting staff and IT resources for remote work. The PRAP also called for instituting temperature checks, social distancing at the SunGuide Transportation Management Center, the availability and use of personal protective equipment (PPE), and more. The FDOT also developed and implemented data tools and specific reports to better understand the profound changes COVID-19 lockdowns had on its roadways. The Department also extended this approach to other aspects of its operations by consolidating data to improve decision-making and the monitoring of devices.

District Six's Traffic Incident Management (TIM) Team took a new approach to its TIM meetings in 2020. It began hosting corridor-specific meetings that divided the county by its major east and west corridors in Miami-Dade County, with the east corridor meetings focusing around Interstate 95 and the west corridor meetings around State Road 826 and Interstate 75. These meetings allowed the team to discuss the construction projects and events affecting each corridor to provide ample time to resolve the issues in a coordinated manner. The team held all meetings and trainings via a virtual platform and included a virtual survey application to ensure attendee engagement.

The Department also continued to grow its scope and responsibilities. In July, it expanded its traffic signal operations into the city of Key West, completing the task of assuming the operations and maintenance of all the traffic signals on US 1 in Monroe County. The Department also launched its Connected Incident Response Vehicle project. This project, a part of the District's connected vehicle strategy, provides motorists with valuable roadway incident information through navigation apps.

## Looking Forward to 2021

Looking ahead to 2021, the Department will continue its expansion into arterial roadway management and its innovative connected vehicle efforts. It will continue to manage District Six roadways to meet the changing needs of South Florida as it continues to move forward amid this pandemic.

*For more information, please contact Javier Rodriguez at (305) 640-7307 or by email at Javier.Rodriguez2@dot.state.fl.us.*

# ITS Florida Awards ITS Field Technician of the Year to District Seven Staff Member

*By Scott Teal, TransCore and ITS Florida*

The Intelligent Transportation Society of Florida (ITS Florida) recognized Charles Schultz as the 2020 ITS Field Technician of the Year. Charles Schultz is the Lead ITS Technician in the Tampa office. He has been in the ITS/Tolls industry for 14 years with experience in troubleshooting and repairing both ITS and Tolling field devices. Currently, he is assigned to the Florida Department of Transportation District Seven ITS Device Management Contract, where he oversees the daily workload for several of the field technicians while also working as a field technician.

Charles can read electrical schematics, technical drawings, and as-builts. He is proficient in troubleshooting: vendor software, network devices, ITS devices, and tolling equipment. Additionally, he is skilled at termination and troubleshooting fiber optics cables, copper communication cables (including TCP-IP, RS232, and RS422/485 communications), and coax cables.


This diverse skill set often makes Charles the "go-to person" for complex issues, enabling him to tackle the problems in a productive manner, allowing him to maintain a closed ticket count that consistently averages 1,000 trouble tickets a year.

Charles is well respected by several ITS equipment manufacturers and has worked closely with them to identify undocumented equipment issues along with the needed repair process. On a recent task, Charles identified a connectivity issue with a new product line. He was then able to communicate this issue to the manufacturer and work with them to resolve the case before the project's deadline.

***"Charles has been an ITS technician for District Seven since 2014. He has worked his way up to Lead Technician for the District, and is entrusted with the more difficult tasks and with managing others. He has been a valuable asset to District Seven and has proven to be extremely reliable." – Romona Burke***

In addition to his daily responsibilities, Mr. Schultz has gone above and beyond his duties rendering aid to the traveling public when needed. On one recent occasion, he was able to assist a motorist whose car had caught on fire by using his fire extinguisher in an attempt to save the vehicle.

District Seven is very proud of Charles for his achievements and recognition as the inaugural recipient of this award. Mr. Schultz is an invaluable member of District Seven and the ITS industry.

*For more information, please contact Romona Burke at (813) 615-8613 or by email at Romona.Burke@dot.state.fl.us.*

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