**PARSONS**

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WV PURCHASING DIVISION

**June 24, 2020**

Ms. Crystal Hustead
Department of Administration, Purchasing Division
2019 Washington Street East
Charleston, WV 25305-0130

**Subject: West Virginia Department of Transportation - ATMS and 511 Platform CRFP DOT2000000001**

Dear Ms. Hustead,

Parsons Transportation Group Inc. (Parsons) is pleased to submit our proposal in response to the CRFP DOT2000000001 for the West Virginia Department of Transportation - ATMS and 511 Platform. As a multidisciplinary firm, Parsons will manage all aspects and phases of complex transportation projects. We have tackled many project-related challenges, including those with significant technical issues, complex designs, multi-agency systems integration including a wide range of systems and field infrastructure. Our diverse staff has designed some of our nation's most advanced and progressive intelligent transportation system (ITS) systems.

Parsons has deployed more than 80 ATMS solutions worldwide and employs world class experts to help us realize these successes. Parsons' proposed teams' past experiences, strong work ethic, and drive for success will result in a successful design, implementation, deployment and support of the West Virginia ATMS and 511 Platform solution.

The proposed team for the West Virginia DOT ATMS and 511 Platform includes both Parsons and Castle Rock Associates, which is representative of our combined expertise in the field of transportation management systems, integrated voice response and traveler information systems. The Parsons team is intimately familiar with various aspects of transportation / traffic management systems and have been assigned critical roles required for the on-time, on-budget, high-quality execution to meet all the requirements defined in the RFP with the highest levels of customer satisfaction.

Please contact me at 262.391.8056 or Joseph.Brahm@parsons.com if you have any questions regarding our proposal. We are very enthusiastic about this important opportunity and look forward to working with the West Virginia Department of Transportation on this innovative project.

Sincerely,

Joseph Brahm
Vice President
Parsons Transportation Group Inc.

# Title Page

## West Virginia Department of Transportation ATMS and 511 Platform

## Solicitation Number: CRFP 0803 DOT2000000001

**Submitted by:**
**Parsons Transportation Group Inc.**
**445 Hutchinson Avenue**
**Columbus, Ohio 43253**
**Direct: 614.310.6363**
**Fax: 614.310.6364**

**Parsons Contact: Joseph Brahm**
**Joseph.Brahm@parsons.com**
**Signature:**

**June 24, 2020**

# Table of Contents

# 1. Qualifications and Experience (§ 4.3)

**RFP Section: 4.3. Qualifications and Experience:** Vendor should provide information and documentation regarding its qualifications and experience in providing services or solving problems similar to those requested in this RFP. Information and documentation should include, but is not limited to, copies of any staff certifications or degrees applicable to this project, proposed staffing plans, descriptions of past projects completed (descriptions should include the location of the project, project manager name and contact information, type of project, and what the project goals and objectives where and how they were met.), references for prior projects, and any other information that vendor deems relevant to the items identified as desirable or mandatory below.

## 1.1. Qualifications and Experience Generally (§ 4.3.1)

**RFP Section: 4.3.1. Qualification and Experience Information:** Vendor should describe in its proposal how it meets the desirable qualification and experience requirements listed below.

### 1.1.1. Prime and subconsultant firm profiles (§ 4.3.1.1)

Parsons and Castle Rock have provided integrated ATMS/511 ATIS solutions to Louisiana, Idaho, and the San Diego Association of Governments.

Founded in 1944, Parsons is recognized by government and industry as a world leader in intelligent transportation systems (ITS). Within the Parsons organization, ITS projects are the responsibility of the Parsons ITS Sector, a group consisting of over 200 ITS professionals exclusively dedicated to the application of technology to transportation systems including advanced transportation management systems (ATMS), traffic signal control (TSC), adaptive control, transit priority, emergency transportation operations, and incident management. We offer a unique blend of transportation- and systems-engineering expertise, which allows us to address our clients' transportation needs in a comprehensive manner and to provide effective solutions that solve complex problems. We are also a systems integrator and integrate our Intelligent NETworks® (iNET™) system with leading third-party providers of advanced ITS technologies. For the delivery of the West Virginia Department of Transportation (WVDOT) 511 Platform as described in the RFP, we have partnered with Castle Rock Associates, Inc. Profile descriptions of both Parsons Transportation Group Inc. (Parsons) and Castle Rock Associates (Castle Rock) follow.

**Parsons**

Parsons initially developed iNET™ in 2007, with 10 modules. Since then, we invested more than $6 million to extend the modules, technology, and functionality extensively, including five new major functional modules.

Parsons is a large, financially strong company that has grown organically and through strategic acquisitions. Our parent company's 2018 revenues exceeded $3 billion. We conquer the toughest logistical challenges and deliver design/design-build, program/construction management, and other professional services packaged in innovative alternative delivery methods to federal, regional, and local government agencies, as well as to private industrial customers worldwide.

We offer innovative solutions around the world to private industries and to federal, regional, and local government agencies. We view our clients as long-term partners in innovation and we have the financial capabilities, technical expertise, and available manpower to undertake almost any project by providing dedicated and skilled resources necessary to deliver successfully.

We focus on our three areas of strength: people, process, and technology. Our assets are our employees, our customers, our reputation, and the methods by which we deliver our services. For more than 75 years, we have combined innovation with advanced technology to assist our customers in achieving their missions. Our success derives from ensuring that innovative solutions are technically feasible to implement and meet operational needs, which is even more important in this challenging economy.

**ABOUT PARSONS**

**70+** Years

**15,600+** Employees

**$3.1 billion+** Annual Revenue

**13,000+** Degrees/Certifications

**Global Expertise & Local Knowledge**

Being part of a global company, our service delivery model focuses on providing clients with a solid core of locally assigned, highly capable resources supported by our global knowledge network. This network gives our clients wide access to company and industry best practices, as well as to the most current technical information and resources. This allows our team members to confront emerging challenges with proven solutions, thereby saving time and cost, and ensuring the highest-quality outcomes while adding value to the project.

As a multidisciplinary firm, we will manage all aspects and phases of complex transportation projects. We have tackled many project-related challenges, including those with significant environmental issues, complex designs in constrained environments, and extensive public involvement. Our diverse staff has designed some of our nation's most progressive, industry leading and award-winning Intelligent Transportation Systems.

#### Castle Rock Associates, Inc.

Founded in 1984 and headquartered in Portland, Oregon, Castle Rock is an industry leader in the design, development, and operation of ITS solutions, with a focus on 511 and Advanced Traveler Information Systems (ATIS). Castle Rock's first 511 phone deployment was in 2002, for the State of Minnesota. Since then, it has worked with more than 20 DOTs on their 511 and traveler information services. Its proven approach continues to lead the industry in providing human-centered, innovative, and dependable 511 services to the public.

Led by CEO and owner Kristin Virshbo, Castle Rock's team of 25 specialists focus on Condition Acquisition and Reporting System (CARS), the company's flagship 511 and traveler information product. CARS offers a suite of coordinated modules that provide clear, consistent information (whether delivered by phone, web, mobile application, or social media) to the public.

In addition to its long-running leadership in the 511 field, Castle Rock is also a state and nationally certified Woman-Owned Business Enterprise (WBE) and Small Business Enterprise (SBE). All work is performed in the USA by Castle Rock's employees (no independent contractors).

Castle Rock is also a security operations center (SOC) Type-II certified organization, audited on the principles of security, confidentiality, and availability.

### 1.1.2. Company and staff qualifications and experience in completing similar projects (§ 4.3.1.2)

Parsons provides market-leading ITS solutions that are designed, deployed, and supported by more than 200 dedicated ITS professionals. The key staff proposed for the WVDOT ATMS and 511 system bring a combined more than 200 years of IT and ITS experience. We are also a highly regarded systems integrator. Embracing an integrator approach enables us to offer our customers a single point of accountability for their desired ITS solutions while also providing access to the best of breed third-party technology solutions to further enhance our offerings. For the WVDOT ATMS and 511 project, Parsons has chosen Castle Rock as our teaming partner to provide the desired 511 system and ATIS. Our companies have teamed successfully in providing a fully integrated ATMS/511/ATIS solution for the Idaho DOT, the DOTD, and San Diego Association of Governments. This Parsons team will provide an integrated ATMS and 511 solution that exceeds your required and desired functionality.

## ATMS Qualifications

Parsons has far more experience in deploying statewide ATMS solutions than any other firm, especially in the deployment of large-scale and/or statewide ATMS solutions in North America, the majority of which have been integrated with traveler information systems. Our core offering in ITS is our iNET™ ATMS, which we have offered and enhanced for more than 20 years. iNET™ consists of 34 distinct modules that enable advanced transportation management for the smallest to the most advanced ITS environments. It is used by engineers and governments around the globe and integrates with more than 63,000 ITSs and devices. Key highlights of our past performance are described in more detail in the sections below.

**In the past 4 months, the Parsons team has recently been awarded the following projects for our iNET™ solution:**

- **Port of Oakland**
- **City of London**
- **Los Angeles World Airports**
- **Vancouver**

Table 1 – Parsons' ATMS Experience Highlights

| # | EXPERIENCE AREA | HIGHLIGHT |
|---|---|---|
| **1** | Parsons deploys ATMS solutions. | Parsons has deployed:<br>• 80+ ATMS solutions worldwide<br>• 58 in North America<br>• 11 statewide ATMS solutions |
| **2** | Parsons integrates iNET™ with traveler information systems. | • All statewide ATMS solutions integrated with ATIS<br>• Many production ATMSs integrated with 511 phone/IVR solutions<br>• Many production ATMSs integrated with parking information systems<br>• Parsons' successful integration with the Castle Rock 511 solution |
| **3** | Parsons brings extensive ATMS experience. | Parsons' **deployment of 11 of the largest ATMS deployments in North America** (our ATMS customers benefit from the existing integration and lessons learned) |
| **4** | Parsons has vast experience in integration of computer-aided dispatch (CAD) systems. | • Many production ATMSs integrated with several live CAD systems<br>• Bidirectional, seamless systems integration exchanging real-time and filterable data between ATMS and CAD systems |
| **5** | Parsons has experience deploying solutions for managing adverse weather conditions | • NOAA Weather event integration<br>• Snowplow Tracking and Services<br>• RWIS-based Fog Warning Systems |
| **6** | Parsons has been recognized for excellence in ATMS deployments. | Parsons has received 40 different awards for ATMS deployments in the last 20 years, including 10 related to its iNET™ ATMS in the last 5 years. |
| **7** | Parsons is an expert in freeway and active traffic management. | Through direct involvement in leading the TRB committees for freeway operations and active traffic management, Parsons is at the forefront of developing and implementing the most leading-edge FMS and ATMS solutions. |
| **8** | Parsons has the most comprehensive ATMS solution. | Parsons offers the most feature-rich and comprehensive production-available ATMS solution on the market via its latest iNET™ product, which encompasses 34 total functional modules. |

| | | |
|---|---|---|
| **9** | Parsons has vast experience with third-party systems. | Parsons is highly experienced with the integration of third-party data and systems into its iNET™ ATMS solution. |
| **10** | Parsons provides a platform for the future. | Parsons offers the most forward-looking ATMS solution on the market today bringing numerous technical advantages to any agency that selects its solution. |

1. ***Parsons deploys ATMS solutions***. We have deployed more than 80 ATMS solutions worldwide: 58 are in North America and 12 use our statewide iNET™ ATMS solution. Figure 1 shows a map of our ATMS deployments in North America, and Figure 2 shows a map of our international ATMS/ITS deployments, including in Hong Kong, Macau, Greece, Cyprus, Sau Paulo, Durban, St. Petersburg, and Sydney. The most relevant of our ATMS project descriptions can be found in Section *1.2.2 Descriptions of past projects*.

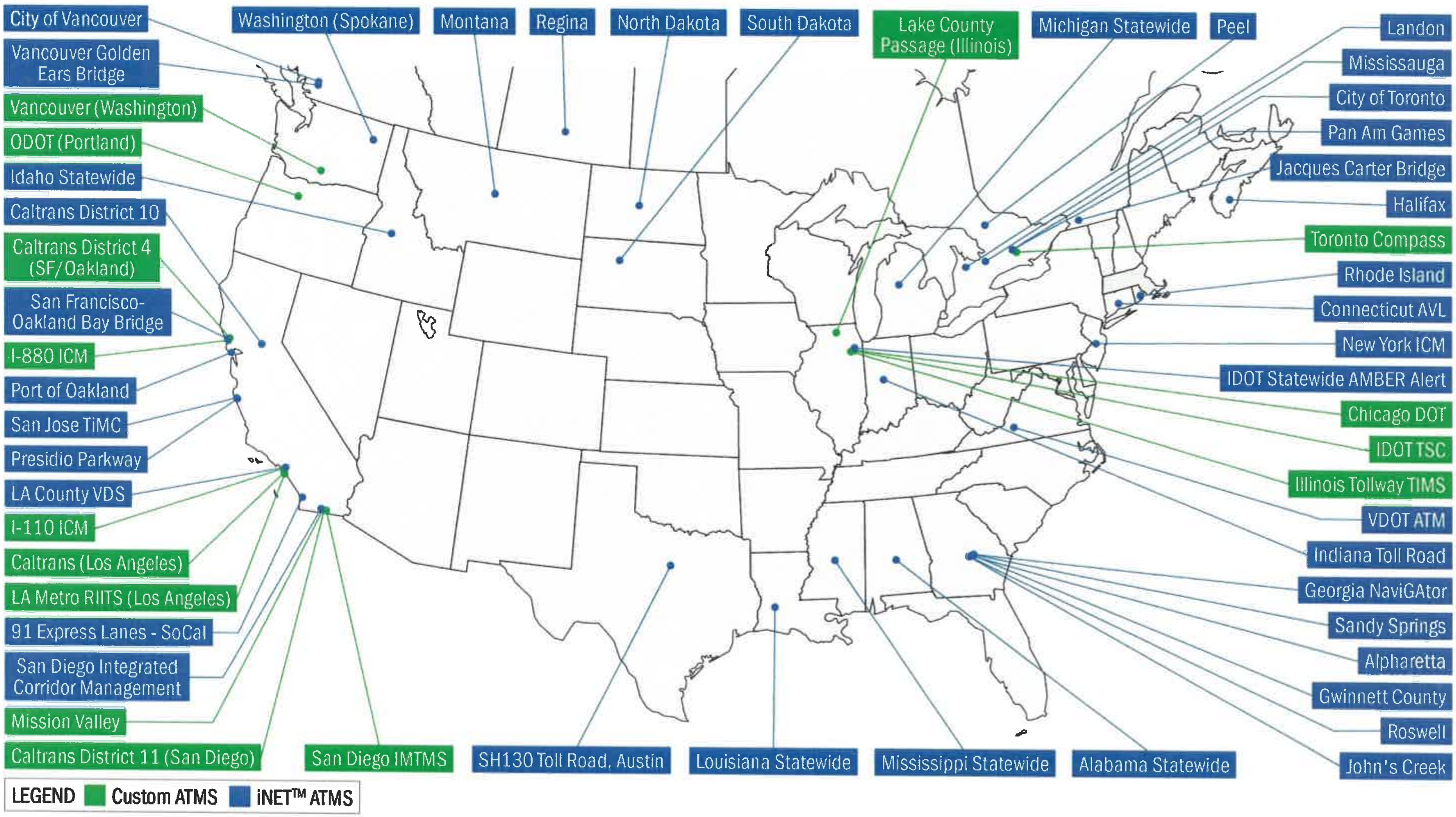



**Figure 1 – Parsons' ATMS Deployments (United States and Canada)**

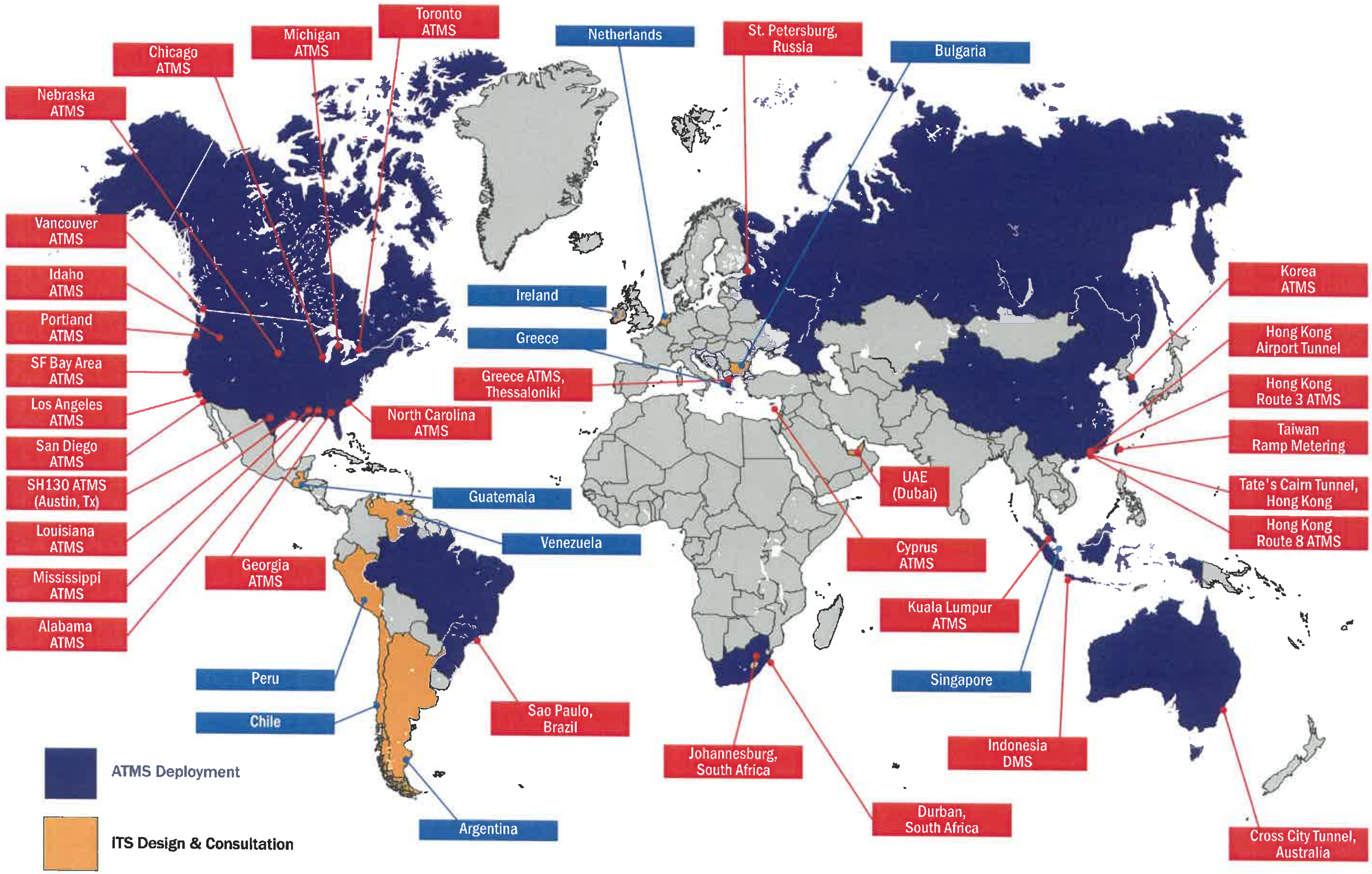



Figure 2 – Parsons' ATMS/ITS International Experience

2. ***Parsons integrates iNET™ with traveler information systems***. 511 systems and other advanced traveler information systems (ATISs) are critical to the overall effectiveness of transportation management strategies and systems. To this end, the majority of our production ATMS solutions are integrated with various ATIS solutions, for example, the following:
    a. All statewide iNET™ systems integrate with numerous traveler information systems and 511 phone solutions.
    b. Many iNET™ systems integrate with publicly available web applications.
    c. Several progressive ATMS customers now leverage Twitter as a traffic-data communication outlet.
3. ***Parsons has extensive ATMS experience***. Our ATMS solutions are actively monitoring and/or controlling more than 63,000 devices, vehicles, or systems today on a 24/7 basis. Table 2 represents a sampling of device counts that we have integrated in other states.

**Table 2 – Parsons' ATMS Device/System Interfaces**

| PARSONS' ATMS PROJECTS | CCTV CAMERAS | VEHICLE DETECTOR STATIONS | DMS | TRAFFIC SIGNALS | WEATHER STATIONS | HIGHWAY ADVISORY RADIO | VSL SIGNS | LANE-CONTROL SIGNS | ACCESS GATES | CAD INTEGRATION | TRAVELER INFORMATION SYSTEM | 511 IVR/PHONE | PARKING SYSTEM | TOTAL DEVICES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Total Field Devices or Components Integrated** | **13,179** | **20,300** | **3,228** | **12,470** | **557** | **108** | **424** | **584** | **167** | **20** | **21** | **8** | **3** | **51,069** |
| Georgia NaviGAtor | 2,418 | 2,224 | 208 | | | | 188 | 5 | 151 | | 1 | 1 | | 5,196 |
| Michigan Statewide ATMS | 620 | 823 | 411 | | 104 | | 60 | 93 | | | 1 | | 1 | 2,113 |
| Caltrans ATMS (Los Angeles) | 550 | 1,320 | 142 | 220 | | 17 | | 5 | | 1 | 1 | 1 | | 2,257 |
| Alabama Statewide ATMS | 365 | 322 | 45 | | 47 | 23 | | | | | 1 | | | 803 |
| Caltrans District 4 ATMS (SF Bay) | 420 | 650 | 83 | | | | 1 | | | 1 | | | | 1,155 |
| LA Metro RIITS (Los Angeles) | 120 | 2,450 | 180 | 2,800 | | 17 | | | 1 | 1 | | | | 5,569 |
| IDOT TSC ATMS (Chicago) | | 1,498 | 58 | | | | | | | | 1 | 1 | | 1,558 |
| Illinois Tollway TIMS (Chicago) | 1,156 | 390 | 82 | | 15 | | | 351 | | 1 | | | | 1,995 |
| Chicago DOT ATMS | 1,800 | 151 | 7 | 84 | 44 | | | | | 2 | | | | 2,088 |
| Louisiana Statewide ATMS | 471 | 67 | 106 | | | | | | | | 1 | 1 | | 646 |
| Mississippi Statewide ATMS | 974 | 142 | 66 | | 40 | 15 | | | | 1 | 1 | 1 | | 1,240 |

| PARSONS' ATMS PROJECTS | CCTV CAMERAS | VEHICLE DETECTOR STATIONS | DMS | TRAFFIC SIGNALS | WEATHER STATIONS | HIGHWAY ADVISORY RADIO | VSL SIGNS | LANE-CONTROL SIGNS | ACCESS GATES | CAD INTEGRATION | TRAVELER INFORMATION SYSTEM | 511 IVR/PHONE | PARKING SYSTEM | TOTAL DEVICES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| San Diego ICM | 168 | 2,031 | 91 | 3,701 | 17 | | | | | 1 | 1 | | 1 | 6,011 |
| ODOT ATMS (Portland) | 150 | 197 | 80 | | | | 1 | | | | | | | 428 |
| Caltrans ATMS (San Diego) | 168 | 1,647 | 65 | | | | | | | | | | | 1,880 |
| Lake County ATMS (Illinois) | 220 | 500 | 7 | 375 | | | | | 1 | 9 | 1 | | | 1,113 |
| IDOT Statewide AMBER Alert | | | 82 | | | | | | | | 1 | 1 | | 84 |
| VDOT ATM | 30 | 40 | 8 | | | | 150 | | | | | | | 228 |
| San Diego IMTMS | 70 | 400 | 55 | 350 | | | | | | 1 | | | | 876 |
| Hong Kong Airport Tunnel TCSS | 102 | 130 | 3 | 12 | 18 | | | 130 | 11 | | | | | 406 |
| Nebraska Statewide ATMS | 87 | 160 | 97 | | 36 | | | | | 1 | 1 | | | 382 |
| Idaho Statewide ATMS | 180 | | 55 | | | 25 | | | | | 1 | | | 261 |
| Spokane ATMS | 113 | 45 | 25 | 346 | 14 | 10 | | | | 1 | | | | 554 |
| Rhode Island ATMS | 28 | 30 | | | 2 | | | | | | 1 | | | 61 |
| City of Toronto ATMS | 234 | 257 | 38 | 2,281 | | | | | | | 1 | | | 2,811 |
| Halifax ATMS | | 27 | | 91 | | | | | | | | | | 118 |
| Mississauga ATMS | 62 | 90 | | 770 | | | | | | | | | | 922 |
| Pan Am Games (Toronto) | 210 | 30 | 42 | | | | | | | | 1 | | | 283 |
| San Jose TiMC | 127 | 953 | 127 | | | | | | | | 1 | 1 | | 1,209 |
| Indiana Toll Road ATMS | 20 | | 12 | | | | 24 | | | | | | | 56 |
| New Hampshire Statewide ATMS | 76 | | 20 | | 12 | | | | | | | | | 108 |
| St. Louis ATMS | 295 | 539 | 121 | | | | | | 1 | | | | | 956 |

| PARSONS' ATMS PROJECTS | CCTV CAMERAS | VEHICLE DETECTOR STATIONS | DMS | TRAFFIC SIGNALS | WEATHER STATIONS | HIGHWAY ADVISORY RADIO | VSL SIGNS | LANE-CONTROL SIGNS | ACCESS GATES | CAD INTEGRATION | TRAVELER INFORMATION SYSTEM | 511 IVR/PHONE | PARKING SYSTEM | TOTAL DEVICES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Route 3 Country Park Section TCSS | | 250 | 18 | 12 | | | | | | | | | | 280 |
| Salt Lake City ATMS (UDOT) | 60 | 300 | 40 | | | | | | 1 | | | | | 401 |
| Lantau Crossing (Hong Kong) | 43 | 153 | 12 | 6 | | | | | | | | | | 214 |
| New Hong Kong Airport TCSS | 23 | 140 | 7 | 19 | | | | | | | | | 1 | 190 |
| Route 8 (Hong Kong) | 88 | 210 | 192 | 41 | 122 | | | | | | | | | 653 |
| Baltimore MMTIS | 280 | 100 | 100 | | 46 | | | | | | | | | 526 |
| SH 130 Toll Road (Austin) | 23 | 55 | 5 | | 1 | | | | | | | | | 84 |
| San Francisco–Oakland Bay Bridge | 5 | 24 | 3 | | | | | | | | | | | 32 |
| Presidio Parkway ATMS | 56 | 13 | 14 | | | 1 | | | | | | | | 84 |
| St. Petersburg, Russia | | | | 350 | | | | | | | | | | 350 |
| 91 Express Lanes (SoCal) | 88 | | | | | | | | | | | | | 88 |
| Toronto Compass | 184 | 761 | 59 | | | | | | | | | | | 1,004 |
| Taiwan Ramp Meter System | | | | | | | | | | | | | | 0 |
| Caltrans District 10 ATMS | | 230 | | | | | | | | | | 1 | | 231 |
| KC Scout ATMS | 83 | 230 | 37 | | | | | | 1 | | | | | 351 |
| Durban ATMS (South Africa) | 86 | 4 | 11 | | | | | | | | | | | 101 |
| Cross Sydney Tunnel (Australia) | 32 | 140 | 42 | 4 | 8 | | | | | | 1 | | | 227 |

| PARSONS' ATMS PROJECTS | CCTV CAMERAS | VEHICLE DETECTOR STATIONS | DMS | TRAFFIC SIGNALS | WEATHER STATIONS | HIGHWAY ADVISORY RADIO | VSL SIGNS | LANE-CONTROL SIGNS | ACCESS GATES | CAD INTEGRATION | TRAVELER INFORMATION SYSTEM | 511 IVR/PHONE | PARKING SYSTEM | TOTAL DEVICES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Tate's Cairn Tunnel (Hong Kong) | | 44 | | 14 | | | | | | | | | | 58 |
| Cyprus ATMS | 25 | 115 | 20 | | | | | | | | | | | 160 |
| SANRAL (South Africa) | 7 | 24 | 102 | | | | | | | | | | | 133 |
| Vancouver ATMS (Washington) | 15 | 14 | 6 | | | | | | | | | | | 35 |
| South Bay Expressway | | 28 | | | | | | | | | | | | 28 |
| Mission Valley ATMS | 20 | | 1 | | | | | | | | | | | 21 |
| Vancouver Golden Ears Bridge | 29 | 46 | | 5 | | | | | | | | | | 80 |
| Thessaloniki, Greece | 23 | 17 | 5 | | | | | | | | | | | 45 |
| Western Harbor Crossing | | 119 | | 6 | | | | | | | | | | 125 |
| JFK International Airport | | | 70 | | | | | | | | | | | 70 |
| Montana ATMS | | | 23 | | | | | | | | 1 | | | 24 |
| North Dakota ATMS | 126 | 7 | 78 | | 30 | | | | | | 1 | | | 242 |
| LA County VDS | 120 | | | | | | | | | | | | | 120 |
| Sao Paulo ATMS (Brazil) | 24 | 48 | 20 | | | | | | | | | | | 92 |
| Macau ATMS | | 24 | | 83 | | | | | | | | | | 107 |
| Hawaii ATMS | | | | | | | | | | | | | | 0 |
| Peel ATMS | | | | | | | | | | | | | | 0 |
| City of Vancouver | | | | 900 | | | | | | | | | | 900 |
| Regina ATMS | 7 | 4 | 3 | | 1 | | | | | | 1 | | | 16 |
| State Road and Tollway Authority | | 87 | 44 | | | | | | | | | | | 131 |

| PARSONS' ATMS PROJECTS | CCTV CAMERAS | VEHICLE DETECTOR STATIONS | DMS | TRAFFIC SIGNALS | WEATHER STATIONS | HIGHWAY ADVISORY RADIO | VSL SIGNS | LANE-CONTROL SIGNS | ACCESS GATES | CAD INTEGRATION | TRAVELER INFORMATION SYSTEM | 511 IVR/PHONE | PARKING SYSTEM | TOTAL DEVICES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| City of Alpharetta ATMS | 25 | | | | | | | | | | | | | 25 |
| Gwinnett County ATMS | 394 | | | | | | | | | | 1 | | | 395 |
| City of Johns Creek ATMS | 20 | | | | | | | | | | | | | 20 |
| City of Roswell ATMS | 59 | | | | | | | | | | | | | 59 |

4. ***Parsons has vast experience in the integration of CAD systems*** – We have immense experience in creating bidirectional interfaces that allow sharing of real-time event updates between the ATMS and CAD systems. Parsons has built several CAD interfaces and understands the criticality of timely and accurate alerts being presented to traffic operations. Additionally, due to our cyber-security expertise, we are in a unique position to be able to meet the heightened security posture necessary for systems that integrate with the FBI weapons database. We understand the complexity of the work required and have experience developing end-to-end working solutions.
5. ***Parsons has experience deploying solutions for managing adverse weather conditions*** – The iNET™ ATMS has integrated RWIS stations for real-time detection of changing weather conditions, in addition to advanced warning systems such as Fog Detection. Weather alerts from the National Oceanic and Atmospheric Administration (NOAA) are integrated into the system allowing for generation Weather Events and response plans.
6. ***Parsons has been recognized for its excellence in ATMS deployments*** – Renowned for our delivery excellence and innovation, we have received more than 40 different awards for ATMS deployments in the last 20 years, including 10 related to our iNET™ ATMS in the last 5 years. Key awards of note include the following:
    a. **2019– International Road Federation (IRF) Global Road Achievement Awards** – Georgia DOT Northwest Corridor Reversible Lanes
    b. **2018 ITS America Best of ITS Award – Transportation Systems Operations** – US 23 Flex Route (Michigan Department of Transportation)
    c. **2018 ITS Midwest Project of the Year** – Chicago Smart Mobility ATMS
    d. **2017 American Council of Engineering Companies (ACEC) – Engineering Excellence Honor Award** – I-80 SMART Corridor Integrated Corridor Mobility (ICM) Project
    e. **2017 SASHTO (Southern Region AASHTO) Operations Excellence Awards** – I-66 Active Traffic Management System
    f. **2016 California Transportation Foundation (CTF) – Operational Efficiency Program of the Year** – San Diego I-15 Integrated Corridor Management System
    g. **2015 ITE Project of the Year, SF Bay Area** – I-80 ICM Project
    h. **2015 ITS America Best of ITS Award (Best New Product, Service, or Application)** – Oregon Department of Transportation (DOT) OR 217 Active Traffic Management
    i. **2015 InfoWeek Elite 100 Award** – Parsons iNET™ ATMS

j. **2015 CIO 100 Awards** – Parsons iNET™ ATMS
k. **2015 CTF Operational Efficiency Program of the Year** – San Diego I-15 Integrated Corridor Management System
l. **2014 ITS America Best of ITS Award (Best New Innovative Practice) – Partnership Deployment** – Mississippi River Bridges' Incident Management, Freight Movement, and Security ITS Project
m. **2014 ITS America Best of ITS Award (Best New Innovative Practice) – Sustainability in Transportation** – Michigan DOT Statewide Automatic Vehicle Location (AVL) and Maintenance Decision Support System (MDSS) Implementation
n. **2014 ITS America "Best of ITS Award" Best New Innovative Practice – Sustainability in Transportation** – Michigan DOT Statewide AVL and MDSS Implementation
o. **2014 California Transportation Foundation (CTF) Operational Efficiency Program of the Year** -San Diego I-15 Integrated Corridor Management System
p. **2013 ITS America "Best of ITS Award" for New Innovative Practices** – San Diego I-15 Integrated Corridor Management System

7. ***Parsons is an expert in freeway management systems (FMS) and active traffic management (ATM)*** – We are known as a worldwide expert in FMS and ATM. We have been a leader for decades on the Transportation Research Board (TRB) FMS, ATM, and ITS committees, where the latest ATMS concepts are researched and ultimately lead to implementation.
8. ***Parsons deploys comprehensive ATMS solutions*** – We offer the most feature-rich, comprehensive ATMS solutions on the market today, which include our latest iNET™ product, built with more than $6 million in new enhancements and modules. iNET™ offers the following benefits:
    a. ***Feature rich*** – The 34 functional modules can be installed one at a time, piecemeal, or all at once. This includes new modules for CAVs, artificial intelligence (AI) and machine learning, traffic prediction, big-data analytics, Internet of Things (IoT), voice-driven assistance, and enhanced traffic signals.
    b. ***Platform independent*** – The system runs on any hardware platform and operating system that supports Java. No commercial off-the-shelf (COTS) software packages are required other than a database (e.g., Microsoft SQL Server and Oracle).
    c. ***User flexibility*** – The system is a true web-based application using standard PC browser from any location with web or local network access.
    d. ***Low lifecycle and capital costs***– Because the system is platform independent, features a thin client, and requires little to no COTS licenses, it is a very cost-effective solution in terms of initial and recurring costs. It is built using technologies and systems that are easily maintainable by DOT IT staff.
    e. ***Configurable and customizable*** – Customers can pick and choose between modules to create the customizations desired. In addition, staff can become developer certified to create new interfaces or customizations via the iNET™ application programming interface (API).
    f. ***Fault tolerant*** – The system is designed for full redundant failover and operations.
    g. ***Open architecture*** – The system follows open industry standards, architecture, and design standards.
    h. ***Modular*** – The system is fully modular, designed to be installed with just one functional module that can be added to one at a time with simple configuration changes.
9. ***Parsons is proficient in the integration of third-party systems*** – We are highly experienced with the integration of third-party systems and data into our iNET™ system. Leveraging the available 34 modules, the iNET™ system is ready to integrate with nearly any ITS device as well as with ATIS, 511, 911/CAD, public-media, social-media, and other center-to-center systems.
10. ***Parsons provides the most technologically advanced ATMS solution*** – In the last 2 years, we have invested more than $6 million of research and development (R&D) money into our already award-winning ATMS software. As a result, we have the most forward-looking ATMS solution on the market today bringing numerous technical advantages to any agency that selects our solution. The advancements include the following:

a. **State-of-the-art traffic signals functionality** – iNET™ integrates arterial traffic signal performance measures (ATSPMs), data analytics, multicriteria adaptive signal (MAC) control, and connected vehicle functionality.
b. **CAV functionality** – We include several dynamic mobility applications such as signal phase and timing (SPaT), speed harmonization, queue warning, traffic-probe monitoring, and traffic signal preemption.
c. **AI/ML** – AI/ML is now integrated into iNET™ with functionality that includes voice-driven assistants, traffic prediction, and ML-based event prediction.
d. **Big-data and cloud analytics** – iNET™ now includes the capabilities to operate in the cloud, store large volumes of data into big data lakes, and leverage big-data analytics from improved operational algorithms.
e. **IoT** – iNET™ now integrates and interfaces with IoT platforms for the ingestion of IoT data feeds, devices, and platforms (e.g., Cisco Kinetic).
f. **Smart-city functionality** – We now provide integration with other smart-city verticals including smart lighting systems, air-quality monitoring systems, video analytics sensors, Wi-Fi stations, and gunshot detectors.

## 511 Qualifications

Castle Rock pioneered much of the 511 work in the United States and has evolved into a specialist 511 and ATIS firm. The company has worked with dozens of transportation agencies in the US and Canada on establishing, upgrading, or transitioning their traveler information platforms. Castle Rock's CARS platform is a "one-stop shop" for 511. Its qualified staff of 25 FTEs have the diverse skill sets needed to do 511 with excellence; it has knowledgeable leadership with subject matter expertise; experienced project managers; in-house software engineers who specialize in web app development, mobile app development, social media integration, and VXML/voice grammars; and a team of 24/7 operations support specialists who manage and operate the hosting infrastructure and applications.

The Castle Rock CARS solution offers WVDOT and the people of West Virginia a renewed, refreshed, modernized, and consistent 511 that goes well beyond the state's current system.

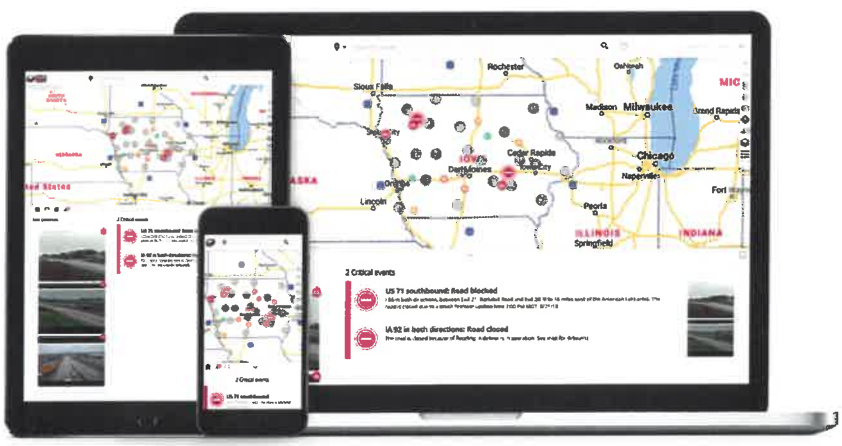



Figure 3 – 511 Traveler Information Platforms

Since Castle Rock's first 511 deployment in 2002, the firm's traveler-information portfolio has evolved to include the following:

- Interactive, responsive **511 websites**
- Feature-rich, eyes-free/hands-free **mobile 511 apps** (iOS and Android)
- Easy-to-use personalized 511 accounts and text/email notifications
- An **interactive voice response (IVR)** with statewide info, plus personalized functions
- Specialized **truckers'** pages
- Intelligent **snowplow** integrations
- Automated **Twitter/Facebook** feeds
- A **road-condition reporting module** (available as a website and mobile app) that makes it easy for DOTs to create frequently updated and clear reports for the public during storms, floods, and more
- An **API** data hub for third-party integrators, support REST, XML, and JSON
- A wide variety of other cutting-edge features and designs

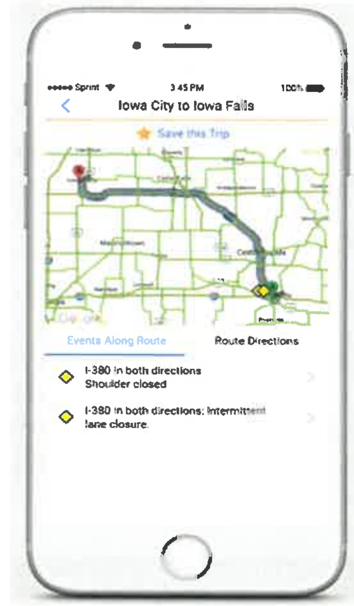



**Figure 4 – CARS mobile app (iOS and Android)**

The Castle Rock CARS solution is used by a wide variety of states and transportation agencies, including Idaho, Kansas, Nebraska, Iowa, Indiana, Minnesota, Colorado, Sacramento, San Diego, British Columbia, and the New York State Thruway Authority. Castle Rock is highly experienced in working with DOTs and in following the systems engineering process and in migrating from legacy systems to CARS.

Castle Rock is proud to be leveraging a previous partnership with Parsons as part of our proposal to WVDOT. In Louisiana, Parsons and Castle Rock successfully integrated iNET™ and CARS so that **information entered into the ATMS flowed smoothly and seamlessly into the state's 511 platform.**

We linked together iNET's and CARS's location databases and data services to create clear, easy-to-read, consistent information for Louisiana 511. That successful iNET™–CARS data integration can be directly leveraged by West Virginia in its next-generation system.

### 1.1.3. Project understanding and approach/methodology to achieving project objectives (§ 4.3.1.3)

Parsons understands that the quality of a major transportation system plays a significant role in the economic growth and quality of life for residents in the state of West Virginia. We recognize that West Virginia hosts a large volume of travelers along several corridors in the Appalachian region. WVDOT has been responsive to the number of motorists on West Virginia's roadways by providing a statewide operation that provides transportation management functions responsible for gathering traffic information via various sources. The information collected by roadway devices, information providers, and emergency management centers in West Virginia is used to disseminate traveler information to the public so that informed decisions can be made, ultimately increasing mobility and ensuring safety.

With more than 7 years of operation, the WV511 website serves approximately 400,000 sessions annually, handles up to 5,000 calls a day in peak events, and the mobile app has been downloaded 45,000 times.

WVDOT has an interesting opportunity to not only maintain the same level of service to all motorists in the state of West Virginia but also to provide a solution that will go beyond the mandatory requirements that will serve as the platform for future growth—a solution that can immediately offer functionality that is noted as "desirable" in the RFP.

In conjunction with Castle Rock, we will provide a high-quality solution using world-class products that have been vetted and continue to operate in production environments in Idaho and San Diego. We have worked independently to address similar needs for West Virginia in the past and have been fortunate to have worked together as a team to provide a fully integrated solution that mirrors WVDOT's expectations. The Parsons and Castle Rock team stands ready to offer exceptional resources and value to WVDOT with its direct knowledge and experience with transportation-management and traveler-information systems.

## ADVANCED TRANSPORTATION MANAGEMENT SYSTEM

Parsons proposes its iNET™ ATMS, which will meet and exceed the WVDOT ATMS requirements. **With more than $6 million in enhancements completed since 2018,** iNET™ is the most feature-rich and production-ready ATMS solution available in the market today. We initially developed iNET™ in 2007, with 10 modules. Since then, we have worked to deploy new major releases each year, with supplementary modules, functionality, and technical enhancements. In 2017, we invested $500,000 in iNET™ to complete a major platform upgrade. Since then, we have invested an additional $6 million in iNET™ to extend the modules, technology, and functionality extensively, including five new major functional modules.

**iNET™ Highlights:**

- **$6M+ Recent Investment**
- **5 New Modules including:**
  - **CAV**
  - **Traffic Signals**
  - **Predictive Analytics**
- **Low Total Cost of Ownership**
- **Easily Customizable**

Today, our iNET™ ATMS solution is the most technically innovative and functionally rich ATMS solution on the market. We can proudly say that we are the only ones to successfully integrate certain key functionalities into our solution. Over the past 25 years, we have also been international ATMS innovators, being the first to develop and install key ATMS capabilities, hence the reason why we have received 40 awards for ATMS technology innovations.

### Key Technical Features of the Parsons iNET™ ATMS

***iNET™ architecture is*** designed ***for the future.*** iNET™ is architected, designed, and implemented with the intention to accommodate future enhancements, design changes, and system modifications. The following five aspects of the iNET™ architecture will facilitate future system modifications and enhancements:

- **Platform independent –** iNET™ is based on a J2EE architecture and can run on any platform that supports Java. Because iNET™ can be used in different environments, this requires less planning and provides the flexibility to install and maintain the application based on existing IT infrastructure. Providing a platform-independent solution is becoming more important as the IT industry moves toward a more pronounced focal point of integrating ecosystems, people, and IoT.
- Open source – Using IT open-source solutions allows for technology agility, customizability, community support, interoperability, and auditability. The iNET™ application server being based on open source also keeps the overall cost down, while ensuring quality based on thousands of developers and hundreds of production deployments that participate in the development and maintenance of the enterprise system.
- Modularity – As a modular application, when changes to one functional area are required, the other modules are not usually impacted. This allows for the flexibility of replacing, deleting, or upgrading one module in the system without impacting the entire system. One advantage of this approach is that it minimizes (or eliminates) disruption to production systems by removing the need for entire system restarts. Another advantage to the modular approach is that it minimizes the risks associated with system upgrades. For example, if only one module is enhanced, there is no risk to other modules during an

upgrade. The third advantage to a modular approach is that if a module has a severe error and is not functional, only the features related to that module become unavailable; the rest of the system remains functional. If this should happen, an administrator can restart one module to restore functionality without disrupting the entire system.

- **Configurability –** iNET™ was designed to allow for customizations. The application is highly configurable, with the ability to turn on/off features through administrative interfaces. When modifications are made to the system or to individual features, these modifications are immediately available without a system restart. This flexibility allows for clients to make system modifications, add and remove features, and set thresholds and alarms without code changes or system restarts. Administrative user interfaces allow for dynamic system modifications without code changes or disruption to the production environment.
- **Fault tolerant –** iNET™ was designed for fully redundant failover and operations.

***iNET™ supports ongoing evolution of computer and mobile technology.*** Computer and mobile-device technology continue to evolve at a rapid pace. The iNET™ application has been designed (and redesigned) to make transitioning to evolving technology easier. Our modular framework means existing features already in place can be expanded in the future. Two areas that nicely position iNET™ for ongoing evolution of computer and mobile-device technology are the iNET™ application server's adherence to J2EE specifications, the Dojo framework, and our widely used and proven TMDD2/3 C2C modules.

- **J2EE platform –** The iNET™ core system leverages the J2EE platform, which provides complete and continuously evolving web services support. J2EE also provides separation of business logic from resource and life-cycle management, which allows our developers to focus on business logic while leveraging future updates to the J2EE platform in order to accommodate ongoing evolution supporting computer and mobile-device technologies.

The iNET™ core system leverages the J2EE platform, which provides complete and continuously evolving web services support.

- **Dojo toolkit –** Our front-end application is built primarily using the Dojo JavaScript Toolkit. Dojo provides us with a full-stack trusted set of high-quality building blocks used by our ATMS client desktop. Dojo has been proven for use in very-high-traffic and high-profile sites. Most importantly, Dojo has a very active community of developers and is continually evolving to current computer and mobile technologies. The modular approach used by iNET™ developers allows us to easily enhance our system to support breaking technologies.
- **iNET™ application services –** iNET™ is platform independent and can be installed on any operating system that supports Java. iNET™ is compatible with MySQL, SQL Server, or Oracle databases. iNET™ can be run from any location that has internet/intranet access and proper security. As technology continues to edge toward cloud-based applications and IoT, iNET™ already has a flexible deployment architecture. Another technology area that is expanding greatly is the ability to place, process, and analyze large volumes of data, both structured and unstructured. Big-data analytic platforms often require a cloud presence for storage and quick retrieval. As this technology continues to evolve, iNET™ already has the flexibility to be deployed/hosted locally or in the cloud. This is just one example that demonstrates how the flexibility of the iNET™ application can adapt to newer technologies as they evolve.
- **iNET™ mobile technology –** iNET™ mobile software uses hybrid technology (JavaScript and/or HTML 5). This technology is preferable to a native application because the design navigates using basic web applications, as opposed to device-specific features. Hybrid mobile applications are quicker to deploy and easier to maintain. As phone vendors update and enhance their platforms, hybrid mobile applications are generally not impacted.
- **C2C module –** This module provides a simplistic web interface tor exchanging information with iNET™. As technologies continue to emerge, the ability for iNET™ to interface with other systems, to either consume

data or to provide information, will become more crucial. With its web interface and ability to translate information into standard XML for use by iNET™, this module could play a big part in quickly integrating with new technologies, including mobile and IoT.

## Key Innovative Features of the Parsons iNET™ ATMS

iNET™ consists of an advanced traffic management platform with 34 functional modules, five of which were newly released in December 2018, with additional features completed in 2019. The system is designed and architected to enable our customers to implement the modules necessary to meet defined requirements and to enable customers to expand their systems over time by adopting new modules as requirements expand. Adding additional modules to the proposed iNET™ system for the State of West Virginia would only require additional license fees and minimum engineering services to activate and integrate the capability(ies) into the operational system. Figure 5 illustrates the iNET™ module list.

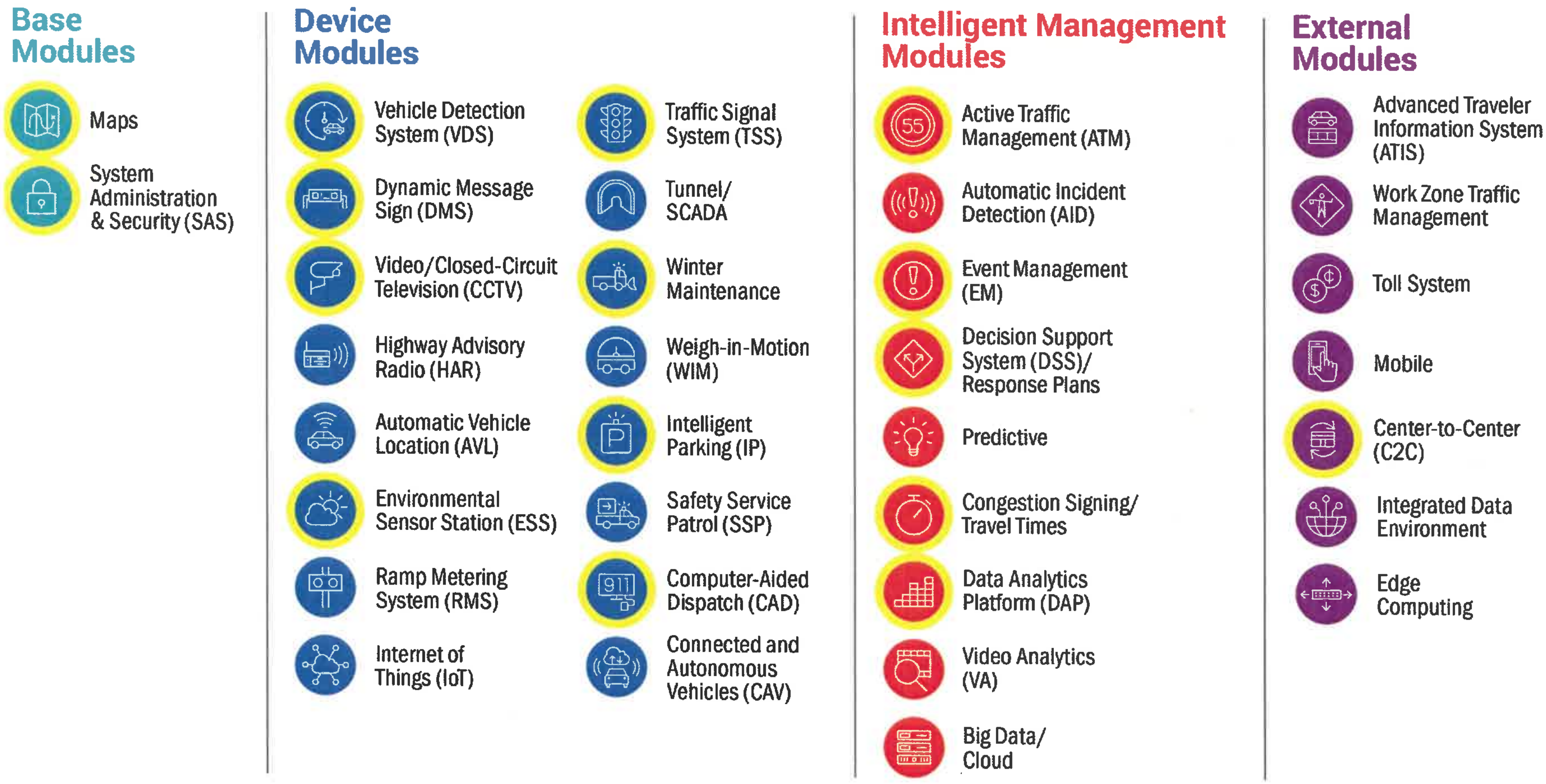



**Figure 5 – iNET™ Modules**

To meet the WVDOT ATMS RFP requirements, the proposed solution will include the following modules:

- Maps
- System Administration & Security (SAS)
- Vehicle Detection System (VDS)
- Dynamic Message Sign (DMS)
- Video/Closed-Circuit Television (CCTV)
- Environmental Sensor System (ESS)
- Traffic Signal System (TSS) (optional future module)
- Winter Maintenance
- Intelligent Parking (IP)
- Computer Aided Dispatch (CAD)
- Active Traffic Management (ATM)
- Event Management (EM)
- Decision Support System (DSS)/Response Plans
- Congestion Signing/Travel Times (TT)
- Data Analytics Platform (DAP)
- Center-to-Center (C2C)

Table 6 is a description of all iNET™ modules that are included in this proposal. The iNET™ platform is the right choice for WVDOT to procure as it not only provides the best solution in the market to meet the RFP requirements but also provides a platform to expand as the state's advanced traffic management system.

**Table 6 - iNET™ Modules**

| BASE MODULES |
|---|
| The **map** module uses a browser-based UI that provides a feature-rich application easily accessible from the internet. A highly detailed, geographically precise map provides a real-time interactive interface to the ATMS, with easy access to controllable field devices. The system can be configured to use a variety of mapping sources, including ESRI, HERE, Google API, OpenStreets, Bing, and DM Solutions. |
| The **SAS** module provides the security component to meet the dynamic operational needs of HA and RWS. Access and control rights to manage events (e.g., incidents and planned events) and ITS field infrastructure can be granted on a per-user, per-group, or per-device basis to support overlapping control responsibilities between agencies' various regional centers. Global system parameters, such as alarm thresholds, are also configured through this module. |
| **IoT AND DEVICE CONTROL MODULES** |
| The **VDS/congestion-monitoring** module uses a wide variety of vehicle detection technologies, including the HA's various vehicle-detection sensor types. This module allows users to view real-time roadway traffic conditions by analyzing traffic speeds, volumes, and occupancy through the use of color-coded icons on the map. Data normalization and failure management algorithms are applied to ensure data validity. |
| The **DMS** module communicates with both fixed and portable DMS signs of varying sizes to disseminate information to motorists. We have a large library of DMS device protocols, including National Transportation Communications for ITS Protocol (NTCIP) v1, NTCIPv2, and other proprietary protocols. Additionally, this module provides a scheduler for users to schedule messages and an AMBER Alert feature. |
| The **video/CCTV** module offers an end-to-end solution for viewing, controlling, and maintaining the cameras in the system. All standard digital formats are supported, and key features include camera control, camera presets, camera tours, video recording, camera locking, and user priority override, as well as video wall configuration and control. |
| The **ESS** module enables users to observe real-time weather conditions, such as surface conditions, temperatures, wind speed, and wind direction, from roadside ESS stations. Color-coded icons on the map quickly alert the user to potentially hazardous conditions. This module is also capable of controlling and monitoring anti-icing systems. |
| The **winter maintenance** module is used to monitor and control snow-plow maintenance operations in the field. The module receives information from the operator, spreader controller, GPS receiver, and plow-blade sensors. This information is made available via an integrated cellular data modem to the iNET™ software. |
| The **intelligent parking (IP)** module assists motorists in finding available parking. The module can operate using a variety of data sources, such as integration to an existing system, in/out counter system, and individual bay monitoring, using hardwired or wireless sensors. |
| The **CAD** module provides for interfaces with CAD systems from various agencies (e.g., highway patrol, police, and fire) to display critical roadway-related event information in real time. |
| The **TSS** module is a full traffic-signal monitoring and control system that includes adaptive traffic-signal control functionality. The system includes real-time analytics, arterial traffic signal performance measures (ATSPMs), and integration with the other system modules including ramp metering and DSS. |

| DATA ANALYTICS, DECISION SUPPORT, AND ARTIFICIAL INTELLIGENCE |
|---|
| The **ATM** module manages and controls traffic demand to efficiently use the available capacity of transportation facilities. This module employs various ATM strategies, including VSLs, DLM, dynamic shoulder use, queue-end warning, reversible lanes, and junction control. |
| The **event management** module provides an intuitive interface that allows users to create, monitor, manage, and remove scheduled and unscheduled events. A vast set of transportation event attributes are supported, such as lane blockage patterns, severe injuries, and property damage. Alerts to the user can be configured. |
| The **DSS/response plans** module allows users to quickly respond to events by providing recommendations for DMS selection and message generation; HAR selection and message generation; operator actions; and automatic electronic notifications through text messages, email, fax, and telephone. Our unique rules-based response plan engine allows for easy customization based on operational needs. |
| The **congestion signing/TT** module provides travel-time information to the public by posting messages on DMS. Key features include customizable target destinations, multi-route destinations, scheduling of operations, and 20 formatting choices. This module now uses AI/ML technology to predict travel times. |
| The **DAR** module logs and stores all pertinent traffic and event information. The data can be retrieved and viewed in a report format. Reports include VDS traffic data (30-second; 5-minute; 15-minute; and hourly, daily, and monthly reports), event summary, DMS message history, CCTV activity, user activity, and inventory audit. These reports also can be exported to other file formats. This module will be used for tracking and reporting the key performance indicators. |
| **EXTERNAL SYSTEM MODULES** |
| The **C2C** module is the gateway to send and receive data to and from the iNET™ ATMS and those systems that are external to the HA and RWS (e.g., for other agencies and municipalities). This module will also be used, as applicable, to exchange information between adjacent regions. This module manages interaction with legacy systems, partners, and agencies. Data is shared via secure internet, intranet, or extranet connections. Standard NTCIP 2306/traffic management data dictionary (TMDD) interfaces are available. |

## 511 PLATFORM/TRAVELER INFORMATION SYSTEM

Castle Rock offers WVDOT something new, different, and innovative for its next-generation 511: a totally upgraded, coordinated, intuitive, and easy-to-use 511 platform that provides traveler information clearly and consistently across 511 channels. Instead of working with multiple vendors on uncoordinated and inconsistent products, WVDOT will have a "one-stop-shop" 511 vendor with Castle Rock. With our proposal, "One-stop-shop" doesn't mean compromising on quality, either. Our 511 user interfaces are more innovative, up-to-date, and user-friendly than the competition.

In addition to its ongoing commitment to innovation and renewal, Castle Rock's 511 platforms are among the most heavily used in the United States. Table 7 demonstrates recent 511 website and mobile app usage stats from some of Castle Rock's clients.

Table 3 – Recent 511 Website and Mobile App Usage Statistics

| CARS STATE | POPULATION | FY 2019 511 WEBSITE/MOBILE APP SESSIONS | FY 2019 511 PHONE CALLS |
|---|---|---|---|
| Idaho | 1.7 million | 5,610,392 visits | 145,266 |
| Iowa | 3.1 million | 15,058,653 visits | 229,143 |
| Minnesota | 5.6 million | 20,439,217 visits | 254,426 |

| CARS STATE | POPULATION | FY 2019 511 WEBSITE/MOBILE APP SESSIONS | FY 2019 511 PHONE CALLS |
|---|---|---|---|
| Nebraska | 1.9 million | 7,586,876 visits | 380,098 |

*Table shows annual web and app sessions for each of the states shown, as collected by Google Analytics*

Castle Rock looks forward to working with WVDOT to help increase public usage of its 511 platform. For every click your operators make in the ATMS, we want to reach as many people as possible who might be impacted by the information.

The key reasons for Castle Rock's demonstrated 511 successes include the following:

- Expert knowledge, based on years of feedback from clients and 511 users in many states, about **what is most important to 511 visitors**
- Clear commitment to delivering information to **rural users** with low-bandwidth or no internet connections
- Proven ability to **scale the systems up and down** to meet 511 demand during major events and crises, **cost-effectively**
- Castle Rock's process of **continued renewal** of all 511 modules, ensuring they stay current, and up to date

## Castle Rock's Vision for the Next-Generation West Virginia 511 Platform

With its new RFP, WVDOT is seeking an ATMS and 511 that either meet or exceed the functionality and performance of its existing platform. Castle Rock's comprehensive 511 offering will **exceed WVDOT's current functionality for all modules,** resulting in a major new upgrade for the DOT and the people of West Virginia.

Following are specific examples of how the CARS platform offers WVDOT a better, more innovative 511 service:

- Interactive **"traffic stories"** that integrate information from multiple sources, rather than just dropping clickable icons on a map
- Beautiful road condition and weather displays for 511 users, including **radar, weather forecasts, CAP alerts, integrated RWIS and snow plow cameras**, and more.
- Comprehensive **trucker information** with beautiful, clear displays
- Near real-time updates: Our CARS modules update their information *within* **seconds** of receiving updates from the ATMS.
- Clear, coordinated information and links **across all 511 channels**
- An innovative road condition reporting system that makes it quick and easy for WVDOT to update road conditions, statewide, using a computer or iOS/Android app.
- Interactive **user onboarding** for new 511 users
- Built-in **social media sharing** for specific events and cameras, allowing your users to spread the word about ATMS events and share cameras
- Comprehensive, coordinated **Your 511** personalized account features across the website, mobile app, and IVR
- My Favorite Camera functionality
- Tweets that include links to individual event reports
- The ability for public users to give feedback on individual events
- And more

Our menu of proven, production-ready modules will provide WVDOT with an innovative new 511 launch well before its deadline. A summary of the proposed Castle Rock solution components follows:

### OneWeb: A 511 Website for 2020 and Beyond

We are pleased to offer WVDOT our *fourth-generation* **OneWeb** module for its new 511 website. Its responsive and up-to-date design will allow WVDOT to make the most of the information it creates in its ATMS.

OneWeb not only meets 100 percent of the RFP requirements but does so with elegance, thoughtfulness, and a user-focus. Instead of simply placing icons on the map with difficult-to-read popups, OneWeb emphasizes the critical information that travelers need to see right away. And, it works elegantly on screens of all sizes.

Personalization is an important part of making 511 accessible and convenient to use. Castle Rock has offered personalized **Your 511** accounts on its 511 platform for more than 10 years—and new users continue to sign up every month.

**Your 511** accounts personalize and coordinate the content the users get on the 511 website, phone, and mobile app, while also offering customized text and email alerts. 511 also includes DMS, RWIS, trucker restrictions, and other layers of interest to WVDOT.

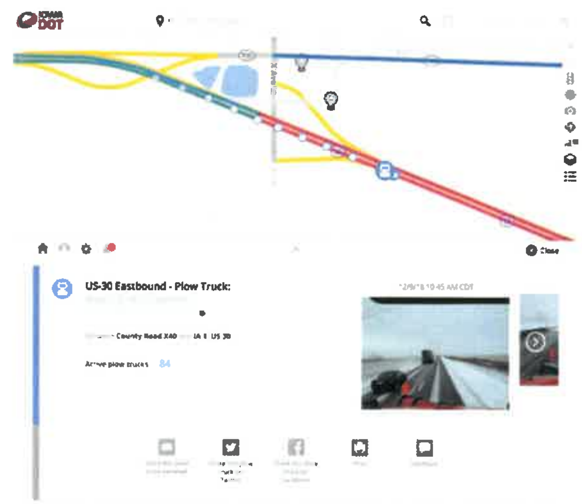



Figure 6 – Snow Plows and Dashcams on Castle Rock's 511 Website in Iowa

### OneApp: A Comprehensive 511 Mobile App for Your Pocket

Our usage statistics, including in the most rural states, show that the majority of 511 web site users are using smart phones—many more than who are using laptops or desktops. For that reason, it is important that WVDOT's new 511 site adapts to small screens.

Castle Rock both understands and honors the importance of maintaining 511 IVRs for rural or no-bandwidth users, and we also recognize the importance of offering a superb 511 mobile app for smart phone users.

Castle Rock built the first version of its 511 mobile app (for both iOS and Android native platforms) in 2013-2014 for the Minnesota Department of Transportation and has since rolled it out for several other states and agencies. Even the very first version of the app was designed to be consistent, coordinated, and integrated with the 511 website and 511 IVR.

The Castle Rock 511 app consistently receives the highest ratings and largest numbers of downloads in the 511 category. Like WVDOT does today, Castle Rock currently offer different "flavors" of the app for general highway and truckers, the latter emphasizing size/weight restrictions, truck ramps, and other information types of particular interest to commercial vehicle operators.

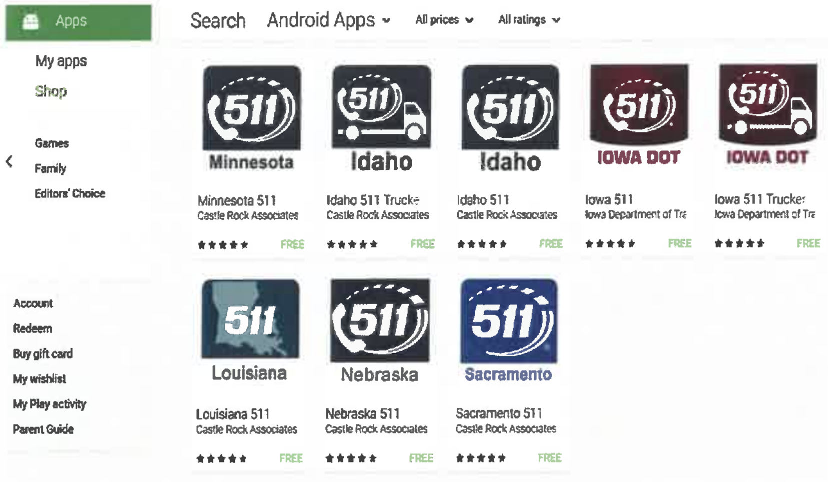



Figure 7 – Castle Rock 511 App

Castle Rock's 511 mobile app was also among the first to support **full hands-free, eyes-free** functionality. The app's talking feature leverages the user's geolocation to describe downstream events and truck-parking availability.

Castle Rock's 511 mobile app is also an industry standout in that it includes complete **Your 511 account creation, management,** and **text/email alert scheduling** functions. It also includes easy-to-use **detour displays.**

All 511 personalization features are available on the 511 website and mobile app, and users can seamlessly move back and forth between the two platforms to access and manage their account info.

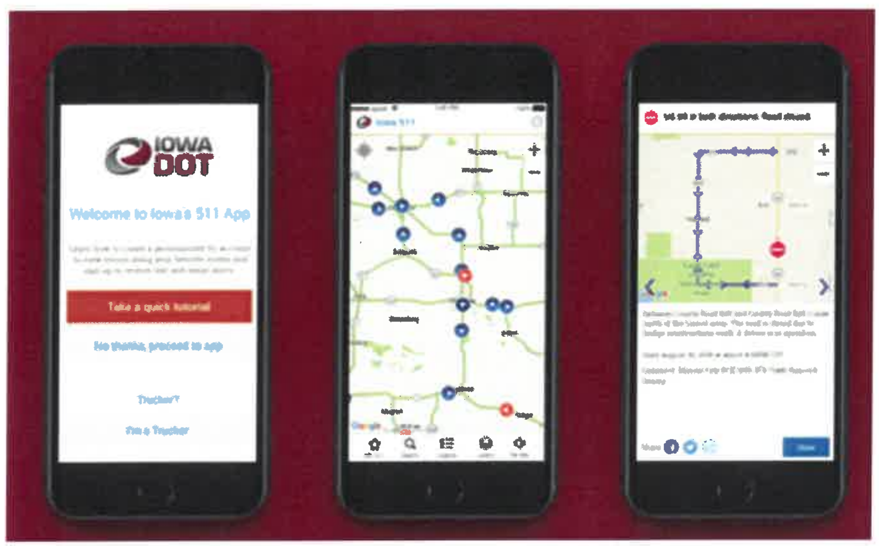



Figure 8 – 511 Mobile App

## Social Media: Auto-Tweets

Castle Rock's Alert B module auto-tweets event and floodgate messages to one or more Twitter/Facebook feeds, just like WVDOT does today. As a **value add,** Castle Rock's module also includes a **shortened** URL that takes the user directly to the event on the 511 website, where they can see the full details. This is another example of how all aspects of Castle Rock's ATIS platform are coordinated and integrated.

## Castle Rock's IVR: The Original

Castle Rock is a well-known pioneer of 511 phone systems. It built the first version of its fully automated CARS-511 IVR module in 2001–2002, originally for the Minnesota Department of Transportation. By deploying the CARS-511 IVR module, many U.S. states became FHWA-recognized early adopters of 511.

Some key differentiators of the IVR platform include the following:

- All VXML coding is done in-house by Castle Rock, so that minor dialog changes and tweaks can be made quickly and efficiently as part of its O&M service
- Floodgate messaging that is fully consistent with the web site and mobile app.
- Distributed call center with no built-in cap on the number of simultaneous calls
- No bursting rates
- Integration with Your 511 accounts, greeting callers who have opted-in by name and playing customized info

### CARS-Segment: The Leading Tool for Road-Condition Reporting

The road-condition reporting module, **CARS-Segment**, was first launched in 2006. It is used by Iowa DOT, Minnesota DOT, the ITD, Indiana DOT, Nebraska DOT, and British Columbia—all geographies of North America that experience major winter storms.

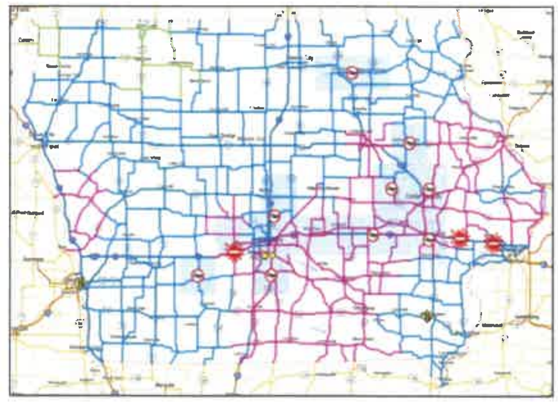


Figure 9 – Road-Condition Reports From CARS-Segment on 511 Web

CARS-Segment includes the following key components:

1. **Segment definition tool:** this map-based tool allows the DOT to specify the boundaries of its winter reporting segments for all statewide roads. The tool includes built-in data-quality checking intelligence to confirm that all state highways are included in the segment definitions, without "gaps" or missing links between reporting segments.
2. A **web-based winter road-condition reporting** interface, accessible through any standard web browser, that allows authorized users to create winter road-condition reports with a few clicks of the mouse or taps of the screen. Users can find specific segments by route, county, district, or maintenance garage.
3. A **mobile app** version of the winter road-condition reporting tool. It is available in both iOS and Android.

CARS-Segment makes it easy to provide quick updates to statewide road conditions. It also aggregates similar adjacent reports, reducing the clutter on 511.

### Real-Time Truck-Parking Specialists

Castle Rock has worked with two states—Minnesota and Iowa—as part of the TPIMS (Truck Parking Information Management System) project to integrate real-time truck parking into the 511 website and mobile app. With usability at the forefront of the design and planning, Castle Rock has carefully designed interfaces that really bring this information to life for 511 users.

The screenshot below, for example, shows how *real-time truck-parking information* is integrated into 511. Carefully laid-out displays make multiple parking camera angles available in a single view, along with color-coded information regarding parking spot availability. The next downstream parking lot's information is presented simultaneously, including the winter driving report.

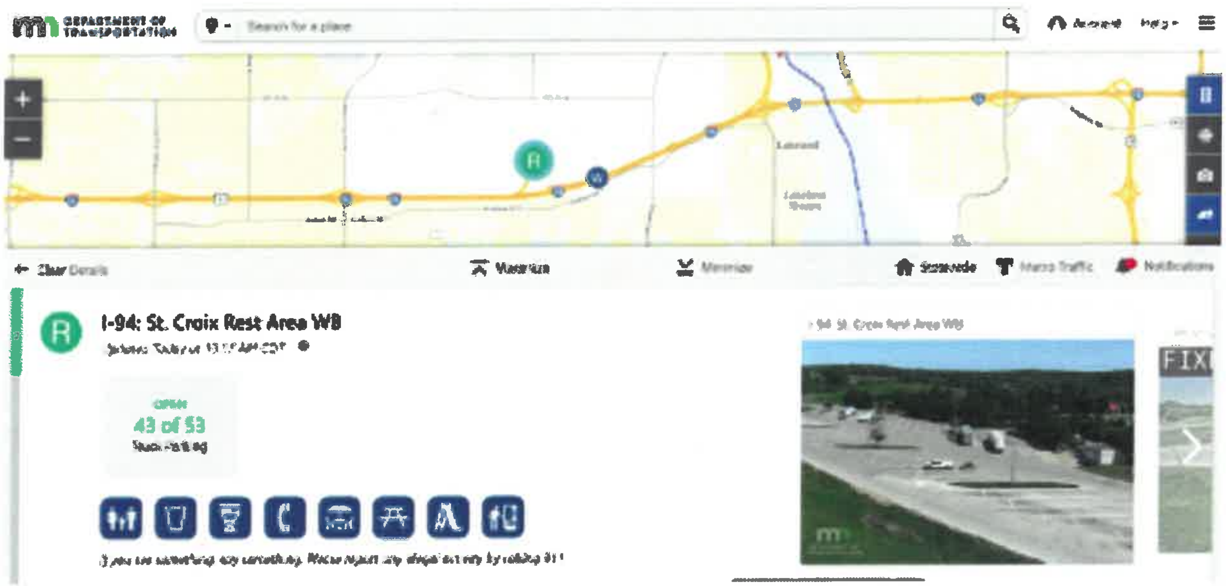



**Figure 10 – Real-Time Truck-Parking Integration on the Public Sites**

The mobile app displays this information in a clear and consistent way (Figure 10). In addition to real-time truck parking, the system includes the following truck-specific layers on the 511 website and mobile app:

- Rest areas (including a tool for updating the status of each rest area, indicating if it is closed and the reason why)
- Truck ramp locations and info
- Clear information about size-weight restrictions on the map and in textual displays
- Weigh station information
- Roundabouts with size/weight restrictions
- Spring breakup restrictions
- Mountain pass displays, which give integrated information for truckers at mountain pass locations (this may be of special interest to West Virginia, given its mountainous terrain)

### CARS-API: An Open Data Feed for Third-Party Integrators

Castle Rock's CARS platform has followed the "open data" principle from Day 1. CARS has always included open-access data for the public 511 information. Today, we offer an open API with XML and JSON feeds for third-party data integrators. Hundreds of third parties make use of our API to create new products, provide data for research and planning projects, feed CVO permitting tools, and more.

In addition to meeting the project requirements and offering several value-adds, Castle Rock is pleased to offer WVDOT a solution in which all of its 511 "desirables" are also included. A quick summary is below.

## Desired 511 Functionality

### Your 511 Accounts – Personalized Alerts

Personalization is a great way to make 511 accessible and convenient to use. **Your 511** accounts personalize and coordinate the content the users get on the 511 website, phone, and mobile app, while also offering customized text and email alerts.

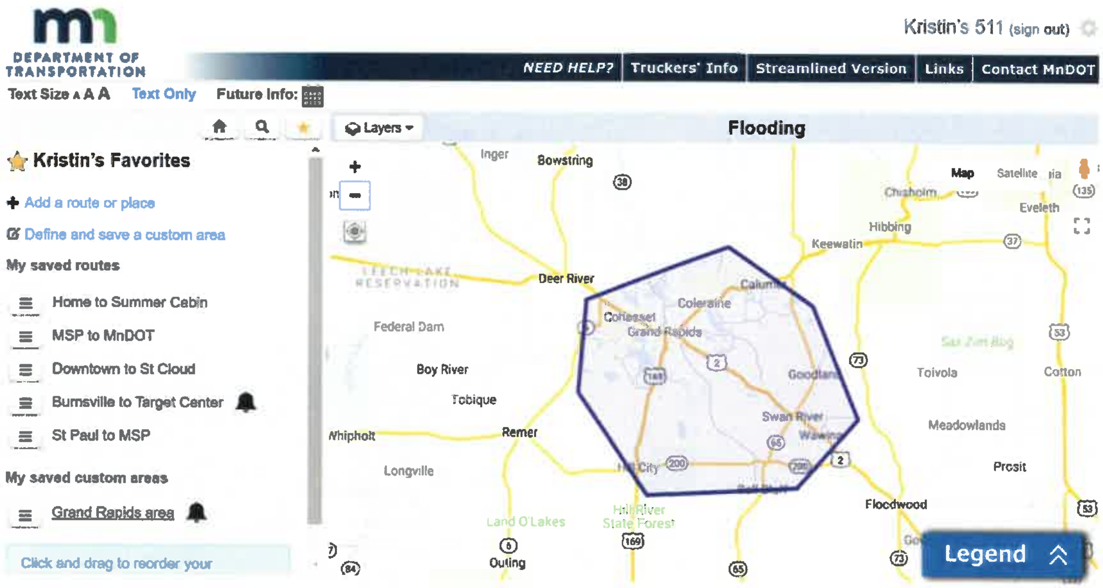



Figure 11 – Save a Custom Area in Your 511

With a Your 511 account on the OneWeb platform, public users can do the following:

> "Hello, Jen. There are currently no delays on your home to work route. To hear about your other saved routes, press or say 1."

- Create and save **favorite routes**, address to address, or with way points using Google Maps search
- Create and save **favorite areas** (custom polygons, as illustrated above)
- Save **favorite cameras**
- Schedule **text message alerts** for favorite routes and areas (free and unlimited, no per-message costs)
- Schedule **email alerts** for favorite routes and areas
- Opt-in to hearing **personalized info** when phoning the 511 IVR
- Give feedback on individual 511 events
- Sign up for **travel-time alerts** (optional)

There is also an option to sign up for **CVO updates,** which include size and weight restriction information.

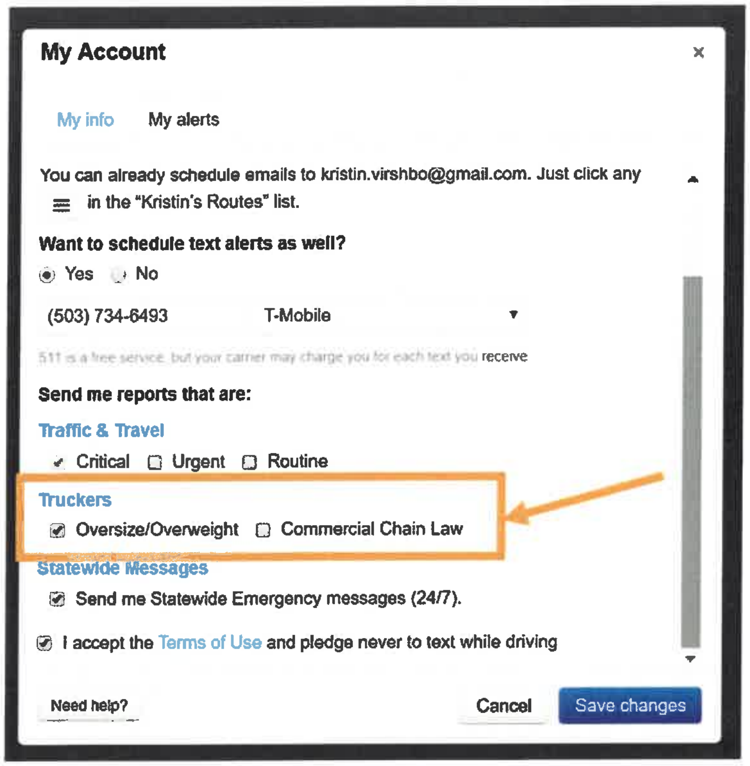



Figure 12 – Size and Weight Restriction Information

Multimodal trip planning is also fully supported. Users can plan, compare, and save routes by highway, transit, bicycle, or walking. Personalization functions can be created and managed on both the **website** and the **mobile app.**

### Scrolling Banner

The Castle Rock 511 solution has included a scrolling banner for more than a decade. The scrolling banner message needs to be created only once by WVDOT operators—and it automatically updates on the phone IVR, web site, and mobile app within seconds.

The scrolling banner is better than those offered by the competition for at least the following reasons:

1. Enter it once, and it appears on the phone, web, and mobile app
2. Automatically finds Priority 1 (severe) incidents imported from the ATMS and includes them in the scrolling banner with a link to the event, so operators don't have to create duplicative scrolling messages
3. Custom, free-text scrolling messages, to be created by operators

Scrolling messages include links that the 511 user can click to get more information, either about the Priority 1 event or the custom floodgate message.

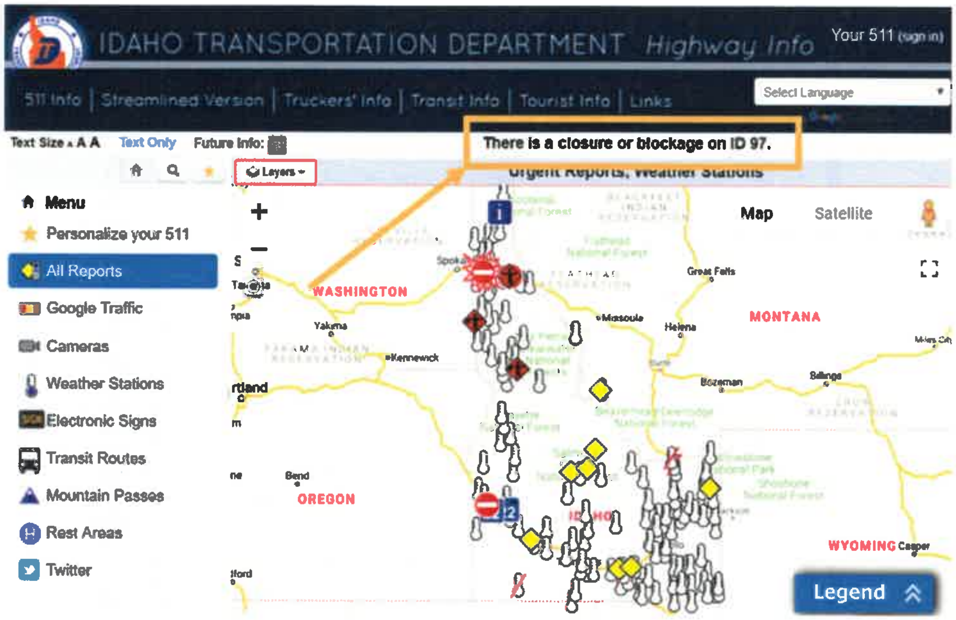



Figure 13 – Scrolling Messages

## Twitter Integration

In June 2009, Castle Rock launched MnDOT's automated 511 Twitter feed @TwinCities511, which covers the Minneapolis/St. Paul metro area. There has been steady growth in traffic over the years and the feed now has over 26,500 followers. The Twitter engine supports tweets to multiple, separate Twitter accounts using geo-fencing—a feature whose underlying logic Castle Rock recently had to update swiftly following sudden changes in the Twitter API terms and conditions.

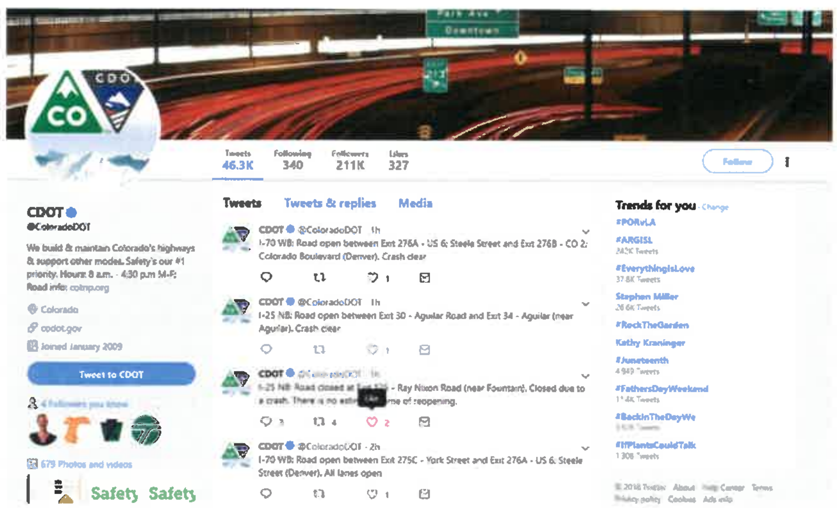



Figure 14 – Automated Twitter Travel Alerts Feed

The Twitter/Facebook posting engine (called Alert B) also includes **links to the events that triggered them** on the 511 website.

## Speed Maps

The proposed solution meets the WVDOT's desire for speeds on most or all roads because of Castle Rock's use of the Google Maps traffic layer on the 511 website and mobile app. Our inter-agency license makes Google a cost-effective and affordable option for WVDOT, with an improved user experience over the HERE maps used today.

**Figure 15 – Google Maps Traffic Layer on 511 Website and Mobile App**

## ATMS Software, System Architecture

Parsons proposes its iNET™ ATMS to meet and exceed the WVDOT ATMS implementation and maintenance services RFP. With more than $6 million in enhancements completed in the last two years, iNET™ is the most feature-rich production-ready ATMS solution available in the market today. The iNET™ ATMS is deployed as a scalable, high-performance, high-availability system that will enable WVDOT to achieve all the objectives for the improved system.

> Our iNET™ ATMS provides a scalable, high-performance, high-availability system.

Our iNET™ ATMS solution uses a flexible deployment model, compatible with most X86-based, enterprise-grade platforms. We understand the necessity to minimize system downtimes during transition to a new platform and as such, Parsons team will procure the necessary hardware to setup the acceptance testing environment using funds from the IDIQ budget line item referenced in 4.2.2.17. Once acceptance has been obtained, the environment will be promoted to production and we will work with WVDOT to transition existing hardware to be utilized as a To ensure maximum benefit from investments already made by WVDOT in existing hardware and software, iNET™ will be deployed using the existing hardware platforms made available by WVDOT for this project. We have included all additional components necessary to provide a performant, and high-availability system and to satisfy all functional requirements for the project. These components are described below.

## System Architecture

The Parsons team has defined a world-class solution that will meet WVDOT's expectations for all mandatory and all desired functionality of the next ATMS and 511 Platform. Our team is leveraging past experiences to provide a proven and successful solution. As illustrated in the diagram below, the Parsons iNET™ platform will be directly integrated with the Castle Rock 511 Traveler Information solution that will exceed the WVDOT requirements and provide a foundation for future expansion in the state of West Virginia.

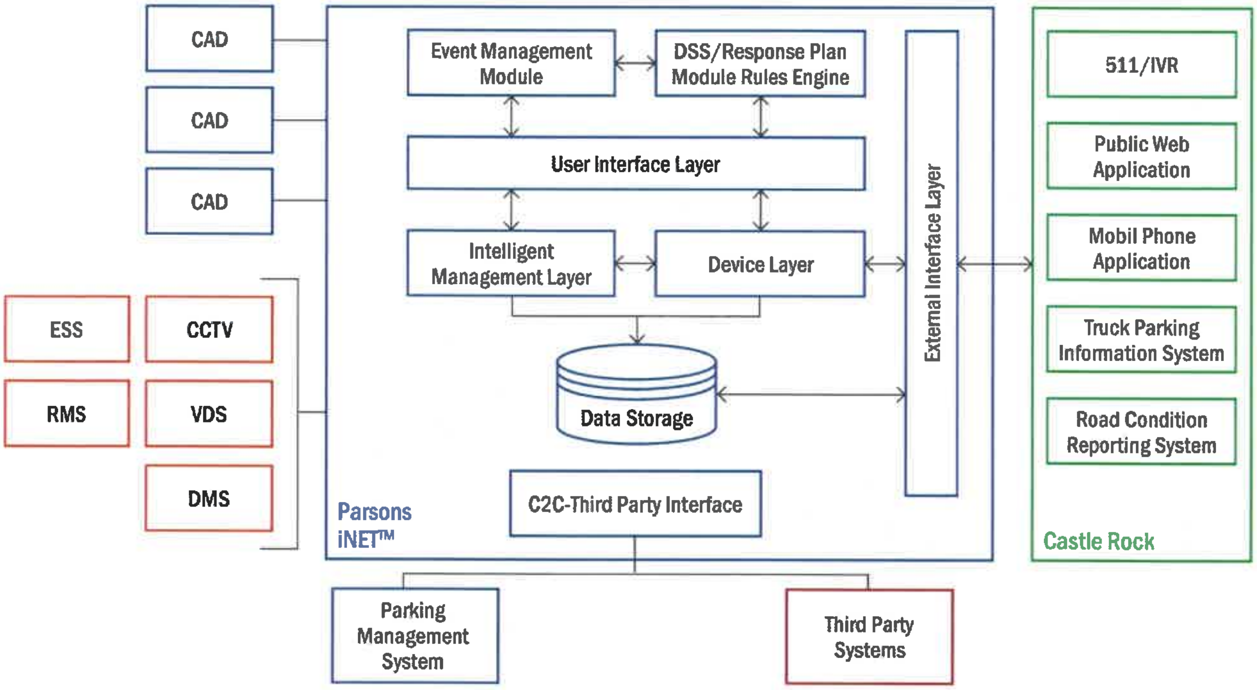



Figure 16 – System Architecture

We will deploy iNET™ cluster and Neverfail Availability Engine integration, providing an industry-proven, high-availability disaster-recovery platform for the WVDOT ATMS.

The proposed configuration satisfies Requirement 4.17 performance requirements by allowing the ATMS application to remain operational through hardware, network and other system failures. Our iNET™ multilayered approach to system availability is simple to manage, while providing state-of-the-art system availability and scalability. The iNET™ solution provides several levels of redundancy to support the 99.9% uptime stated in requirement 4.17.14. This solution also provides the appropriate processing power to meet the high-performance metrics stated in Requirements 4.17.1.5–7. A high-level representation of the proposed deployment architecture is provided below. Core features of the solution are numbered in the following diagram. Each numbered item is described below.

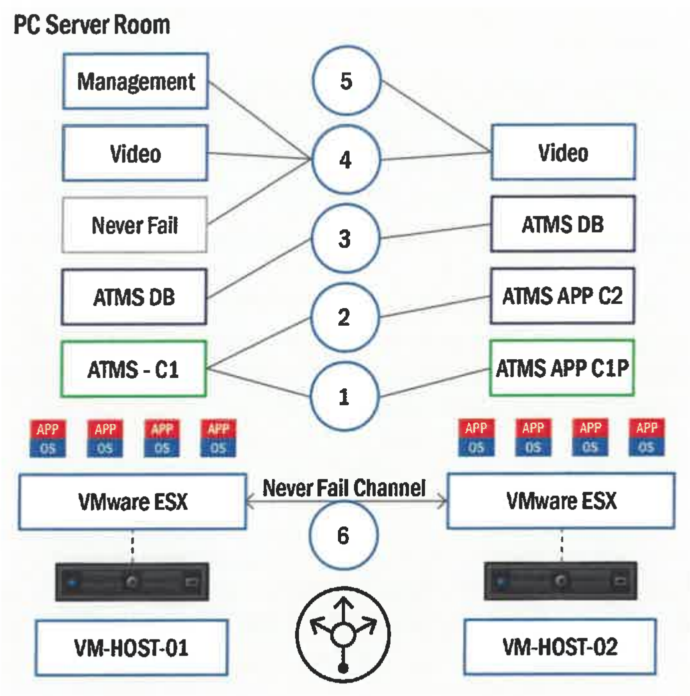



Figure 17 – Proposed Deployment Architecture

1. iNET™ application cluster – The iNET™ application cluster consists of two active virtual servers deployed in the data center virtual server cluster. The iNET™ cluster servers synchronize session and device data in real-time to provide seamless failover for clients when a failure on one cluster server occurs. Another benefit of this configuration is that most application updates can be applied to one active server and tested without disrupting operations. This functionality is described in greater detail later in this document.
   a. Additional iNET™ cluster servers can be added as necessary, allowing the system to scale as necessary. Single iNET™ servers have been load tested to support hundreds of concurrent clients.
2. Neverfail availability server pair – The Primary iNET™ cluster server will also be configured with Neverfail real-time replication to a hot-standby (passive) server. Neverfail Engine monitors the application and server health and will automatically fail-over services to the hot-standby server when necessary.
3. Neverfail SQL database replication – Two Microsoft SQL database servers are also configured as a Neverfail pair. Neverfail manages replication of all data to the secondary (data center hot-standby database server).
   a. Neverfail database replication provides a lower-cost and easy-to-manage solution compared to traditional SQL replication solutions, eliminating the need to purchase enterprise licensing or deploy complex availability systems for SQL clusters.
4. Failover and failback management – Neverfail manages health monitoring and the failover process, including failover operations for the application and database servers, as well as supporting applications such as video management, monitoring, reporting, and management services, when necessary. Failback operations are also managed through Neverfail ending with a simple one-click operation.
5. Video services – iNET™ video services will be deployed on hardware procured by Parsons during the development and transition period. The14 Dell servers provided by WVDOT will become spares and will be utilized to scale as necessary after acceptance and system transition has occurred. iNET™ provides a robust set of video management and video distribution features including the following:
   a. iNET™ integrates with EvoStream Media Server to provide low-latency video streaming in HTML-5 capable browsers, bandwidth management, and transcoding capabilities.

b. iNET™ provides an advanced desktop client, providing operators a personal-video-wall interface that can be managed through the client.
c. iNET™ manages inventory; connections to CCTV devices across multiple video servers allows aggregation of connections, bandwidth management, transcoding, and snapshot collection for a variety of devices. iNET™ Video supports streams from all H.264 and MJPEG, including RTSP/RTMP streams.
d. iNET™ desktop player additionally supports streaming of MPEG-4 RTSP/RTMP video sources.

6. High-availability replication – Neverfail channel efficiently replicates data between active and hot-standby servers hosted on the PCC virtual server cluster. The servers in the PCC share a virtual public IP allowing clients to seamlessly connect to the active server when any failover occurs. The same cluster-based configuration can also run on physical servers or a mix of physical and virtual servers as required. We have specified a high-availability KEMP load balancer pair that will monitor the health of each application and seamlessly re-direct clients to a healthy server when necessary.

## INET™ SERVER SPECIFICATIONS

### CORE INET™ ATMS

The Parsons team will deploy the iNET™ ATMS solution to virtual servers running on upgraded server hardware procured using IDIQ funding. This platform will be utilized for initial buildout and acceptance of the ATMS solution and will be promoted to production once acceptance has been obtained. We have reviewed the hardware specifications provided by WVDOT in Section 4.2 of the RFP and have validated that our solution can operate and meet functional requirements using the existing equipment and software. As such we will utilize the existing hardware platform to scale the production ATMS as necessary and to provide a test environment for validation of upgrades and new versions. As stated in Addendum 2, additional hardware details will be provided to the successful bidder, and we will work with WVDOT to complete any modifications or upgrades necessary using IDIQ funds. Recommended server requirements are listed in the iNET™ Server Requirements section below:

#### INET™ SERVER REQUIREMENTS

Three iNET™ application VMSs provide local clustering and failover and remote disaster-recovery capabilities, which will be deployed to server infrastructure located at the primary data center.

Table 4 – iNET™ Server Requirements

| DESCRIPTION | OPERATING SYSTEM | ROOT PARTITION (GB) | ADDITIONAL PARTITION (GB) | CORES | MEMORY (GB) | QUANTITY |
|---|---|---|---|---|---|---|
| iNET™ Application Server Primary Cluster VM | Windows Server 2016 or greater | 100 | 160 | 8* | 32 | 2 |
| iNET™ Application Server Secondary Cluster VM | Windows Server 2016 or greater | 100 | 160 | 8* | 32 | 2 |
| iNET™ Application Server Hot-Standby VM | Windows Server 2016 or greater | 100 | 160 | 8* | 32 | 2 |

#### INET™ PRODUCTION DATABASE SERVER REQUIREMENTS

Three database VM servers running Windows 2016 or greater and Microsoft SQL server standard are required to provide local replication and high availability.

Table 5 – iNET™ Production Database Server Requirements

| DESCRIPTION | OPERATING SYSTEM | ROOT PARTITION (GB) | ADDITIONAL PARTITION (GB) | CORES | MEMORY (GB) | QUANTITY |
|---|---|---|---|---|---|---|
| iNET™ Database Server Primary Cluster VM | Windows Server 2016 or greater | 100 | 1200 | 8* | 32 | 2 |
| iNET™ Database Server Secondary Cluster VM | Windows Server 2016 or greater | 100 | 1200 | 8* | 32 | 2 |

**Note:* 2 sockets with a minimum or 4 cores per socket are typically used, additional CPU may be necessary for large deployments.

#### VIDEO DISTRIBUTION / ANALYTICS

We propose to utilize the existing Citilog solution for video analytics and validate that the existing features can be used to satisfy project requirements. Our video solutions support deployment on most enterprise-grade hardware and will utilize a combination of Parsons and WVDOT provided hardware. Some enhancements and upgrades may be necessary, and we will work with WVDOT to optimize hardware and software components using IDIQ funding.

#### INET™ PRODUCTION SUPPORT SERVER REQUIREMENTS

Two video server VMSs will be deployed to support on-demand recording and snapshot collection. We will provide additional video distribution servers using IDIQ funding to support video distribution during the initial buildout and acceptance. Parsons will leverage Citilog video analytic servers specified in RFP Section 4.2 for video analytic services. We have also included the necessary licenses to enhance the existing distribution systems by deploying EvoStream Media Server and integration with the iNET™ platform.

Two VMSs will be deployed to support system management functions such as Neverfail and system monitoring. One physical server will be deployed to support tableau, archive, and reporting features.

Table 6 – iNET™ Production Support Server Requirements

| DESCRIPTION | OPERATING SYSTEM | ROOT PARTITION (GB) | ADDITIONAL PARTITION (GB) | CORES | MEMORY (GB) | QUANTITY |
|---|---|---|---|---|---|---|
| INET™ Video Primary VM | Windows Server 2016 or greater | 100 | 1200 | 8* | 64 | 14 |
| Neverfail and Management VM | Windows Server 2016 or greater | 100 | 1200 | 8* | 16 | 2 |

#### INET™ NONPRODUCTION SERVER REQUIREMENTS

The Parsons team will deploy a non-production *Testing* environment in order to provide on-going testing of new upgrades and operator training. The *Testing* environment will be created initially with Parsons provided hardware and then migrated to existing WVDOT hardware post-acceptance.

Table 7 – iNET™ Nonproduction Server Requirements

| APPLICATION | OPERATING SYSTEM | ROOT PARTITION (GB) | ADDITIONAL PARTITION (GB) | CORES | MEMORY (GB) | QUANTITY |
|---|---|---|---|---|---|---|
| iNET™ Application Servers | Windows Server 2016 or greater | 100 | 160 | 8 | 32 | 2 |
| iNET™ Database Server (VM) | Windows Server 2016 or greater | 100 | 160 | 4 | 16 | 1 |
| iNET™ Reporting Server (VM) | Windows Server 2016 or greater | 100 | 160 | 4 | 16 | 1 |

**** Nonproduction database partitions may be reduced or thin provisioned as required by client infrastructure.***

*Note: additional resources and VMS may be required based on HA and DR design requirements*

## INET™ Database Storage Requirements

Archive database storage has been estimated based on project requirements. This estimate may be affected by additional devices or frequency changes. We have verified that the proposed equipment as well as equipment provided to this project by WVDOT will satisfy project requirements.

## INET™ Database Requirements

The database servers used by the iNET™ solution and recommended configurations are described below. iNET™ is compatible with a variety of enterprise database solutions. We have recommended integration with Microsoft SQL server standard and Neverfail database replication features for this project.

Table 8 – iNET™ Database Requirements

| DATABASE | DESCRIPTION | SIZE (GB) | ACCESS |
|---|---|---|---|
| iNET™ Production Configuration DB | iNET™ configuration data | 50 | iNET™ Production Application Server and Report Server |
| iNET™ Production Archive DB | iNET™ status, traffic and event historical data | 1200 | iNET™ Production Application Server and Report Server |
| iNET™ Nonproduction Configuration DB | iNET™ configuration data (development and test environment) | 20 | iNET™ Nonproduction Application Server and Report Server |
| iNET™ Nonproduction Archive DB | iNET™ status, traffic and event historical data (development and test environment) | 100 | iNET™ Nonproduction Application Server and Report Server |
| iNET™ Archive and Analytics DB | Stores historical data and analytics tables | 2000 | iNET™ Nonproduction Application Server and Report Server, Reporting Clients, Tableau Server |

## Client Workstation Requirements

High-performance workstations are recommended to provide WVDOT users with the best iNET™ experience. We are proposing to use IDIQ funding to provide upgraded workstation computers including two (2) monitors per workstation, in order to mitigate any possible workstation performance issues using the existing equipment.

**Table 9 – iNET™ Browser-Based UI Platform Requirements**

| ITEM | DESCRIPTION | QUANTITY |
|---|---|---|
| Workstations | Intel Xeon (Quad core HT Turbo,10MB), or I5 or better CPU<br>Windows 7/10<br>16 GB DDR3 RDIMM<br>1GB graphics card<br>500GB SATA (10K RPM)<br>Endpoint Security<br>2x 23-inch Monitor – P2314H | 8 (workstations)<br>16 (monitors) |

## Server COTS Software

**Table 10 – Server COTS Software**

| ITEM | DESCRIPTION | QUANTITY |
|---|---|---|
| Server OS | Microsoft Windows Server 2016 Standard or greater for production and nonproduction servers. | 17 |
| Antivirus | The client will provide endpoint protection license and install for production and nonproduction servers and workstations. | 32 |
| Wildfly | Application server used by iNET™ application. | 4 |
| Microsoft SQL Standard 2012 or greater | Used for iNET™ database and archive instances. | 5 |
| Microsoft SQL server management studio | Requested to be installed on iNET™ application and DB SQL servers for management and troubleshooting operations. | 3 |
| .NET | Requirements for SQL management studio installation. | 3 |
| Java OpenJDK | Deployed with iNET™ application servers during iNET™ configuration. | 2 |
| Jasper Reports Community Edition 6.5 | Reporting services installed on iNET™ report servers. | 2 |
| PostgreSQL | Jasper reports DB on iNET™ report servers. | 2 |
| Java JRE | Installed with Jasper Reports on iNET™ report servers. | 4 |
| EvoStream Media Server | Video streaming servers integrated with iNET™ video services. | 14 |
| Neverfail | Four server pairs, with tertiary license for DR support and installation services. | 4 |
| Patching and vulnerability scanning | AlienVault client and LanGuard client. | 32 |
| BI and ad-hoc reporting | Tableau Server, desktop professional, and user licenses. | 1 server, 10 developers, 20 server interactors |

## System Security

Using its extensive security experience, Parsons will provide a comprehensive system security plan based on FIPS 199 risk assessment and provide required NIST-800-53 controls and reporting procedures to satisfy all security requirements including Requirements 4.2.2.12.1–4. For decades Parsons worked behind the scenes delivering cybersecurity services to protect our customers' most-sensitive information and valued critical infrastructure. Our customers include the Intelligence Community, federal and state agencies, the DoD, and commercial enterprises. WVDOT can select us with full confidence that our system security deliverables and implementation will exceed all requirements and expectations for this project. Our proposed components, which will be used to satisfy security requirements for this project, have been included in our base system price and are described below.

### SYSTEM SECURITY PLATFORM – PROTECTION, DETECTION, AUDIT, AND LOGGING

We have included McAfee and AlienVault licenses in the cost proposal to provide a comprehensive system security platform. AlienVault® Unified Security Management® (USM) delivers powerful threat detection, incident response, and compliance management across cloud, on-premises, and hybrid environments. McAfee Endpoint Security will be deployed to provide core threat prevention, state-of-the art techniques to identify malicious code based on appearance and behavior, application containment, and endpoint detection and response.

### SERVER VULNERABILITY SCANNING AND PATCHING

We have included GFI LanGuard in our base cost proposal. GFI LanGuard provides comprehensive patching and vulnerability management, change management, and inventory assessment for all servers used by our solution. We will deploy updates on a monthly schedule to ensure system security. Updates will be deployed first to staging environments, verified, and then deployed to production on an approved maintenance schedule.

### NEXT GENERATION FIREWALL

**To satisfy Requirements 4.2.2.12, the Cisco ASA 5545 Series Firewall with FirePOWER services is proposed,** which will enable secure deployment mission-critical applications and networks in a highly reliable manner, while providing significant investment protection and lower operational costs through its unique, modular design. Cisco ASA combines the most deployed stateful inspection firewall in the industry with industry-leading Sourcefire threat and advanced malware protection in a single device. Firepower Services provide several advanced capabilities including: Clustering and HA services, Network Firewall Routing, Switching, Intrusion Prevention, Application Visibility and Control, Firesight Analytics and Automation, Advanced Malware Protection, Built-In Network Profiling, URL filtering, Identity Policy control and VPN. The Proposed model meets or exceeds the specific Security and Access Control requirements outlined below.

**Table 11 –Security Appliance Requirements**

| | |
|---|---|
| Stateful inspection throughput (max1) | 3 Gbps |
| Stateful inspection throughput (multiprotocol2) | 1.5 Gbps |
| Maximum application visibility and control (AVC) throughput | 1,500 Mbps |
| Maximum AVC and NGIPS throughput | 1,000 Mbps |
| Maximum concurrent sessions | 750,000 |
| Maximum new connections per second | 30,000 |

| | |
|---|---|
| Application control (AVC) or NGIPS sizing throughput [440 byte HTTP]3 | 575 Mbps |
| Packets per second (64 byte) | 900,000 |
| Maximum 3DES/AES VPN throughput4 | 400 Mbps |
| Maximum site-to-site and IPsec IKEv1 client VPN user sessions4 | 2,500 |
| Maximum Cisco AnyConnect IKEv2 remote access VPN or clientless VPN user sessions5 | 2,500 |
| Cisco Cloud Web Security users6 | 5000 |
| VLANs | 300 |
| High-availability support | A/A and A/S |
| Integrated I/O | 8-port 10/100/1000 |
| Expansion I/O | 6-port 10/100/1000 or 6-port GE (SFP) |

## Network Architecture

The Parsons team is industry experts in network design and architecture. We understand the necessity of a solid network backbone for ATMS systems that incorporate video streaming and distribution components. We have evaluated the current network requirements as outlined in the RFP and have determined that the existing agreements and network pipes are able to support the Parsons iNET™ ATMS and Video Distribution solution.

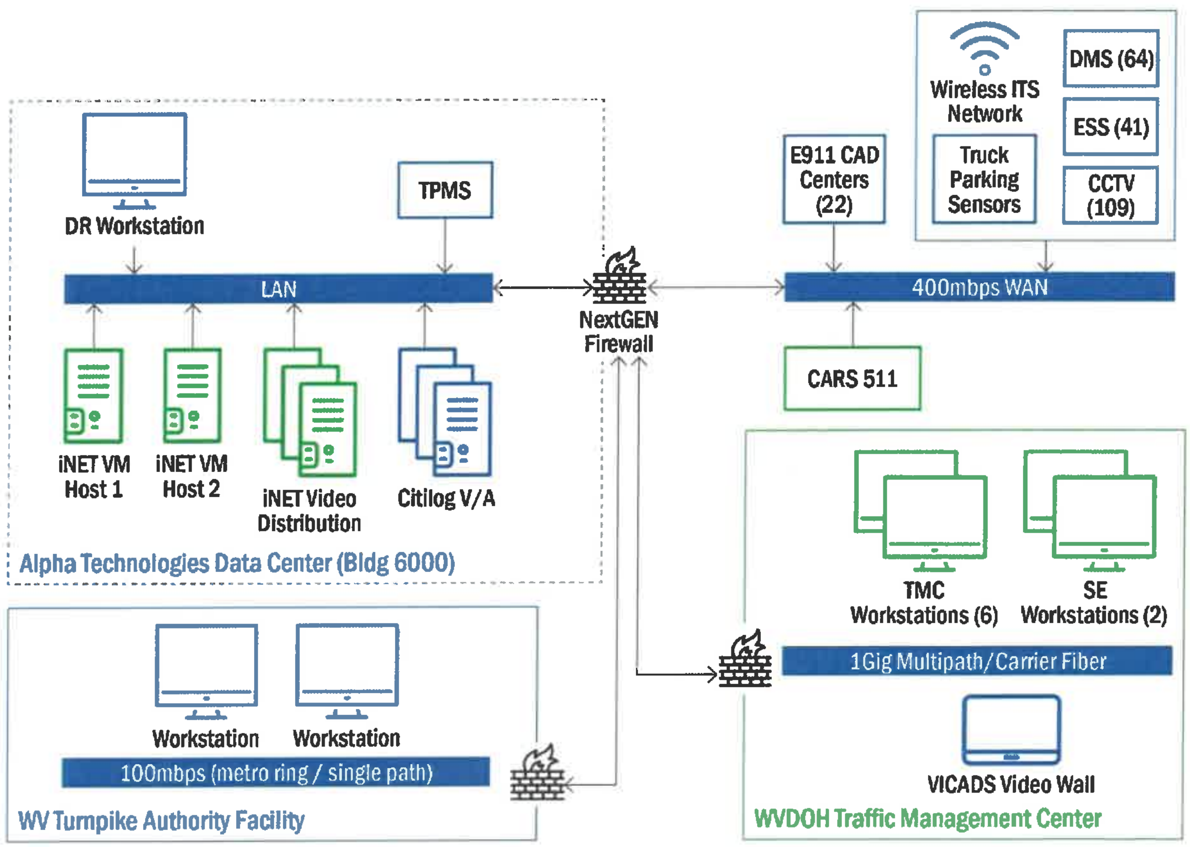



Figure 18 - Network Architecture

Parsons is prepared to enter an agreement with Alpha Technologies to provide the necessary network paths to support the following requirements:

- 400Mbps Internet / WAN connection (CAD / ITS Device Network)
- 100Mbps Metro Ring connection to West Virginia Parkways Authority (WV Turnpike)
- 1Gbps Multipath / Carrier connection to Traffic Management Center

It is our assumption that costs related to network communications infrastructure and connections to/from the TMC, data center, WV Turnpike Authority and Internet are covered by the cost line item *Communications system and services required to provide the ATMS and associated operations desired – Years 2 – 8.*

**NOTE:** Parsons recommends performing regular backups to an offsite facility or to cold storage at the Traffic Management Center.

## FAILOVER AND APPLICATION HIGH AVAILABILITY

An active/warm-standby Neverfail continuity cluster will be deployed and configured to provide high availability in the PCC server room cluster and disaster-recovery (DR) server configurations. Neverfail efficiently manages data replication between the active and passive MSSQL servers in the PCC server room.

Neverfail Continuity Engine consists of the engine management service that is used to deploy and manage the Neverfail engine service that provides for MSSQL application-aware continuous availability.

Using the engine management service, administrators can manage the Neverfail engine with the ability to view Neverfail engine status and perform most routine Neverfail engine operations from a single pane of glass. Details of the failure and recovery options, along with any needs and requirements necessary for cluster deployment, are described below.

Castle Rock's 511 platform also meets High Availability standards. The primary and failover sites are hosted on two separate AWS regions (Ohio and Oregon), with complete failover/failback functionality. We test failover/failback on a quarterly basis.

### Failover and Recovery

The Neverfail engine will be configured to provide high-availability server pairs at the primary data center, and a supports Failover Disaster Recovery host. Configuring our application servers with the Neverfail engine will provide multiple levels of protection (server, network, application, performance, and data) providing high availability in the LAN.

For high availability, a LAN connection is used. Due to the speed of a LAN connection (normally 100 MB or more) bandwidth optimization is not necessary.

#### SYSTEM PROTECTION

Neverfail Continuity Engine provides five levels of protection, described below, which ensure our solution remains available and operational in the event of any system failure.

- Server protection. The Neverfail engine continues to provide availability to end-user clients in the event of a hardware failure or operating system crash. When deployed, the Neverfail engine provides the ability to monitor the active server by sending "I'm alive" messages from the passive server to the active server, which reciprocates with an acknowledgment over a network connection referred to as the Neverfail channel. Should the passive server detect that the process or "heartbeat" has failed, it can then initiate a failover. A failover occurs when the passive server detects that the active server is no longer responding. This can be because the active server's hardware has crashed or because its network connections are lost. Rather than the active server being gracefully closed, it has been deemed to have failed and requires no further operations. In a failover, the passive server is brought up immediately to take on the role of the active server.

- Network protection. The Neverfail engine proactively monitors the ability of the active server to communicate with the rest of the network by polling up to three defined nodes around the network, including, by default, the default gateway, primary DNS server, and the global catalog server, at regular intervals. If all three nodes fail to respond, for example, if a network card or local switch fails, the Neverfail engine can gracefully switch the roles of the active and passive servers (referred to as a switchover) allowing the previously passive server to assume an identical network identity to that of the previously active server. After the switchover, the newly active server then continues to service the clients.
- Application protection. The Neverfail engine running on the active server locally monitors the applications and services it has been configured to protect using plug-ins. If a protected application should fail, the Neverfail engine will first try to restart the application on the active server. If a restart of the application fails, then the Neverfail engine can initiate a switchover. A switchover gracefully closes any protected applications that are running on the active server and restarts them on the passive server along with the application or service that caused the failure.
- Performance protection. The Neverfail engine proactively monitors system performance attributes to ensure that your protected applications are operational and providing service to your end users, and that the performance of those applications is adequate for the needs of those users. The Neverfail engine plug-ins provide these monitoring and preemptive repair capabilities. The Neverfail engine plug-ins monitor application services to ensure that protected applications are operational and not in a “hung” or “stopped” state. In addition to monitoring application services, the Neverfail engine can also monitor specific application attributes to ensure that they remain within normal operating ranges. Like application monitoring, various rules can be set to trigger specific corrective actions whenever these attributes fall outside of their respective ranges.
- Data protection. The Neverfail engine ensures that the data files that applications or users require in the application environment are made available should a failure occur. Once installed, the Neverfail engine can be configured to protect files, folders, and even the registry settings of the active server by mirroring these protected items, in real time, to the passive server. This means that if a failover occurs, all files that were protected on the failed server will be available to users on the server that assumes the active role after the failover. Updates to protected files are placed in a queue on the active server (the send queue), ready to be sent to the passive server with each request numbered to maintain its order in the queue. Once the send queue reaches a specific configured size, or the configured time duration has expired, the update is sent to the passive server, which places all the requests in an array of log files termed the receive queue. The passive server then confirms the changes have been logged by sending the active server an acknowledgment. The passive server’s receive queue is then read in numerical order and a duplicate set of file operations are applied to the disk of the passive server.

## 1.1.4. Proposed staffing plan and/or organizational chart (§ 4.3.1.4)

Parsons has deployed more than 80 ATMS solutions worldwide and employs world-class experts to help us realize these successes. Castle Rock has deployed more than 20 traveler information/511 systems and related offerings, leading the industry in providing human-centered, innovative, and dependable 511 services to the public. The proposed teams’ past experiences, strong work ethic, and drive for success will result in the successful design, implementation, deployment, and support of the West Virginia ATMS and 511 platform solution. Parsons understands and respects WVDOT’s desire to work with a team who is not only experienced with the deployment of ATMS’, but also a team that includes individuals intimately familiar with your existing environment. Parsons is pleased to announce that Brian Smith has joined our team as a Senior Systems Engineer in our Intelligent Transportation Systems business sector. In this role and in close partnership with the Project Manager who brings extensive experiences with Parsons iNET™ ATMS system, Brian would be responsible for the overall technical implementation of the new ATMS system. The Parsons project management team will work closely with the WVDOT project team as an integrated, high-performing team and incorporate all input and feedback into its performance management program. This will ensure high levels of staff performance and overall project success throughout the program. Parsons team staff experience is highlighted in Table 12.

## Organization Chart

The Parsons team was assembled to ensure that the highest-quality, most-advanced solution is provided to meet and exceed the WVDOT ATMS and 511 platform requirements. We will complement our team with additional personnel who are key experts at the forefront of intelligent transportation innovations and who will provide support to ensure the lowest risk to successful implementation, deployment, long-term operation, and technology advancement.

**The Parsons team is committed to providing the most experienced experts for a successful implementation.**

The Parsons team understands the importance of the partnerships necessary to provide a platform for long term success. The scope of the project will require close coordination with WVDOT partners and stakeholders during different stages of the implementation, deployment, operations and maintenance. The proposed team for the WVDOT ATMS and 511 platform includes both Parsons and Castle Rock personnel who have the specific expertise to carry out a smooth, seamless, problem-free migration from WVDOT's legacy system to a new, modern one based on iNET & CARS. We have identified senior members with direct knowledge of the scope, environment and existing solutions, that also have previously worked alongside WVDOT to deliver several successful projects (including the original 2012 ATMS/511 deployment). All team members proposed for this project have extensive hands-on experience in the design and deployment, systems architecture, device integration, testing, maintenance, and operations of ATMS and 511 platforms. Finally, we understand the importance of on-site support and as such the Parsons team will include a talented and experienced systems administrator to oversee the configuration and maintenance of the systems and daily activities at the Traffic Management Center.

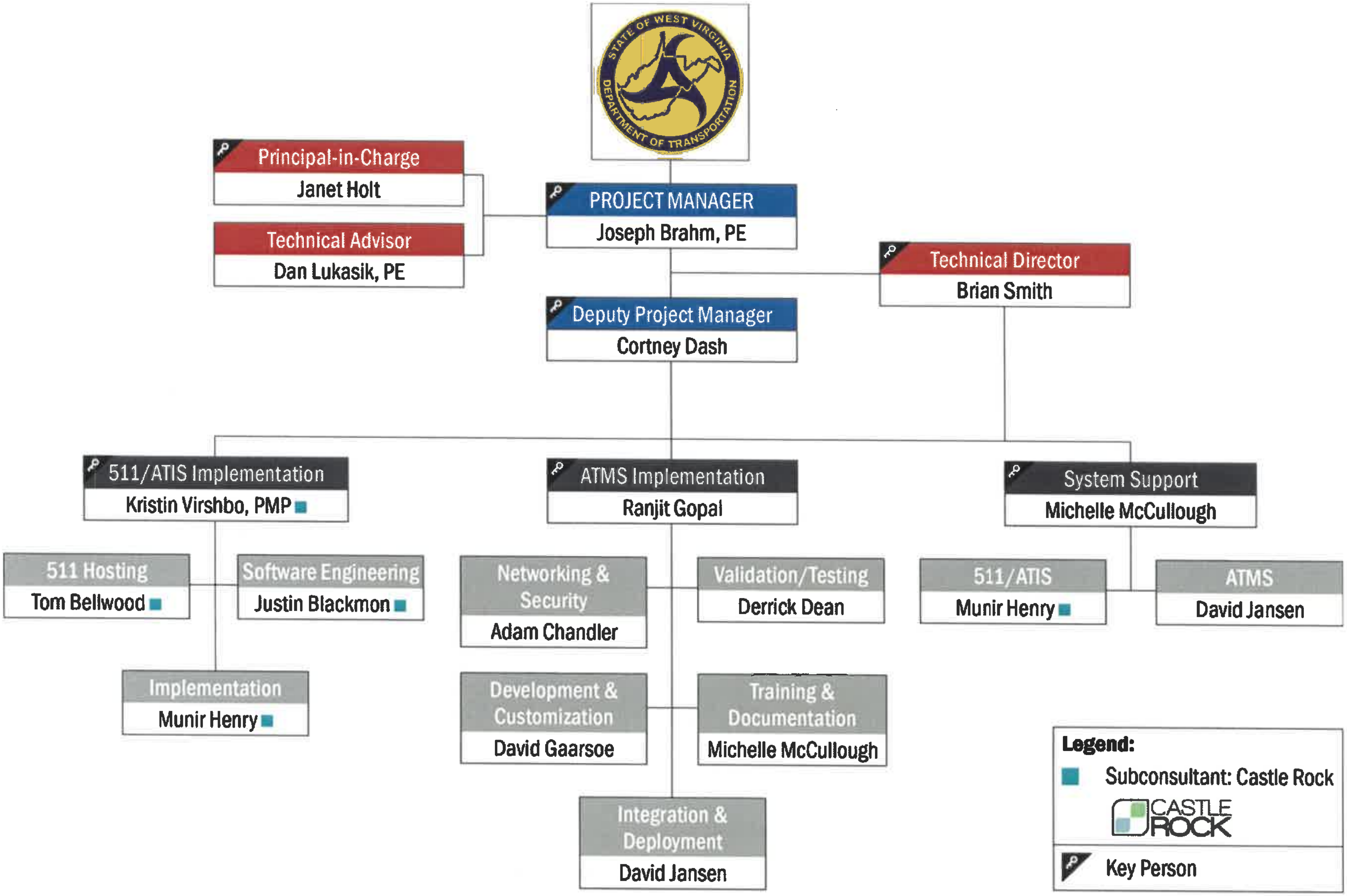



Figure 19 – Organizational Chart

Table 12 – Staff Experience

| STAFF NAME | PROJECT ROLE | EXPERIENCE HIGHLIGHTS |
|---|---|---|
|  Joseph Brahm, PE | **Project Manager** | • 30 years of extensive transportation experience, mostly related to the operations, planning, design, or deployment of ITS<br>• Proven track record managing several highly successful ATMS deployments leading to **eight prestigious awards**<br>• Extensive background in freeway and arterial operations and ATIS<br>• Previously managed three TMCs, including Caltrans District 7 (Metro area) TMC<br>• Managed several large-scale ATMS deployments with many interfaces to external systems including several 911 CAD, 311, 511, road-conditions, asset-management, and other external systems<br>• Proven ability to help agencies leverage the latest ITS technologies to support true operational improvements |
|  Brian Smith | **Technical Director** | • Over 9 years of experience developing and delivering ATMS and 511 solutions to statewide, regional and international agencies<br>• Extensive knowledge of WVDOT environment through role as Technical Lead (2012-2017) responsible for delivering many innovative projects including the original 2012 WV 511 / ATMS deployment.<br>• Key technical personnel on major deployments in Virginia, West Virginia, Pennsylvania, Illinois, Ohio, Mexico and Abu Dhabi.<br>• Managed ATMS product development, R&D and project deliveries, implementing new innovative ideas and solutions<br>• Proven ability to understand client requirements and translate them to solutions that improve TMC operations |
|  Janet Holt | **Principal-in-Charge** | • Thought leader in successful execution and deployment strategies for ITS solutions<br>• Proven program leader in design, implementation, and support of all electronic tolling systems<br>• Proven program leader in the deployment of mission critical converged voice, video, and data solutions<br>• Assists with the project management of ATMS and ITS initiatives in the southeast region |
|  Cortney Dash | **Deputy Project Manager** | • Proven project manager in areas of software design and implementation<br>• Perform project management of ATMS and ITS by coordinating resources, schedules and deliverables as agreed upon<br>• Proven project manager using Waterfall and Agile methodologies to accomplish financial objectives by forecasting requirements and resources; managing the project budget; pricing equipment; analyzing variances and initiating corrective action. |

| STAFF NAME | PROJECT ROLE | EXPERIENCE HIGHLIGHTS |
|---|---|---|
| <br>**Kristin Virshbo** | **511/ATIS Lead** | • 20 years of experience as an ITS and IT professional<br>• Leads the Castle Rock team to innovate and build forward-thinking, human-centered traveler-information and traffic-management solutions<br>• Experience with dozens of transportation agencies in designing, developing, and operating their traveler-information and traffic-management systems<br>• Expert 511 and ATIS solution innovator and problem solver |
| <br>**Ranjit Gopal** | **ATMS Implementation Lead** | • 20 years of experience in IT, project management, and consulting<br>• 13 years of experience in the ITS/ATMS domain<br>• Core competencies including technical leadership, software design and architecture, implementation, and project management<br>• Implementation lead for successful ATMS deployments in Michigan, Indiana, Mississippi, and Rhode Island<br>• Expert in ATMS software development, web-based technologies, databases, design patterns, and agile methodologies<br>• Highly experienced in understanding operational requirements and designing appropriate technology solutions<br>• Strong managerial, analytical, problem-solving, and troubleshooting skills |
| <br>**Michelle McCullough** | **System Support Lead; Training and Documentation Lead** | • Expert knowledge in the creation of program deliverables such as user/administrative guides<br>• Opened and managed the first district operation center in Georgia<br>• Created training materials for ATMS deployments and upgrades<br>• Conducts on-site training for DOT and TMC staff<br>• 5 years of direct end-user experience as a TMC operator for the Georgia DOT |
| <br>Tom Bellwood | 511 Hosting Lead | • 35 years of corporate and product IT experience<br>• Responsible for Castle Rock's operations and developer teams<br>• Nearly 20 years of operating and automating production systems<br>• AWS cloud specialist<br>• Automated the auto-scale burst capacity for the 511 public-facing websites in AWS<br>• Focus on delivering stability and scalability using public and private clouds |
| <br>Justin Blackmon | Software Engineering | • 12 years of experience in advanced software development<br>• Led the multiplatform development of Castle Rock's CARS mobile apps and other major innovations<br>• Works with the project management team through all phases of design and development to meet client requirements |

| STAFF NAME | PROJECT ROLE | EXPERIENCE HIGHLIGHTS |
|---|---|---|
| <br>Munir Henry | Implementation and 511/ATIS | • Successful project manager of ATIS implementations for Kansas, Idaho, San Diego and British Columbia<br>• Certified scrum master, Scrum Alliance, 2019<br>• Acts as liaison between agencies and software development and operations teams to facilitate system changes and upgrades<br>• Performs systems testing and collaborates with clients to define and plan future activities |
| <br>Adam Chandler | Configuration and Installation Lead | • Cisco Certified Network Associate (CCNA)<br>• Led the design and implementation of the Georgia SRTA ITS network and failover solution<br>• Lead project IT engineer for numerous advanced ITS deployments across the country<br>• Expert in platform as a service (PaaS) architectures for ITS solutions<br>• Extensive experiences providing secure, available, scalable networks for video, voice, and data for ITS |
| <br>David Gaarsoe | Development and Customization | • 30+ years of experience in software development<br>• 20+ years in ATMS/ITS domain<br>• Full-stack iNET™ software lead since iNET™ inception for more than 10 years.<br>• Hands-on experience with nearly every iNET™ ATMS module<br>• Numerous successful iNET™ ATMS deliveries |
| <br>David Jansen | Integration and Deployment; ATMS | • 25 years of experience working with ATMS<br>• Expert troubleshooting skills resulting in rapid trouble identification and resolution<br>• Expert with integration of all makes and models of field devices, as well as external data feeds<br>• Developer of ATMS features and administration tools |
| <br>Derrick Dean | Validation/ Testing | • Extensive experience in the implementation and testing of ATMS<br>• Successful operational experience as safety service patroller and traffic operations operator<br>• Decorated police officer for the City of Charlottesville, Virginia<br>• More than 3 years of testing for standards compliance and acceptance trials<br>• Experience with Virginia, Louisiana, Alabama, Mississippi, and Georgia ATMS systems, providing expert support and troubleshooting |

*Key staff resumes (noted in **BOLD**) can be found in Section *"1.1.10. Bios/Resumes of key personnel."*

## Technical Experts

In addition to the program leadership for the WVDOT ATMS/511 platform project, Parsons maintains a deep bench of technical experts who are available to support the implementation for this project as required. Based on our project understanding, we anticipate leveraging resources in the following areas:

- Automated traffic signal performance metrics
- Transit signal priority
- CAVs
- AI/ML
- Traffic engineering algorithms
- TIM
- Cybersecurity

## 1.1.5. Proposed project schedule (§ 4.3.1.5)

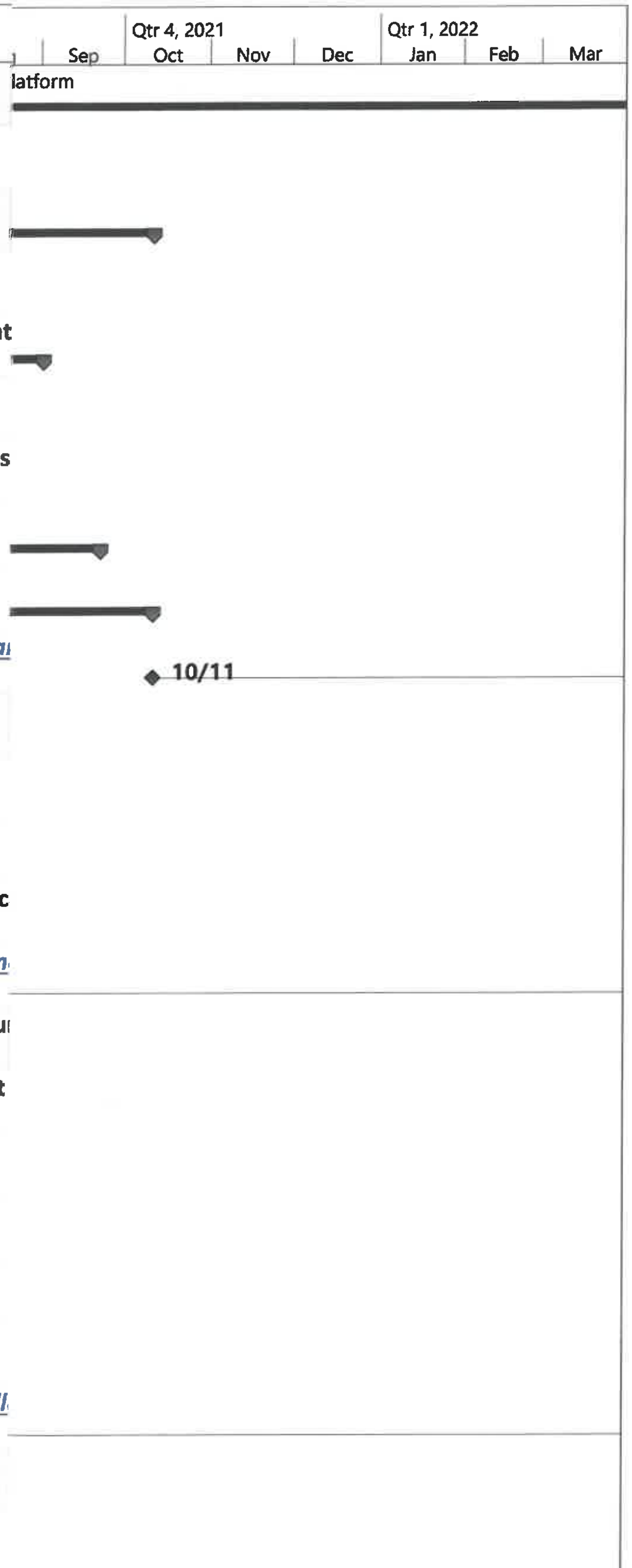
The Parsons team recognizes the level of detail associated with the scope for the WVDOT ATMS and 511 platform. We pride ourselves in thoroughly reviewing all details associated with the projects that we pursue, and we develop detailed schedules to ensure that all tasks are defined and that all key milestones are noted. We invested additional effort in developing a detailed master schedule for the duration of the project that we believe will serve as a valuable baseline for deliverables required during the first phase of the project.

The overall project schedule methodology is driven by and consists of work steps that detail our team's activities for all phases of work related to this project. Our processes are based on structured methodologies that will enable a collaborative approach to ensure that all requirements have been satisfied. Our approach is based on a work plan that is in full compliance with the RFP, which includes appropriate validation points throughout the project's implementation.

Assuming this project is underway on November 2, 2020, we anticipate a system deployment/cutover date of September 21, 2021, approximately 10 months from notice to proceed (NTP). We have identified the estimated start and end dates for immediate reference and designed a schedule to meet the deadlines anticipated.

The schedule is located on the following pages.

| ID | WBS | Task Name |
|---|---|---|
| 1 | 1 | **WVDOT - ATMS and 511 Platform** |
| 2 | 1.1 | *Issue Notice to Proceed (NTP)* |
| 3 | 1.2 | **Task 0: Project Management** |
| 4 | 1.2.1 | **Kick-off Meeting** |
| 7 | 1.2.2 | **Software / System Deployment** |
| 25 | 1.2.3 | **Project Schedule** |
| 32 | 1.2.4 | **Software Development Process** |
| 39 | 1.2.5 | **Monthly Progress Meetings** |
| 41 | 1.2.6 | **Monthly Progress Reports** |
| 43 | 1.2.7 | *Complete Task 0: Project Ma* |
| 44 | 1.3 | **Task 1: Analysis and Design** |
| 45 | 1.3.1 | **System Requirements Review** |
| 51 | 1.3.2 | **System Security Plan** |
| 58 | 1.3.3 | **Information System Design Doc** |
| 65 | 1.3.4 | *Complete Task 1: Analysis an* |
| 66 | 1.4 | **Task 2: Base Installation / Configu** |
| 67 | 1.4.1 | **Dev Environment (Parsons Test** |
| 71 | 1.4.2 | **Device Inventory Setup** |
| 79 | 1.4.3 | **Test Environment (Client Test)** |
| 84 | 1.4.4 | **Next-Generation Firewall** |
| 87 | 1.4.5 | **Production Environment** |
| 92 | 1.4.6 | *Complete Task 2: Base Install* |
| 93 | 1.5 | **Task 3: System Implementation** |
| 94 | 1.5.1 | **Iteration 1** |



| ID | WBS | Task Name | g / Sep / Qtr 4, 2021: Oct, Nov, Dec / Qtr 1, 2022: Jan, Feb, Mar |
|---|---|---|---|
| 100 | **1.5.2** | **Iteration 2** | |
| 106 | **1.5.3** | **Iteration 3** | |
| 111 | *1.5.4* | *Complete Task 3: System Inst* | |
| 112 | **1.6** | **Task 4: System Acceptance** | |
| 113 | **1.6.1** | **Acceptance Test Plan** | |
| 120 | **1.6.2** | **Acceptance Testing** | |
| 124 | *1.6.3* | *Complete Task 4: System Test* | |
| 125 | **1.7** | **Task 5: Documentation and Trainii** | |
| 126 | **1.7.1** | **User's Manual** | |
| 133 | **1.7.2** | **Administrators Guide** | |
| 140 | **1.7.3** | **Training Plan** | |
| 147 | **1.7.4** | **Training Materials** | |
| 151 | **1.7.5** | **Training** | |
| 160 | *1.7.6* | *Complete Task 5: Documenta* | |
| 161 | **1.8** | **Task 6: System Cutover/Migration** | stem Cutover/Migration |
| 162 | **1.8.1** | **System Deployment / Cutover** | Deployment / Cutover |
| 166 | *1.8.2* | *Complete Task 6: System Cutc* | **9/21** |
| 167 | **1.9** | **Task 7: Operations & Maintenance** | Task 7: Operations & Maintenance (Year 1 - Year 3) |
| 168 | **1.9.1** | **Year 1** | Year 1 |
| 179 | **1.9.2** | **Year 2** | |
| 190 | **1.9.3** | **Year 3** | |
| 201 | *1.9.4* | *Complete Task 7: Maintenanc* | |
| 202 | *1.10* | *Complete WVDOT - ATMS and 5* | |

## Work Plan

The following sections detail our proposed work plan of activities. The plan is organized by the major tasks as outlined in the project schedule above. As prescribed, each major task outlined below embodies specific subtasks/activities that define the solution being proposed to WVDOT and result in critical deliverables through the project duration.

### TASK 0 – PROJECT MANAGEMENT

The objective of this task is to provide project leadership that encompasses managing resources, tasks, project schedule, and costs while ensuring the highest levels of customer satisfaction. This task includes overall administration of the project and maintaining frequent communications to ensure that WVDOT remains informed throughout the project life cycle.

**Table 13 – Task 0 – Project Management**

| APPROACH |
|---|
| Conduct project kickoff meeting to review project expectations. |
| Produce a software development process proposal describing the overall implementation process. |
| Produce a software/system deployment transition plan describing the approach to migrate from the existing software systems. |
| Conduct project update meetings. |
| Generate monthly progress reports. |
| Coordinate delivery of project deliverables. |
| Ensure successful ATMS acceptance events. |

### TASK 1 – ANALYSIS AND DESIGN

The objective of this task is to review existing procedures and documentation to gather information that will enable our team to have a thorough understanding of the WVDOT functional requirements. The first part of this task includes a thorough review of the WVDOT functional requirements with project stakeholders to ensure complete understanding. This task will result in providing document deliverables that will serve as the foundation for establishing the new ATMS and 511 platform.

**Table 14 – Task 1 – Analysis and Design**

| APPROACH |
|---|
| Conduct requirement review workshops/meetings with stakeholders to ensure understanding of the WVDOT functional requirements. |
| Coordinate and review existing IVR phone tree along with the proposed new changes to ensure smooth transition on cutover. |
| Coordinate with relevant project stakeholders to define the recommended deployment environment. |
| Generate an information system design document describing the overall system architecture. |
| Generate a system security plan describing the security requirements associated with the system and the approach to satisfy. |
| Coordinate review/feedback cycles of all document deliverables. |

### TASK 2 – BASE INSTALLATION

The task will result in a fully configured iNET™ software baseline that will serve as the foundation for the WVDOT ATMS and 511 platform. The purpose for this task is to establish the initial inventory, configure the required software modules, and build out the environments required to support and host the final WVDOT ATMS/511 solution.

Table 15 – Task 2 – Base Installation

| APPROACH |
|---|
| Establish a development environment with the baseline ATMS software. |
| Configure system modules required to support the WVDOT ATMS. |
| Populate field-device inventory and configure simulation software. |
| Coordinate test and production environment setup and validate with WVDOT staff. |

### TASK 3 – SYSTEM IMPLEMENTATION

This task represents all activities associated with building out the WVDOT ATMS. The objective of this task is to produce software releases that ultimately satisfy the anticipated system's functional, technical, and operational requirements. The structure of this task is iterative and allows for checkpoints to measure progress and validate system functionality. Our proposed implementation plan includes progress reviews, which we expect to provide as a formal demonstration, noting functionality introduced while validating the requirements satisfied.

Table 16 – Task 3 – System Implementation

| APPROACH |
|---|
| Extend/customize required software modules to support the WVDOT ATMS. |
| Establish final configuration and inventory for the ATMS. |
| Perform device integration for all makes/models and inventory provided by WVDOT. |
| Coordinate software release schedule and provide milestone demonstrations. |
| Collect feedback and validate requirements for each software release milestone. |
| Perform system validation in the development and test environments. |

### TASK 4 – SYSTEM ACCEPTANCE

The purpose of this task is to demonstrate to and gain acceptance from WVDOT that the delivered ATMS/511 platform meets or exceeds all contracted requirements. The Parsons team will develop a detailed acceptance test plan (ATP) detailing all steps that lead to validation of the system's functional requirements. Upon approval of the ATP, our team will conduct formal acceptance tests with WVDOT to validate system functionality in a segregated testing environment.

Table 17 – Task 4 – System Acceptance

| APPROACH |
|---|
| Provide an ATP that includes detailed test steps to demonstrate compliance with all requirements. |
| Execute the ATP in a segregated testing environment, set apart from the WVDOT production network. |
| Work with WVDOT IT to ensure the testing environment is installed and configured properly. |

| |
|---|
| Work with WVDOT project team to perform the steps in the approved ATP. |
| Address any issues that are identified during acceptance testing and re-execute test steps associated with any failed tests. |

## TASK 5 – DOCUMENTATION AND TRAINING

This task will result in the delivery of the documentation necessary to fully enable users to use and administer the ATMS and 511 platform. The documentation will be delivered for review and comment and will be updated to include any requested changes resulting from all reviews. All documentation provided will be high quality and thorough to ensure that WVDOT is provided with documentation necessary to fully train employees and administrators on how to operate and maintain the new system. In addition, this task consists of delivery of all contracted training sessions to be provided to all system users and administrators.

**Table 18 – Task 5 – Documentation and Training**

| APPROACH |
|---|
| Provide a user's manual that details the use of the functionality included in the ATMS. |
| Deliver an administrator's manual that details the procedures to set up and completely configure and maintain the ATMS. |
| Provide training materials that consist of PowerPoint presentations, hands-on exercises, and handouts necessary to train users effectively. |
| Conduct initial training for users and administrators. |
| Coordinate review/feedback cycles for all documentation. |
| Submit final deliverables noted for this task. |

## Task 6 – System Cutover/Migration

The task represents all activities associated with the rollout of the final production WVDOT ATMS/511 system, allowing WVDOT to easily retire all components of the legacy system. A smooth, successful system migration is the end result of planning, preparation, and practice, which begin at project kick-off. The project team will take care to fully understand in detail the footprint of the current system and the current users and stakeholders to help us plan, prepare, test, and implement a successful, seamless rollover. We will prepare and document migration activities well in advance of the actual cutover, including coordinating stakeholder roles/responsibilities and overall timing of the migration. As part of this task, we will simulate the system cutover/migration process to ensure that all required functions are thoroughly captured. In addition, a rollback plan will make sure we are prepared with clear, WVDOT-approved steps to follow in the event that we encounter any unexpected issues along the way.

**Table 19 – Task 6 – System Cutover/Migration**

| APPROACH |
|---|
| Coordinate with WVDOT project stakeholders on the scheduling of the system cutover. |
| Work with WVDOT to identify all stakeholders and related parties who will be involved with or need to be informed of the cutover throughout the rollover. |
| Prepare and test data migration scripts for migrating applicable legacy data from the old system to the Parsons/Castle Rock solution. |

| |
|---|
| Prepare and review a training and communications plan to notify internal administrators, users, and other stakeholders throughout transition. |
| Prepare a rollback plan in the event that the unexpected or unanticipated occurs before, during, and after the cutover. |
| Coordinate with WVDOT project stakeholders on the scheduling of the system cutover. |
| Validate the software/system deployment transition plan and establish a schedule of activities for cutover day. |
| Perform simulation exercises to confirm schedule of activities and define roles/responsibilities. |
| Conduct the system cutover/migration tasks in coordination with WVDOT staff. |

### Task 7 – Maintenance and Support

The objective of this task is to provide maintenance and support for the fully implemented WVDOT ATMS/511 system for a period of 3 years at the conclusion and full acceptance of the final WVDOT ATMS/511 platform. This task consists of providing ongoing support and providing software enhancement releases updates each maintenance year. In addition, this task will consist of renewing software licenses to benefit from core product upgrades.

Table 20 – Task 7 – Maintenance and Support

| APPROACH |
|---|
| Provide on-site support during and outside normal business hours as required. |
| Provide 24/7 telephone help desk support and track issues reported. |
| Provide core system upgrades and bug fix releases. |

## Milestones/Deliverables

The table below outlines the key milestones/deliverables and their estimated time frame for completion.

Table 21 – Key Milestones/Deliverables

| TASK | MONTH | ESTIMATED COMPLETION |
|---|---|---|
| Conduct Kickoff Meeting | 0 | NTP + 2 weeks |
| Submit Software/System Deployment Transition Plan (draft) | 0 | NTP + 2 weeks |
| Receive Software/System Deployment Transition Plan Comments | 0 | NTP + 3 weeks |
| Submit Software/System Deployment Transition Plan (final) | 1 | NTP + 4 weeks |
| Submit Software/System Deployment Transition Plan (Update #1) | 4 | NTP + 18 weeks |
| Submit Software/System Deployment Transition Plan (Update #2) | 8 | NTP + 32 weeks |
| Submit Software/System Deployment Transition Plan (Update #3) | 11 | NTP + 45 weeks |
| Submit Project Schedule (draft) | 0 | NTP + 2 weeks |
| Receive Project Schedule Comments | 0 | NTP + 3 weeks |
| Submit Project Schedule (final) | 1 | NTP + 4 weeks |
| Submit Software Development Process Proposal (draft) | 0 | NTP + 3 weeks |
| Receive Software Development Process Proposal (draft) Comments | 1 | NTP + 4 weeks |
| Submit Software Development Process Proposal (final) | 1 | NTP + 4 weeks |

| TASK | MONTH | ESTIMATED COMPLETION |
|---|---|---|
| Complete Task 0: Project Management | 12 | NTP + 51 weeks |
| Conduct System Requirements Review | 1 | NTP + 6 weeks |
| Submit System Security Plan (draft) | 1 | NTP + 5 weeks |
| Receive System Security Plan Comments | 1 | NTP + 6 weeks |
| Submit System Security Plan (final) | 1 | NTP + 7 weeks |
| Submit Information System Design Document (draft) | 1 | NTP + 7 weeks |
| Receive Information System Design Document Comments | 2 | NTP + 8 weeks |
| Submit Information System Design Document (final) | 2 | NTP + 9 weeks |
| Complete Task 1: Analysis and Design | 2 | NTP + 9 weeks |
| Receive ITS Device Inventory | 2 | NTP + 8 weeks |
| Complete Baseline Configuration (dev) | 2 | NTP + 11 weeks |
| Receive Access to Environment (test) | 3 | NTP + 13 weeks |
| Procure Next-Generation Firewall (NGFW) | 3 | NTP + 15 weeks |
| Receive Access to Environment (prod) | 4 | NTP + 18 weeks |
| Complete Task 2: Base Installation | 4 | NTP + 19 weeks |
| Conduct Progress Milestone #1 | 3 | NTP + 15 weeks |
| Conduct Progress Milestone #2 | 5 | NTP + 21 weeks |
| Conduct Progress Milestone #3 | 6 | NTP + 27 weeks |
| Complete Task 3: System Installation | 6 | NTP + 27 weeks |
| Submit Acceptance Test Plan (draft) | 6 | NTP + 24 weeks |
| Receive Acceptance Test Plan Comments | 6 | NTP + 25 weeks |
| Submit Acceptance Test Plan (final) | 6 | NTP + 26 weeks |
| Conduct Acceptance Tests (Iterations 1-3) | 7 | NTP + 31 weeks |
| Complete Task 4: System Testing | 7 | NTP + 31 weeks |
| Submit User's Manual (draft) | 6 | NTP + 27 weeks |
| Receive User's Manual Comments | 7 | NTP + 28 weeks |
| Submit User's Manual (final) | 7 | NTP + 29 weeks |
| Submit Administrators Guide (draft) | 7 | NTP + 28 weeks |
| Receive User's Manual Comments | 7 | NTP + 29 weeks |
| Submit Administrators Guide (final) | 7 | NTP + 30 weeks |
| Submit Training Plan (draft) | 7 | NTP + 31 weeks |
| Receive Training Plan Comments | 8 | NTP + 32 weeks |
| Submit Training Plan (final) | 8 | NTP + 33 weeks |
| Provide Training Manuals/Presentations | 8 | NTP + 33 weeks |
| Conduct User Training | 8 | NTP + 32 weeks |
| Conduct Supervisor/Administrator Training | 8 | NTP + 32 weeks |

| TASK | MONTH | ESTIMATED COMPLETION |
|---|---|---|
| Complete Task 5: Documentation and Training | 8 | NTP + 33 weeks |
| Conduct System Cutover/Migration | 11 | NTP + 47 weeks |
| Complete Task 6: System Cutover/Migration | 11 | NTP + 47 weeks |
| Provide Training Manuals/Presentations (Year 1) | 13 | NTP + 52 weeks |
| Conduct Training Session (Year 1) | 13 | NTP + 53 weeks |
| Provide Training Manuals/Presentations (Year 2) | 26 | NTP + 104 weeks |
| Conduct Training Session (Year 2) | 26 | NTP + 105 weeks |
| Provide Training Manuals/Presentations (Year 3) | 39 | NTP + 157 weeks |
| Conduct Training Session (Year 3) | 39 | NTP + 157 weeks |
| Complete Task 7: Maintenance and Support | 39 | NTP + 157 weeks |
| Complete WVDOT ATMS and 511 Platform | 39 | NTP + 157 weeks |

### 1.1.6. Software Development Process and how it will be employed on this project (e.g. functional requirement development, requirement traceability, software/system development and client review process, test procedure development, acceptance testing, etc.) (§ 4.3.1.6)

The Parsons team follows rigorous systems engineering processes and applies these methodologies to all projects. We understand the necessity of proper requirement analysis, traceability and transparency into all activities and deliverables. This section describes the approach and methodology that we will utilize to deliver this project successfully for the WVDOT.

#### System Design and Development Process

We will use an enhanced version of the DOT-approved Vee systems-engineering process for the planning, design, development, testing, and verification of the WVDOT ATMS and 511 platform. The enhanced version of this process introduces agile development methodologies and is currently supported by the DOT and the Federal Highway Administration (FHWA) Resource Center for its advantages to allow for dynamic changes, improved quality, and early and predictable delivery. The enhanced process is depicted in the Vee diagram in Figure 20. We recognize that our role as implementers may start anywhere on the left side of this process, depending on the system definition tasks the client has completed before consultant engagement. In this case, a set of requirements has been included in the RFP, signifying that WVDOT has done a significant amount of planning in the development of these requirements. Therefore, the systems-engineering process starts with the systems-requirements stage on the left side of the Vee diagram.

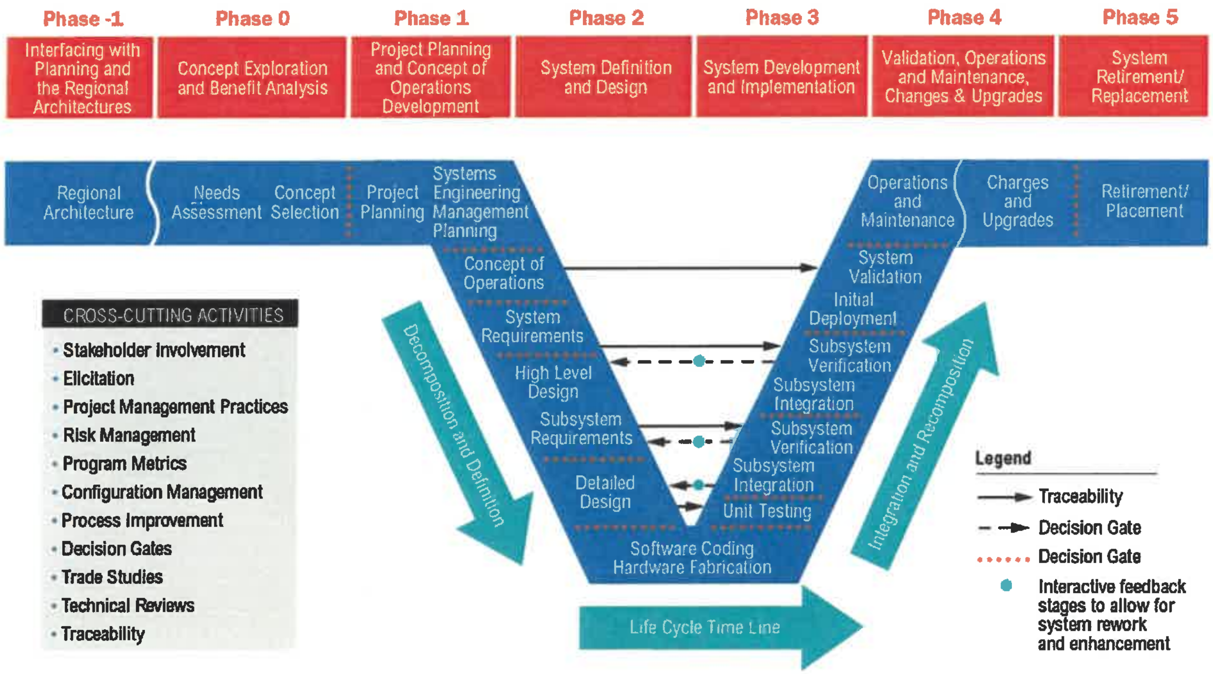



**Figure 20 – Systems-Engineering Process – Vee Diagram**

> We will use a modified version of the Vee systems-engineering process that includes agile development, which allows for an interactive feedback stage, system rework, and enhancements.

The specific starting point affects how we organize our development team—the constant is that this team's designers, architects, software developers, quality assurance testers, and systems-deployment engineers have a well-tested organization that ensures excellent internal team communications, project manager interaction, and client relationships. In the tasks described below, the engagement starts with the systems-requirements phase to provide a complete description of our approach and commitment to the systems-engineering process.

For systems integration projects similar to the WVDOT ATMS and 511 platform, we have found it very beneficial to follow an enhanced version of the systems-engineering process, which allows us to implement aspects of the agile or open unified process (OUP). This method allows for a more iterative design, prototype, and development approach, which allows for the system to be redesigned and enhanced as the project progresses. This may include the introduction or modification of requirements if time and budget permit. This method also allows for multiple smaller incremental system implementation phases, with feedback stages after the system is deployed and tested. These feedback stages allow for system improvements as the project progresses. The result is an improved, higher-performing system.

## Agile Development with Vee Systems Engineering

We will use a modified version of the Vee systems-engineering process that incorporates agile development during the software design, development, and testing stages. Agile development is a highly collaborative iterative process where the team incrementally develops software. This approach is adaptable and encourages continuous client feedback, continuous integration, and continuous planning. Figure 46 highlights the major aspects of agile development.

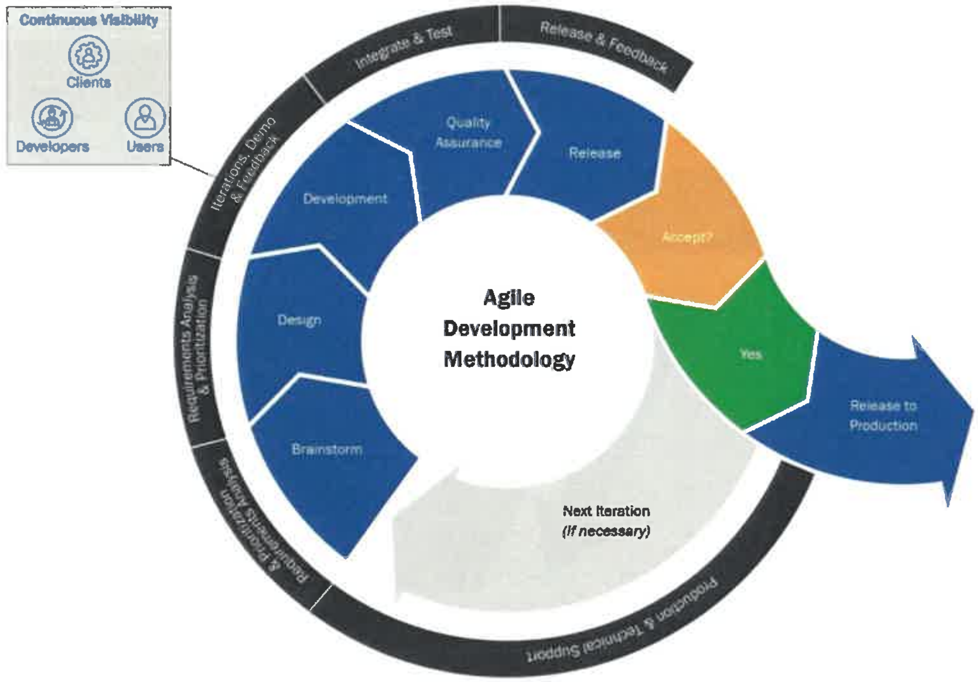



Figure 21 – Agile Development Diagram

- **Requirements analysis and prioritization**. At the beginning of the project, one or more meetings are scheduled to formally walk through the requirements. During this time, clarifications between Parsons and the stakeholders are reached on each requirement. A prioritization is assigned to requirements and an agreement on what prototypes are required for the next phase of development.
- **Design, document, and prototype**. Rapid prototyping allows us to receive feedback from the users and stakeholder of the project. Any misunderstandings between requirements and implementation are resolved during the prototype phase. Ease of use, logical flow of user interfaces, and aesthetics are all aspects of the user experience reviewed and agreed upon during prototyping.
- **Iterations, demo, and feedback**. During the agile iterations, functionality is configured and implemented, and a demo is provided to stakeholders. This step in the process allows clients to provide feedback sooner rather than later in the process and allows us to incorporate that feedback incrementally instead of waiting until the end of the project.
- **Integrate and test**. Once functionality and features are implemented, and the agreed-on user experience is provided, integration and verification testing will occur. This testing is iteratively performed and typically yields test results daily and, at a maximum, weekly. Testing early in the project reduces risk and adds to the overall stability of the system.
- **Release and feedback**. Once an agreed-on level of functionality has been implemented, a release can be scheduled, and software can be deployed to a system test or staging area. This allows stakeholders and users to test, learn, and use the system early in the process. Feedback from the releases is resolved by the collective stakeholder and Parsons team.
- **Acceptance**. Once functionality has been implemented and testing is successful, a decision is made to move this software to a production environment. This step incorporates a more formal test and QA effort be performed.
- **Release(s) to production**. Once successful testing has occurred and stakeholders agree that functionality and usability have been accomplished, a formal software release is scheduled to transition software to a production environment. For the first iteration, this is usually referred to as "Go Live." In subsequent

iterations, changes to production can be “patches” (small releases to address critical defects) or a “release” (which updates the software to incorporate new features or address software anomalies).


Figure 22 - iNET Environments

## Requirements and System Design

We will review, assess, revise, and confirm the system requirements as part of the very first project activities. This is of paramount importance to ensure everyone completely understands all the requirements and what they mean.

Using a combination of face-to-face discussions, WebEx meetings and teleconferences, and key individuals from each of the stakeholder domain areas, we will confirm key components for inclusion in the final system requirements, including the characteristics of the future desired state, the guiding principles, and the high-level roles and responsibilities. Along with other supporting documentation, the updated annotated system requirements document will become the basis for the design. We will manage the requirements following the process outlined in Figure 23.

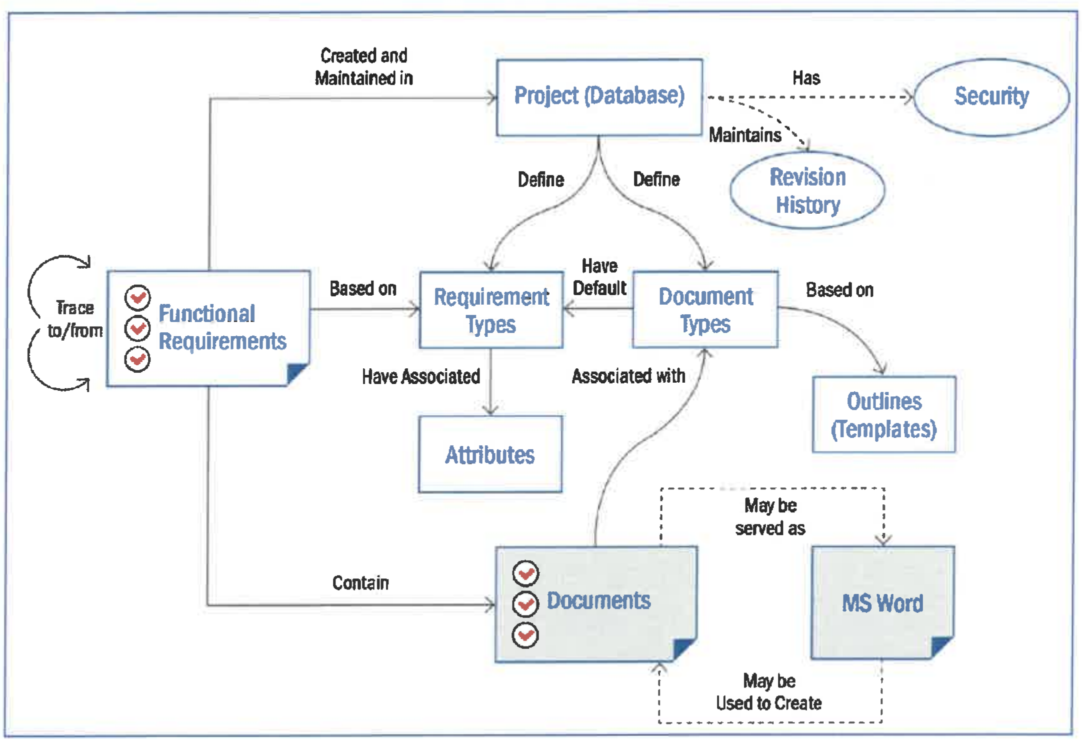



Figure 23 – Requirements Management

Our team will follow established industry systems-development processes through adherence to internal development guidelines and the IEEE 12207 Software Lifecycle Management process. As part of this, requirements management and validation have become an important ongoing process at Parsons due to our extensive development of software systems and products. In fact, requirements management and validation have evolved into a process that receives as much attention as software development itself.

Once all functional requirements are agreed on, the process becomes one of managing change. This is accomplished through the tool set by recording and tagging the requirements. The requirements document for this project will be maintained in Microsoft Word/Excel. The document allows the establishment of attribute and traceability matrices for the list of requirements.

### Requirements Traceability Matrix

As stated above, our team will follow the established industry system development processes through adherence to internal development guidelines and the IEEE 12207 Software Lifecycle Management process. Once all functional and performance requirements are agreed upon, the process becomes one of managing change. This is done through the tool set by recording and tagging the requirements. The document allows the establishment of attribute and traceability matrices for the list of requirements. The traceability matrix is illustrated below. The attribute matrix will allow our team to assign important information to each requirement, such as priority, implementation build (or release), risk, and responsible developer. Traceability matrices allow both forward and reverse tracing among the various phases in the development cycle. For example, a particular test procedure can be traced backward to the functional requirement that is being tested. Additionally, all the test procedures relating to a particular functional requirement can be traced forward.

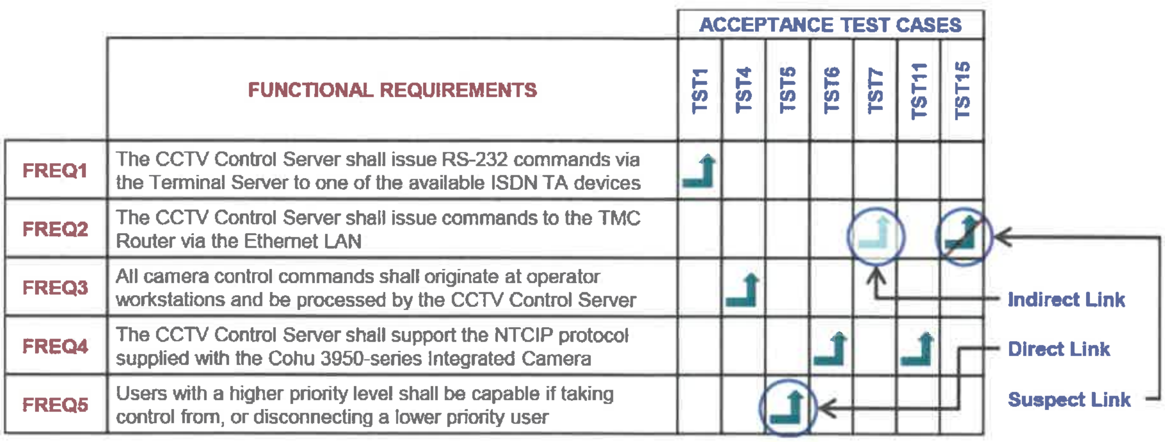



Figure 24 – Example of a Requirements Traceability Matrix (functional requirements versus ATP)

## 1.1.7. Quality Management/Change Management Plan details and how it will be employed on this project (§ 4.3.1.7)

QUALITY POLICY

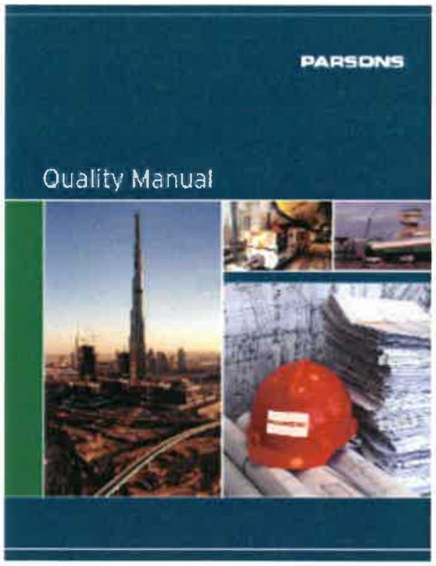
*Parsons is committed to providing quality services and products. We will, as a corporation and as individuals, meet the mutually agreed-to requirements the first time and strive for continuous improvement of our work processes.*

Parsons is an ISO 9001:2015-certified organization. In turn, we have a very strict quality management system (QMS), which outlines specific policies and guidelines that all project managers must follow whether it is an extremely large multimillion-dollar endeavor or a very small project that will take just a few short months to complete. This QMS holds managers and staff accountable that all services are delivered with high quality while being on schedule, on budget, and as specified within the technical baseline and requirements of the associated project. Our QMS is described as a hierarchy of elements, as indicated in Figure 25 below. Parsons Quality Assurance Program will be implemented on the WVDOT ATMS project.


**Figure 25 – Parsons' QMS Hierarchy**

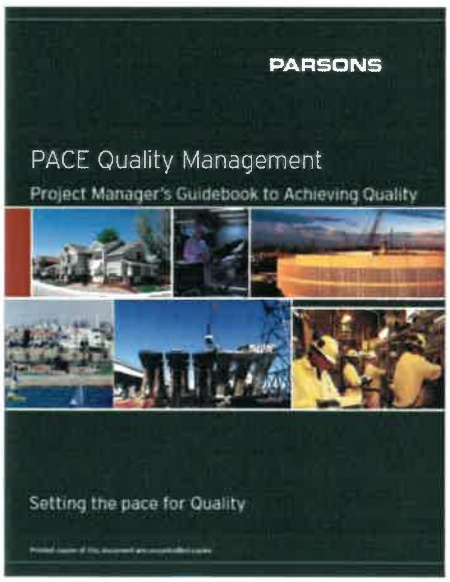
> *The Parsons Quality Manual follows the American National Standard ANSI/ISO/ASQ*

Our quality policy and quality manual were developed for the organization in compliance with the ISO 9001-2015 standard to establish a QMS that supports the safe delivery of compliant deliverables on schedule and on budget. Two key documents critical to the QMS, which must be understood and followed by all Parsons project managers, are the *Parsons Quality Manual* and the *PACE Quality Management Guidebook*. All project managers are required to take training on these documents and must past testing before being allowed to manage any projects. These are described in the following sections.




The *Quality Manual* (written to provide baselines to project quality plans) references the following:

- Quality operating policy
- Client feedback and assessment core policy
- Policy and procedure development
- Project document management
- Project records management
- Quality assurance audits (internal/supplier)
- Nonconforming products
- Client assessments/project feedback
- Quality systems management review
- Source inspection
- Corrective and preventive actions




The *PACE Quality Management Guidebook* sets the minimum standards for achieving mutually agreed-to requirements on a project and improving project performance. The PACE (plan, act, check, excel) guidebook is issued as reference material for project managers and quality management professionals. The guidebook is an excellent source of information on quality management and provides useful tools that can be used on a project. The PACE quizzes are designed to provide records of training and to verify effectiveness and comprehension of the information. The PACE guidebook serves as a source of information on quality to the project manager or the quality management professional without searching

## Project Deliverable Reviews

The Parsons team understands the importance of providing the highest-quality written deliverables that ensure the system is designed, deployed, and tested to meet contracted requirements and that documentation is provided to enable WVDOT to operate, administer, and maintain the system as necessary. To this end, for every system document/deliverable, the Parsons team has included a client review process that spans 2 to 5 weeks, depending on the complexity of the document, and includes three iterations of client review to achieve final approval. For every deliverable, we will provide initial draft, proposed final, and final versions of the document incorporating modifications to address all WVDOT comments for each version. Once the document is final and approved, during the maintenance period

> Parsons has a strict QA/QC process that requires multiple levels of reviews/approvals before deliverables are submitted to a client.

when system updates are conducted, the Parsons team will update the documentation as necessary and submit to WVDOT for comment and approval.

To facilitate an efficient and effective client review process, we focus our efforts on ensuring the highest-quality documentation possible is provided as first draft for client review. To achieve this, technical and other work products/deliverables (e.g., studies, analyses, drawings, reports, plans, calculations, estimates, and specifications) are checked and reviewed internally at multiple stages of progress. This will ensure that the project deliverables are correct and free of errors. For the WVDOT ATMS and 511 platform project, the following types of internal reviews will be conducted:

- Intradisciplinary checks will be conducted within the originating discipline (i.e., software or testing). The project manager or task lead for that specific discipline will appoint experienced engineers/designers as "checkers." These checkers will be independent of those who prepared the deliverable and will have experience equal to or greater than that of the originator.
- Project management or technical team reviews will verify that the deliverables meet the contract requirements before they are submitted to the client. The project manager may call on project engineers or senior engineers to participate in this review. This review will also ensure that comments or recommendations from previous reviews are successfully incorporated.
- Design verification review will verify design inputs are correct and adequate and outputs have met the design inputs, evaluate the ability of the design and development to meet customer design criteria (such as a basis of design), and identify any problems and propose necessary actions. This verification will be performed as part the intradisciplinary review processes described above.
- Design and development validation will be performed as necessary to ensure that the resulting product is capable of meeting the requirements for the specified application or intended use, which is determined during design and development planning. This design and development validation may be performed as part of the intradisciplinary review or through additional steps, such as testing and inspection.

## Checking Technical Documents

As described above, intradisciplinary checks of technical documents or project deliverables will be independently executed by a qualified individual other than the person/group that performed the work. Those participating in the process will sign the check/review print document. Typical review elements include the following:

- Conformance to scope of work
- Conformance with relevant standards
- Documented, accurate supporting calculations or other data
- Conclusions supported with appropriate detail
- Resolution of previous review comments

## Checking Other Types of Project Documents

Other project deliverables, such as correspondence, meeting minutes, schedules, and progress reports, will also be checked for content, format, accuracy of cross-references, grammar, spelling, and acronyms prior to submittal. Emphasis will be placed on the review and editing of written reports. Typical review elements include the following:

- Logical organization of the report
- Logical development of ideas or arguments

- Appropriate emphasis (length and detail), considering the importance and relevance of the report elements
- Appropriate references to data and other source materials
- Conformance with client's format requirements
- Clear writing and appropriate illustrations and tables
- Good grammar and spelling

## Software Quality Assurance

For the WVDOT ATMS and 511 platform project, we will use a modified version of the Vee systems-engineering process that incorporates agile development during the software design, development, and testing stages. This modified approach has recently been highly supported by the U.S. DOT. Agile development is a highly collaborative iterative process where the team incrementally develops software. This approach is adaptable and encourages continuous client feedback, testing, integration, and planning.

> Agile development encourages continual software testing and evaluation leading to reduced risk and adding to overall stability of the system.

The agile software development framework promotes an iterative process, which provides adaptive planning, evolutionary development, and quick response to change. The software development is accomplished in smaller, iterative pieces with progress being tracked on a daily basis. Unlike the traditional sequential approach, the client is able to review the development progress through a demonstration on a regular basis, as opposed to just once at the end. This process allows for constant QA/QC evaluation of the application. Figure 26 is an example of the form completed for the review of the development progress.

**Computer Software**
**Validation and Verification Certificate**

**Project No:** ____________________

**Software Title:** ____________________
**Release Version:** ____________________ **Release Date:** ____________________
**Software Description:** ____________________

**Computer System Requirements**
**Computer System Used:** ____________________
**Workstation Used:** ____________________

**Describe Supporting Data/Attachments:**
____________________
____________________
____________________
____________________

**Description of Verification:** ____________________
**Results of Verification Run:** ____________________
**Validated by:** ____________________ **Date:** ____________________
**Checked by:** ____________________ **Date:** ____________________
**Verified by:** ____________________ **Date:** ____________________
**Checked by:** ____________________ **Date:** ____________________
**Project Manager:** ____________________ **Date:** ____________________

Figure 26 – Software Validation Form Example

Our team has established a robust software quality assurance and testing capability that will begin immediately in this project's life cycle. This applies to all phases of the project including on-site and formal user acceptance testing. Software testing will be completed and tracked through unit, integration, and systems testing. An integrated configuration management system will ensure that module checkouts and check-ins are properly managed. Artifacts used include the project plan, CM plan, software test plan, software test cases and software test procedures. Traceability is established through the requirements management tool.

We have developed software systems for numerous agencies and have refined the process used to ensure a quality product is delivered. Table 22 describes the four levels of testing that occur with each release of software.

**Table 22 – Types of Testing**

| Test Type | Description |
|---|---|
| **Unit Test** | Unit testing is accomplished by the software developer in a development environment. After having completed a code-walkthrough where the software is evaluated by peers, and unit testing is complete, the code can be checked into the software repository and is ready to be promoted to the integration environment. |
| **Integration Test** | Once all the software for a release has completed unit testing, a software build will take place and the software will be placed in the integration environment. Integration testing can use simulators for devices or can be connected to live devices. Once the software passes integration testing, and with approval from the client, the software can be promoted to the system test environment. |
| **System Test** | The system testing is done at the client site with access to field device hardware. System Tests stimulate multiple modules or components of the application in a manner consistent with client operations. This approach ensures edge cases and environmental configurations are considered. Once the software passes system testing, a test readiness review (TRR) can be scheduled. During the TRR, a date for the formal acceptance test can be scheduled. |
| **Acceptance Test** | An acceptance test is a scripted test procedure, conducted with all stakeholders present. These tests are built with approved acceptance criteria and expected outcomes to eliminate ambiguities of results. A "pass" on the acceptance test signifies the acceptance of the system. |

Figure 27 displays the software build and testing process.

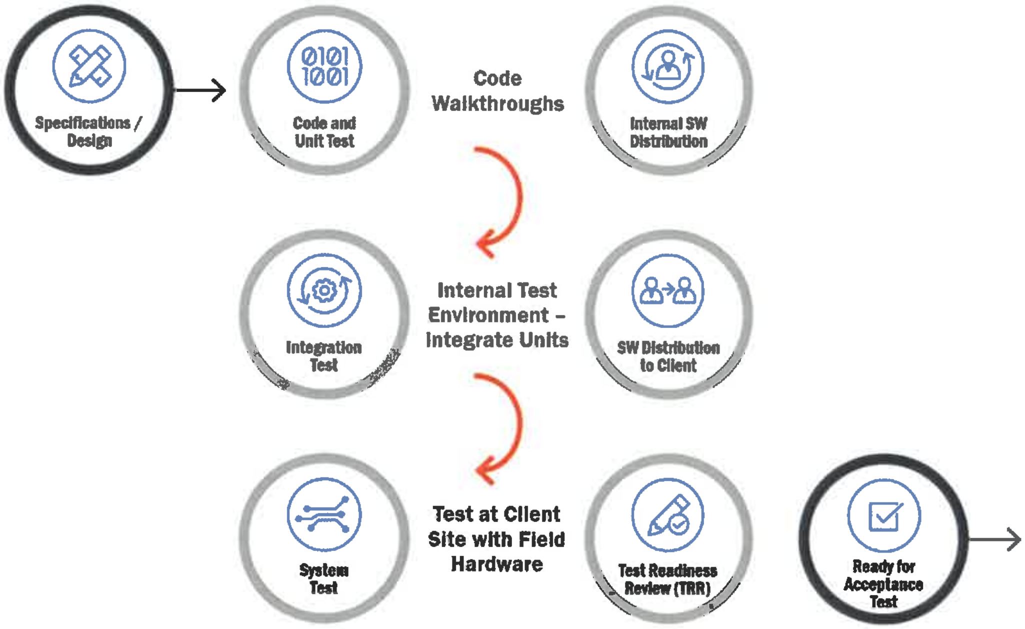



Figure 27 – Software Build and Testing Process

## Configuration Management Process

The Parsons team will implement its standard software configuration-management (CM) and change-control processes for this project. The development of software will be managed by a traceability tool that helps manage the various development streams or releases that a project or product will undertake. All development staff must check in their software using this tool. The tool helps to manage change, configuration, bug fixes, deployment, and maturity of the software.

Our team has unparalleled experience related to end-to-end software CM and change. We have developed CM plans, performed end-to-end system configuration management, and used a variety of software CM tools for large transportation management systems across the country and world. This includes systems in more than 30 urban areas across the United States. We have developed CM plans for most of these systems suited to our clients' needs and our internal CM processes. Our team members have maintained or are currently maintaining the majority of these installations following the agreed CM plans we develop and are active day-to-day participants in the CM process for these projects.

Another important process that must be followed when modifying or enhancing systems is the change management process. This change request process is depicted in Figure 28 below. All system change requests for systems engineering will follow the process shown in this figure. An abbreviated summary of the change request process is as follows:

- Enter change request into CM tool
- Estimate the level of effort required for change request
- Enter estimated effort of change request into tool
- Control board approves change request execution
- Team receives approval for implementation and executes modifications/work request
- Team distributes system change and tests
- Team updates any associated system documentation, user manuals, etc
- Once complete, change request is closed in CM tool

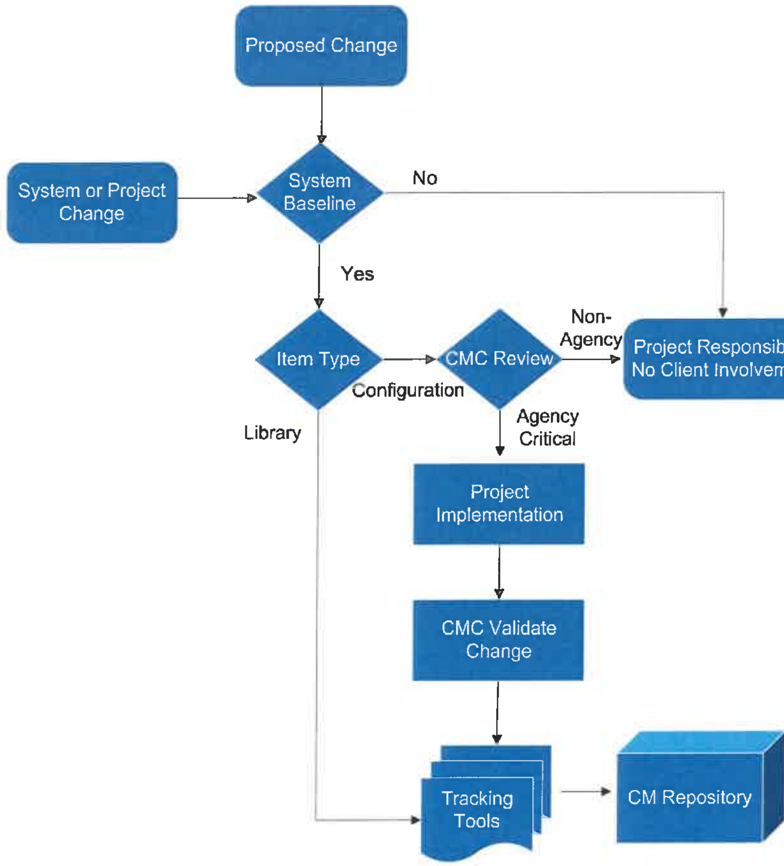



**Figure 28 – Parsons' Configuration Management Process**

## Test Plans and Procedures

Our team has established a robust software quality assurance and testing capability that will begin immediately in this project's life cycle. This applies to all phases of the project including on-site and formal user acceptance testing. Software testing will be completed and tracked through unit, integration and system testing as shown in Figure 27 – Software Build and Testing Process. An integrated configuration management system will ensure that module checkouts and check-ins are properly managed. Artifacts used include the ATP, test cases, and test procedures. Traceability is established through the requirements management tool. Test cases and test procedures will be developed using in-house documentation based on IEEE 12207, Software Life Cycle Management.

The ATP will be developed to verify all components, servers, and software system requirements for each requirement outlined in the system functional requirements matrix and stated within the County RFP, unless otherwise negotiated. The ATP will be conducted in the presence of WVDOT at the designated test location and will serve as the basis for final system acceptance necessary to proceed with system cutover and migration.

During the course of developing the ATP test procedures, we will develop procedures that address and test every system requirement, including any provided hardware and subsystems necessary for proper operation.

The ATP will state the requirement and expected outcome of each test so that it can be verified that the software is working as specified. The verification method will be clearly noted for each test procedure in the ATP. The method will be one of the following four methods:

- **Demonstration:** used for a requirement that the system can demonstrate without external test equipment.
- **Testing:** used for a requirement that requires some external piece of test equipment (such as logic analyzer and volt meter). The test and required equipment shall be clearly documented in the procedure.
- **Analysis:** used for a requirement that is met indirectly through a logical conclusion or mathematical analysis of a result. For example, algorithms for calculation of headway; setting of "late" flag; generation of priority request
- **Inspection:** used for verification through a visual comparison. For example, quality of welding may be done through a visual comparison against an in-house standard.

Prior to system integration and before configuration and implementation of each system software, we will submit the ATP to WVDOT for review and approval.

When executing the ATP, the outcome of each verification step shall be recorded as one of the following:

- Complied
- Partially complied, with a statement of acceptable supplementary testing
- Failed, verification procedure to be repeated

We will submit to WVDOT the fully documented ATP as the final test documentation for signoff. The test plan documentation submitted will include a printout of the final approved ATP as described above. Throughout the test execution, a record will be maintained of each verification in the ATP, the outcome of the verification recorded, and the record signed by the verifier and County representative. Any failed or incomplete tests will either be retested or submitted in a written summary explaining why the testing requirement could not be completed as written in the ATP. We will execute any failed/incomplete tests and/or provide written documentation in an iterative cycle as required until WVDOT determines the ATP was satisfactorily completed and grants approval to begin system migration and cutover.

## 1.1.8. Issue Resolution process (§ 4.3.1.8)

The Parsons project manager is responsible for the management of any issues that affect customer satisfaction, scope, quality, cost or schedule. Issues can be identified at any phase of the project and are handled with a consistent process for identification, tracking and communication to ensure all issues are identified and resolved as rapidly as possible.

### Scope Management

Having designed and deployed hundreds of Intelligent Transportation Systems throughout the world, we understand the importance of managing and controlling project scope. Proactively managing scope is a critical element of effective project management. We agree that scope creep is a common cause of project failure. At the same time, we understand the importance in allowing for a certain degree of flexibility in the design and deployment of an ATMS. It is not possible for agency staff to fully know exactly how they want the system to operate to every detail at the onset of the project as different systems have nuances in the way they deliver a given feature. In preparing the detailed project execution plan, we will include system walkthroughs and other activities that we have found help agencies refine their operational needs early in the process and help refine requirements before we get too far down the development path. We will do the following:

- Define and manage the scope of project work so that it complies with the project requirements and
- budget
- Establish the plan/process for change request evaluation with respect to impact on schedule, budget and

- resources, and project objectives
- Develop, implement, manage, and monitor the processes for managing project issues and change
- requests
- Provide a description of proposed change control tools and establish an approach to change request implementation in coordination with the WVDOT project team

In addition to monitoring the scope of work of a project, the Parsons team will maintain and manage the project to ensure conformance with contract terms and conditions. Changes to the project scope may, in turn, affect the project schedule, cost, quality, and approved work products. We will work closely with the WVDOT project team to ensure any changes are managed and processed in accordance with the terms of the agreement and the WVDOT policies and procedures.

## Issue Identification and Tracking

All Parsons and WVDOT project personnel will be enabled to enter issues accessing an online tool called Jira. The project manager will coordinate with WVDOT to review all issues entered into the Jira ticketing system. Once the issue is dispositioned and the level of effort, costs and schedule are agreed upon (if any), the Parsons project manager will assign the work to the Parsons team. The project manager will notify WVDOT immediately if during implementation, the design changes or additional issues are identified.

The process for reporting issues is automated and streamlined from the client/end-user perspective. Any user with a browser and access will be able to report a project/system issue. Once the issue is entered into the system, our internal process includes reviewing the issue, dispositioning the issue with WVDOT, and, if work is determined to be needed, assigning the work to a developer and scheduling test and deployment activities to address the issue. The following diagram demonstrates our process for incorporating system changes.

## Change Management

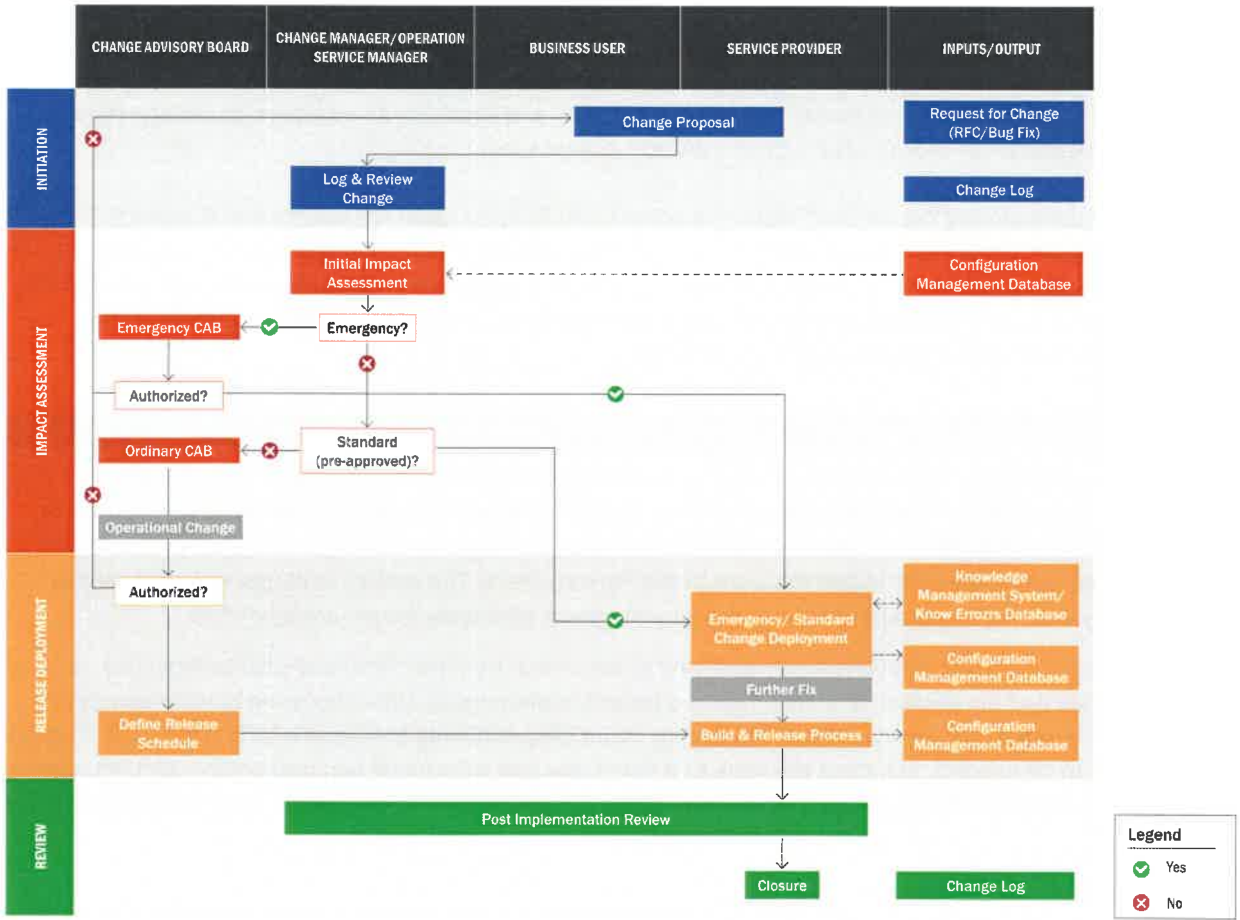



Figure 29 – Change Management Process

The parts of this process that may involve WVDOT are as follows:

- Initial entry of the issue into Jira
- Clarification of the requirement/problem (if/when needed)
- Clarification/confirmation of the validation test steps
- System change management (the responsibility of the Parsons Quality Assurance Group and includes managing the software baseline, deploying software releases, communicating release schedules, release content, and ensuring system testing is successfully complete, prior to releases)

Once the developer has completed making the appropriate changes and performing unit testing, Jira is updated, and the software is ready for a system test. When the system test is complete, once again Jira is updated to include the test details until all tests are successfully executed. Issues identified prior to system acceptance will be incorporated into the development cycle as appropriate and will follow the contracted test program. Once in the maintenance and support phase of the contract, the Parsons project manager will coordinate the software release schedule with WVDOT.

## System Enhancements

Jira will also be used to document system enhancement requests. Users wishing to request new features or enhancements to the system will use the same process and tools within Jira and indicating the issue is a "new task." New feature requests will not automatically be assigned to a developer. In this case, a change control board (CCB) meeting between our project management and WVDOT management will be held to discuss design, schedule, and cost for the new enhancements. Approved changes and upgrades are incorporated into the system baseline using the systems engineering process. Jira tickets are referred to as software change requests (SCRs). A CCB meeting can be conducted jointly with WVDOT to discuss new system enhancements. The purpose of the CCB is to review the change, the level of effort for the change, and the proposed schedule and to agree on moving forward with the implementation. Once the change has been made, a Parsons test engineer will conduct a test to verify completeness. The change is then moved to the initial development test environment where we can confirm the change is operable in the WVDOT environment. Once confirmed, the change is scheduled to be moved to the test/QA environments for customer evaluation and approval of the change for release to the production environment.

## Issue Resolution and Communication

The Parsons team uses a standard process for handling system issues. And while process is the key to success that enables repeatability, lessons learned, and the highest levels of system availability, the most important aspect of our escalation process is frequent and informative updates to all key stakeholders. For every step of the process, there is frequent and accurate communication from the project manager, deputy project manager, and/or technical lead that ensures all stakeholders are provided the key important information to enable WVDOT to be well aware of the progress to issue resolution. This process is illustrated below in Figure 30.

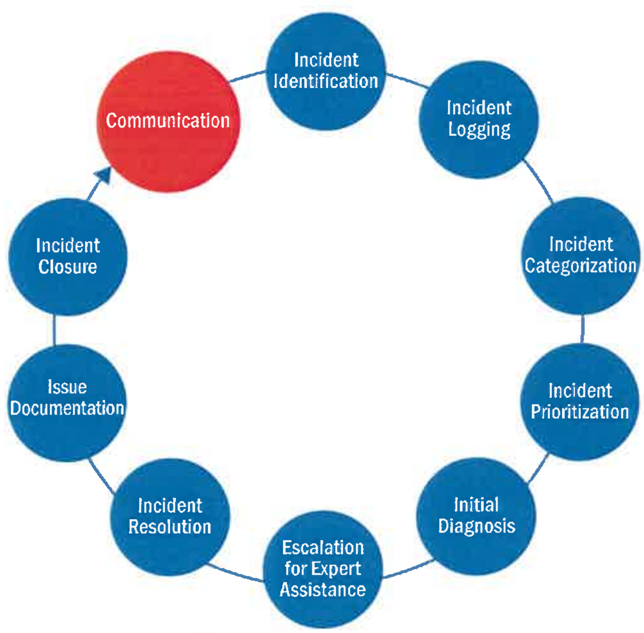



**Figure 30 – Escalation for Incident Resolution**

As depicted in the workflow above, the Parsons support team ensures all issues are handled consistently and effectively. This is made possible not only through swift handling of all issues but also through a purposeful approach to effective troubleshooting that includes escalation to system experts as necessary to identify and resolve issues effectively.

Once the issue is identified and resolved, the team also ensures all information regarding the identification and resolution of the issue is documented. This enables rapid issue resolution based on documented lessons learned.

The incident and tracking system referenced in the section above will be leveraged to provide all of the required information as defined by the RFP and will also be the basis of the information repository for the information captured for all issues. Additionally, because our deployed ATMSs leverage the same core software, our customers benefit from issue identification and resolution across all our customer's environments. This results in even more effective issue identification and resolution as each customer benefits from the incident resolution escalation process of others.

## 1.1.9. Risk Identification process (§ 4.3.1.9)

The Parsons team is experienced in identifying, tracking, and managing risks and their resolutions. A risk identified early in the project and mitigated properly can save time and money by avoiding rework. All risks that are identified will be assessed and then will be documented in the risk register. The discussion of the risk register will be an agenda item in the regular status meetings.

Risks will be tracked in the risk register and any changes in the register will be discussed in the regular teleconferences and status meetings. Specifically, any risk with a grade of A, B, or C (see Table 23 below) will be listed as an item for discussion. Risk mitigation actions will be developed, documented, and assigned an owner. Figure 31 lists ratings and codes used in the risk register.

| Rating for Likelihood and seriousness of each risk | | | |
|---|---|---|---|
| L | Rated as low | E | Rated as extreme (used for seriousness only) |
| M | Rated as medium | NA | Not assesses |
| H | Rated as high | | |

| Grade: Combined effect of likelihood/impact | | | | | |
|---|---|---|---|---|---|
| | | Impact | | | |
| | | Low | Medium | High | Extreme |
| Likelihood | Low | E | D | C | A |
| | Medium | D | C | B | A |
| | High | C | B | A | A |

| Recommended actions for grades of risk | |
|---|---|
| Grade | Risk Actions |
| A | Actions to reduce the likelihood and seriousness to be identified and implemented as soon as the project commences. |
| B | Actions to reduce the likelihood and seriousness to be identified and appropriate actions implemented during project execution. |
| C | Actions to reduce the likelihood and seriousness to be identified and costs developed for possible action if funds permit. |
| D | To be noted – no action is needed unless grading increases over time. |
| E | To be noted – no action is needed unless grading increases over time. |

| Change to grade since last assessment | | | |
|---|---|---|---|
| NEW | New risk | ↓ | Grading decreased |
| – | No change to grade | ↑ | Grading increased |

Figure 31 – Risk Register

Table 23 provides some initial risks identified for this project.

**Table 23 –Initial Risk Matrix**

| ID | GRADE | RISK | SOURCE | IMPACT |
|---|---|---|---|---|
| **R1** | A | Inaccurate/incomplete documentation exists on technical interfaces | The development team is not able to obtain accurate definition of the interfaces. | The development team could be led down an unproductive path, or the end product is incomplete. |
| **R2** | B | Stakeholders' timely review of deliverables could pace ability to complete project deliverables and key milestones and project anticipated dates. | Consensus is not reached on deliverables. Delays in responses from stakeholders, delays in responses to comment on deliverables. Missed technical meetings. | Schedule overrun.<br>Lack of technical implementation. |
| **R3** | B | Agency availability for administrative and technical coordination with software enhancements | Delays in responses to technical issues and review of documentation or participation in coordination meetings | The team could be led down an unproductive path or the quality cf deliverables could be undermined. |
| **R4** | B | Availability for operations staff to complete the training sessions. | Difficulty in transitioning from current system to the upgraded ATMS and 511 platform | Confusion could develop among the operations staff on how to use the new system. |
| **R5** | C | Additional features identified after 'go-live' that would make tasks easier. | The operations staff would like additional features not initially identified to better accomplish their tasks. | If workaround exists, impact would be minimal. |
| **R6** | A | Delay in cooperation of e911 CAD vendors to provide integration information | Unresponsive or unknown CAD vendors will impact the pace at which they can be integrated into the ATMS | Some county e911 alerts may be missing in the system |

## 1.1.10. Bios/Resumes of key personnel (§ 4.3.1.10)

Resumes for key staff are provided in the following pages.

## 1.1.11. Copies of any staff certifications or degrees applicable to this project (§ 4.3.1.11)

Applicable degrees and certifications for key personnel are provided behind key staff resumes.

# JOSEPH BRAHM

## PROJECT MANAGER

Joseph has over 30 years of experience and has worked with many agencies in the United States, and internationally, to evaluate, plan, design, deploy, operate, and maintain many of the most advanced transportation management systems in the country. Projects that Joseph supported have won 9 awards for ***their innovation or industry leading practices, including two ITS America "Best of ITS Award" for New Innovative Practices.***

He has a background in transportation system and software development, policy and legal development, smart traffic management, smart infrastructure, Active Traffic Management, freeway operations advanced traveler information systems, national architecture, the National Transportation Communications for ITS Protocol Standards, electronic toll collection systems, freeway tow service operations, and toll evasion violation enforcement systems.

Before joining Parsons, Joseph managed the California Department of Transportation (Caltrans) District 7 Traffic Management Center, which controlled one of the largest advanced traffic management systems in the world. Joseph was Operations Manager for the world's first totally automated toll road (91 Express Lanes).

### YEARS OF EXPERIENCE

Total: 32
With Parsons: 21

### EDUCATION

- Master of Business Administration, Business Administration Management, California State University, Long Beach, California, 1999
- Bachelor of Science, Civil Engineering, University of Wisconsin-Milwaukee, Wisconsin, 1988

### PROFESSIONAL AFFILIATIONS

- Intelligent Transportation Society of America (ITS America), Midwest Board of Directors, 2001-Present

## WORK EXPERIENCE

**Project Manager. Michigan Department of Transportation, MDOT Statewide Advanced Traffic Management System, Michigan, United States. 01/2008-Present.** Parsons is providing project management, design development and implementation, software and hardware services, and ongoing support and maintenance for Michigan's statewide advanced traffic management system used in all traffic management centers across the state of Michigan. Joseph is project manager and design lead for numerous components of the system design, which is based on more than 1,400 detailed system requirements, incorporating many of the nation's most intelligent and advanced system functionality. The design includes unprecedented levels of intelligence and automation, and many advanced features such as Active Traffic Management, Integrated Corridor Management, advanced truck parking guidance, and advanced automated weather response features. The US 23 ATM module addition won the 2018 ITS America "Best of Award" for "Best innovative Practices".

**Project Manager. Chicago Department of Transportation, Chicago Smart Mobility Project Professional Consulting Services, Chicago, Illinois, United States. 11/2015-Present.** Parsons' scope of work involves integrating a diverse collection of 22 systems into a fully integrated, citywide traffic management solution. The project includes a full range of intelligent transportation system support as needed to ensure successful deployment of a fully integrated, state-of-the-art advanced traffic management system. Joseph is responsible for Project Management and design lead. **This Project won the 2018 ITS "Project of the Year" Award for its level of integration, intelligence and operational improvements.**

**Project Manager. Ann Arbor Transit Authority, Clever Devices Bus Arrival System, Ann Arbor, Michigan, United States. 01/2012-07/2017.** Parsons developed and deployed the interface to receive bus arrival times from the Clever Devices BusTime® system and display them on the University of Michigan's next bus signs in the same format as the current university next bus signing. Static data included routes and stops, and dynamic information included vehicle IDs and predicted arrivals.

**Project Manager. Nebraska Department of Roads, Nebraska Amendments, Nebraska, United States. 12/2014-04/2017.** This project included the deployment, support and maintenance for a statewide ATMS and ATIS. Joseph was the Parsons Project manager and helped design and develop requirements for new features and system upgrades.

**Project Manager. Lake County Division of Transportation, Lake County PASSAGE Phase 4, Libertyville, Illinois, United States. 12/2014-01/2017.** Parsons helped plan, design, deploy, and support a regional traffic management system for Lake County, Illinois. The PASSAGE Program is a coordinated effort with the Lake County Division of Transportation, the Illinois Department of Transportation, the Illinois State Toll Highway Authority, the regional emergency telephone system board, and other local municipalities. The project was designed and deployed in phases. Personally designed and managed development of the central traffic management software, including system software testing and debugging, database software, graphical user interfaces, system documentation, and training of operations personnel. Evaluated regional traffic and developed custom reports to support design and planning decisions. Developed regional system deployment plans, including short- and long-term strategies based on traffic conditions, client needs, and funding restrictions. **This Project won the ITS America "Best of Award" for "Best innovative Practices".**

**Principal-in-Charge. Illinois State Toll Highway Authority, Traffic and Incident Management System Design and Integration, Statewide Illinois, United States. 01/1999-01/2017.** Parsons designed and implemented an integrated traffic and incident management system for the Illinois State Toll Highway Authority, including automated interfaces with the I-PASS electronic toll collection system, the road weather information system, computer-aided dispatch, changeable message signs, and the Gary-Chicago-Milwaukee (GCM) Gateway. Joseph was principal in charge and task lead responsible for the concept of operations, computer-aided dispatch interface requirements, transportation operations center layout design, system graphical user interface design, and video distribution system evaluation and design oversight.

**Operations Manager. California Private Transportation Company. 01/1995-01/1999.** Joseph was the operations manager for the world's first totally automated toll road (91 Express Lanes), responsible for getting the facility up and running. This project was the first of its kind and won multiple awards.

**TMC Manager. Traffic Management Center Manager. California Department of Transportation District 7, Los Angeles, California. 01/1988-01/1995.** Joseph was responsible for the operation of the Traffic Management Center (TMC) and the Earthquake Planning and Implementation Center (EPI Center). The EPI Center project won multiple awards.

Joseph has Managed many other ITS projects throughout the country and internationally.

# Brian Smith

## TECHNICAL DIRECTOR

Brian Smith has extensive experience working in software development and information technology roles. He is a proven leader in intelligent transportation systems, having delivered some of the most innovative advanced traffic management systems (ATMS) to domestic and international clients. Brian has served in both technical and leadership roles, managing all aspects of project delivery and client satisfaction. His core competencies include strategic planning, technical leadership, and project delivery.

## WORK EXPERIENCE

**Senior Director of Product Development. Virginia Department of Transportation, Statewide Advanced Traffic Management System, Richmond, Virginia, United States. 01/2016-01/2019.** The project involved delivering a statewide ATMS platform to consolidate Virginia's regional traffic management centers on a centralized ATMS platform. Key components of the project were integrations with advanced traveler information/511 systems, public safety answering point CAD systems, center-to-center integrations with managed lanes, and reversible lane operations. Brian provided senior leadership and oversight to the project, assisting with contract negotiations, requirements analysis, regional engagement, and the ultimate delivery of the system to four of the five regions. The project required close coordination and engagement from each of the regional operation centers, and responsibilities included helping facilitate collaboration to solidify requirements, limit project delays, and integrate with other third-party systems.

**Senior Director of Product Development. Ohio Department of Transportation, I-90/I-670 Smart Lanes, Columbus, Ohio, United States. 01/2017-01/2019.** This project consisted of two different Ohio roadways that were to be set up as integrated corridors. The first section along I-90 was set up with road weather information system stations, vehicle detectors, dynamic message signs, and variable speed limits. The project used inputs from the road weather information system and the detector data streams and executed algorithms to provide advanced weather and visibility warnings and speed harmonization using dynamic message signs and variable speed limit devices. Along I-670 in Columbus, the project used radar detectors, lane control signals, dynamic message signs, and variable speed limits to harmonize speed, control traffic flow using active traffic management gantries, and implement time of day and responsive hard shoulder running response plans. Brian provided technical leadership and system architectures for the I-90 and I-670 integrated corridor management projects. Helped design the algorithms to enable a weather responsive corridor along I-90 that adjusts variable speed limits based on fog, blizzard, and other degraded visibility conditions. Also worked to design and implement advanced queue warning, hard shoulder running, and active traffic management capabilities along the I-670 Smart Corridor.

**Director of Engineering. Pennsylvania Department of Transportation, Statewide Advanced Traffic Management System, Pennsylvania, United States. 01/2014-01/2019.** The project involved unifying 12 Pennsylvania Department of

### YEARS OF EXPERIENCE

Total: 14
With Parsons: 1

### EDUCATION

- Master of Engineering, Modeling and Simulation, Old Dominion University, Virginia, 2010
- Bachelor of Science, Computer Engineering, Virginia Polytechnic Institute and State University, Virginia, 2006

### CERTIFICATIONS

- CompTIA Linux+, CompTIA
- CompTIA Security+ CE, CompTIA

### COMPUTER/SOFTWARE SKILLS

- Java
- JavaScript
- HTML
- CSS
- React
- SQL
- NoSQL
- C/C++
- ActiveMQ
- RabbitMQ
- Protobuf
- Corba
- Bash
- Python
- Linux Certified
- Microsoft Project
- Microsoft Office Suite

The project also included components of integrated corridor management along I-95 (Betsy Ross Bridge), an I-76 queue warning system, and integration with third-party systems, such as the INRIX traveler information service, the road condition reporting system, and the iPeMS traffic analytics and performance measurement system. This project also had one of the first freeway and arterial traffic signal integrations for use in the various integrated corridor management deployments throughout the state. Brian worked to provide technical guidance and resourcing to various project teams implementing capabilities for the statewide ATMS. Helped with analysis, design, and implementation of various modules and components, including the traffic signals module (with Intelight), integrated corridor management (I-95 Betsy Ross Bridge), the queue detection and warning module, and video module enhancements.

**Technical Lead and Senior Director of Product Development. West Virginia Division of Highways, Advanced Traffic Management System, Charleston, West Virginia, United States. 01/2012-01/2019.** This project was the initial delivery of the WV511 system and ATMS integration. The project consisted of key components that included 511 Traveler Information, 511 Mobile Application, ATMS, and marketing capabilities delivered by internal and external agencies and subcontractors. The project was also expanded to incorporate a Web-based ATMS solution, automated incident response, a truck parking information management module, video analytics through partnership with Citilog, and various other video and ATMS enhancements. Brian served as the senior technical lead overseeing project execution. Responsibilities included gathering and analyzing customer requirements, designing software solutions, implementing ATMS/511 software products, and coordinating delivery of the product. Also served as an advisor on many smaller projects, ensuring that technical due diligence, design, and quality were delivered to the client's satisfaction.

**Technical Lead and Senior Director of Product Development. Servyre, Michoacán Toll Road Advanced Traffic Management System, Michoacán, Mexico. 01/2015-12/2017.** The project involved construction and deployment of a number of different intelligent transportation system devices in support of a new toll road along 37D in the state of Michoacán in Mexico. New roadside equipment included devices such as dynamic message signs, road weather information systems, radar detectors, closed-circuit television, and emergency phones (SOS callboxes). The project brought these devices into the ATMS for command and control, traffic monitoring, and incident response. Brian worked as the senior technical advisor and lead for design and implementation of the ATMS for the toll road. Led the effort to work with a diverse multinational team of engineers and subject matter experts to deliver the project successfully. Spearheaded the effort to translate the ATMS into Spanish, leveraging regional experts to assist with language and dialect translation.

**Technical Lead. Virginia Department of Transportation, Advanced Traffic Management System-to-511 Integration, Richmond, Virginia, United States. 01/2011-12/2012.** The ATMS-to-511 integration project was an effort to improve the speed at which incident- and traffic-related information was relayed to the traveling public. The project integrated the region's individual ATMS systems to the statewide Virginia traffic and 511 traveler information system. The project evolved into the transportation video and data distribution effort which was used to disseminate traveler information to third parties and the public. Brian worked as a technical lead alongside a team of talented integration, training, and advanced traveler information system experts to implement and upgrade the existing ATMS platform so that it could be fully integrated with the statewide traveler information system (advanced traveler information system/511). Was responsible for deploying the upgrade to each traffic management center in four of the five regions and for assisting with installations and operator and administrator training.

# Janet Holt

## PRINCIPAL-IN-CHARGE

With 32 years of experience, Janet is a senior business leader with a reputation for leading complex programs for the implementation and deployment of advanced technology adoption. For the past three years, Janet was the business leader of a highway transportation product area that provided open road and all electronic tolling as well as other intelligent transportation solutions to some of the world's leading concessionaires and tolling agencies. Janet thrives on the challenge of enabling clients to realize maximum revenues, streamline operations, and leveraging technology to drive program success.

### YEARS OF EXPERIENCE

Total: 32
With Parsons: 2

### CERTIFICATIONS

- Project Manager Certification
- Earned Value Certification
- Risk Management Certification

### EDUCATION

- Bachelor of Science, Computer Science, North Carolina State University, North Carolina, 1987

## WORK EXPERIENCE

**Principal Program Manager. Neology, Inc./Georgia State Road and Tollway Authority (SRTA). 07/2018-04/2019.** Janet leads the maintenance and support functions for the Intelligent Transportation Solutions (ITS) provided to SRTA in support of the reversible tolled express lanes in metro-Atlanta. For this Project, Neology performed as Prime with Parsons as the subcontractor to provide ITS solutions. Parsons enhanced GDOT's existing ATMS to monitor traffic, control messaging signs, and operate access gates for the reversible tolled express lanes. Parsons also enhanced the ATMS to automate the workflow required for safe and effective roadway reversal transitions. Lastly, Parsons provided SRTA with the design, implementation, and installation of the ITS network along with Parsons' iNET™ software to enable dynamic toll pricing.

**Principal Program Manager. Stansell Electric, Inc./Tennessee Department of Transportation. 07/2018-04/2019.** Janet is the Project Manager leading the implementation of key ITS solutions in support of TDOT's I-24 Smart Corridor project, a comprehensive approach to managing their existing infrastructure while improving travel time reliability. I-24 SMART Corridor Program includes over 85 miles of roadway where physical improvements are being made to extend ramp lengths, add emergency pull-offs, and install ramp meters. ITS features are also being deployed that will upgrade signals and optimize signal timing on certain routes. As Prime of the first phase of this extensive three phase program, Stansell Electric will provide the highway infrastructure improvements, overall program management, and installation and support services. Stansell and Parsons are partnered to provide the ITS infrastructure that includes dynamic message signs and the platform to enable communications with roadside ITS solutions and connected vehicles. This will lay the groundwork for the deployment of an extensive ITS platform in subsequent phases.

**Principal Program Manager. Louisiana Department of Transportation and Development. 07/2018-04/2019.** Janet leads the maintenance and support functions for the DOTD iNET™ ATMS system. In addition to maintaining the system accepted in 2015, Janet is also leading the advancement of their current platform to Parsons next generation ATMS platform.

**Transportation Product Area Director, Raytheon Company. 407ETR, Toronto, Canada. 08/2015-06/2018.** As the first concessionaire to implement all electronic tolling in North America, 407ETR holds providers accountable for providing high performing, leading edge tolling solutions. As the Business Director, Janet led program to successfully define and implement proof of concepts for innovative ideas for advanced tolling solutions that ultimately resulted in production enhancements to the long-standing tolling solution in operation since the late 1990s. The technological advancements not only enabled 407ETR to realize increased revenue, but also enabled lower operations costs.

**Transportation Product Area Director, Raytheon Company. MassDOT All Electronic Tolling System. 08/2015-06/2018.** MassDOT implemented the first statewide all electronic tolling solution in the US. This system went live in October 2016 and has been published numerous times since Go Live as one of the most successful implementations and highest performing tolling system. As the Program Director for this significant implementation, Janet provided the critical customer interface and overall program direction to lead the project team to success.

**Transportation Product Area Director, Raytheon Company. Cross Israel Highway. 08/2015-06/2018.** Another long-standing all electronic tolling system provided in the late 1990's, Cross Israel Highway required implementation and integration of front image capture. As Program Director, oversaw successful program execution through design, implementation, integration and test to successful system acceptance. With the enablement of front image capture to improve image quality and accuracy combined with world leading enforcement technologies and strategies, the customer is realizing one of the highest toll revenue collections percentage in the world.

**Transportation Product Area Director, Raytheon Company. Transurban. 08/2015-06/2018.** For the concessionaire of the VA I-95/495/395 toll roads, provided overall program directorship for the maintenance scope provided by Raytheon. In early 2018, Transurban reported the team had provided the highest quality maintenance service, providing high commendations for both the technology and the staff.

**Public Safety Product Area Director, Raytheon Company. Los Angeles Police Department. 05/2013-08/2015.** Led the team who implemented in-vehicle video for all marked and unmarked police vehicles for the LAPD. Solution included all hardware and software required in the vehicles, the local and wireless area networks required for high speed video uploads, and the back-office storage and retrieval systems for the storage, retrieval and submittal of videos as evidentiary material.

**Public Safety Product Area Director, Raytheon Company. San Luis Obispo Sheriff Office. 04/2014-08/2015.** Led the team who implemented and supported the first ever all digital dispatch control system for the Sheriff's department. This included all hardware and software required to replace the existing dispatch system based on traditional telephony solutions.

**President, JPS Communications, (wholly-owned subsidiary of Raytheon Company). 05/2012-08/2015.** Responsible for overall financial performance, business strategy, operations, and sales and marketing. Refined the business strategy to include company intellectual property combined with third-party value-add offerings to drive improved success with sales within the Public Safety marketplace. Redefined the organization structure to enable higher levels of accountability and empowerment and to support strong financial performance. Developed channel sales strategy for rapid increase in profitable revenues. Refined Raytheon's broader strategy within the Public Safety marketplace to include integrated voice, video and data solution offerings.

# Cortney Dash

## DEPUTY PROJECT MANAGER

Cortney Dash has expertise analyzing customer requirements to develop products and processes that are efficient as well as profitable. He is a collaborative and decisive manager with strong communication and interpersonal abilities.

As an IT support professional, Cortney's experience includes software project management, software implementation, systems analysis, and product analysis for network infrastructure and cloud-based products. He is a highly effective analyst with proven skills in identifying market needs and opportunities and translating needs into functional requirements for product lines. Cortney is a network expert with an extensive background in troubleshooting hardware and software connectivity issues and providing network analysis and administration, hardware and software upgrades, and user support.

Cortney is proficient in all Windows Operating Systems (95, 98, 2000, XP, Vista, Windows 7/8/10), Microsoft Project, Jira, Asana, Wrike, SharePoint, Microsoft Office Suite, Internet Research, PeopleSoft, HP Service Manager, Cisco routing and switching, subnetting, TCP/IP, DNS, VOIP, and routing protocols, including BGP, RIP, RIPv2, EIGRP, OSPF, and other less used protocols.

### YEARS OF EXPERIENCE

Total: 16
With Parsons: 1

### COMPUTER/SOFTWARE SKILLS

- Systems Analysis
- Software Implementation
- Software Configuration
- User Acceptance Testing
- SDLC
- GAP Analysis
- Agile and Waterfall Methodology
- Scrum Master
- SaaS/DaaS/MDM
- Salesforce CRM
- Network Design, Analysis, Admin
- Hardware/Software Troubleshooting
- Servers/LAN/WAN Optimization
- Firewalls/IPS/IDS
- VPN Tunneling/VOIP Administration

## WORK EXPERIENCE

**Project Manager. Mississippi Department of Transportation, Advanced Traffic Management System Maintenance, Mississippi, United States. 06/2020-Present.** Cortney is the project manager leading the upgrade of the client's existing iNET™ advanced traffic management system platform to Parsons' next generation platform. Responsible all aspects of project management for this effort, including planning, scheduling, resourcing, financial management, and customer engagement and satisfaction. Mississippi has been a long-standing customer of Parsons' advanced traffic management system solutions and contracted with Parsons in May 2020 to conduct the upgrade.

**Deputy Project Manager. Tennessee Department of Transportation, I-24 SMART Corridor, Rutherford and Davidson Counties, Tennessee, United States. 05/2020-Present.** The I-24 SMART Corridor project is a major transportation route for commuters and freight between Rutherford and Davidson counties. To alleviate significant congestion issues, this project creates 30 miles of connector routes between I-24 and SR 1 (US 70S/US 41/Murfreesboro Road). Work spans approximately 28 miles along both I-24 and SR 1 from their junction in metropolitan Nashville to SR 10/US 231 in the city of Murfreesboro. Parsons, as a subcontractor on the team, is deploying intelligent transportation system features to upgrade signals and optimize signal timing on SR 1 and the connector routes and to provide dynamic message signs on both I-24 and SR 1. By integrating freeway and arterial roadway elements with physical, technological, and operational improvements, the Tennessee Department of Transportation will be able to better manage the existing infrastructure, actively manage traffic, improve travel time reliability, and provide drivers with accurate, real-time information. Cortney assists the project managers with planning, scheduling, procurement, resourcing, and financial management for the intelligent transportation systems and system integration provided by Parsons. I-24 is a critical component of the Nashville-Davidson County transportation network and a major route for commuters and freight. The Tennessee Department of Transportation is leading the industry with its I-24 SMART Corridor strategy to integrate freeway and arterial roadway elements, while improving physical, technological, and operational transportation measures.

**Technical Project Manager. Genuine Parts Company. 01/2020-04/2020.** Cortney was the technical project manager for NAPA TRACS which is NAPA's proprietary shop management software used by more than 6,000 companies worldwide. Responsibilities included furthering the push to an Agile environment, including grooming the extensive backlog, assisting with drafting feature requirements, providing sprint planning, and leading the daily scrums, sprint reviews and demo meetings, and sprint retrospectives. Hosted daily shareholder meetings and delivered detailed weekly status reports on risks, accomplishments, and the budget

**Project Manager. Amplifi. 12/2018-12/2019.** Cortney managed master data management software implementation projects for Abercrombie and Fitch, Office Depot, Floor and Décor, Newell Rubbermaid, Sysco, Delta Faucets, Retail Business Services, and Cardone. Met with clients and the sales team to discuss each client's individual needs and expectations in order to understand project scopes. Created estimation documents (resources needed, resource hours needed, total budget) to present to the estimation board for approval. Created statement of work documents to present to legal for approval. Upon approval, sent statements of work to clients for signature. Created project plans and conducted internal and external kickoff meetings to introduce the corresponding teams and to provide a high-level review of impending projects. Executed a discovery exercise for gathering all information from the client that the project team needed to perform. Set internal and external meetings, as needed, maximizing utilization, progress, and timelines. Monitored resources and budgets on a weekly basis. Conduct exit meetings with project teams and clients. Looked for new statement of work or change request opportunities with clients based upon perceived future needs.

**Project Manager. Hewlett Packard. 02/2014-12/2018.** Cortney managed, on average, five projects simultaneously, working with shareholders, product owners, the development team, and any outside vendors through the entire project life cycle. Assessed market competition, positioned HP products, and determined areas to drive differentiation against competitors' SaaS/DaaS offerings. Identified software and service features required to create a competitive advantage in the SaaS and DaaS market. Built strong relationships with the engineering, region category, and product marketing teams to identify priorities and activities needed to drive end business results. Served as product technical expert and provided a third level of support for technical services to maximize sales and general marketing of engineered systems. Conducted on-site and remote sessions with customers, partners, and internal sales and field groups (technical sales, delivery, support) to obtain input and feedback. Provided leadership and worked within cross-division functional teams or on projects that affected the organization's long-term goals and objectives. Regularly recommended product, service, and solution strategic direction to senior management. Was seen by shareholders, product owners, and development teams as an expert in the products, services, and solutions and was regularly called on to defend the benefits in front of customers or partners. Built, pruned, and maintained the team requirements backlog, consisting of user stories, defects, and enablers, with input from key stakeholders. Managed the release cycle and supported technical product managers by obtaining required input from the field and from regular customer meetings with technical product managers regarding the progress of features through the project life cycle. Responsible for accepting final iteration plans on behalf of the Agile team.

# Kristin Virshbo

## 511/ATIS IMPLEMENTATION

Kristin Virshbo is Castle Rock's CEO and President. Kristin oversees and sets direction and priorities for all Castle Rock teams and for the overall company direction. Her mission is to lead and inspire the Castle Rock team to continue innovating and building forward-thinking, human-centered traveler information and traffic management solutions.

Kristin remains closely involved in the design process and creative direction for all new Castle Rock-developed software, with a focus on usability, reliability, and end-user experience. She liaises closely with clients and employees, establishing clear lines of communication, while also providing project direction and oversight.

With 20 years of experience as an ITS and information technology professional, Kristin has worked with dozens of transportation agencies to conceive, develop, and operate their traveler information and traffic management systems.

### YEARS OF EXPERIENCE

Total: 21

### COMPUTER/SOFTWARE SKILLS

- Master of Science, Information Science, Indiana University, 2001
- Bachelor of Arts, English, Reed College, 1998

## WORK EXPERIENCE

**Iowa Road Reporting and 511 System - Iowa Department of Transportation. 2002-Present.** Kristin has worked closely with Iowa DOT on designing, iterating, evolving, and operating its current ATIS platform since 2002. Three major versions of the traveler web site were launched in this period, each one a major leap forward from the last. The IVR phone system has gone through two major design iterations. Kristin's work with Iowa DOT also included an integration with Iowa's current ATMS, awarded through the SIMS (Statewide Information Management System) RFP. Iowa's SIMS project brought new traffic management and traveler information functionality to Iowa's Traffic Management Center, with ATMS functions provided by the TransCore TransSuite platform. Kristin led the development of the Interface Control Documents between the ATMS and ATIS systems. She also headed up the design, architecture, and roll-out for new software components developed under this project. She looks forward to building upon that experience to create a fully seamless ATMS-ATIS in this project. Kristin has also worked with Iowa to innovate as well as creatively problem-solve issues arising on the platform. Examples include the Waze integration, Track a Plow x 511 integration, Twitter and social media, 511 traffic stories and filmstrips, CARS-Delay real-time slowdown integration, TPIMS, and more.

**Idaho Transportation Department 511 System Integration - Idaho Transportation Department. 2010-Present.** Kristin has worked closely with the Idaho Transportation Department since 2010 on its ATIS platform. Through regular strategic meetings with the Department, Kristin helps the agency set and realize a roadmap for continuing to grow and evolve its traveler information services. Kristin has worked closely with Idaho on several developments—including Road Weather Information Station integrations, AMBER Alert reporting tools, automated delay information, winter road condition reporting tools, and National Weather Service integrations. Most recently, Kristin is working with Idaho on integrating real- time dashcam photos from snow plows and rideshare coaches from the Department and its partner agency, the Idaho National Laboratories, into Idaho's 511 system.

**Minnesota ITS Innovative Ideas Program- Minnesota Department of Transportation. 2014-Present.** Kristin leads the Minnesota Department of Transportation's Innovative Ideas and other research and development work. Some of her work in Minnesota has included integration with winter storm watches and warning data from the US National Weather Service; the development of a tool forcreating winter driving reports from the field using tablets and smart phones; the integration of public, crowd-sourced feedback on MN's 511 system; and the integration of real-time delay information on MN's traveler information system. Most recently, Kristin led the effort to integrate automated roadwork reports from GPS-equipped construction site "smart arrow boards" into Minnesota's 511 traveler information system. She is also working with MnDOT's operations and weather forecast teams to incorporate automated road weather nowcasts and forecasts from the state's MDSS platform into Minnesota ATIS.

**San Diego Association of Governments (SANDAG) 511 IVR and Web Site Deployment. 2014-Present.** Kristin led the proposal team that resulted in the RFP-awarded contract to replace SANDAG's legacy 511 phone and web-based ATIS. Kristin led the project team through design and implementation.

**DriveBC Input Tool (DIT) Project - The Ministry of Transportation and Infrastructure of British Columbia.2016-Present.** MoTI selected Castle Rock and CARS as the basis for its new DriveBC Input Tool—the data entry tool for the province's DriveBC Traveler Information Service. Kristin led the proposal team for the bid; developed the design concept; has overseen the project implementation team; and works closely with the MoTI Portfolio lead in her role as account manager.

**Colorado DOT 511 IVR and Traffic Text/Email Alert Implementation - Colorado Department of Transportation.2017-Present.** The Colorado Department of Transportation awarded Castle Rock a competitively bid contract to replace its legacy 511 IVR and Text/Email Alert notification systems with a CARS-based solution. Kristin led the proposal-writing team; designed the project architecture; and provides project direction and oversight.

**New York State Thruway Authority ATMS-ATIS Deployment - New York State Thruway Authority (NYSTA). 2007-Present.** The New York State Thruway Authority selected Castle Rock to deploy the CARS platform to serve as the Authority's ATMS system in its traffic management center. Kristin developed the scope of work and project plan and provided project management and design leadership for the project, which included integrated CCTV, Dynamic Message Signs (fixed and portable), police CAD (Computer-Aided Dispatch) data imports, and automated Highway Advisory Radio functions.

**Waze CCP W10 Launch and 511 Integration. 2014-2015.** Kristin represented CARS clients in the Waze "W10" pilot kick-off of its Connected Citizens Program. Kristin participated in the global kick-off meeting for the initiative, as well as subsequent summits and coordination efforts. Kristin led the design, development, and launch of the integration of live Waze data from the CCP with the traveler information systems including Iowa, Kentucky, Louisiana, and Nebraska.

# Ranjit Gopal

## ATMS IMPLEMENTATION LEAD

Ranjit Gopal has more than 20 years of experience in Information Technology, Project Management and Consulting. Ranjit's primary role and responsibility in his current position is focused on leading and managing all aspects of design and development of smart mobility platforms, intelligent transportation systems (ITS), automatic vehicle location systems (AVL), IOT and data analytics platforms for various agencies within the U.S. and internationally. His vast experience has revolved mainly around building and leading high-performance teams, designing complex software systems, and delivering smart mobility and IoT based systems for various organizations.

Ranjit has played an important role in modernizing iNET™ - Parsons' IoT data management and data analytics platform. He has vast experience in system architecture, analysis, design and development of mission critical applications on smart mobility platforms. Ranjit is currently leading several projects that is focused on customization, and integration of the IoT data management and data analytics platform (iNET™) for several agencies such as Michigan Department of Transportation, Illinois Department of Transportation, and Indiana Toll Road Agency. Ranjit possesses strong technical, managerial, analytical, problem solving and troubleshooting skills.

### YEARS OF EXPERIENCE

Total: 25
With Parsons: 12

### EDUCATION

- Master of Business Administration, Entrepreneurship and Family Business, DePaul University, Illinois, 2004
- Bachelor of Engineering, Electrical Engineering Technology, National Institute of Technology, India, 1993

### COMPUTER/SOFTWARE SKILLS

- Java
- JEE
- Hadoop
- AWS
- Kafka
- IoT
- SOA
- Oracle
- SQL Server
- DevOps
- Agile methodologies
- JavaScript
- JBOSS
- WildFly
- ATG Commerce
- Microsoft Office Suite
- Visio
- Analytics
- Dashboards

## WORK EXPERIENCE

**Technical Lead and Manager. Michigan Department of Transportation, MDOT Statewide Advanced Traffic Management System, Michigan, United States. 01/2015-Present.** Michigan Department of Transportation Statewide ATMS is built on Parsons' Advanced Traffic Management (ATMS) system - iNET™. Ranjit is the Project Software manager for this project. He provides overall technical direction as well as leads team efforts for design, architecture, development, customization and integration of iNET™ for the state of Michigan (MDOT). The functionalities include a comprehensive Video Management System, Event Management System, Decision Support System, Regional Video distribution, Dynamic Message Signs, Automatic Vehicle Location, Variable Speed Advisory, Vehicle Detection System, Lane Control Signs, Travel Times, Border Wait times and much more. Ranjit is also involved with the client to develop requirements and directs his team to customize and deliver the iNET™ system in a timely, efficient and cost-effective manner.

**Technical Lead and Manager. Michigan Department of Transportation, US 23 ATMS, Washtenaw and Livingston Counties, Michigan, United States. 10/2015-10/2017.** Parsons' technology platform (iNET™) was further enhanced and a new module added that supports all the desired functionality for the US 23 ATM Corridor. The new features and functionalities include Lane Control (LC), Hard Shoulder Running (HSR), Variable Speed Limits (VSL), and functional integration with the IoT data management and analytics.

**Technical Manager and Lead. Indiana Toll Road Concession Co. Ltd., Indiana Toll Road Advanced Traffic Management System, Statewide , Illinois, United States. 05/2017-04/2019.** This project involved development and deployment of state of the art ATMS system that integrated all of the ITS field devices including DMS, VDS, ESS and Genetec Camera systems for the Indiana Toll Road to utilize, monitor and transform their day-to-day operations in their traffic centers, Essentially, iNET ATMS is the hub that controls all ITS field devices while sharing real-time incident and roadwork information with other stakeholders. As the software development lead/manager, Ranjit spearheaded the software development team efforts to build all of the necessary ATMS iNET-based software services and interfaces. He also worked closely with the client to understand all their operational needs and translate them into software requirements for this project.

**Technical Lead. Rhode Island Turnpike and Bridge Authority, RITBA On-Call Professional Engineering Services, Contract 15-16, Rhode Island, United States. 08/2017-11/2019.** Ranjit performed as the software lead for this project that developed modern state of the art ATMS system that integrates ITS field devices including DMS, VDS, ESS and Genetec Camera systems. This was used by RITBA personnel to utilize and monitor for their daily operations in their traffic management centers, Ranjit provided technical direction to build all of the necessary ATMS iNET-based software services and interfaces. He worked closely with the stakeholders of this project to understand their operational needs and translate them into software requirement.

**Technical Manager. State Road and Tollway Authority (SRTA), Managed Toll Lanes, Cobb and Cherokee Counties, Georgia, United States. 07/2015-03/2017.** SRTA ITS is another web-based application system that is built on Parsons' ATMS platform - iNET™. This system is designed to assist in the management of traffic on freeways, toll-ways and arterial roadways. Ranjit served as a technical manager and was instrumental in creating a scalable data and IoT platform architecture that can be customized to meet their unique operational environments. This system is designed to serve as the ITS foundation for SRTA Toll Collection Systems Implementation. SRTA system leverages web service technologies to support integration with several other external systems such as ETC (Electronic Toll Collection), DPS (Dynamic Pricing System), MOMS (Maintenance Online Management System).

**Technical Lead and Manager. Michigan Department of Transportation, Michigan Truck Parking Project, Michigan, United States. 07/2013-06/2015.** The scope of this project is to provide a timely and reliable dissemination of information regarding truck parking availability to end users. A new truck parking module was added to Parsons' iNET™ platform. For this project, iNET™ was also required to be integrated with the road side equipment that uses technology to disseminate parking information to the trucks. The parking data is also published from statewide iNET™ Data platform to Michigan public website MiDrive to share parking information. Ranjit played a key role in coordinating with the client and third-party vendors to develop and refine software requirements. His responsibilities also include directing and leading team efforts to architect, design, develop and test new software components within the iNET™ to integrate parking data from public and private infrastructure.

# Michelle McCullough

## SYSTEM SUPPORT

Michelle has 11 years of customer service experience and a history in developing high performing staff. Her experience in a range of responsibilities include procedural implementation, operations management, training and development. Core competencies include compiling data reports, collaborative leadership, project prioritization, research and analysis

### YEARS OF EXPERIENCE

Total: 11
With Parsons: 6

### LANGUAGES

- Korean

### COMPUTER/SOFTWARE SKILLS

- ATMS
- GCIC/NCIC
- Microsoft Office: Word, Excel, Access, Power Point, and Outlook

## WORK EXPERIENCE

**Operations Shift Supervisor. Georgia Department of Transportation, GDOT Traffic Management Center Operations Support Services, Macon, Georgia, United States. 07/2016-05/2018.** Parsons assisted the Transportation Control Center in Macon, Georgia, with staffing, operations, outreach, and logistics support. Support included using NaviGAtor software and systems to detect and manage incidents, using task management tracking databases, performing data entry, responding to customer inquiries, and interacting with GDOT to resolve problems and complaints. Parsons also evaluated and enhanced traffic signal operations throughout the district. This project consists of creating and executing Customer Service Initiatives specific to District 3's 31 counties. Responsible for the onboarding and training of all new hires. Built new training plan and certification for staff. Addressing inquires and requests from the client, upper management, and staff. This is first District in the state to have their own operations center focused on customer service in a District Office.

**Call Center Assistant. Georgia Department of Transportation, GDOT Transportation Management Center Operations and Support, Macon, Georgia, United States. 12/2014-09/2016.** Parsons provided the services necessary to staff and operate GDOT's Transportation Management Center. Parsons assisted GDOT with operating and improving the statewide NaviGAtor system through such tasks as 24/7 operations, incident reporting, traffic incident management, and various supporting engineering studies to support the improvement, performance, and benefits of Georgia's Advanced Traffic Management System. Michelle monitored traffic flow patterns and disperse information to minimize congestion which may include means of floodgates and/or changeable message signs. She compiled incident data reports as requested by management. Michelle disseminated non-emergency and emergency issues via email, phone or T.O.D.D. correspondence to appropriate personnel. She liaised with emergency response organizations for appropriate responders to emergency incidents. Michelle received calls from the traveling public; provide information such as accidents, construction and traffic and served as point-of-contact in the mornings in the event that Management is not present.

**E911 Communications Officer. Public and other Emergency Services, E911 Communications Center, McDonough, Georgia, United States. 01/2013-01/2014.** Execution of concurrent activities, often within a tense environment, while maintaining constant communication with all field units. Responsible for receiving incoming calls from the general public; addressing emergency situations while also acting as a comforting and calming force on the caller. Record and document all incidents addressed by units, bringing statistical value to the response and resolution of emergency situations.

**Senior Traffic Management Operator II. Georgia DOT and Public, Georgia DOT 511, Atlanta, Georgia, United States. 01/2011-01/2013.** Monitored traffic flow patterns and disseminated information to minimize congestion. Liaised with emergency response organizations for appropriate responders to emergency incidents. Received calls from the travelling public; provided information such as accidents, construction, and traffic. Mentored trainees by acclimating them from the Training Room to the Operations Floor.

**Sr. Surveillance Agent. Public, Harrah's Maryland Heights, Maryland Heights, Missouri, United States. 01/2008-01/2011.** Primary role was to protect company assets by using video surveillance equipment. Monitored hundreds of employees to insure quality assurance and prevent loss of assets. When major incidents occurred acted as investigator, poured over thousands of hours of footage and compiling evidence for criminal proceedings; answered to the Missouri Gaming Agency.

**Sr. Promotions Representative. Public, Harrah's Maryland Heights, Maryland Heights, Missouri, United States. 01/2006-01/2008.** Acted as the face of the business for guests. Responsible for planning, implementation, and execution of events and tournaments. Responded calmly to demands of internal customers, always working in high-pressure situations.

# UNIVERSITY OF WISCONSIN - MILWAUKEE

THE BOARD OF REGENTS OF THE UNIVERSITY OF WISCONSIN SYSTEM
ON THE NOMINATION OF THE FACULTY OF
COLLEGE OF ENGINEERING AND APPLIED SCIENCE
HAS CONFERRED UPON

JOSEPH JOHN BRAHM

THE DEGREE OF

BACHELOR OF SCIENCE

TOGETHER WITH ALL HONORS, RIGHTS, AND PRIVILEGES BELONGING TO THAT DEGREE. IN WITNESS WHEREOF, THIS DIPLOMA IS GRANTED.
GIVEN AT MILWAUKEE IN THE STATE OF WISCONSIN, THIS FOURTEENTH DAY OF MAY, NINETEEN HUNDRED EIGHTY-EIGHT.

Lawrence A. Weinstein
President of the Board of Regents

Kenneth A. Shaw
President, University of Wisconsin System

Clifford V. Smith Jr.
Chancellor, University of Wisconsin-Milwaukee

# North Carolina State University

On the recommendation of the Faculty and by virtue of the authority vested in them, the Trustees of the University have conferred on

Janet Leigh Small

the degree of

Bachelor of Science
in Computer Science

In testimony whereof, the seal of the University and the signatures of its officers are hereunto affixed this ninth day of May, nineteen eighty-seven.

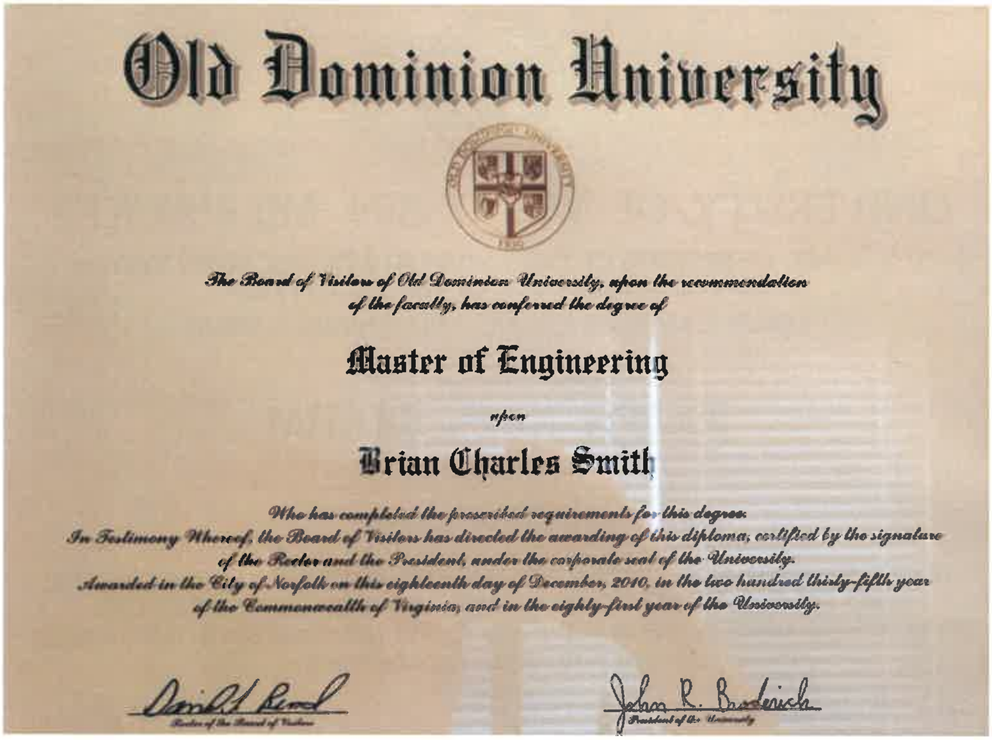
Philip A. Carson
Chairman of the Board of Governors

C.D. Spangler Jr.
President of the University of North Carolina

James A. Hackney, III
Chairman of the Board of Trustees

Bruce R. Poulton
Chancellor

Samuel Biggs
Dean, School of Physical and Mathematical Sciences



Old Dominion University

The Board of Visitors of Old Dominion University, upon the recommendation of the faculty, has conferred the degree of

Master of Engineering

upon

Brian Charles Smith

Who has completed the prescribed requirements for this degree.
In Testimony Whereof, the Board of Visitors has directed the awarding of this diploma, certified by the signature of the Rector and the President, under the corporate seal of the University.
Awarded in the City of Norfolk on this eighteenth day of December, 2010, in the two hundred thirty-fifth year of the Commonwealth of Virginia, and in the eighty-first year of the University.

Rector of the Board of Visitors

President of the University

Virginia Polytechnic Institute and State University

The Board of Visitors of the Virginia Polytechnic Institute and State University has conferred upon

Brian Charles Smith

upon the recommendation of the Faculty, the degree of

Bachelor of Science in Computer Engineering

with all the rights, privileges and honors pertaining thereto.
In testimony whereof, the undersigned, by authority vested in them, have hereunto affixed their signatures and the seal of the University at Blacksburg, Virginia this fourteenth day of December, two thousand and six.

Rector

Dean

President

CompTIA

# Brian Smith

has successfully completed the requirements to be recognized as

CompTIA
**Linux+**
POWERED BY LPI
CERTIFIED

[redacted]
CANDIDATE ID

February 18, 2011
CERTIFICATION DATE

TODD THIBODEAUX, PRESIDENT & CEO

Code: 3XXNVC2D33RQCB0S
Verify at: http://verify.CompTIA.org

CompTIA

# Brian Smith

has successfully completed the requirements to be recognized as

CompTIA
**Security+**
CERTIFIED · CE

[redacted]
CANDIDATE ID

August 15, 2019
CERTIFICATION DATE
EXP DATE: 08/15/2022

TODD THIBODEAUX, PRESIDENT & CEO

Code: GVQSMY33TL1Q1M59
Verify at: http://verify.CompTIA.org

# DePaul University

**Kellstadt Graduate School of Business**

*Be it known that the Board of Trustees on the nomination and approval of the faculty do hereby confer upon*

**Ranjit Gopal**

*who has satisfactorily completed the required course of study appropriate for this distinction, the degree of*

**Master of Business Administration**

With Distinction

*together with all the rights, privileges and honors which appertain thereto*

*In witness whereof, the President and the Secretary of the University, and the Academic Dean have hereunto set their hands and affixed the seal of DePaul University, Chicago, Illinois, March 19, 2004*

President — Secretary — Dean

## 1.2 Exceeding Mandatory Qualifications/Experience Requirements (§ 4.3.2)

**RFP Section: 4.3.2.** Mandatory Qualification/Experience Requirements: The following mandatory qualification/experience requirements must be met by the Vendor as a part of its submitted proposal. Vendor should describe how it meets the mandatory requirements and include any areas where it exceeds the mandatory requirements. Failure to comply with mandatory requirements will lead to disqualification, but areas where the mandatory requirements are exceeded will be included in technical scores where appropriate. The mandatory qualifications/experience requirements are listed below.

The following mandatory qualification/experience requirements must be met by the Vendor as a part of its submitted proposal. Vendor should describe how it meets the mandatory requirements and include any areas where it exceeds the mandatory requirements.

## MANDATORY REQUIREMENTS

| Req ID | Mandatory Requirements | Exceeds Requirement |
|---|---|---|
| 4.2.2.1 | Functionality of the proposed ATMS and 511 software and systems must meet or exceed the current functionality of the existing WVDOT system and elements described in the Background and Current Operating Environment document, meet the accompanying mandatory high-level functional requirements, and respond as necessary to any specific answers to questions submitted to WVDOT through this RFP process. | ✓ |

**How the Parsons team exceeds the requirement:** We will meet all the mandatory and optional requirements stipulated in the RFP. In fact, we meet the vast majority of the requirements out of the box. For the ATMS, our iNET™ product has 34 functional modules, of which your RFP calls for 15 modules to be installed, plus one optional future modules (Traffic Signals). The others are available at any time for installation. Furthermore, we have a great deal of additional functionality available to the WVDOT (and which will be installed with our solution). The additional functionality available that exceeds the mandatory requirements includes the following:

### ADDITIONAL MODULE CAPABILITIES

The **CAV** module enables iNET™ to receive both safety and mobility CAV messages (e.g., BSM1 and BSM2) as well as to send messages to aftermarket devices or directly to vehicle dashboards in support of CV dynamic mobility applications such as speed harmonization (SPD-HARM), queue warning (Q-Warn), weather responsive traffic information (WxINFO), motorist assist warning (MAW), and transit signal priority.

The **predictive** module facilitates the integration of online traffic-simulation tools and/or ML tools to provide predictive travel times and decision support capabilities. It enables the display and use of 15-, 30-, 45-, and 60-minute prediction data in the forms of level of service, speed, and volume/capacity ratios.

The **video analytics (VA)** module uses Parsons-developed embedded video analytics tools to perform the following types of detection: vehicle presence, vehicle speed, stopped vehicles, and wrong-way driving. The system uses video from any CCTV camera in the system to automatically perform video analytics without the use of third-party tools or cameras.

The **big data/cloud** module creates a framework for the ingestion and storage of large volumes of transportation and other smart-city data into a cloud- and/or premises-based big data environment. iNET™ currently supports all major cloud environments and is provisioned for big data using AWS, Microsoft Azure, and Google Cloud. We've integrated big-data analytics tools to enable ad hoc reporting.

The **safety service patrol (SSP)** module allows for the management of all aspects of the SSP program, including live GPS tracking, routing, dispatch, assignment, shift details, incident details, and reports. When combined with the iNET™ event module, the ATMS becomes a single point of management for traffic and safety patrol operations via 2-way communications with SSP vehicles/drivers.

In addition to the ATM strategies called for in the RFP (e.g., VSL and dynamic lane use), the iNET™ **ATM** module has several other strategies that can be employed here. The ATM module manages and controls traffic demand to efficiently use the available capacity of transportation facilities. This module employs various ATM strategies, including VSLs, dynamic lane management, dynamic shoulder use, queue-end warning, reversible lanes, and junction control.

## ADDITIONAL MODULE CAPABILITIES

The **HAR** module communicates with HAR transmitters and beacons to disseminate real-time traffic information to motorists via standard radio signals. This module composes the radio message, sends the messages to the HAR transmitters, and activates the associated HAR beacons.

The **AVL** module interfaces with off-the-shelf AVL systems to display real-time information on the locations of vehicles and other moveable assets on the map. This module tracks the location of vehicles such as SSP trucks, buses, trains, snow plows, and other AVL-equipped vehicles and enables the quickest dispatch of emergency responders.

The **tunnel/SCADA** module monitors and controls typical traffic management elements, such as vehicle sensors, surveillance cameras, signs, and signals, to manage tunnel traffic. It also interfaces with SCADA elements, such as lighting systems, fire detection, fire suppression, flood controls, carbon monoxide emissions sensors, and fan controls.

The **winter maintenance** module is used to monitor and control snow-plow maintenance operations in the field. The module receives information from the operator, spreader controller, GPS receiver, and plow blade sensors. This information is made available via an integrated cellular data modem to the iNET™ software.

The **WIM** module collects data from WIM devices, which are designed to capture and record truck-axle weights and gross vehicle weights as trucks drive over vehicle sensors.

The **AID** module automatically detects congestion and events due to incidents on roadways and alerts the user by placing an unconfirmed icon on the map using its GIS location. This module employs various AID methods including analytic algorithms, video analytics, and ML-based event detection.

The **work zone traffic management** module enhances agencies' transportation management capabilities in work zones by managing construction-zone ITS technologies and implementing work-zone management strategies. Key features include VSL controls, construction zone speed, event monitoring, and GPS tracking of portable ITS field devices.

The **toll system** module extends the traffic management capabilities on toll roads to include the capability to integrate with third-party tolling system solutions using two-way communications. This includes assistance with the calculation of tolling rates, camera monitoring, and control and the use of toll DMSs.

The **integrated data environment** module allows for the storage and standardized exchange of all information contained in this environment in real time. All smart-city data is housed in the environment and exchanged in real time using standard C2C interfaces.

The **edge computing** module moves specific computing functionality to edge devices; communicates with specific edge devices, such as edge-enabled computer and controllers; and includes capabilities for adaptive traffic signal control functions at the edge of the network.

The system also supports the following additional capabilities:

- Although the WVDOT ATMS requirements do not call for any AI and/or ML functionality, this is an important next-generation technology that is being included in TMC solutions. We have integrated five areas of AI/ML technology into iNET™, which can be offered to WVDOT. The iNET™ installation that can be provided to WVDOT for this project includes the following capabilities:

1. Voice-driven assistance using Amazon Alexa and Google Home
2. Event prediction
3. Travel-time prediction using ML
4. Fuzzy logic used for systemwide ARM and mainline metering
5. New intelligent DSS module

The operational concept behind integrating AI and ML into iNET™ is represented in Figure 32.

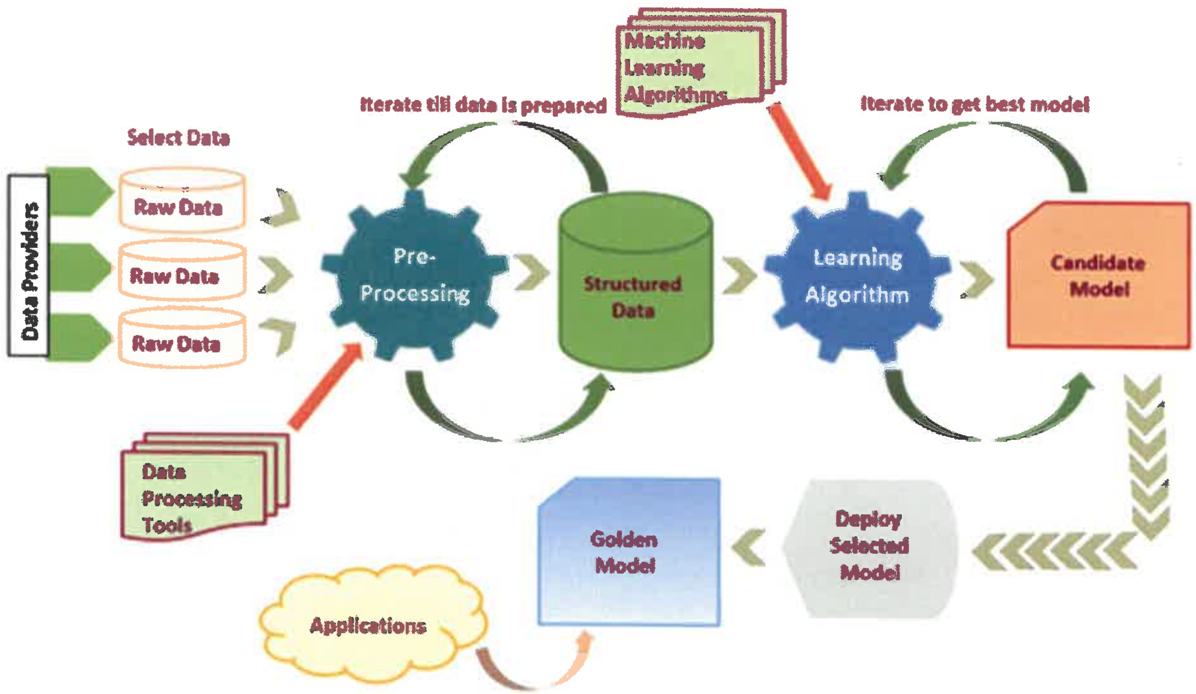



Figure 32 – Integration of AI and ML Technology Into iNET™

## HERO UNMANNED AERIAL VEHICLES/DRONE INTEGRATION

To enhance the situational awareness of the TMC, WVDOT may elect to include video-streaming cameras from drones to record/transmit incidents. The remotely operated drones would be mounted on service patrol trucks to give the TMC managers a "boots on the ground" perspective of incidents as they are unfolding. This could provide a bird's-eye view of incidents and construction status and offer evidence to share with law enforcement to hasten quick clearance of traffic crashes. We will provide two wirelessly enabled drones with cellular data service to transmit the video back to the iNET™ ATMS user interface. We can also use the existing drones that HERO has, assuming they have sufficient capabilities.

## PARSONS' DRONE EXPERIENCE

Throughout our history, we've developed a reputation for staying ahead of the curve. Today is no different. Although the use of small unmanned aerial systems (sUAS) or drones is becoming more widespread for a variety purposes, we have been developing an impressive portfolio using drones in the engineering field to improve safety and reduce expenses on a variety of projects. As the rest of the field struggles to catch up, our boots are already on the ground, and our eyes are in the sky.

We use drones to reduce the costs and risks associated with the traditional use of manned platforms. The range and precision of our drones allow us to accurately survey project areas, perform on-the-spot progress assessments, and monitor areas for safety or security.

## KEY DRONE APPLICATIONS

- Incident management
- Bridge inspections
- Cell and radio tower inspection
- Safety equipment inspection
- Marketing photo and video projects
- Disaster response
- Insurance claim adjusting and underwriting
- Construction development and monitoring
- Precision agriculture
- Construction site planning
- Unexploded ordnance detection
- Oil and gas pipeline monitoring
- Material goods inventory reporting
- Surveying
- 3D modeling
- Stockpile measuring
- Asset management


## INCIDENT MANAGEMENT VEHICLE LIVE-VIDEO-STREAMING DASH CAMERA

WVDOT could include permanently vehicle-mounted PTZ cameras on service vehicles that will stream live video to the TMC. Cameras would have high-resolution image recordings from the front, outside driver's window and rear-end positions. Video images up to 64 GB will automatically be saved to an internal SD card or live video streaming and audio for real-time viewing by the TMC online. This could be a real advantage in areas that do not have camera coverage making event information harder to collect by the TMC.

## INET™ Big-Data Analytics Platform

Parsons has integrated cloud computing with IoT, big data, and data visualizations to realize how large volumes of data can be used to aid in data analysis and decision making for next-generation ATMS solutions. The Parsons iNET™ platform is now integrated for use in the following:

- AWS
- Microsoft Azure
- Google Cloud

Figure 33 is a diagram on how iNET™ is integrated to make use of big data, cloud computing, IoT, and new visualizations.

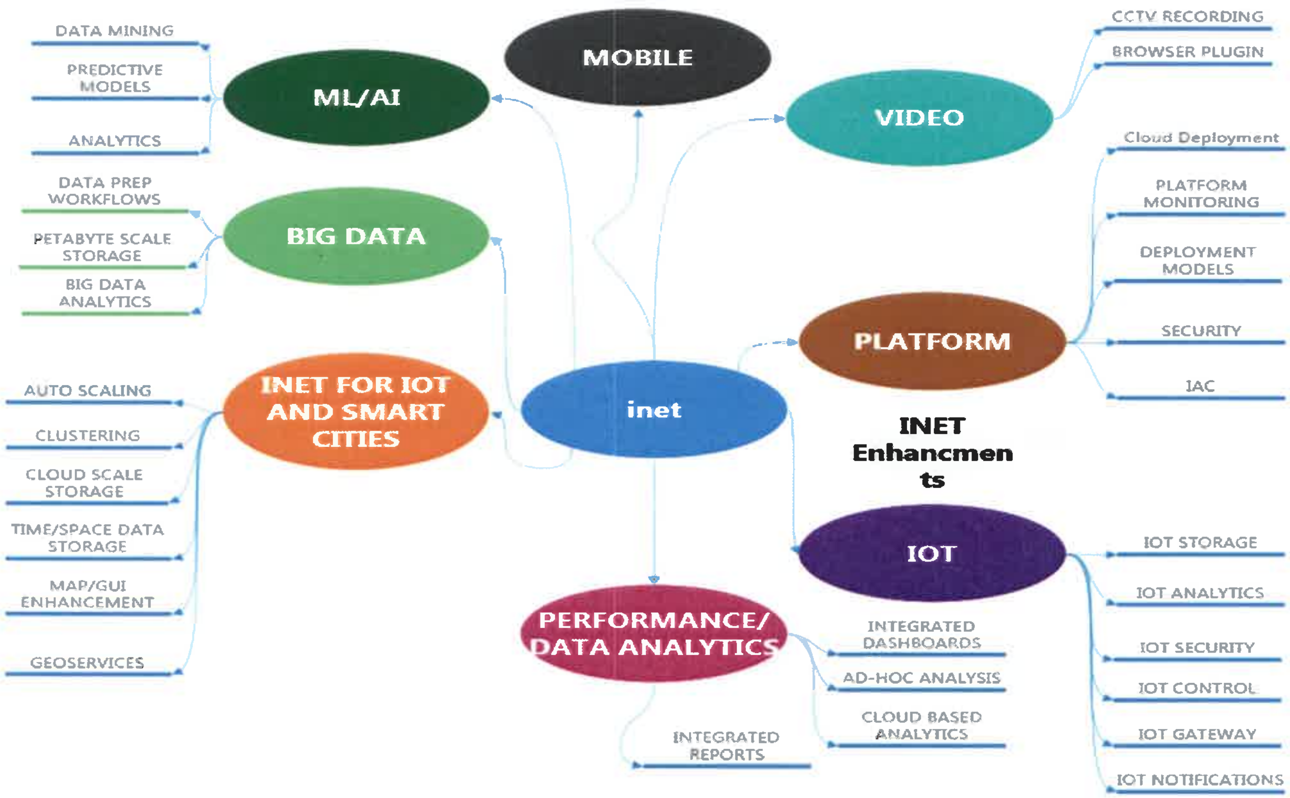



Figure 33 – iNET™ Integration With Big Data, Data Visualizations, Cloud Computing, and IoT

Figure 34 and Figure 35 show examples of the new iNET™ big-data visualizations.

## Smart Cities Performance

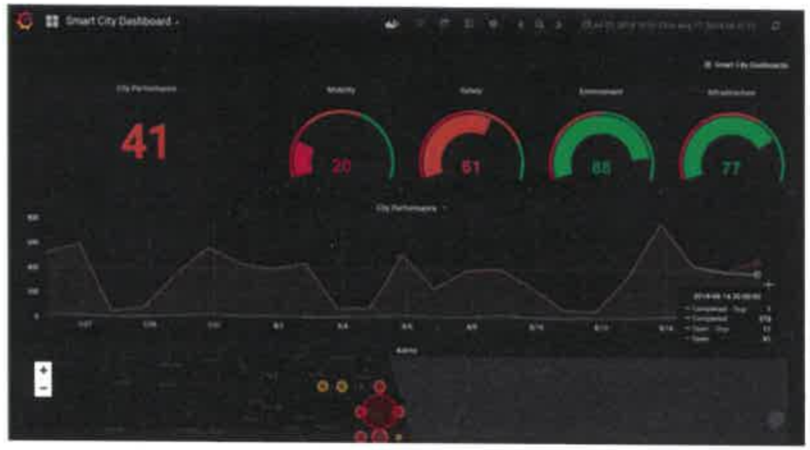



Figure 34 – iNET™ Smart Mobility Dashboard

z

## Smart Cities Performance

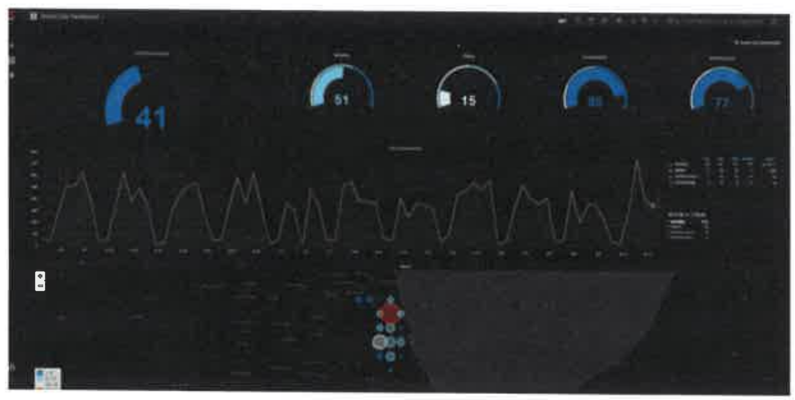



Figure 35 – iNET™ Smart-Cities Dashboard

## INET™ Multicriteria Adaptive Traffic Signal Control Module

As a pluggable module in Parsons' award-winning iNET™ web-based, off-the-shelf ATMS, Parsons' traffic-signal management solution can be provided alone or in combination with other complementary iNET™ modules (such as video/CCTV, event management, travel times, DMS, and VDS). The traffic signal system module is seamlessly integrated into the iNET™ virtual desktop and takes advantage of the many common features built into that environment, including system administration and security, multilingual support, geographic information systems (GIS)-based map display, standard and custom reporting, and alert notification. The module includes a full suite of traffic signal management functions and features including:

### MULTIPLE CONTROL MODES

The system possesses the following three control modes:

- ***Standard time of day*** – Allows operational management of the signal timings by full and complete access to the controller database, enabling remote configuration of phases, timings, schedules, and all other parameters. Uses the universal traffic data format to import signal timings from Synchro software to signal controllers and to export signal timings from signal controllers to Synchro and other traffic modeling and simulation tools.
- ***Intelligent response*** – Uses an AI inference engine to learn normal traffic conditions and provide fast and effective responsive plan selection in the event of nonrecurrent congestion, greatly reducing configuration and maintenance effort.
- ***Adaptive control*** – Performs online, real-time signal-timing optimization based on real-time vehicle detection using different control strategies according to the network topology and current traffic conditions.

### ADVANCED ANALYSIS

Advanced analysis functions include the following:

- ***Real-time monitor*** – Uses real-time data to display second-by-second traffic signal indications in both tabular and graphical formats.
- ***Time-Space Diagram*** - Uses real-time data to show second-by-second green, yellow, and red bands for a group of consecutive signals on a corridor to detect and correct coordination issues.
- ***Measures of effectiveness (MoE) monitor*** – Uses high-resolution event data to display traffic signal measures of effectiveness for ATSPMs in both tabular and graphical formats, providing continuous performance monitoring capability to proactively identify and correct deficiencies and for signal retiming efforts.

Figure 36 and Figure 37 reflect a status-monitoring and situational-awareness screenshot: map, list viewer, multiviewer, group viewer, signal viewer, and detector station viewer.

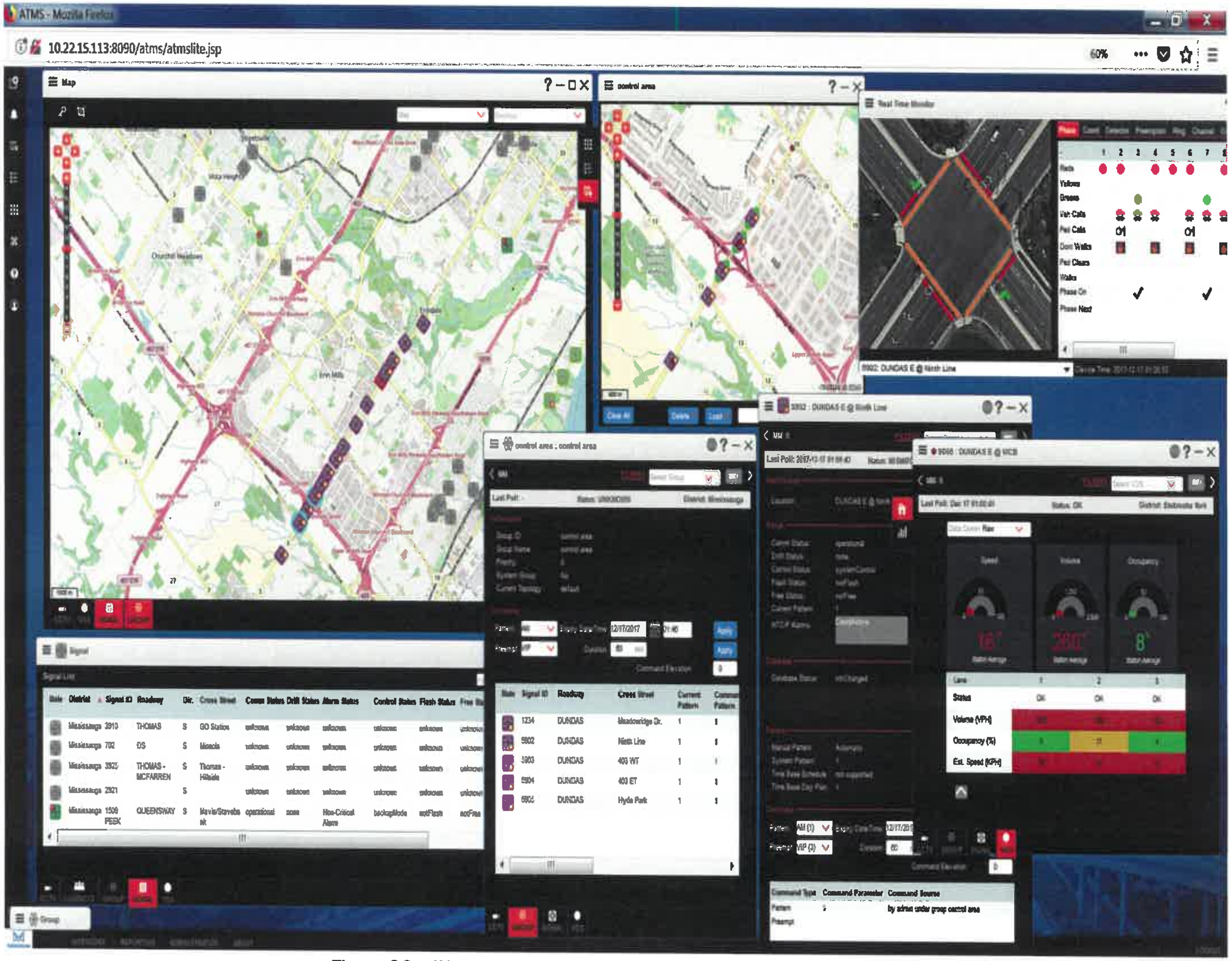



Figure 36 – iNET™ Advanced Traffic Signal Control Systems Screen

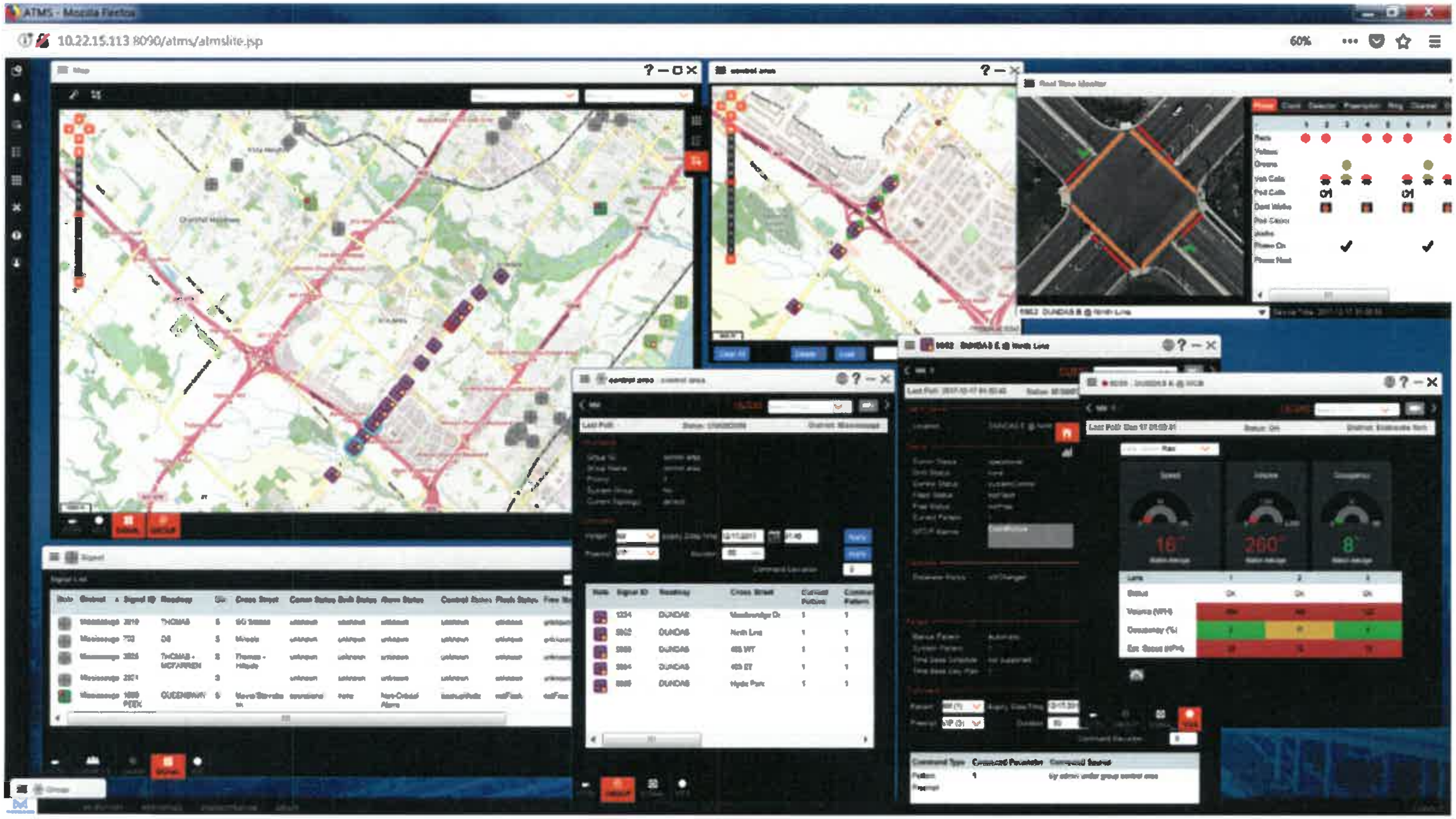


Figure 37 – iNET™ TS Screens With Analytics

**How the Parsons team exceeds the requirement:** The Castle Rock CARS 511 traveler information system offers WVDOT a better, more innovative 511 service with the following features and functions that exceed the requirements:

- Clear, coordinated information and links across all 511 channels
- Interactive user onboarding for new 511 users
- Built-in social-media sharing for specific events and cameras, allowing users to effectively communicate ATMS events and to share cameras
- Interactive "traffic story" displays that integrate information from multiple sources, rather than only dropping clickable icons on a map
- Comprehensive, coordinated **Your 511** personalized account features across the website, mobile app, and IVR

- My Favorite Cameras functionality
- Tweets that include links to individual event reports
- Comprehensive trucker information with intuitive displays

The ability for public users to give feedback on individual events

| Req ID | Mandatory Requirements | Exceeds Requirement |
|---|---|---|
| 4.2.2.2 | The period of service for this contract is 4 years with two optional 2-year renewals. | ✓ |

How the Parsons team exceeds the requirement: See response to Requirement 4.2.2.3 below.

| Req ID | Mandatory Requirements | Exceeds Requirement |
|---|---|---|
| 4.2.2.3 | The Vendor shall submit a formal Software Development Process proposal and schedule to the WVDOT for their approval prior to beginning any work. Consideration should be given to including an iterative process by which the WVDOT representatives are able to review progress, review GUI mock-ups, provide input to the development team, and participate in acceptance testing and requirements verification. Project progress meetings will be required monthly at a minimum, either in person or by teleconference. Project progress reports shall be submitted monthly. | ✓ |

How the Parsons team exceeds the requirement: Per the description of the software development process in our proposal, we will use the Vee systems-engineering process infused with agile programming. Via agile programming, we will do software builds on a frequent basis. In this case, ***there will be weekly automated builds that will be accessible to WVDOT via the internet*** (e.g., using AWS). ***During the monthly progress meetings, there will be system demonstrations of the software and its current state***. Within the first month of project initiation, we will have an initial software installation available for viewing with all the core modules. Enhancements will occur to this base system as the project progresses, and they will be demonstrated during the monthly progress meetings.

| Req ID | Mandatory Requirements | Exceeds Requirement |
|---|---|---|
| 4.2.2.4 | Vendor must provide on-site and remote technical support to the WVDOT for the purpose of maintaining and upgrading the proposed ATMS and 511 System software and providing other TMC support services for an initial period of 3 years with two optional 2-year renewals. The initial 3-year O&M period is to commence following a 1-year software and system development period and final software and system acceptance by WVDOT. The necessary on-site support for the Year 1 system development period is to be included in the base system costs for the ATMS and 511 System. The O&M support periods will include one person onsite for 40 hours per week (standard work days, excluding holidays and vacation) plus on-call hours as necessary to resolve issues in a | ✓ |

| | | |
|---|---|---|
| | timely manner, which may include but not be limited to troubleshooting and resolution of issues related to field devices, communications, networks, software and hardware. In addition, 24/7 phone support shall be provided for the ATMS and 511 System software and associated systems to assist the WVDOT during hours when on-site support is not available. Vendor to include a cost component, if any, for ATMS and 511 System software upgrade/maintenance services and contracts for the term of the contract and renewals. During the system development period (Year 1) and for one year following final acceptance, these upgrade/maintenance costs will be part of the Base System Package costs. | |

**How the Parsons team exceeds the requirement:** For the ATMS and 511 system, we will provide our platinum-level maintenance, which consists of 24/7/365 support, including both remote and on-site support. The Parsons team will provide a talented systems administrator to work on-site at the TMC during normal business hours to provide day-to-day maintenance of systems, networks, on-going operator training, troubleshooting, and light field work. After hours support and/or additional reach-back support to the technical/development team is also provided by this service level should any escalation be necessary. A copy of our maintenance agreement can be provided, or we can use a maintenance service agreement preferred by WVDOT. The iNET™ ATMS platinum-level support license includes the following services:

- **Telephone help desk support**. We will provide telephone help desk support to answer user questions and issues regarding the ATMS application, database, TMC network, and any related ancillary components used to operate the system. The help desk support will be available 24/7/365 using our 1-800 help desk number.
- **Online e-ticket support system**. All system trouble tickets will be reported, viewed, and tracked using an online e-ticket system using Salesforce, which is the same system we use for other ATMS deployments today.
- **Core system upgrades**. We will provide all core system upgrades to the agencies' current iNET™ ATMS version during the time period of the maintenance contract.
- **On-site support (normal business hours)**. We will provide on-site troubleshooting and fault isolation of the ATMS application, database, and other related components in support of the servers, network, data storage system, and workstations. A qualified Parsons resource will be located on-site at the Traffic Management Center (TMC) and able to respond to any issues as notified. Each incident or callout will be issued a tracking or reference number. On-site support will be made available Monday through Friday from 8 a.m. to 5 p.m., excluding state holidays.
- **On-site support (outside normal business hours)**. We will provide on-site support outside of the normal business hours on major or unforeseen problems that result in severe system failures that prevent the Department from performing its core business functions. The work will include on-site troubleshooting and fault isolation of the hardware, database, and ATMS application. Each callout will be issued a tracking or reference number.
- **Bug fix releases**. Bug fix releases not incorporated with a core system upgrade will be provided to resolve software and system issues that prevent the WVDOT from performing its core business functions. This includes all support as necessary to address fixes to data as requested and approved by WVDOT.
- **System performance**. The Parsons maintenance team will ensure the system continues to perform to the requirements specified in Section 7 of the RFP during the contracted maintenance period.

- **Configuration management.** We will perform software configuration management activities related to the ATMS as defined in the WVDOT-approved next-generation ATMS configuration management plan (CMP).

## TECHNICAL SUPPORT

Technical support will be provided when issues or failures arise with the ATMS and 511 system. Support will be provided via telephone or email communication on a 24/7/365 basis. To investigate and resolve the issue, we will have access to WVDOT's VPN to access the production and test systems. We will implement a multilevel support process to handle issues and failures as follows:

- A 1-800 phone number to reach Parsons
- Email and chat tools to interact with the help desk personnel in addition to the 1-800 phone number
- An online Salesforce issue-tracking tool (identified WVDOT users can enter issues into a web-based tool that are tracked in the tool until resolution)

The first point of contact for all critical issues during business hours will be to notify the on-site system administrator who will create a service ticket for tracking purposes. Outside of normal business hours, a 1-800 number will be provided to report any issues and launch the rapid process for issue diagnosis and resolution. Detailed information will be obtained, and a ticket will be created in the issue-tracking tool for status tracking until resolved. Ticket information will be relayed back to the reporter to verify that a ticket was created. We will make reasonable efforts to resolve the issue within the agreed-on response and resolution times and will provide status on a regular basis to WVDOT.

The Parsons maintenance team will be notified immediately of open service tickets and will be accountable for response and resolution as required by the defined severity levels and associated response times. Additionally, the Parsons maintenance project manager will review open service tickets during monthly meetings with WVDOT.

| Req ID | Mandatory Requirements | Exceeds Requirement |
|---|---|---|
| 4.2.2.5 | Vendor is required to not interrupt connectivity and key data transfer functionality without notice and prior approval, during the ATMS software and 511 system installations, between the WVDOT TMC located in Charleston, WV and the remote users and offices that provide information to and/or receive information from the TMC and the current ATMS and 511 software and systems. This includes the E-911 centers located across the state that provide accident data directly to the current WVDOT ATMS platform and the West Virginia Parkways Authority. | ✓ |

How the Parsons team exceeds the requirement: Although the Parsons team will always inform WVDOT and the project stakeholders of all installation activities, the system will be installed and configured in a manner where there should be virtually no disruption in service. Below is the recommended deployment configuration. Within this structure, the deployment areas for the ATMS will be broken down into two components: preproduction and production. The preproduction sites are used for integration testing, training, and user-acceptance testing. The production sites are the operational TMC systems. In addition, there will be independent ATMS testing and development areas accessible by agency-approved parties and our dedicated team. There will be primary and secondary production areas, which will be clustered and set in failover mode. During system updates, the clustering will be disabled temporarily to allow the system upgrade to be put on one server first, then the second. Operators will be directed only to the 100 percent operational servers during this time. This will allow for zero downtime during transition.

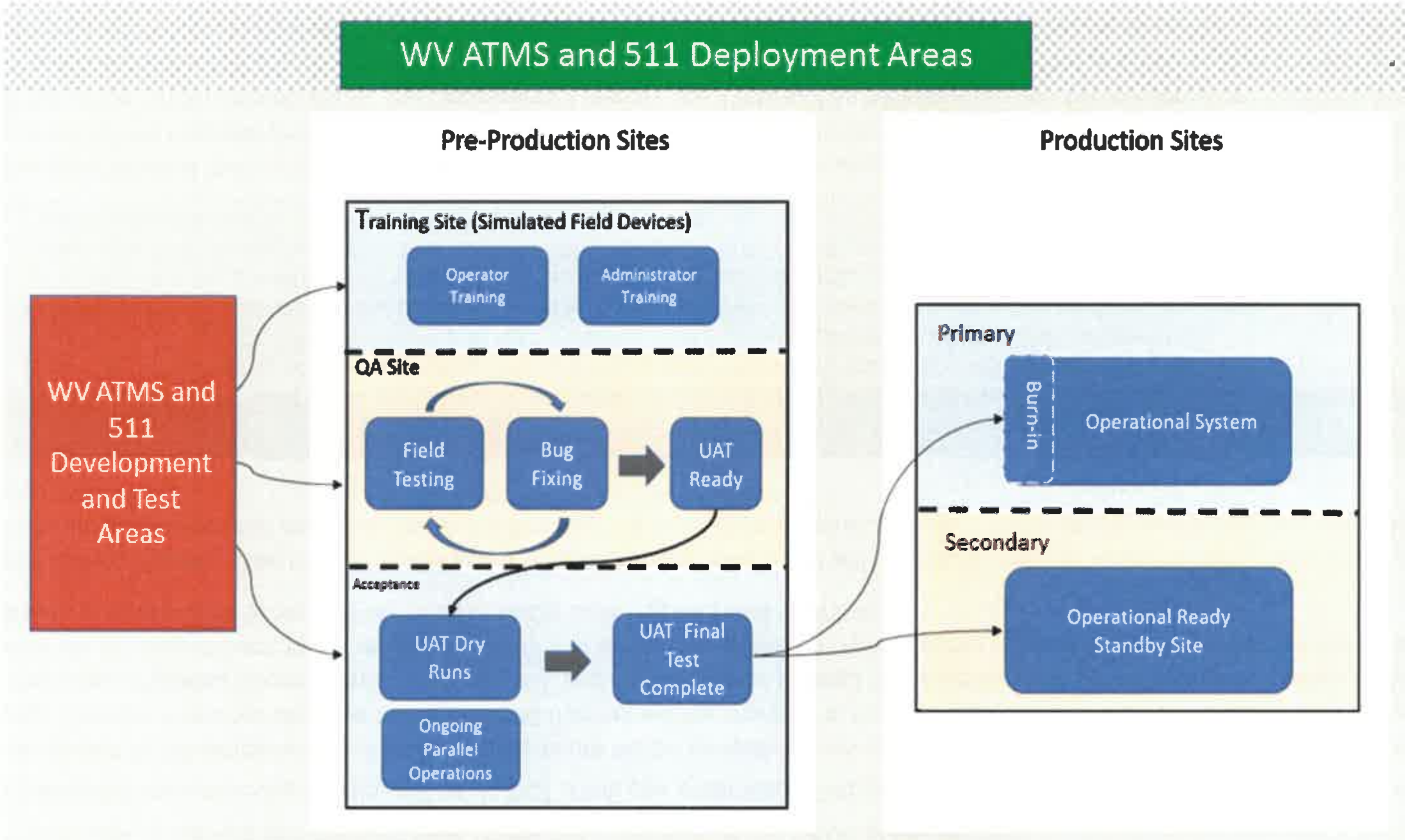



Figure 38 – WV ATMS and 511 Deployment Areas

NOTE: The *Testing* environment will be utilized for both Training and User Acceptance during the development and transition period.

| Req ID | Mandatory Requirements | Exceeds Requirement |
|---|---|---|
| 4.2.2.6 | The proposed Vendor software and systems must have the ability to be integrated with current WVDOT field devices, including 109 CCTV, 64 DMS, and 41 RWIS. The list of devices is included as Attachment E. | ✓ |

How the Parsons team exceeds the requirement: Our ATMS solutions have integrated with more than 63,000 different devices and system interfaces worldwide. *We currently have ATMS solutions that interface with more than 9,000 devices today, and our system can easily scale to more than 20,000 devices*. We support all the device drivers required in the Attachment E device interface list. In addition, we have hundreds of additional device drives and system interfaces to choose from.

| Req ID | Mandatory Requirements | Exceeds Requirement |
|---|---|---|
| 4.2.2.7 | The 511 systems proposed shall maintain the capability for information retrieval via telephone access using voice recognition, the WV 511.org website and the WV511 Drive Safe mobile application. The 511 system shall also have a road condition reporting system associated with it that allows for remote user data entry and master user data entry of road conditions from partner agencies and the TMC. | ✓ |

**How the Parsons team exceeds the requirement:** The Castle Rock 511 solution covers **all four channels of WVDOT's** traveler information platform (telephone, website, mobile app, and social media) in a **coordinated, consistent fashion**. Our designs include **user onboarding, context-sensitive help,** and **updated, modern designs.** The architecture, shown below, illustrates our "enter it once, everything else happens automatically, across all 511 channels" concept.

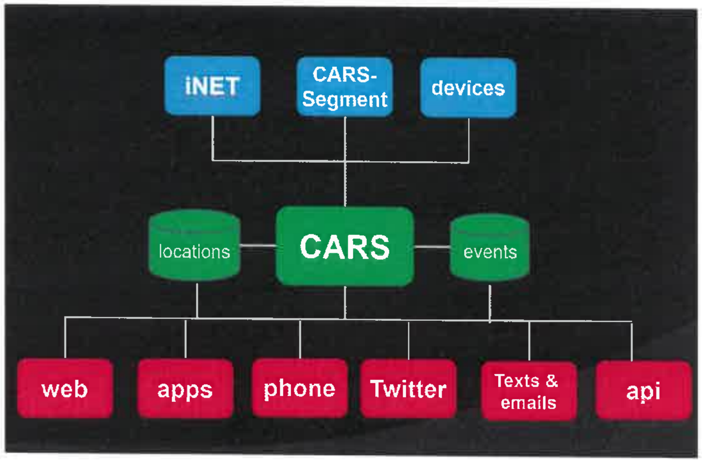



Figure 39 – CARS Data Flow

For road-condition reporting, we offer a comprehensive, easy-to-use data entry platform (CARS-Segment) that **includes both a web-based interface and a downloadable mobile app (iOS and Android).** CARS-Segment makes it quick and easy to update road-condition reports for a whole route, a route segment, a maintenance area, a district, or statewide. And our style of presenting road conditions to the public on all 511 channels is clear and consistent.

Data entry can be performed by anyone from any Internet-connected device after the user authenticates themselves with a username and password. Under the CARS license, WVDOT can create an unlimited number of user accounts both for the Department and its partner agencies. User accounts can be managed directly within the CARS UI by users with System Administrator permissions.

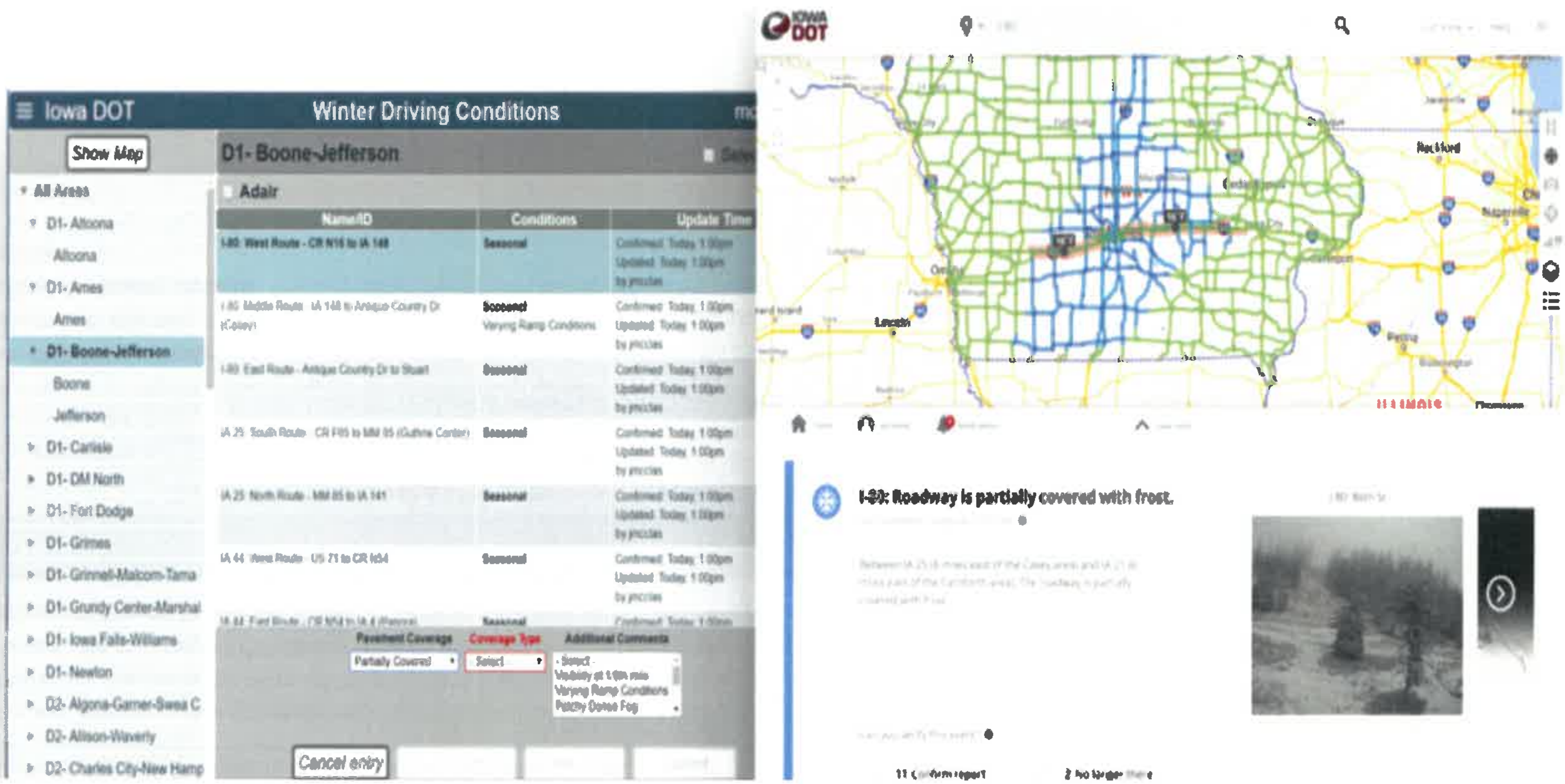
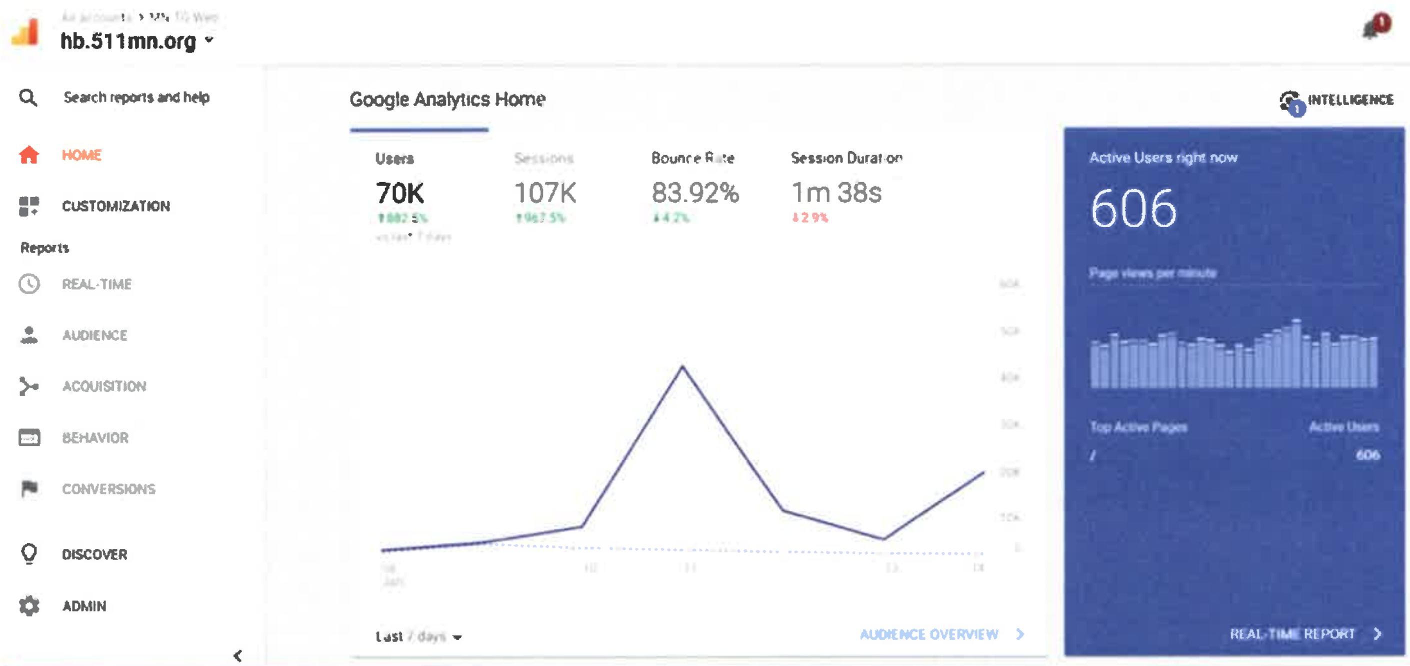


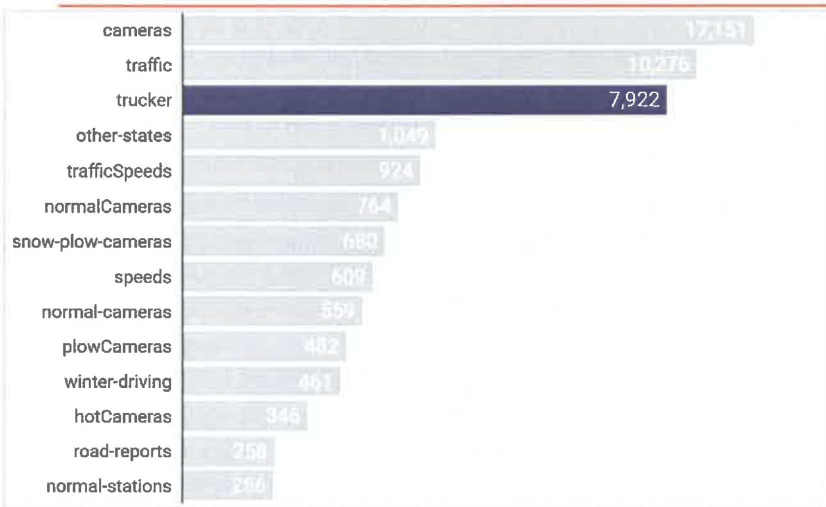

Figure 40 – Castle Rock's Consistent, Coordinated 511 Traveler Information Platform

| Req ID | Mandatory Requirements | Exceeds Requirement |
|---|---|---|
| 4.2.2.8 | The 511-website development and product shall adhere to the requirements noted in the Functional Requirements. In addition, the Vendor shall include and/or provide the following:<br>• WVDOT to have administrative rights and control over any public facing websites and applications.<br>• WVDOT personnel shall have the administrative ability to modify links, graphics, language, etc. on the website.<br>• A resources tab/link shall be included for linking to other WVDOT pages, resource documents, and partner agencies. Resource links might include information/links to construction updates, significant project websites, tolling information, truck permits, rest areas, social media, etc.<br>• Ability to place advertising on the website and track advertising metrics.<br>• Tracking of analytics/usage of the 511 website and the 511 application by the public.<br>Annual review of the 511 website and the 511 application between the Vendor and WVDOT to update design, content, graphics, links, features, etc. This work will be part of the annual maintenance costs. Costs for items, design or equipment upgrades above and beyond normal maintenance will be paid through the materials or IDIQ budget provided by WVDOT. | ✓ |

**How the Parsons team exceeds the requirement:** Castle Rock grants WVDOT administrative rights and control over any public-facing websites and applications. Our user interfaces make it easy for WVDOT to control and update content—e.g., floodgates, events, news items, etc. Where content is not managed through a GUI, we will grant WVDOT access for modifying other parts of the web site. These changes are also covered in our M&O agreement, so we can make them for you at no additional cost.

We offer a comprehensive analytics tracking platform that includes detailed information about usage of the web site and mobile app. We now also track user behavior within the 511 applications, offering insight into what the most frequently clicked layers, events, and content types are. Examples of our analytics reports are shown below.




## Iowa Call Flow for 2020-05

| Point | Requests |
|---|---|
| Main Menu | 2085 |
| Driving Times | 1 |
| Road Reports | 401 |
| Metro Reports | 79 |
| Truckers Reports | 45 |
| Nearby States | 45 |
| Leave Comment | 50 |
| Statewide Floodgate | 15 |

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Figure 41 – Website Usage Statistics

Our websites and apps include the ability to link to external resources. Our IVR allows for **call transfers** to neighboring states' 511, tourism, transit, etc.

While none of our current 511 customers places advertising on the system, there are several locations where it can easily be added in.

As another major value-add, we prepare a comprehensive annual M&O review document every year at our **annual meeting** (to which all CARS agencies are invited). It reviews the last year of M&O; includes statistics from the last and prior years; and sets a plan for the year ahead from both a cost and a maintenance work plan perspective. It is a comprehensive review of the last year of operations and is a planned vision for the year ahead. This document is shared annually with all of Castle Rock's current 511 clients.

| Req ID | Mandatory Requirements | Exceeds Requirement |
|---|---|---|
| 4.2.2.9 | The Vendor shall provide training on the ATMS and 511 software and systems to operators and supervisors initially and then as specified below for new personnel and upgrades. During the first year, Vendors should plan on two training sessions to be provided at two locations in Charleston. One will be at the WVDOT TMC and the other will be at the West Virginia Parkways Authority office. Facilities will be arranged for by the host agency. Up to 20 trainees should be planned for at the WVDOT TMC site with training to take place across two shifts. Up to 10 trainees should be planned for at the WV Parkways Authority site with training to take place across two shifts. Each ATMS training session will be accomplished within one 8-hour period. In each of the following years, including renewal years, the Vendor shall provide a training session to new employees and software updates/refresher to previously trained employees at the same locations in a similar format. At every training session, training manuals shall be supplied for trainees as well as prepared presentations and live training on host supplied workstations. The training period should be quoted to include time, materials and travel expenses associated with this task. Alternatives to this training plan can be submitted by the Vendor, but the Vendor shall provide a quote based on the training plan specified above and an alternative bid if desired for consideration by WVDOT. | ✓ |

**How the Parsons team exceeds the requirement:** Training is an integral part of the successful deployment of the next-generation ATMS solution. We are convinced that the expertise garnered through continuing education is paramount to nearly anything else that is done; indeed, the team is committed to keeping the WVDOT team educated on the software we deliver and its impact on the operation and on best practices and current ITS industry trends.

Training sessions will include PowerPoint presentations led by qualified instructors, with hands-on exercises using real-life examples.

The iNET™ team will use the established training site for the next-generation ATMS and 511 systems; this training site will be identical but separate from the production site. The training site will have its own dataset like the production system, but it will not impact or affect the live environment. The system training site will be dedicated to training the users and administrators of the system, not to traffic operations.

A system training plan (STP) will be developed and delivered for the next-generation ATMS. The STP will contain the following items discussing the different levels of training:

- Location of training sessions
- Training equipment, including training software needed
- Format of training session (PowerPoint and hands-on)
- Training material (e.g., PowerPoint presentations)
- Operator training sessions
- Agenda
- Skill level/expertise level necessary
- Class size
- Number of training sessions
- Administrator training session
- Agenda
- Skill level/expertise level necessary for operator training session
- Class size
- Number of training sessions

The format of the training sessions will be similar for all sessions, whether the sessions are for operators, ITS supervisors and managers, or system administrators. Training will be delivered on-site as a series of PowerPoint presentations, demonstrations, and hands-on assignments using the next-generation ATMS training environment. All training presentations and hands-on assignments will be distributed to each attendee as a training handout.

The hands-on assignments will be examples from real-life scenarios. The training environment will give participants the opportunity to experiment and try the functions that are explained during the training sessions.

As mentioned above, the team training approach is on-site, instructor based, and using an established training environment. Typically, our training workshops include the following (but our instructors, our STP, and our materials can be tailored to suit the client's needs):

- Operator Training – Provided to operators, the focus of this workshop will be to teach the participants how to use the software for maximum efficiency and effectiveness. Hands-on exercises will include event management examples from recent months, as well as normal day-to-day operations.
- ITS Supervisor and Manager – Provided to the next level of operations management, this workshop builds on the operator workshop and then focuses on the additional functionality primary to supervisors and managers.
- Administrator Training – Provided to personnel responsible for the administration and management of the next generation ATMS, the focus of this workshop will be to educate IT personnel on system administration procedures, such as system startup/shutdown, user management, and backup and restore.

Computer-based training of the iNET™ modules will also be provided as part of the training materials.

Additionally, we understand that staff are continually changing. As part of our training package, we will provide materials for instructor-led training for each of the workshops listed above. Part of this instructor-led training material will be video recordings of each of the training workshops so new staff can sit and watch the video training and execute the hands-on training exercises. This video training will be delivered (for no additional fee) in a standard format compatible with Microsoft Windows.

Another feature of our training package, in addition to the instructor-led video recordings, is a computer-based training of the individual modules. This computer-based training is a keyboard/keystroke demonstration of each feature/functionality of iNET™. It will allow the staff, whether it's an operator, ITS supervisor, or system administrator, to view the actual keystrokes of the system. The staff will be able to continually review this presentation whenever they wish, as it requires no additional software on the workstations.

The iNET™ also has on-line help in each viewer and module. The operator simply selects the "?" in the upper right corner of the various viewers in the software and the current, up-to-date help selection is shown to the system user. This help selection is continually monitored and when modifications are necessary, the help is revised and the iNET™ modules are updated with the new help.

The STP, as well as all the training materials, will be formatted for 8.5-inch x 11-inch printing and will be delivered in PDF, Microsoft Word, and Microsoft PowerPoint formats, where applicable.

| Req ID | Mandatory Requirements | Exceeds Requirement |
|---|---|---|
| 4.2.2.10 | The Vendor shall provide a list of servers, computers, workstations, third-party software, and other hardware required to successfully implement their proposed solution. No hardware/software cost data is to be included in the technical proposal. If the hardware or software is to be included with or is already absorbed into the base software cost, that should be noted in the cost proposal response. | ✓ |

**How the Parsons team exceeds the requirement:** See the response to Requirements 4.2.2.11 and 4.2.2.15.

| Req ID | Mandatory Requirements | Exceeds Requirement |
|---|---|---|
| 4.2.2.11 | The WVDOT will provide a test environment location within the same building and general location of the existing TMC for the Vendor. The Vendor may propose an alternate solution which will be subject to WVDOT approval after award. | ✓ |

**How the Parsons team exceeds the requirement:** Our solution can be installed on premises, in a cloud environment, or using a hybrid within the constraints of many different physical architectures and server locations. It can also be installed in a virtual machine environment. The iNET™ licensing model does not change with regard to the number of servers, their location, the number of devices, or the number of user accounts. It is the same in all cases; therefore, we are extremely flexible as it relates to installation location, as long as the network supports the required center-to-center (C2C), center-to-field (C2F), and local area network (LAN) communications.

Castle Rock offers a **three-part** environment for its 511 traveler information system: 1) **staging,** 2) **preproduction**, and 3) **production**. All environments are hosted on the AWS cloud. Testing, training, and demos are performed on staging. All challenges are validated in the preproduction environment by Castle Rock and the DOT before being pushed automatically to production. The only exception to this is the IVR call center, for which we have both staging and production environments.

| Req ID | Mandatory Requirements | Exceeds Requirement |
|---|---|---|
| 4.2.2.12 | The Vendor should develop a comprehensive System Security Plan (SSP) for review and approval by the WVDOT and the West Virginia Office of Information Technology prior to system design acceptance. The purpose of the system security plan is to provide an overview of the security requirements of the system and describe the controls in place or planned for meeting those requirements, in addition to delineating security control responsibility as it pertains to the vendor and the state. At a minimum, the SSP should address:<br>• Defense-in-depth (layered security) methodology<br>• Risk management, risk assessment, risk analysis<br>• Standards compliance<br>• Access control - user authentication, authorization, permissions and accounting<br>• Network boundary and remote access security<br>• Endpoint security<br>• Application Security<br>• Vulnerability management<br>• Cybersecurity & operations system monitoring<br>• Incident response/management<br>• Logging and log management<br>• Change management<br>• Contingency of operations & disaster recovery<br>The ATMS Vendor shall procure, install, configure, manage, maintain, and monitor the Next-Generation Firewall (NGFW) protection at the boundaries of the ATMS network including public Internet and partner network connections. NGFW equipment shall, at a minimum, be capable of traditional firewall functionality (e.g., NAT, PAT, VPN), inline deep packet inspection, intrusion detection systems (IDS), next-generation intrusion prevention systems (NGIPS), SSWSSL inspection, advanced malware protection, website monitoring, and QoS/bandwidth management. | ✓ |

**How the Parsons team exceeds the requirement:** We have an entire division dedicated to cybersecurity. We are an industry leader in the United States. Our Cyber & Intelligence (C&I) group will develop the system security plan (SSP). Our C&I group provides end-to-end tools, capabilities, and services that support the full spectrum of cyber and space operations and produces actionable intelligence for a diverse government, commercial, and intelligence-community (IC) customer base. We are the recognized leader in transformational solutions and an invaluable and trusted mission partner to our customers.

The cyber-expertise levels and competencies that we can dedicate to this effort include the following:

- **National Cyber Programs (NCP)** delivers a full range of integrated cybersecurity capabilities to local, state, federal government and commercial customers. These offerings include cybersecurity engineering, operations, risk management, system administration, and policy development.
- **Cyber and Signals Intelligence (C&S)** develops full-spectrum, end-to-end hardware and software solutions for the IC and DoD in support of cyber and signals intelligence (SIGINT) missions. The actionable intelligence produced by these comprehensive cyber and SIGINT capabilities enables our nation's leaders to make informed decisions on our national security.
- **Cyber Operations (CO)** is a critical partner to its Department of Defense (DoD) customers. CO's agile product development approach delivers cyber platforms that seamlessly integrate complex cyber capabilities. Customers across the globe use the CO platform to effectively and efficiently plan and execute cyber missions to defend our nation.
- **Knowledge, Analytics, and Intelligence Solutions (KAIS)** partners with our customers to design and implement enterprise intelligence and situational understanding capabilities. Our operations experts ensure that critical knowledge is delivered on time, every time—from strategic command centers to the tactical edge. Facilitating secure information sharing, collaboration, and data analysis in highly complex network environments, our solutions have been adopted to support U.S.-led coalition operations around the world and are used internationally in more than 25 countries.
- **Federal Security (FS)** delivers unique hardware and software capabilities that provide innovative solutions to our customers' difficult intelligence-collection requirements. Our innovative approach to solving new and complex problems has prompted the development of technologies that are shared across the federal government. FS' proven track record of performance has resulted in multiple sole-source awards and letters of commendation. Quick reaction capabilities make FS the trusted contractor for time-critical technology deployments in missions of national importance.
- **Intelligence Solutions (IS)** delivers niche hardware and software solutions to the IC that exceed our customers' most complex technical requirements and ensure mission success. IS' end-to-end cyber capabilities not only support the IC but are also poised to expand and grow into adjacent markets.
- **Reconnaissance and Sensor Solutions (RSS)** provides real-time situational awareness capabilities, high-speed infrastructure processing, mission planning, and AI/ML-enabled analytics. Core competencies of RSS include software engineering and semantic technologies, which give meaning to disparate and raw data.

| Req ID | Mandatory Requirements | Exceeds Requirement |
|---|---|---|
| 4.2.2.12.1 | Vendor shall develop a comprehensive cyber risk reporting procedure to ensure identified cyber risks are reported to both WVDOT and Office of Technology. The reporting procedure shall address the nature of the risk, as well as a detailed plan of action and milestones to address the risk. | ✓ |

How the Parsons team exceeds the requirement: We have an entire division dedicated to cybersecurity. We are an industry leader in the United States. Our C&I group will handle the cyber-risk reporting activities. See response to Requirement 4.2.2.12 above.

| Req ID | Mandatory Requirements | Exceeds Requirement |
|---|---|---|
| 4.2.2.12.2 | The Vendor shall inform both WVDOT and the Office of Technology of any confirmed security incident or data breach. The Vendor should report a confirmed security incident as soon as practicable. | ✓ |

**How the Parsons team exceeds the requirement:** Any security breaches that are detected by our system-monitoring tools will be logged and automated notifications vie email and text messages will take place should any breach occur. Please see response to Requirement 4.2.2.12, above, for further information on our cybersecurity capabilities.

| Req ID | Mandatory Requirements | Exceeds Requirement |
|---|---|---|
| 4.2.2.12.3 | The vendor shall comply with the Office of Technology software standards and security policies as outlined in Section 4.5. | ✓ |

**How the Parsons team exceeds the requirement:** We will meet all the security policies outlined in Section 4.5. In fact, our C&I group has some recommendations on how these policies can be augmented. Please see response to Requirement 4.2.2.12, above, for further information on our cybersecurity capabilities.

| Req ID | Mandatory Requirements | Exceeds Requirement |
|---|---|---|
| 4.2.2.12.4 | The state reserves the right to conduct a cybersecurity audit or to contract a third-party to conduct such an audit on the information system, to include the operational management and support provided by the Vendor. The findings shall be shared with both representatives of both WVDOT and OT. | ✓ |

**How the Parsons team exceeds the requirement:** Our solutions have undergone cybersecurity audits in the past, and we have been fully cooperative with these activities. We will be fully compliant and work diligently to resolve any issues that may be found during said audit.

Castle Rock undergoes an annual SOC Type II independent audit, which covers cybersecurity and other key controls related to security, availability, and confidentiality.

| Req ID | Mandatory Requirements | Exceeds Requirement |
|---|---|---|
| 4.2.2.13 | The Vendor shall develop a Software and System Deployment Transition Plan for approval by WVDOT at the project start and update at least quarterly through final acceptance testing. The plan should consider and include:<br><br>Communications service development for ITS field devices, 911 center connectivity, telephony service for 511, and website accessOur solutions have undergone cybersecurity audits in the past, and we have been fully cooperative with these activities. We will be fully compliant and work diligently to resolve any issues that may be found during said audit.<br><br>• Castle Rock undergoes an annual SOC Type II independent audit, which covers cybersecurity and other key controls related to security, availability, and confidentiality<br>• Development and cut over of public websites, mobile applications and 511 services to existing access methods, phone numbers and URLs.<br>• Development of ATMS/511 software, databases and systems<br>• Installation and testing of ATMS/511 software, databases and systems<br>• Transition from existing ATMS/511 to new ATMS/511 including overlap to ensure functionality is maintained at a satisfactory operating level (Can be done system by system)<br>• Advance notice periods to WVDOT of software/system transitions (minimum 1 week notice, prefer 2 weeks' notice)<br>• Transition approval by WVDOT (Provide minimum 3 days for WVDOT approvals in schedule) | ✓ |

**How the Parsons team exceeds the requirement:** We have implemented system cutovers for some of the most complicated, large-scale TMCs and ATMSs in the world, including those in Atlanta, the San Francisco/Oakland area, Los Angeles, Chicago, San Diego, Portland, St. Louis, Toronto, Kansas City, Salt Lake City, Taiwan, Macau, and Hong Kong. In addition, we were chosen to transition large-scale ATMSs in Georgia, Louisiana, Alabama, Mississippi, Michigan, Idaho, and Rhode Island, among several others. Our iNET™ ATMS is designed with the latest technologies to create a smooth transition. This transition experience will provide WVDOT with a seamless cutover solution that will minimize operation disruptions.

The process by which the system will be transitioned will be described in detail in the system deployment transition plan (SDTP). This document will analyze the systems to transition as well as the types and sources of data, interfaces, and communications. The plan will align with the agreed software releases and milestones, so that ATMS and 511 data is available to support the software development, deployment, testing, and acceptance for each milestone. Techniques and tools for automating the data migration will be discussed in the SDTP, so that existing tools can be reused and new tools created as necessary.

In this proposal, we describe our approach to migration for each system, breaking the process down into a series of activities based on the number and complexity of the individual legacy systems to be replaced. In general, our approach is to operate both the legacy systems and iNET™ in parallel during the migration as this enables an incremental rollout of functionality, reduces risk of disruption to the TMC operations, allows the operators to gain familiarization with the new system, and provides a framework for rollback procedures to be easily and quickly implemented.

The **SDTP** will establish the appropriate timing and sequencing for all activities and will result in a controlled and managed migration/transition process. Other key inputs will include the location of work, access requirements, resources, and details of any restrictions imposed by WVDOT (e.g., suspension of changes over holidays).

The draft migration/transition plan will be distributed to WVDOT and the relevant stakeholders to communicate our initial ideas about the migration process, acting as a starting point for discussions. The technical manager will then consult with the agencies and relevant stakeholders to capture any additional constraints or restrictions that may affect our intended approach, with the plan duly updated.

The activities of the migration process will be underpinned by risk mitigation procedures defined in a series of **rollback plans** to manage any interruptions to operations. A separate **rollback plan** will be developed for each migration activity based on strict and unique system time-based decision trees. The process assigns a period of time to a particular migration activity with a scheduled time-based checkpoint. If sufficient progress has not been made by the checkpoint time, the migration activities are brought to a close by the technical manager, and the actions defined in the **rollback plans** are implemented. In most cases, these actions will be to revert the control of devices back to the legacy systems. In the event that rollback is complicated by a specific activity, process, or specific circumstances, the situation will be escalated in line with previously agreed procedures.

**System Deployment Transition Plan**

Smooth system transition is the most important aspect of the project to WVDOT due to the risks it presents to live operations. We will mitigate the risks by developing a draft of the **SDTP** during the early stages of the project so that it can inform the design, integration, and testing processes and ultimately see the system functionality required by the agencies to be fully operational and supported in the new software environment. Detailed, accurate, and realistic planning is important to minimize disruption to each agency's operation and road users and to maintain adherence to the program. A comprehensive assessment process will review the risks associated with the proposed migration activities. The risk assessment will categorize the risks, and a mitigation activity will be specified to eliminate, reduce, isolate or control each one.

| Req ID | Mandatory Requirements | Exceeds Requirement |
|---|---|---|
| 4.2.2.14 | Communication Services:<br>• The State contracts for and provides wireless communications services between the TMC and all ITS field devices through AT&T. Currently, all ITS field devices are connected to the TMC through wireless telecommunications.<br>• The Vendor shall provide 511 IVR hosting and telephony services.<br>• The Vendor shall provide for WV 511 Drive Safe application hosting and service agreements.<br>The Vendor shall provide for data communications between the TMC and the 911 centers across the state and the West Virginia Parkway Authority dispatch center. | ✓ |

How the Parsons team exceeds the requirement: Castle Rock's solution provides all IVR hosting & telephone services; the WV 511 Drive Safe app and all hosting and service agreements (iOS and Android). We provide end-to-end service for application updates on iTunes and Google Play. We go above and beyond these requirements by operating 511 phone on a **distributed, multicenter Verizon call bank** with **no known limit on the number of simultaneous calls** and **no bursting fees.** The platform includes all needed telephony features for answering WV's 511 calls, including call ports, a speech recognition engine, and a VXML delivery engine. Castle Rock fully manages the platform on behalf of its clients. We offer both a **staging phone number** and a **production backdoor number** for all its 511 IVR clients.

Additionally, Parsons team understands the necessity to have a solid ATMS network infrastructure and as such has been in discussions with Alpha Technologies in order to provide the required 400Mbps internet connection from the hosting facility to the 911 centers, ITS network and internet as well as the required 1Gbps TMC fiber connection and 100Mbps connection to WV Parkways Authority.

| Req ID | Mandatory Requirements | Exceeds Requirement |
|---|---|---|
| 4.2.2.15 | Vendor shall provide a comprehensive information system design document, outlined the intended information system physical and logical topology with complete hardware, Operating System (OS) and software lists. All hardware, operating systems, and software must be supported versions throughout the contract term, including any extensions. Required updates and patches will be performed at an agreed upon schedule to maintain system integrity. Vendor shall test upgrades and patches in their own test environments to verify compatibility with the WVDOT systems. If for any reason in the future during the contract term (not including State of West Virginia requirements), the Vendor needs to change hardware, OS, or software it will be the Vendor's responsibility to maintain the operational capability of the WVDOT system at no additional cost. | ✓ |

How the Parsons team exceeds the requirement: We will provide the following design documentation as it pertains to the requirements:

- Bill of materials (BOM)
- High-level design (HLD)
- Detailed design document
- GUI prototype design (to cover any customizations)
- Interface control documents (ICDs)

Included in these documents will be the specifics of the end-to-end architecture as well as the specifications for all hardware and software. As it relates to the ATMS, our system has the following three characteristics that makes it much easier for us to switch hardware, operating systems, or database tools with little impact to our solution:

- **Platform independent** – iNET™ is based on a J2EE architecture and can run on any platform that supports Java. Because iNET™ can be used in different environments, this requires less planning and provides the flexibility to install and maintain the application based on existing IT infrastructure. Providing a platform-independent solution is becoming more important as the IT industry moves toward a more pronounced focal point of integrating ecosystems, people, and IoT.
- **Open source** – Using IT open-source solutions allows for technology agility, customizability, community support, interoperability, and auditability. The iNET™ application server being based on open source also keeps the overall cost down, while ensuring quality based on thousands of developers and hundreds of production deployments that participate in the development and maintenance of the enterprise system.
- **Modularity** – As a modular application, when changes to one functional area are required, the other modules are not usually impacted. This allows for the flexibility of replacing, deleting, or upgrading one module in the system without impacting the entire system. One advantage of this approach is that it minimizes (or eliminates) disruption to production systems by removing the need for entire system restarts. Another advantage to the modular approach is that it minimizes the risks associated with system upgrades. For example, if only one module is enhanced, there is no risk to other modules during an upgrade. The third advantage to a modular approach is that if a module has a severe error and is not functional, only the features related to that module become unavailable; the rest of the system remains functional. If this should happen, an administrator can restart one module to restore functionality without disrupting the entire system.

| Req ID | Mandatory Requirements | Exceeds Requirement |
|---|---|---|
| 4.2.2.15.1 | Vendor shall outline in detail hardware infrastructure that will be provided. All hardware components shall be supported by the hardware manufacturer throughout the term of the contract, including any extensions. Hardware provided shall be current supported model equipment. Vendor is required to maintain all hardware components to ensure high availability of the system throughout the life of the contract at no additional cost to WVDOT. | ✓ |

How the Parsons team exceeds the requirement: Parsons exceeds this as described in the resp in Requirement 4.2.2.15. Castle Rock's 511 solution includes a warm disaster recovery (DR) application that is production-ready in the AWS cloud.

| Req ID | Mandatory Requirements | Exceeds Requirement |
|---|---|---|
| 4.2.2.16 | Other Equipment, Systems and Services:<br>There are current typical expenses incurred annually for systems, software, services and equipment that need to be accounted for in the Vendor's cost proposal, or not included because the Vendor's proposed solution does not require it. If there are any additional systems, software, services and equipment that the Vendor requires as part of their solution, these should be included in the cost proposal and described in the Vendor's proposal. As information, the list below is an example of materials and equipment, including computers, servers, | ✓ |

| | | |
|---|---|---|
| | workstations, miscellaneous hardware, third-party software, etc. that the vendor may be expected to supply as part of their solution during a typical year. Include a cost component for the materials and equipment the Vendor feels are necessary to provide a complete and accepted solution for the term of the contract and renewals.<br><br>TMC items:<br>• Alpha Technologies Network Data Line<br>• Rack Rental in Building 6000<br>• Server Storage in Building 6000<br>• InterAct Interface Maintenance Costs (CAD Integrations with InterAct Systems)<br>• LifeSize Maintenance Costs (Video Conferencing)<br>• Citilog Maintenance/Service (Video Analytics)<br>511 Items:<br>• IVR Hosting Maintenance<br>• IVR Phone Usage Charges<br>• Drive Safe Service Agreement<br>• Skyline Maintenance/Service<br>Miscellaneous Hardware Items:<br>• Satellite Phones Data Plan<br>• Ipad Data Plans<br>• Cisco ASA 515x (xl)<br>• Cisco 3560x (x2)<br>Service Agreements and Software Licenses:<br>• Domain Name: Roadsummary; includes .com; .net<br>• SSL Certificate (Digicert): WVDOT.Roadsummary.com for 1 year<br>• Cisco SMARTnet Premium - Extended service agreement - replacement - 24x7 - 4h<br>• Syslog Daemon Software for Firewall and network Gear logfile capture<br>• SAP Crystal Reports Server, 5 named user license, 1 year maintenance renewal<br>• Java Service Wrapper Development License (Java Service Wrapper Standard<br>• Edition 32/64-bit TS IMS)<br>• Symantec Endpoint 12.1<br>• Symantec GOVT UPG-V 12MO BACKUP EXEC 2014 AGT VW AND HV WIN SVR BS ES | |

| | | |
|---|---|---|
| | • Symantec GOVT UPG-V 12MO BACKUP EXEC 2014 SVR WIN BNDL LIC BS ESS<br>• LogMein licensing<br>• Cisco SMARTnet 1 Year Extended Service - Service 24x7x4hour<br>• Cisco SMARTnet Premium - Extended service agreement RX:'i - 4b.<br>• VMWare vSphere Essentials Kit Support<br>• Barracuda Energized Updates<br>• Barracuda Web App Firewall 460 1 YR<br>• VMW are Essentials Support<br>• Windows 2008 R2 Server License<br>• Oracle Enterprise Named User (Data Base)<br>• Windows 7 Pro License<br>• VMW are Essentials<br>• Dell Hardware (r320 *5)<br>• ESRI License<br>• Dell Hardware Service Plans | |

**How the Parsons team exceeds the requirement:** The Parsons team will deploy updated server equipment and associated software utilizing IDIQ funding during the development and transition period. This hardware will serve as the primary production environment post system acceptance. The Parsons iNET™ platform is an open system capable of operating on many standard environments and as such can reuse a majority of the existing equipment for the *Testing/Training* environment. This approach will provide the best possible performance and value for the WVDOT while leveraging much of the investment already made in existing equipment. The Parsons team will provide a comprehensive list of all hardware and software required to provide the ATMS *pre-production* and *production* environments as well as any other supporting components.

| Req ID | Mandatory Requirements | Exceeds Requirement |
|---|---|---|
| 4.2.2.17 | IDIQ Time & Materials Cost:<br>In order to allow for equitable comparisons of received cost proposals, each Vendor will be required to list a cost item in the amount of $1,000,000 in their cost proposal as an Indefinite Delivery/Indefinite Quantity Time & Materials line item, with use to be determined after contract award. The purpose of this line item is to 1) minimize any advantage one vendor may have over another vendor with regard to existing hardware, software, systems, interfaces or existing system knowledge; 2) rectify any unknowns encountered after award that may not have been foreseen by the WVDOH; and 3) rectify complications with integration efforts that are determined solely by WVDOT to be no fault of the Vendor. Additional use of this line item may be for the upgrade or replacement of WVDOT owned hardware and software that may currently be in existence, but that needs to be modified/replaced to meet specifications required by the Vendor. If the Vendor has specific Vendor owned hardware and software that is required to plan, design, program, install, operate and/or maintain their systems, these items shall be included in their overall costs. Any use of State funds for the purposes noted above is solely at the discretion of the WVDOT and should not be assumed. | ✓ |

**How the Parsons team exceeds the requirement:** We have included the $1 million cost line item in our proposal to account for initial hardware/software upgrades and to account for any unforeseen integration issues. Our proposed price assumes the following items are funded through the IDIQ time and materials cost:

- All initial hardware required for setting up the proposed system: including application servers, database servers, video distribution, video analytics, OS, and other software
- All required networking equipment
- Support software such as Antivirus, Alienvault and Neverfail
- Any labor required to implement one-off interfaces to legacy CAD vendors, parking management systems and legacy video systems that are determined solely by WVDOT to be no fault of the vendor

We will work to minimize the usage of these funds and believe our approach to deploying ATMS systems is low risk for the following reasons:

1. We have installed nearly 80 ATMS solutions worldwide. Eleven U.S. states have used our ATMS on a statewide basis. For these reasons, we have a very mature product with hundreds of systems interfaces and device drivers already developed. With this level of experience, complications with integration efforts will be greatly reduced.
2. We are well versed at developing and implementing transition plans to our system from other legacy systems. Our true and steady transition processes are time-tested and have been proven during many ATMS deployments. Additional integration complications are unlikely.
3. The Parsons-audited markup rates are very low compared with other competitors, and our salary rates are competitive.
4. Our software platform is very flexible because it runs on any system that supports Java. If the existing hardware is in good shape, we believe it can easily be reused with our solution.
5. Castle Rock and Parsons ATMS solutions have already been integrated for other statewide solutions. Integration challenges in these regards will be greatly reduced.

| Req ID | Mandatory Requirements | Exceeds Requirement |
|---|---|---|
| 4.11.1.2 | The data sharable with the 511 website and 511 app shall include all traveler information reports Incidents, construction, events, freight, parking) entered, received, or edited in the ATMS. | ✓ |

**How the Parsons team exceeds the requirement:** Castle Rock's 511 website and the mobile app use clear, consistent layer controls to display all these information types—and more.

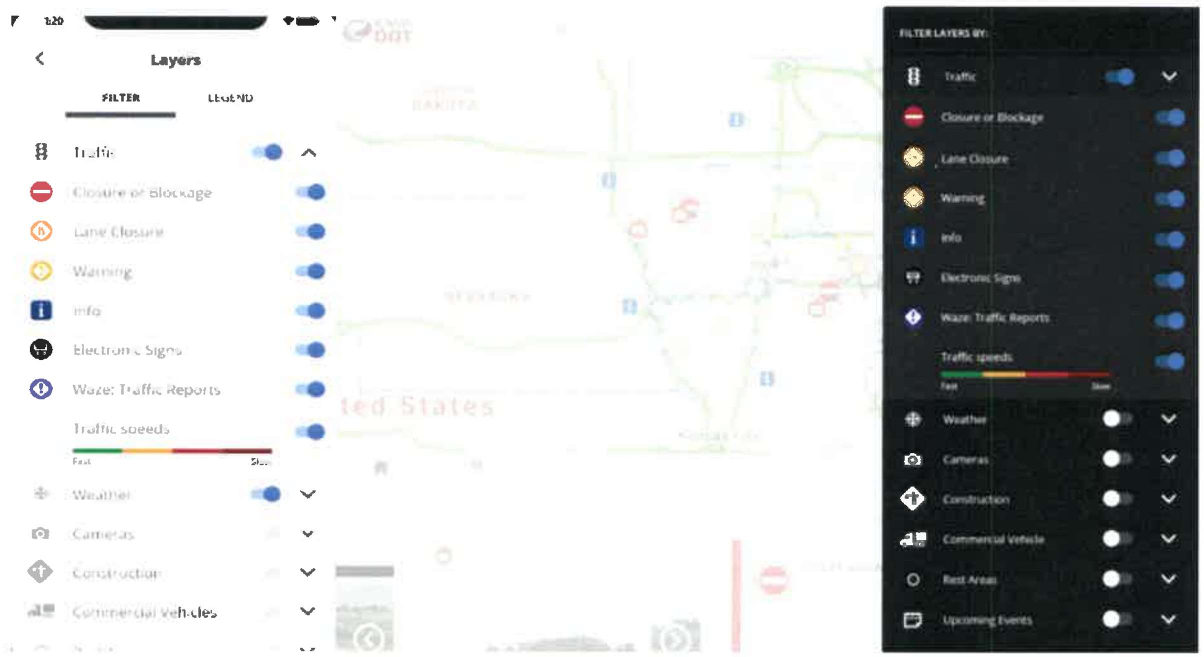



Figure 42 – Layer Controls on 511 Web and App

We offer many other information types beyond those listed in the requirement:

- A radar layer
- NWS watches, warnings, and forecasts
- Road segment forecasts
- Citizen reports, imported from Waze
- Rest areas
- Dynamic message signs
- Mountain passes
- Roundabouts
- And more

| Req ID | Mandatory Requirements | Exceeds Requirement |
|---|---|---|
| 4.11.1.3 | The data sharable with the 511 website and 511 app shall include CCTV video images captured by cameras connected to the ATMS. | ✓ |

**How the Parsons team exceeds the requirement:** Castle Rock knows that cameras and real-time road images are among the most popular data types offered over 511. We have designed our system to automatically pull in an integrate camera images automatically to help people understand better the impacts of the traffic events and road condition reports they read about on 511.

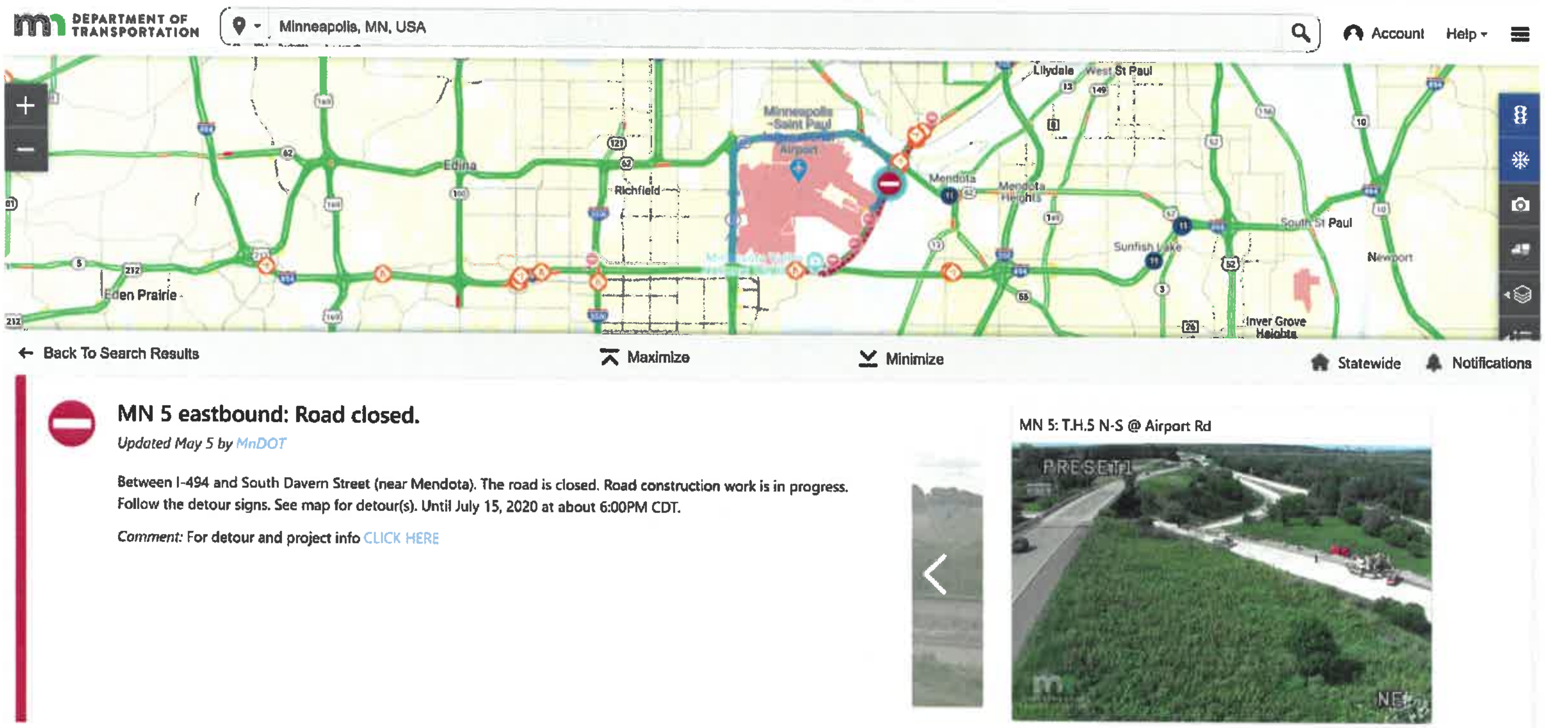



Figure 43 – CARS CCTV Video and Images

The example above shows a road closure, but the same technique is also applied usefully to winter driving reports.


Figure 44 – CARS Winter Driving Report

In addition, CARS provides the following camera extras:

- My Favorite Camera feature, allowing users to store their favorite cameras to their accounts.
- "Video tours" for the public, allow users to swish through cameras along their routes/areas of interest
- Ability to share individual cameras through social media and email.
- Automatic integration of nearby cameras with road-condition and other events.


Figure 45 – Traffic Camera Viewer on 511 Web

| Req ID | Mandatory Requirements | Exceeds Requirement |
|---|---|---|
| 4.11.1.4 | The data sharable with the 511 website and 511 app shall include DMS messages posted to DMS connected to the ATMS. | ✓ |

How the Parsons team exceeds the requirement: Castle Rock's CARS platform includes a beautiful DMS layer that, at a glance, shows the state's DMS devices, and whether or not there is currently a message on each one.

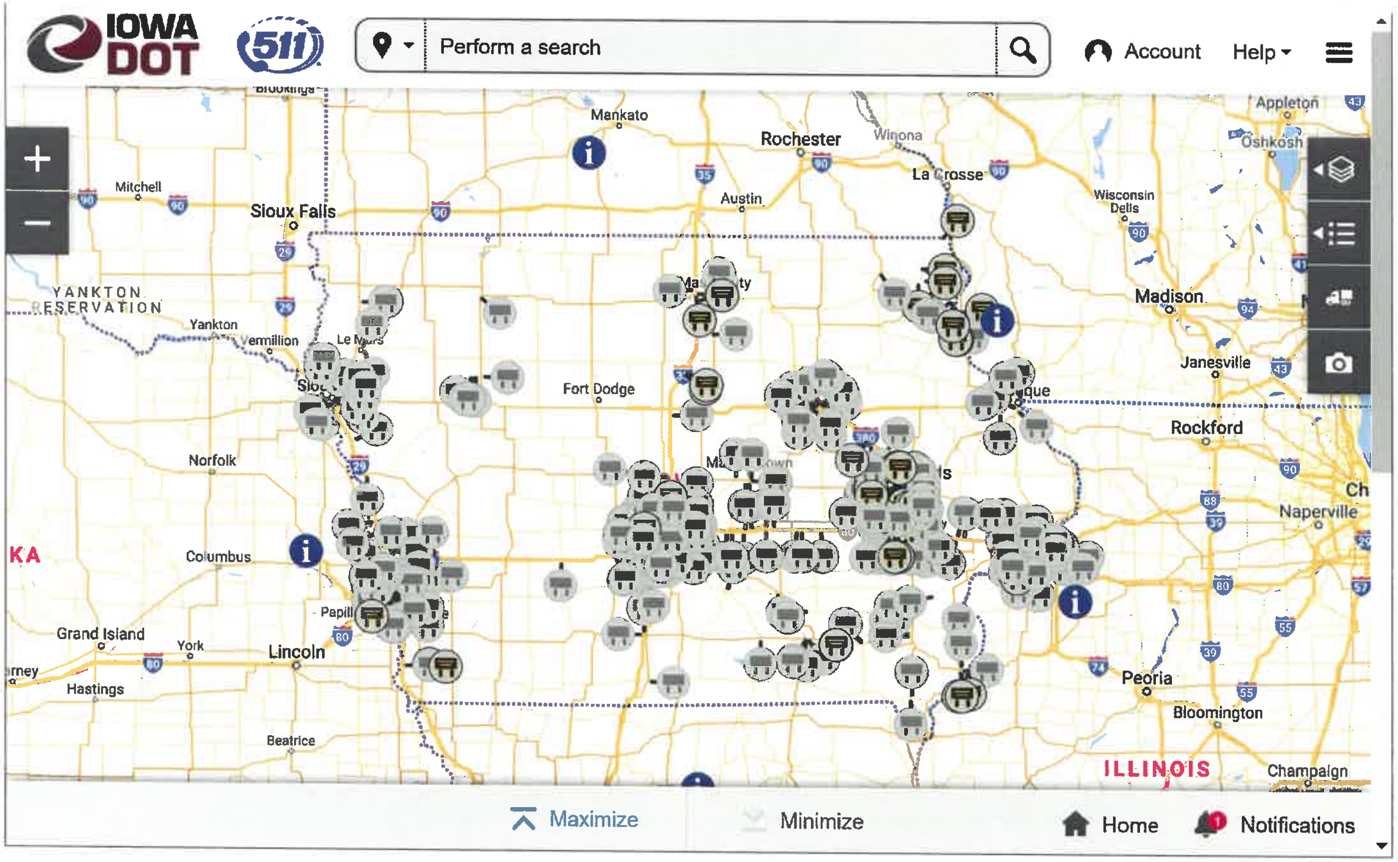



Figure 46 – DMS Display on 511 Web

The CARS DMS layer supports different icon styles for travel times and event-related sign messages. The platform supports both text-display DMS and full-color-matrix graphical DMS displays.

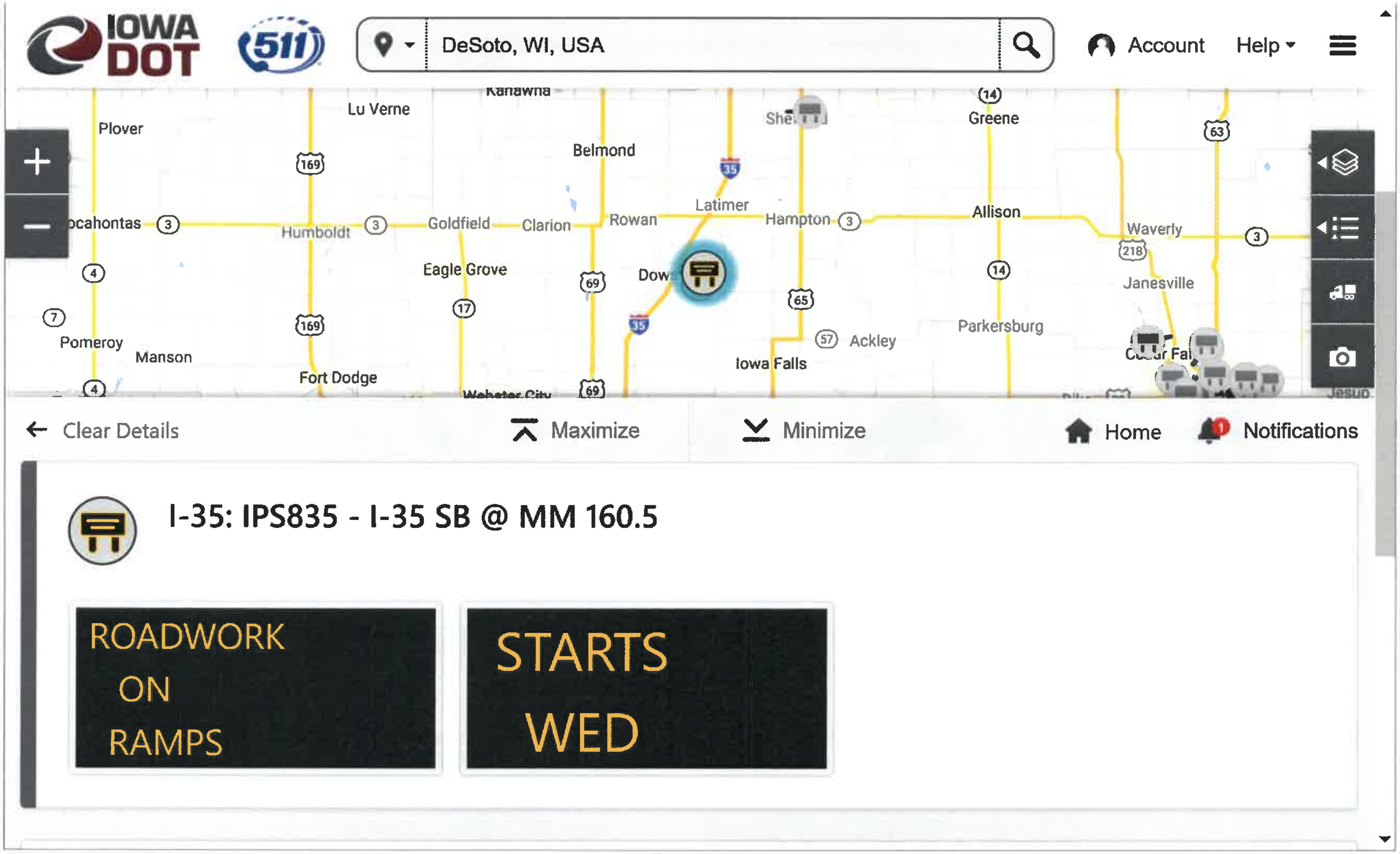



Figure 47 – DMS Display on 511 Web

| Req ID | Mandatory Requirements | Exceeds Requirement |
|---|---|---|
| 4.11.1.10 | The ATMS shall provide for a highway conditions, including trend data, reporting system that can be accessed by authorized users with ATMS software or application access. | ✓ |

**How the Parsons team exceeds the requirement:** Castle Rock's CARS-Segment tool makes it easy for authorize operators to updated highway condition data quickly and easily, from anywhere in the state. Once highway conditions are entered, the software automatically transforms the information into human-friendly reports. Nearby RWIS, traffic, and snow plow images are automatically integrated.

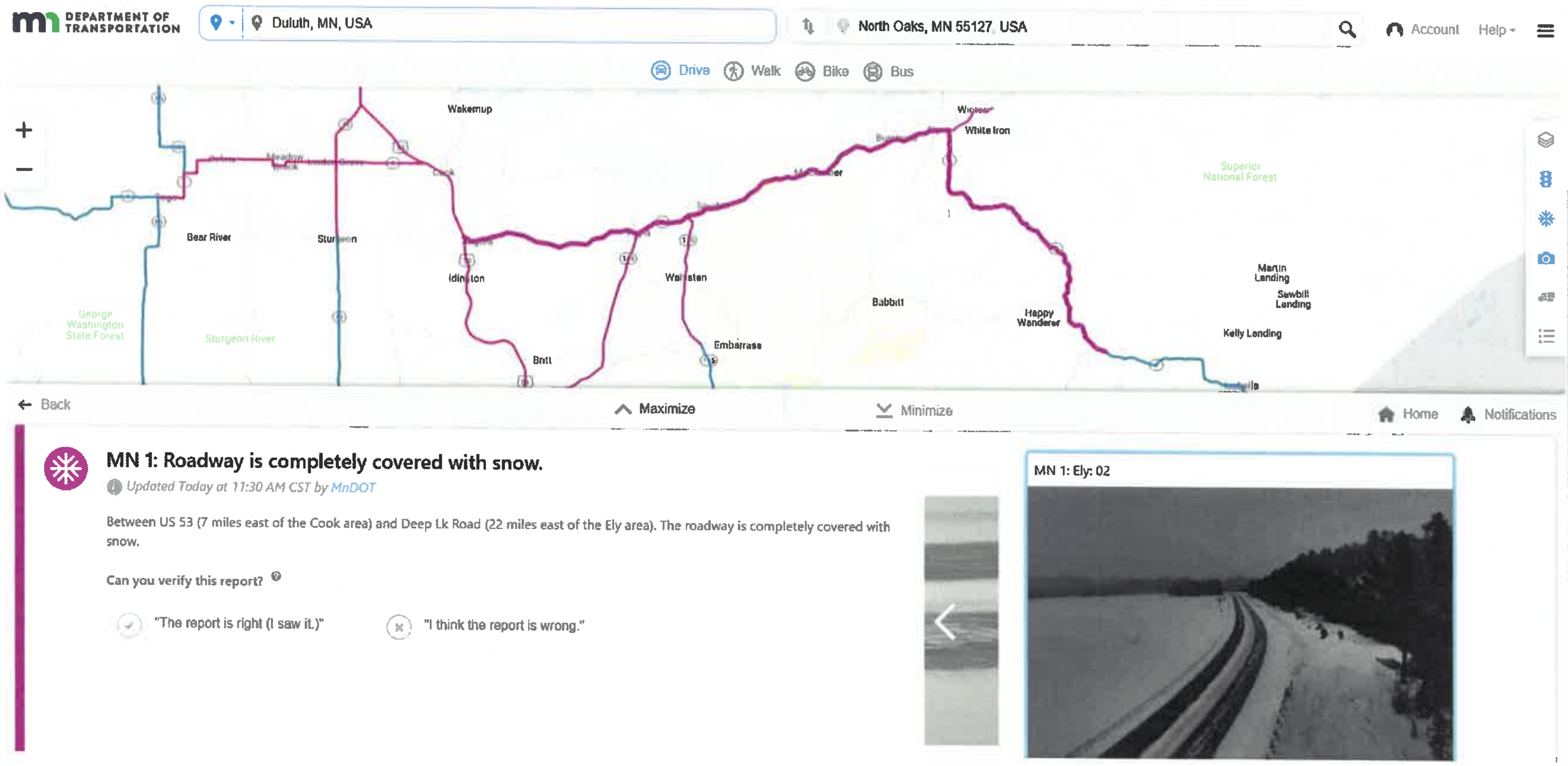



Figure 48 – CARS Road Condition Reports

We offer the following extras, as well:

- Inclusion of road condition forecasts or trends
- Automatic road condition reporting where MDSS or similar systems are available
- Radar layer
- NWS warnings, including automated road-level reports for 511

| Req ID | Mandatory Requirements | Exceeds Requirement |
|---|---|---|
| 4.11.1.11 | The ATMS highway conditions reporting system shall have the ability to enter road conditions for multiple locations or the entire state or an entire district all at once versus having to enter conditions for each segment of road one by one. | ✓ |

**How the Parsons team exceeds the requirement:** Castle Rock's road-condition reporting tool includes a web interface and a downloadable iOS/Android app to support field entry. Road conditions can be entered at the statewide, district, county, roadway or roadway segment level. This flexibility allows for a rapid response during adverse conditions where multi-tasking and speed of data entry is paramount.

The data entry tool includes multiple ways for operators to drill down and find their segments. Segments can be found by:

- Route ID
- District / Area / County
- Maintenance garage or area


**Figure 49 - Castle Rock's road condition reporting tool for desktop (left) and iOS and Android (right)**

We also have an online tool that allows WVDOT system administrators to update the boundaries of the segment definitions using a map-based interactive UI:

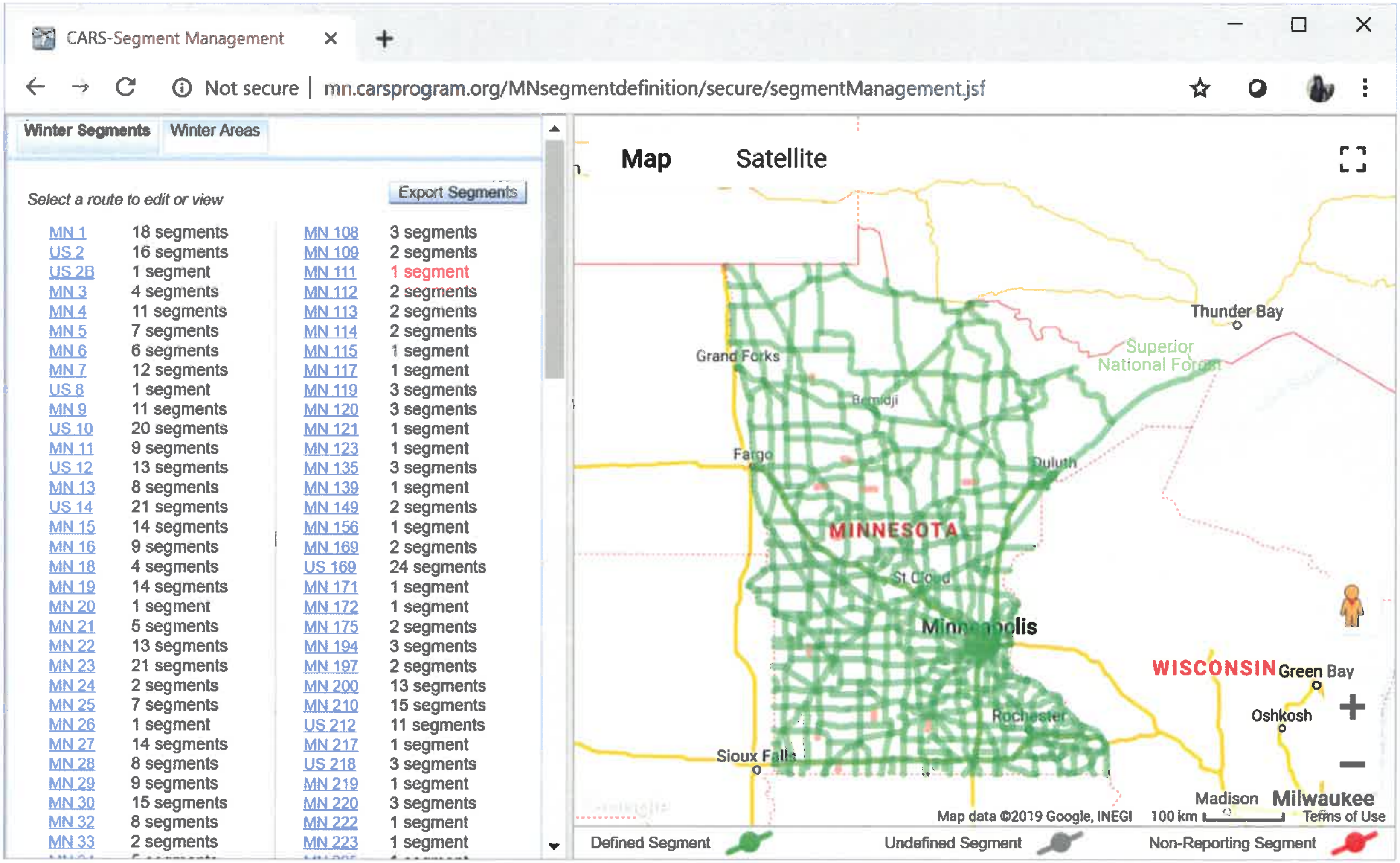



Figure 50 – Winter Roadway Segment Configuration

Once road condition reports are entered, the system transforms them into easy-to-read reports for the public, including pulling in nearby cameras.

| Req ID | Mandatory Requirements | Exceeds Requirement |
|---|---|---|
| 4.11.1.12 | The ATMS shall have the ability to create warnings of commercial vehicle and oversize/overweight restrictions due to closures, width restrictions/height restrictions, construction and maintenance. | ✓ |

**How the Parsons team exceeds the requirement:** The Castle Rock provided 511 traveler information system website highlights and calls out the specific size/weight restrictions associated with each event, making it easy for truckers to read this important information.

The screenshot below shows how we put size/weight restriction in bold text for truckers, as well as call out the specific dimensions in a table below the event text.

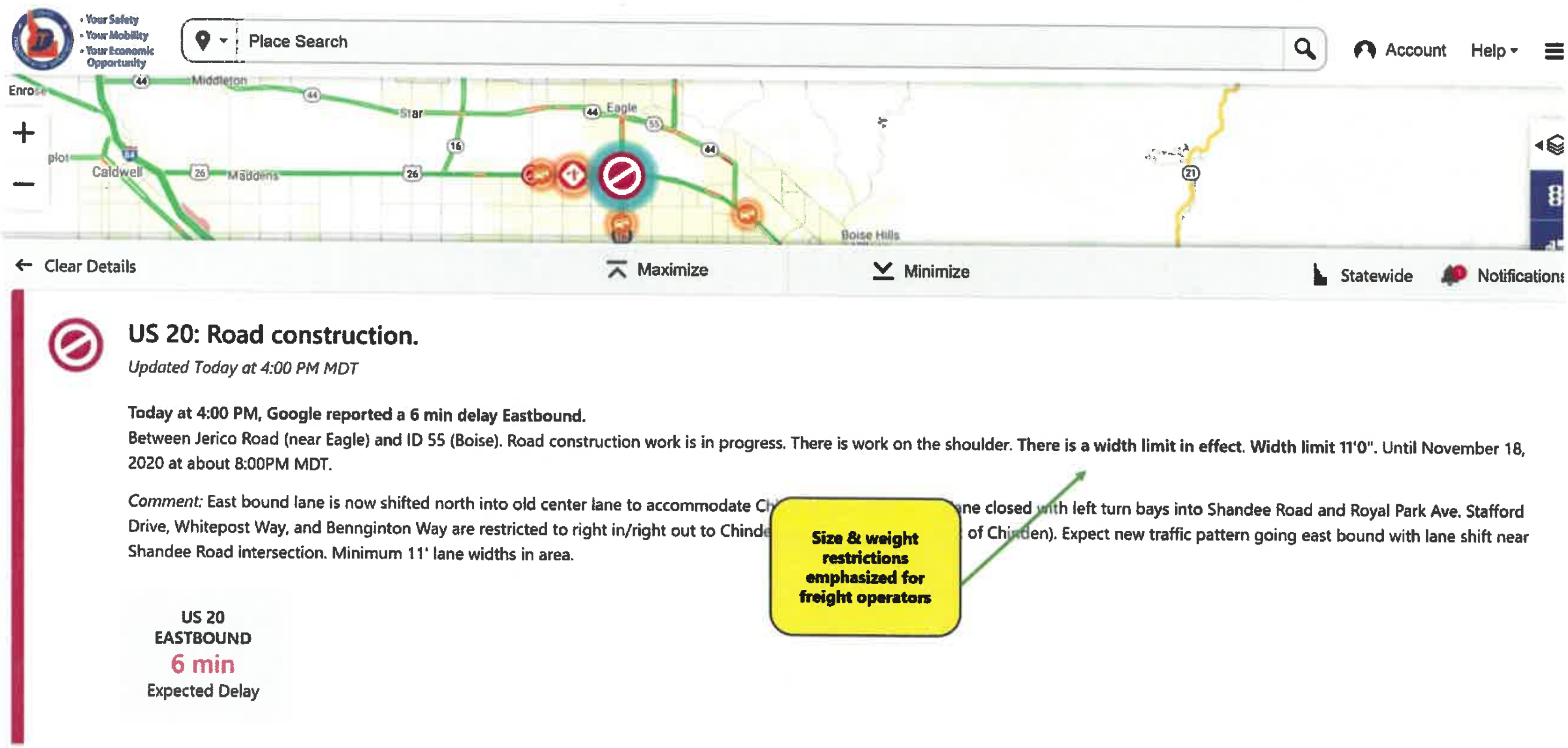



Figure 51 – Size and Weight Restrictions

| Req ID | Mandatory Requirements | Exceeds Requirement |
| --- | --- | --- |
| 4.11.1.13 | The ATMS Vendor shall provide a telephony and web-based 511 system to meet or exceed the capabilities of the current 511 system used by WVDOT | ✓ |

**How the Parsons team exceeds the requirement:** As demonstrated throughout our response to these requirements, the Castle Rock telephony and web-based 511 system meets and in many cases exceeds the capabilities of the current 511 system used by WVDOT. Each feature is supported on our current platform, but with newer, updated designs than available on the current platform. If WVDOT feels that our platform is missing a feature, then we will use our very best effort to modify the platform further to meet any need/requirement expressed in the RFP.

Our platform also has extensive configuration options (e.g., icons, colors, wording, styling), and we will work with WVDOT to configure and customize the platform to the DOT's satisfaction. We perform this activity with all of our customers, as we have learned in our decades of experience that there is no such thing as a "one-size-fits-all" 511 platform. If you peruse our current customer's 511 systems, you'll see there is quite a bit of variation in the different implementations of our product.

We also pride ourselves on being agile and quick to respond to our changing world. As the COVID 19 pandemic came about, we quickly mobilized our team to develop tools for sharing information about COVID-related restrictions at the county and road level. The screen shot below is taken from Minnesota's 511 web site, where road closures due to the pandemic are communicated.

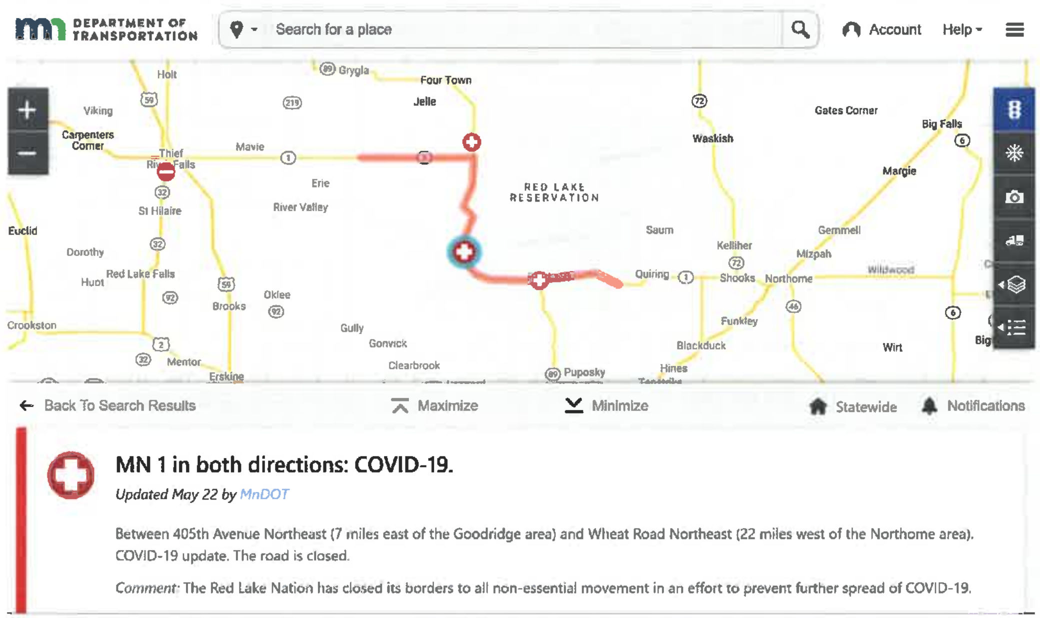



Figure 52 - Need Figure Caption

| Req ID | Mandatory Requirements | Exceeds Requirement |
|---|---|---|
| 4.11.1.14 | The 511 system shall the ability to provide public safety alerts and announcements at the beginning of a call based on the location entered or statewide on all calls. | ✓ |

**How the Parsons team exceeds the requirement:** If the 511 IVR recognizes the caller's phone number because they have opted in on the public website or mobile app, personalized information about the user's saved routes will be announced. The user can then ask for a specific route, route segment, region, or metro area to hear real-time information about conditions in that location

| Req ID | Mandatory Requirements | Exceeds Requirement |
|---|---|---|
| 4.11.1.15 | The ATMS shall transfer data useful for traveler information into WVDOT's 511 system for access by the general public. Data shall include at a minimum event-related data provided by the highway condition reporting system, relevant data obtained from ITS field devices, NWS weather alerts, weather forecast, and estimated travels times. | ✓ |

**How the Parsons team exceeds the requirement:** Castle Rock's CARS platform will automatically import all ATMS, field device, weather, travel time, and other data from iNET and the NWS for beautiful, integrated presentation on 511. Highway condition reporting data from our reporting tool are also fully integrated in real time.

We take care to display all data clearly and simply for end users. For example, NWS alerts are displayed as shaded polygons on the web and app map. The user only needs to click on the map to receive the full details as imported from the NWS. When adjacent counties or weather zones have the same NWS alert in effect, they are merged into a single, common shape for ease of use and understanding.

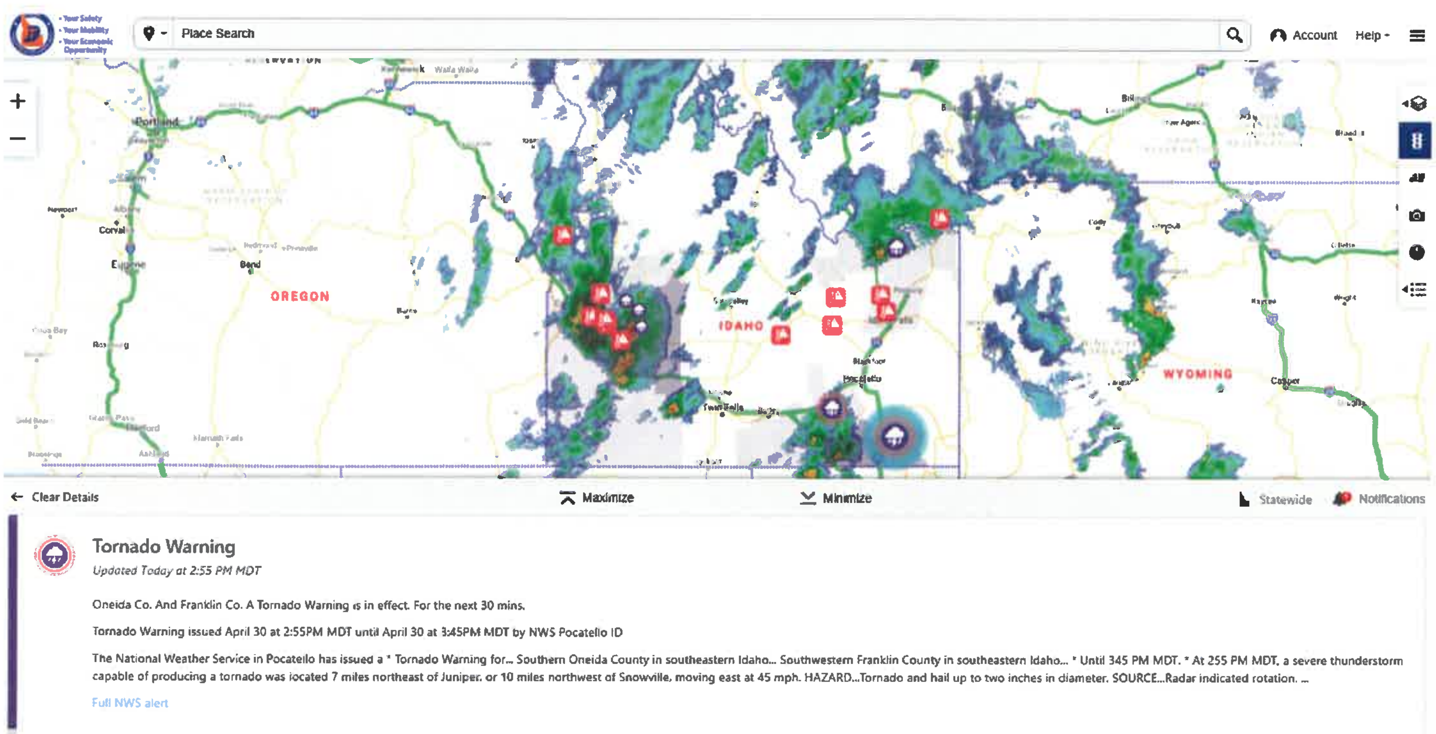



Figure 53 – RWIS and NWS Watch Displays on the 511 Mobile App

| Req ID | Mandatory Requirements | Exceeds Requirement |
|---|---|---|
| 4.11.1.17 | The ATMS shall provide a mechanism for automatically publishing data and video images from multiple sources to the WVDOT 511 as well as various traveler information web sites at specific intervals. | ✓ |

**How the Parsons team exceeds the requirement:** Castle Rock's CARS platforms integrate data and video images *from multiple sources* in real time—ATMS, NWS, snow plows dashcams, traffic camera feeds, RWIS camera feeds, Waze, etc. We can work with native data source formats of many kinds: XML, JSON, REST API, SOAP, FTP push, SQL view—whatever it takes. We set our polling rates so that we pick up the new information almost immediately after it is published (within seconds, typically) so that it can appear on the 511 platform **within 1 minute or less**.

Once the data are in the CARS platform, we weave them together into integrated displays so that they are easy to understand for members of the public, as shown below.

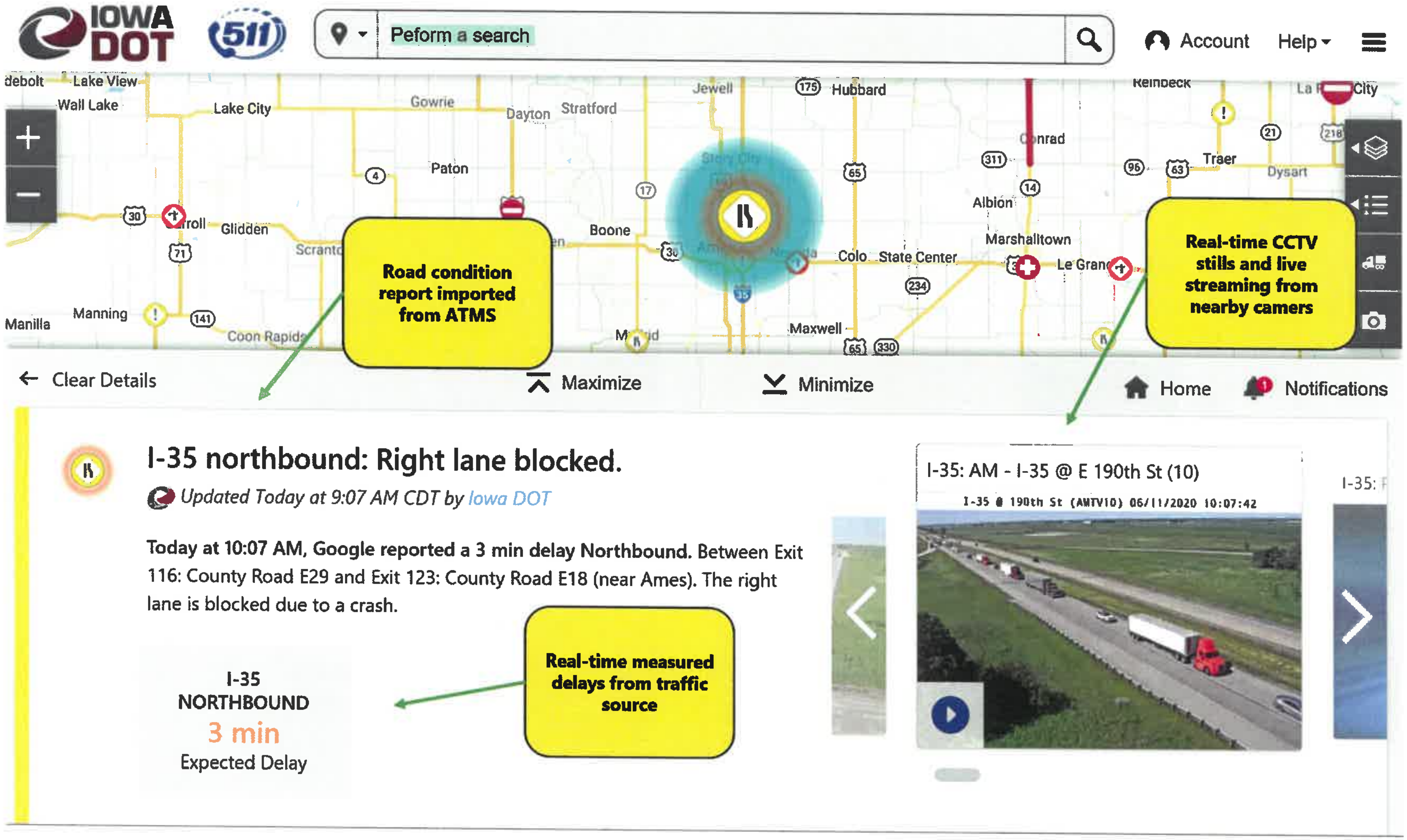



Figure 54 – 511 Video Images

| Req ID | Mandatory Requirements | Exceeds Requirement |
|---|---|---|
| 4.11.1.18 | The ATMS shall transmit highway conditions reporting data to the 511 system. | ✓ |

**How the Parsons team exceeds the requirement:** The Castle Rock system automatically incorporates traffic cameras and (if licensed) snow-plow pictures into highway-condition reports so that users can view roadway conditions instantly and at a glance. These images provide visual verification of the text-based reports.

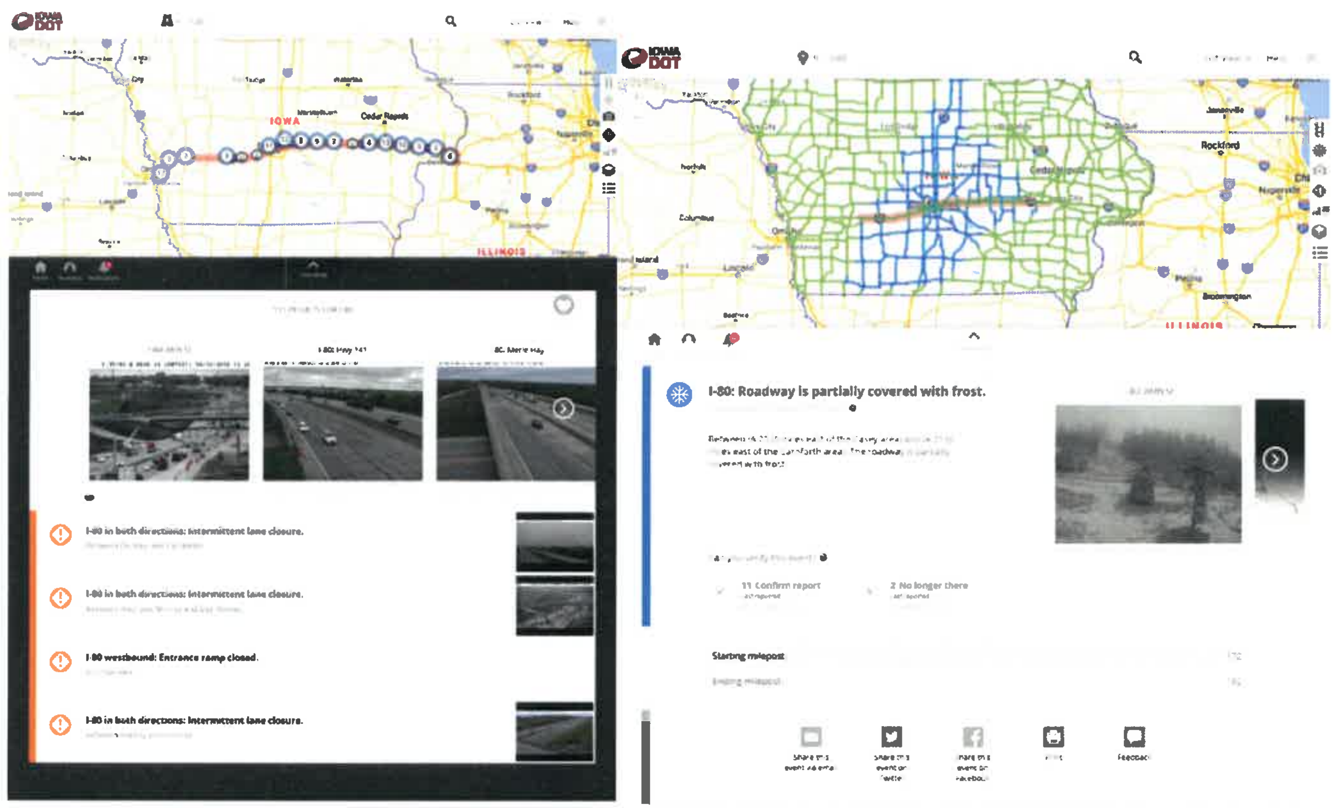



Figure 55 – Interactive Camera Filmstrips and Carousels

| Req ID | Mandatory Requirements | Exceeds Requirement |
|---|---|---|
| 4.11.1.24 | The 511 map shall display for internet distribution the appropriate information being supplied by corresponding ITS devices including at minimum full motion video images from cameras, sign display for DMS, and data from RWIS. | ✓ |

**How the Parsons team exceeds the requirement:** The Castle Rock 511 traveler information system's web and mobile products support full-color graphical DMS displays as well as text-based messages. The RWIS integration includes alerts, which indicate when an RWIS is detecting high winds, frozen precipitation, icy pavement, or other conditions that may be of importance to travelers

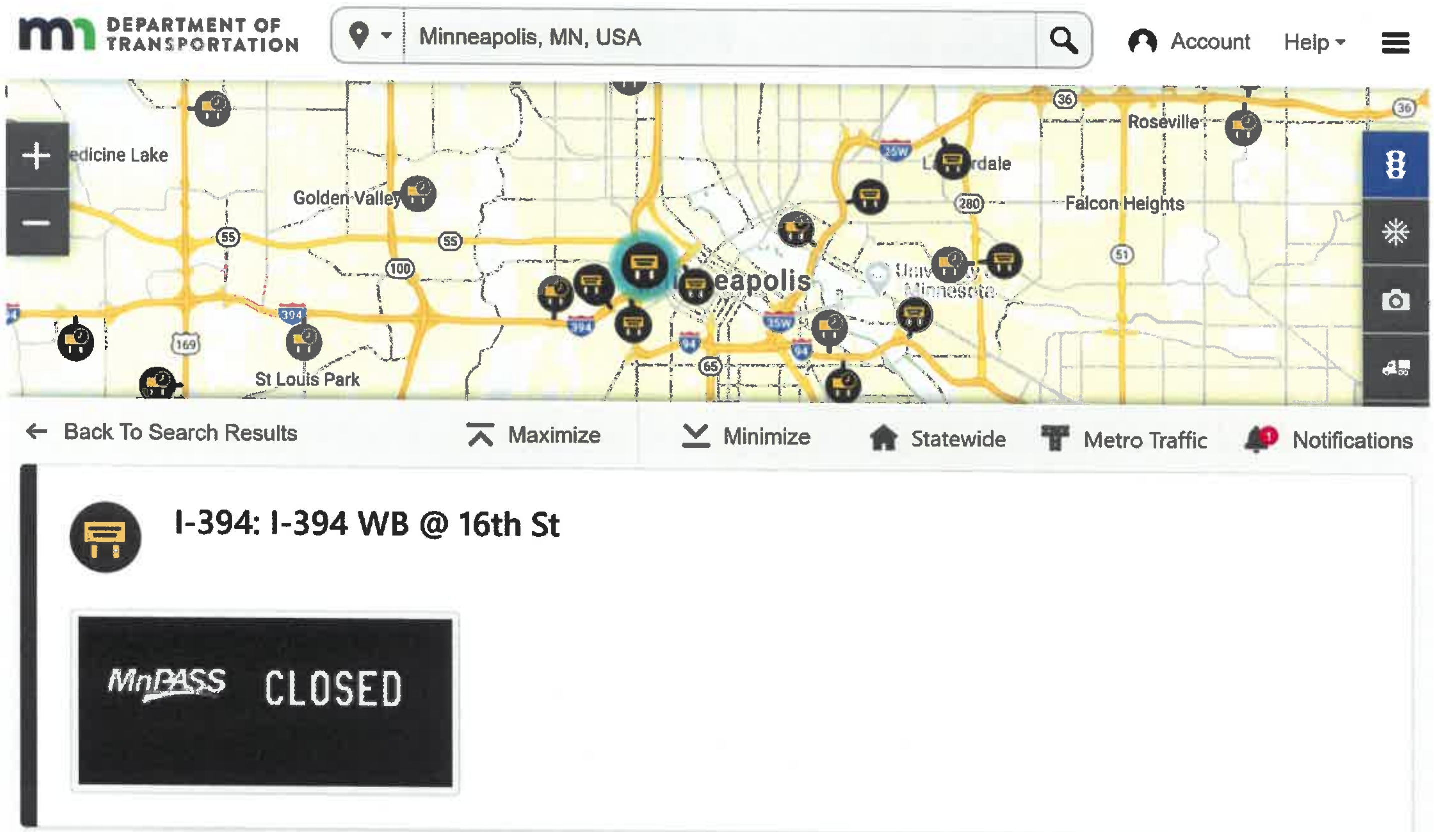



Figure 56 – DMS showing text and graphics

RWIS alerts, which indicate when an RWIS is detecting high winds, frozen precipitation, icy pavement, or other conditions that may be of importance to travelers.

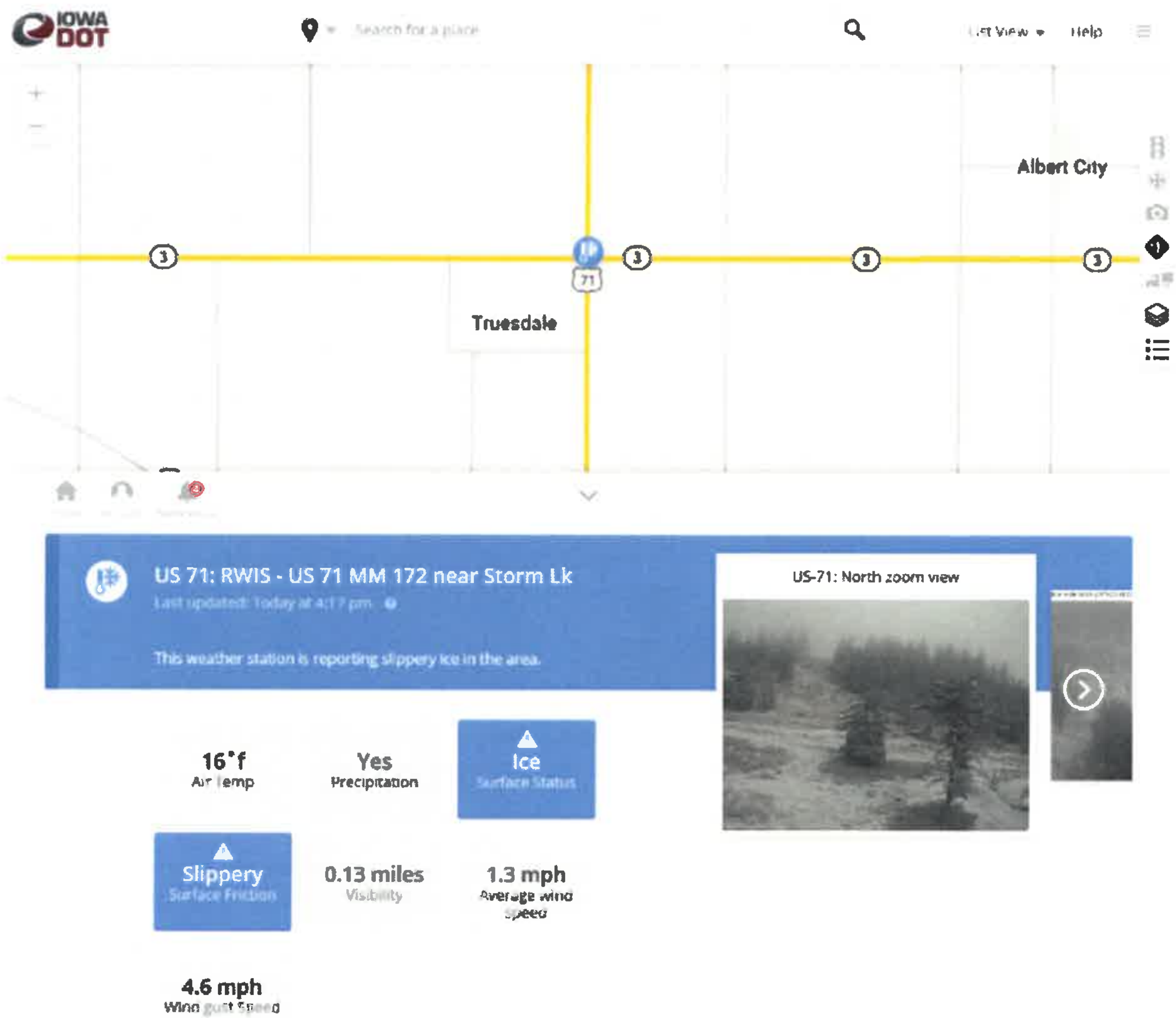



Figure 57 – RWIS in Alert State Due to Slippery Ice

| Req ID | Mandatory Requirements | Exceeds Requirement |
|---|---|---|
| 4.11.1.25 | The 511 website shall provide a menu to select which ITS devices to display (layer controls). | ✓ |

How the Parsons team exceeds the requirement: The 511 website and the 511 mobile app include layers for switching on and off the display of various ITS equipment. The website and mobile app use consistent styling and labeling for the legend.

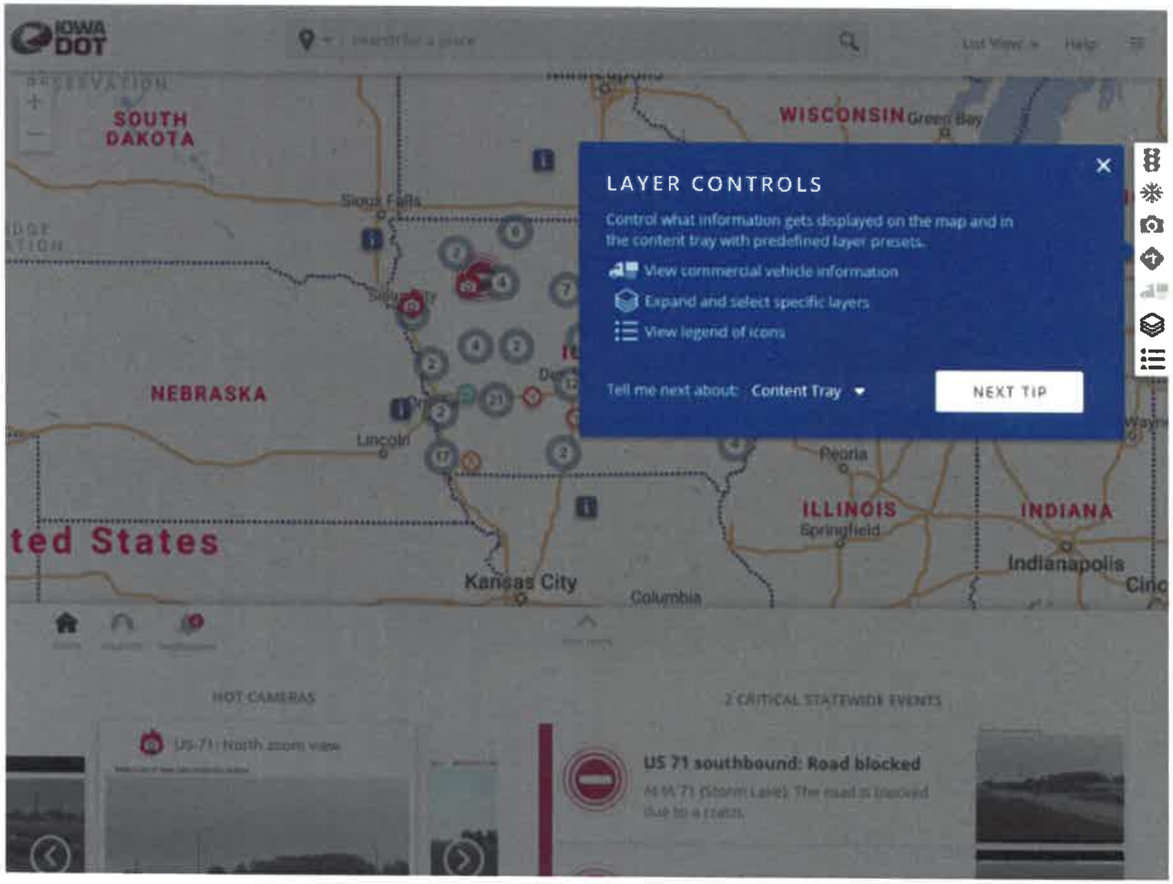



Figure 58 – Onboarding Tutorials Showing Layers Function, Which Includes Various ITS Equipment Options

| Req ID | Mandatory Requirements | Exceeds Requirement |
|---|---|---|
| 4.11.1.32 | The 511 shall graphically provide the location of each camera and a representation to show the user what direction the camera is facing. | ✓ |

**How the Parsons team exceeds the requirement:** The 511 website and mobile app include interactive camera "film strips" that make it easy for users to scan and view the camera or snow-plow (if licensed) images along a road-condition report or near an incident. The "swishable" displays are available on the website and on the mobile app.

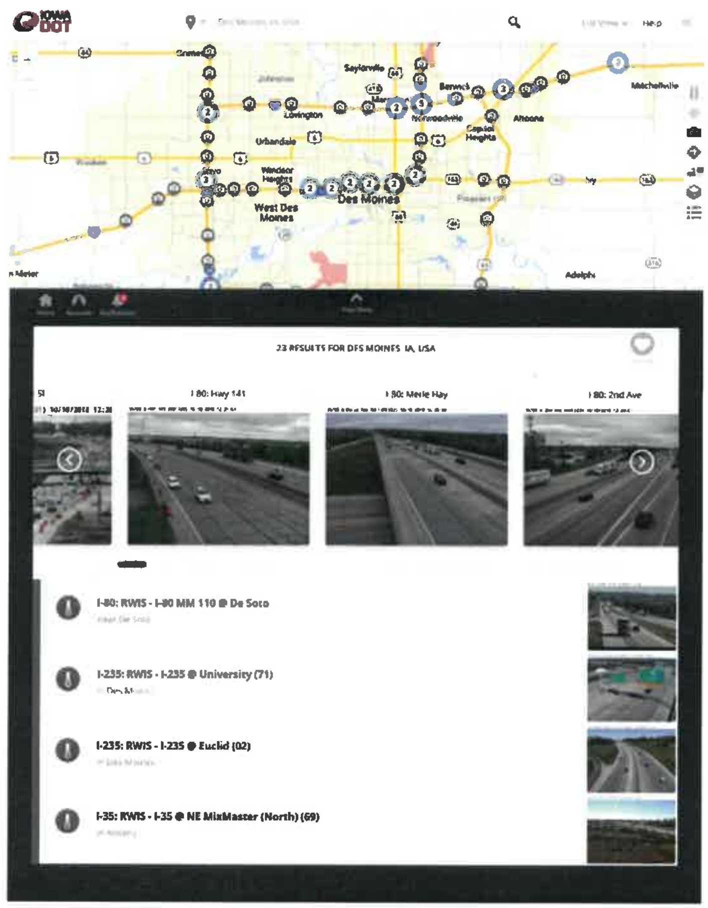



Figure 59 – Interacting With Cameras on 511 Web

| Req ID | Mandatory Requirements | Exceeds Requirement |
|---|---|---|
| 4.11.1.37 | The 511 website shall provide a link to specific WVDOT construction projects/special projects/studies information sites. | ✓ |

**How the Parsons team exceeds the requirement:** The Castle Rock 511 traveler information system allows the WVDOT to add attachments (e.g., PDF or image) to the event, which become a clickable hyperlink on the website and mobile app.

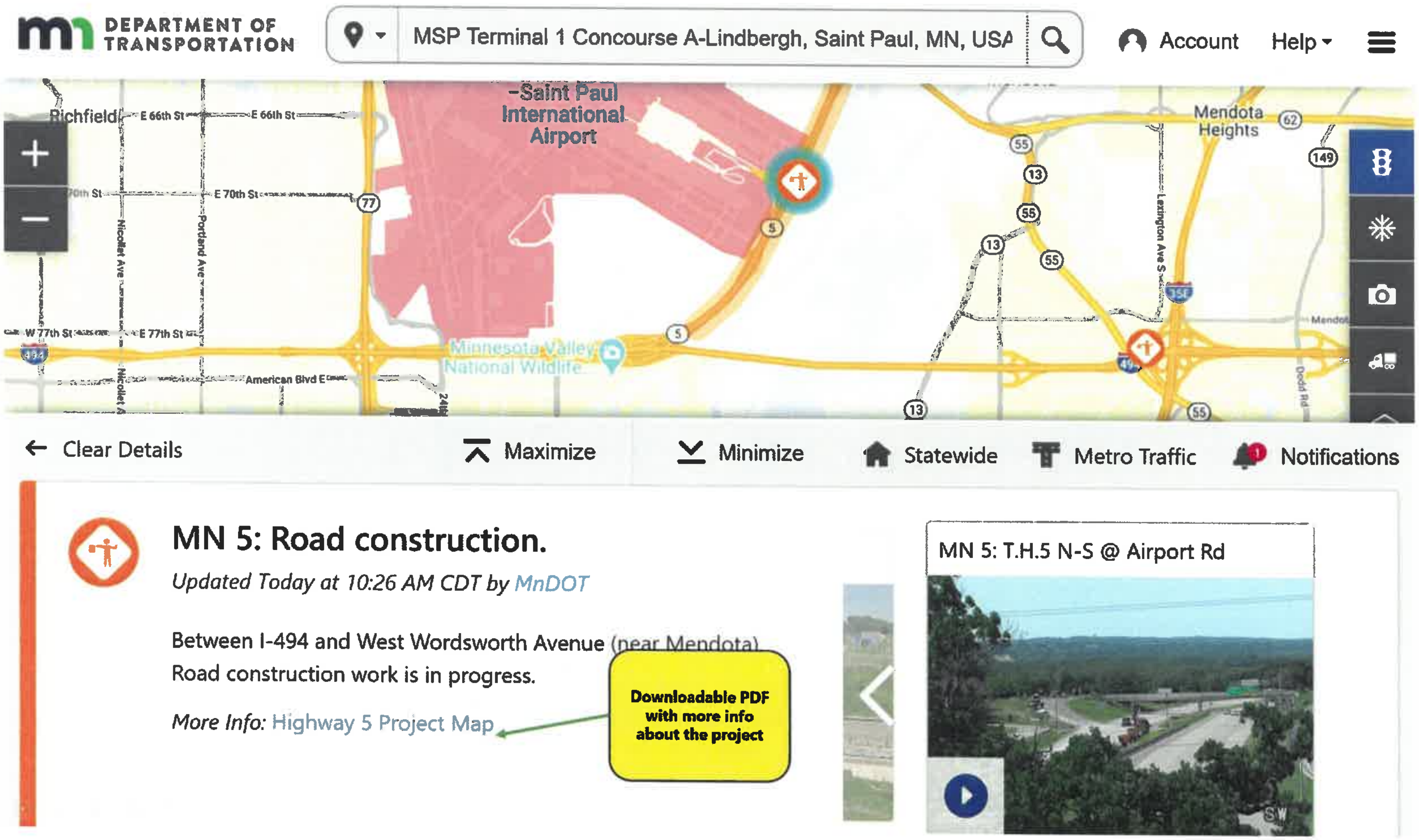



Figure 60 – 511 Additional Links and Attachments

| Req ID | Mandatory Requirements | Exceeds Requirement |
|---|---|---|
| 4.11.1.39 | The 511 mobile website and the 511 app shall have a warning banner regarding use while driving and disclaimer similar to one used on the current WV511 app. | ✓ |

**How the Parsons team exceeds the requirement:** The scrolling banner can be configured to automatically include Priority 1 events, as well as human-created content, helping to avoid duplicative data entry and outdated banner messages.

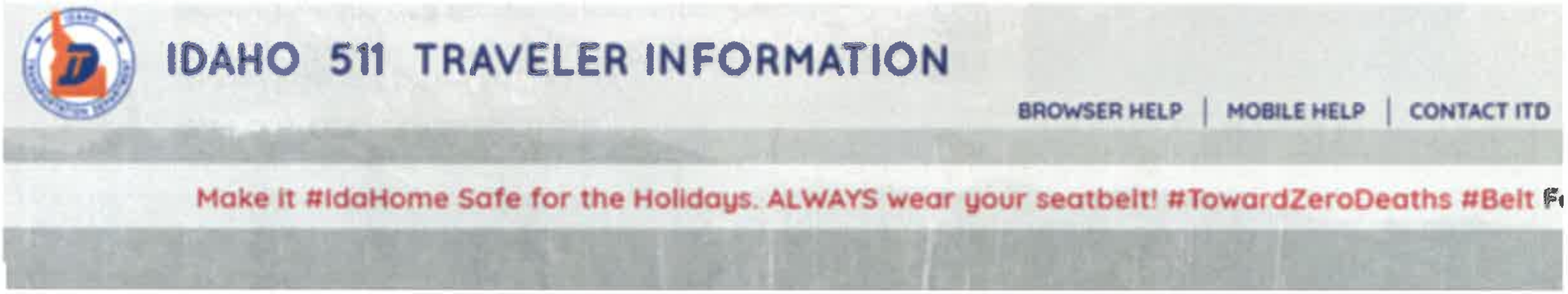



Figure 61 – Scrolling Banner on 511 Web

| Req ID | Mandatory Requirements | Exceeds Requirement |
|---|---|---|
| 4.11.2.7 | The ATMS should have the ability to push commercial vehicle and OS/OW restrictions to subscribers. | ✓ |

**How the Parsons team exceeds the requirement:** The Castle Rock 511 traveler information system platform **highlights size and weight restrictions for truckers**, making it easy to find, read, and use the information.

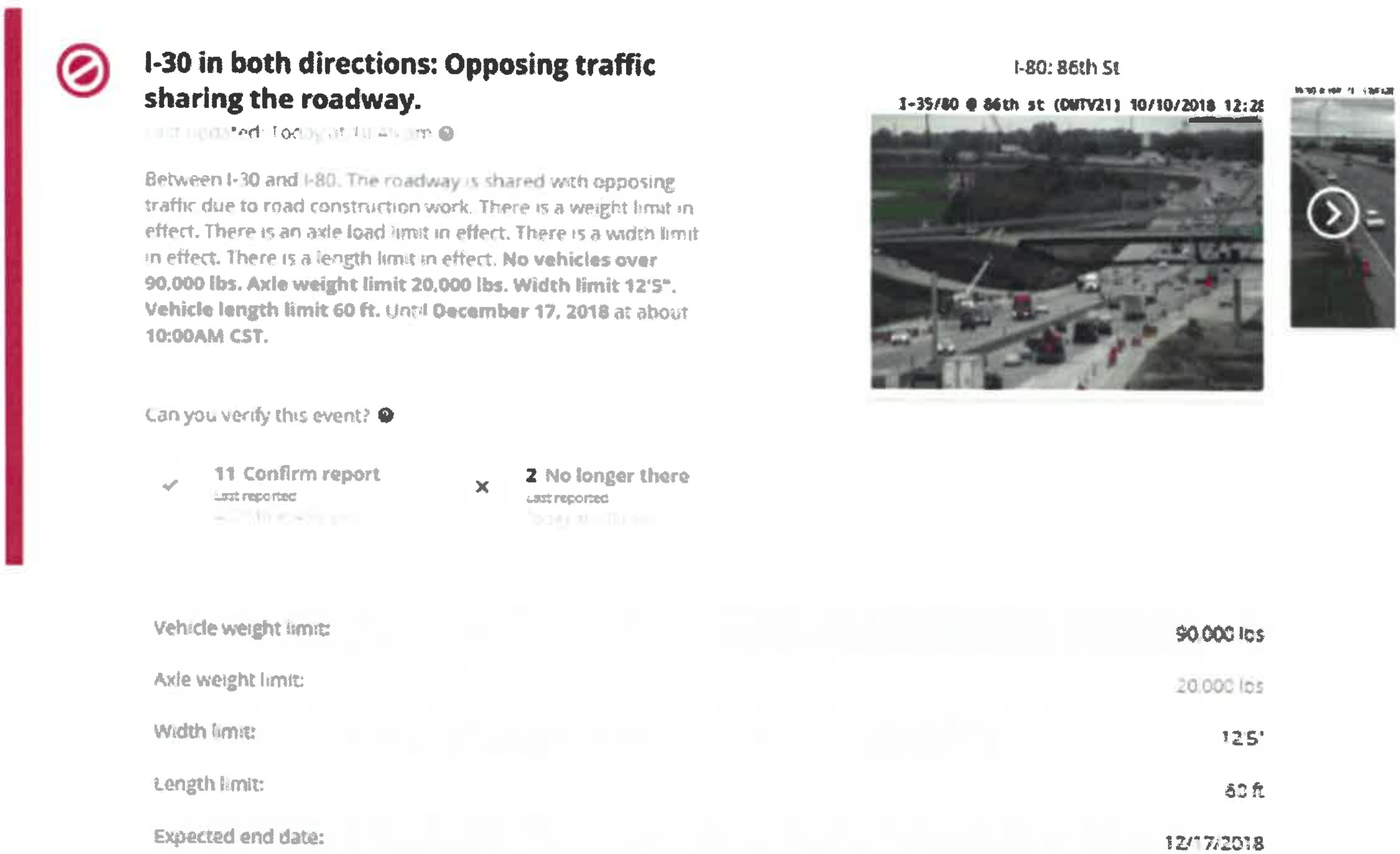



Figure 62 – Highlighting OS/OW Restriction Info

| Req ID | Mandatory Requirements | Exceeds Requirement |
|---|---|---|
| 4.11.2.9 | The 511 website should provide for individual public users to create user accounts and customize travel route alerts to notify them of incident, events or unusual congestion along their designated travel route(s) and display specified camera images related to that route. | ✓ |

**How the Parsons team exceeds the requirement:** In addition to user accounts with travel route notifications, the Castle Rock system also offers travel-time alerts. Users can sign up to be alerted when their travel time is slower than normal for their commutes.

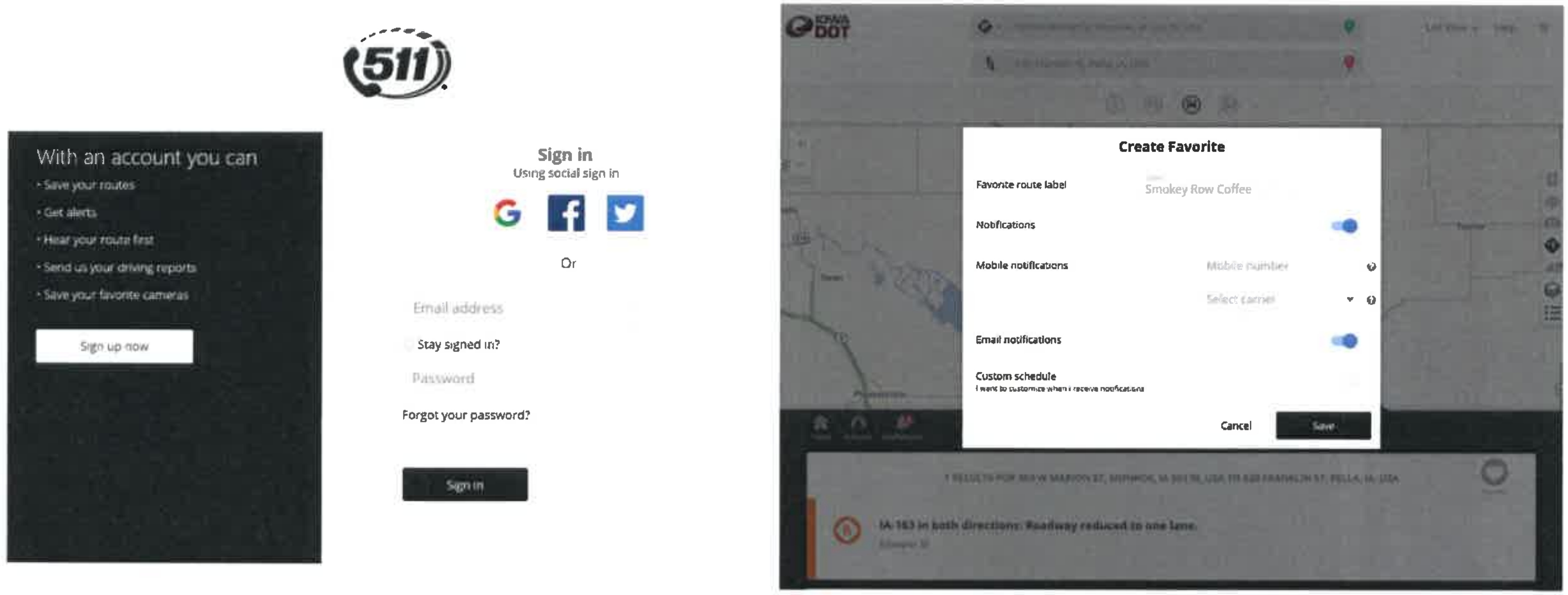



Figure 63 – Creating Accounts and Saving Commutes

| Req ID | Mandatory Requirements | Exceeds Requirement |
|---|---|---|
| 4.11.2.12 | The 511-phone system to have a comprehensive vocabulary for text to voice system or more intuitive interpretation of what the operator types in to the system. (e.g. if the operator types “SB”, 511 system should know that means southbound versus having to type the words out.) | ✓ |

**How the Parsons team exceeds the requirement:** The 511 IVR modules also include a system configuration that automatically translates commonly used abbreviations such as “SB” or “MP” into fully understandable words on the IVR when announcing any free text entered by the operators associated with an event report. With more than 15 years of experience with 511 IVR, the configuration comes with a list of common abbreviation translations provided automatically in the traveler information system. Additional words can be added to the system configuration as desired.

| Req ID | Mandatory Requirements | Exceeds Requirement |
|---|---|---|
| 4.17.3.2.3 | The ATMS should provide a commuter route app so users can enter a frequent route and receive a specific update for their route including incidents, construction, congestion, events, etc. | ✓ |

**How the Parsons team exceeds the requirement:** The proposed system allows users to create favorite areas as well as favorite commuter routes. Users can create one or more custom polygon shapes by clicking on the 511 website map. They can then sign up to receive text and email alerts for events that fall within the shape's boundary. Users can specify the days of the week and hours during which they want to receive alerts, just as they can with commuter routes.

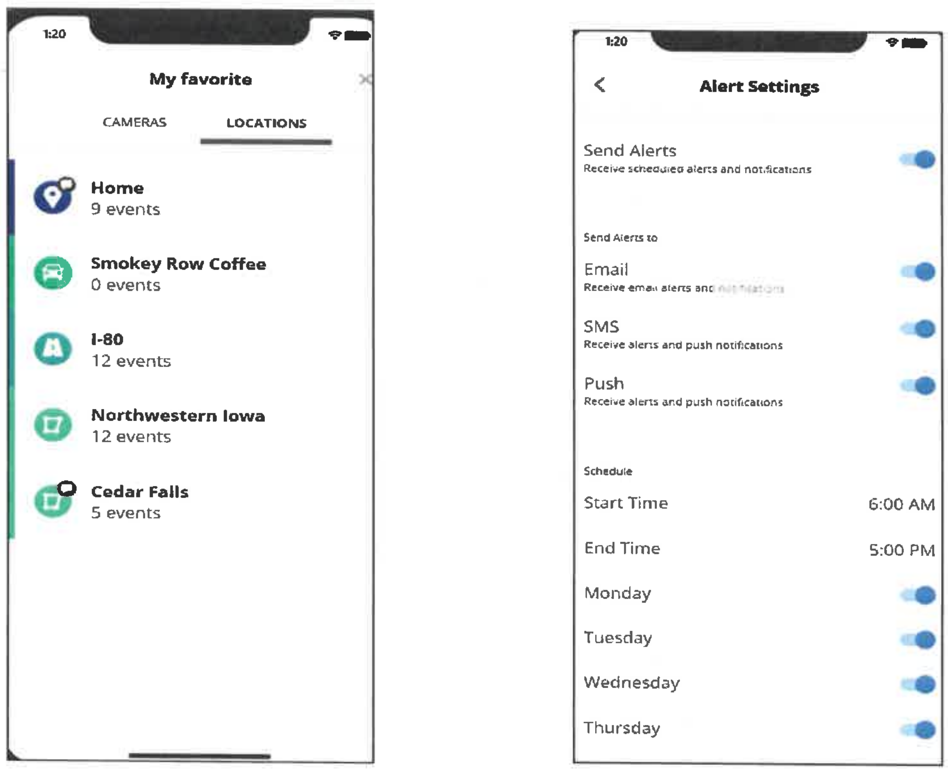



Figure 64 – Favorite Routes and Areas, Configuring Alerts

| Req ID | Mandatory Requirements | Exceeds Requirement |
|---|---|---|
| 4.17.3.2.4 | The ATMS should populate social media mechanisms with event data automatically. | ✓ |

How the Parsons team exceeds the requirement: The system provides tweets that include links to the events they are associated with. Each tweet/post includes a link to the full details of the event on the public website. This feature links the different 511 channels together and allows social-media users access to full event details.


Figure 65 – Tweets Include a Link to the Event on 511 Website

| Req ID | Mandatory Requirements | Exceeds Requirement |
|---|---|---|
| 4.17.3.2.5 | The ATMS should provide for enhanced social media capabilities to allow for easier use of Twitter, Facebook, etc. for events or emergencies. | ✓ |

How the Parsons team exceeds the requirement: In addition to posting information automatically to Twitter and Facebook, our system includes **built-in social-media sharing.**

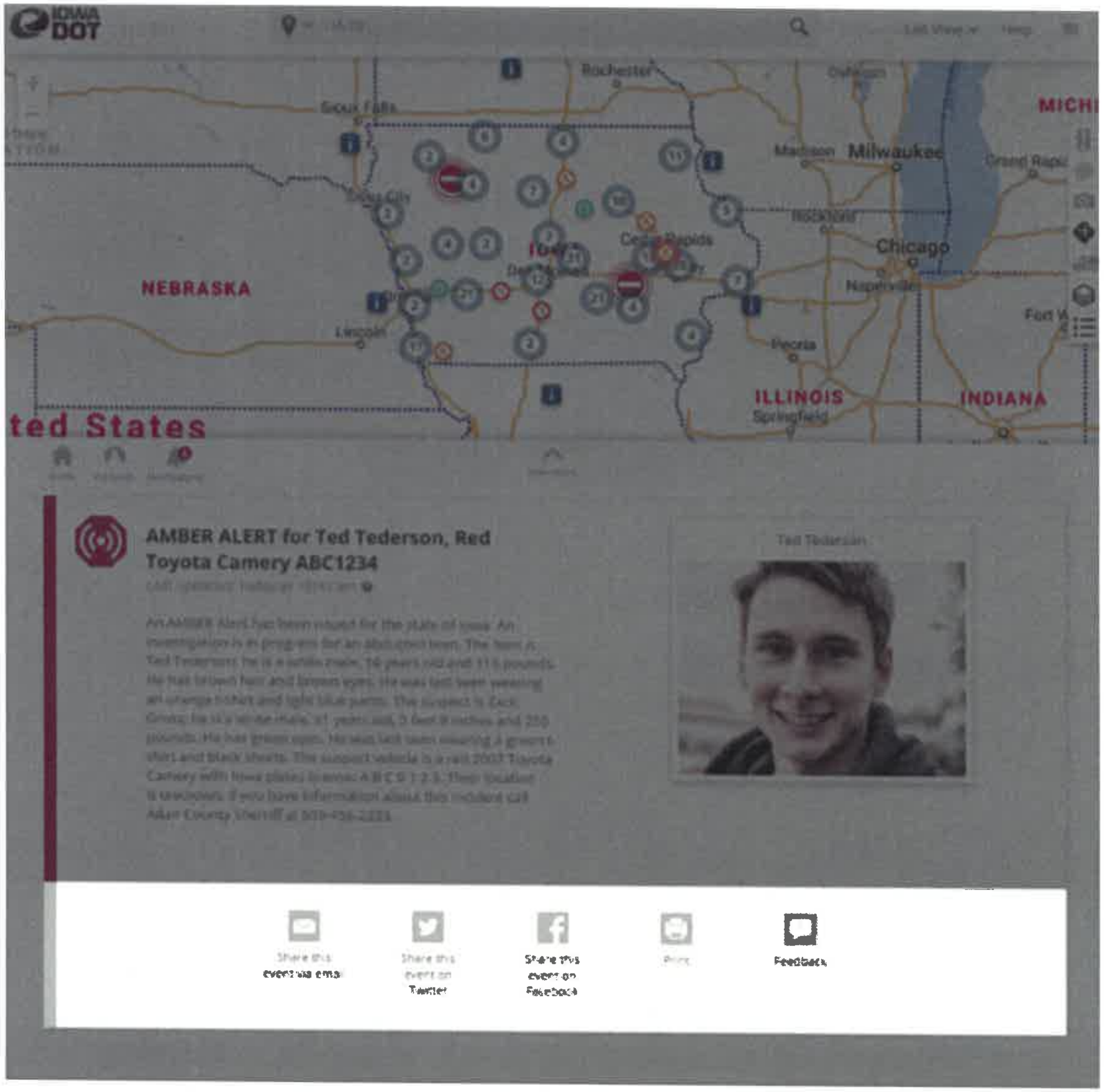



Figure 66 – Share Information From 511 With Your Followers and by Email

## 1.2.1 References (§ 4.3.2.1)

**RFP Section: 4.3.2.1. References** (minimum 3, maximum 5 references) (no WVDOT references permitted), including name, agency, address, phone and email.

**Table 24 – Parsons Team's References**

| | |
|---|---|
| Reference 1 | Louisiana Department of Transportation and Development (DOTD)<br>Statewide Advanced Transportation Management System<br>Carryn Sollie, ITS System Integration Manager<br>1201 Capitol Access Road, Baton Rouge, LA 70802<br>225.379.1302<br>Carryn.Sollie@la.gov |
| Reference 2 | Michigan Department of Transportation<br>Statewide Advanced Transportation Management System<br>Monica Coulter, IT Architect Specialist<br>State Transportation Building, Design Division<br>425 West Ottawa Street, PO Box 30050, Lansing, Michigan 48909<br>517.241.0177<br>CoulterM@michigan.gov |
| Reference 3 | Mississippi Department of Transportation<br>Statewide Advanced Transportation Management System<br>James Sullivan, State Traffic Engineer<br>PO Box 1850, Jackson, Mississippi 39215<br>601.359.1454<br>jsullivan@mdot.ms.gov |
| Reference 4 | Iowa Department of Transportation<br>511 Traveler Information System<br>Sinclair Stolle, Traffic Management Systems Engineer<br>800 Lincoln Way, Ames, IA 50010<br>515.239.1933<br>Sinclair.Stolle@iowadot.us |
| Reference 5 | Minnesota Department of Transportation<br>Advanced Traveler Information System<br>Kelly Braunig, 511 Coordinator<br>1500 County Road B2 W, Roseville, MN 55113<br>651.234.7026<br>kelly.braunig@state.mn.us |

### Letters of Reference

The following pages are Letters of Reference that we have received in reference is ATMS.

# ALABAMA
## DEPARTMENT OF TRANSPORTATION
**MAINTENANCE BUREAU**
**1409 COLISEUM BOULEVARD**
**MONTGOMERY, ALABAMA 36110**
**PHONE (334) 242-6272 FAX (334) 242-6378**

Kay Ivey
Governor

John R. Cooper
Transportation Director


May 20, 2020

To Whom It May Concern:

The Alabama Department of Transportation's (ALDOT) mission is to provide a safe, efficient and environmentally sound intermodal transportation system to facilitate economic and social development through the efficient movement of people and goods. In support of ALDOT's mission, a statewide advanced transportation management system (ATMS) was employed to facilitate traffic management operations across the state.

ALGO, Alabama's statewide ATMS, was initially implemented in January 2015 to address the needs of three regional centers (Montgomery, Mobile, Birmingham). Since the initial deployment, ALGO has been extended and being used by two additional centers (Tuscaloosa and Huntsville), which were recently established to provide coverage in other areas most travelled. The ALGO system presently covers more than 1,100 miles of Interstates, serving the largest cities in the state. ALGO has over 350 closed-circuit television cameras, over 45 dynamic message signs, and over 10,000 miles of vehicle detection data, all being used to manage Alabama's roadways.

Parsons involvement with ALGO began in 2012 as the statewide ATMS software provider, which included conducting a Systems Engineering Analysis (SEA) prior to implementation. Parsons was responsible for system planning and design; hardware specifications; software development and customization; system documentation; user/administrator training; and system support. Parsons was instrumental in providing ALDOT with a base software platform that is being used to expand their statewide transportation management initiatives. ALGO is a system undergoing continued evolution, and Parsons continues to provide services to ALDOT for system expansion and enhancement.

Parsons' services have been highly satisfactory, and I regard this firm as a leader in the field of Intelligent Transportation Systems and Advanced Transportation Management Systems. If you have any questions concerning this reference, please do not hesitate to contact me directly at (334) 242-6883 or hilyerc@dot.state.al.us .

Sincerely,

Christopher O. Hilyer

Christopher O. Hilyer
State TSM&O Administrator

LOUISIANA DEPARTMENT OF TRANSPORTATION & DEVELOPMENT

**Office of Operations**
PO Box 94245 | Baton Rouge, LA 70804-9245
ph: 225-379-1232| fx: 225-379-1861

**John Bel Edwards,** Governor
**Shawn D. Wilson, Ph.D.,** Secretary
**Vincent C. Latino,** Assistant Secretary

January 16, 2019

To Whom It May Concern:

RE: Letter of Reference – Parsons Transportation Group

Parsons (previously Delcan) has been active in the deployment, support and expansion of the State of Louisiana Department of Transportation and Development's (DOTD's) Advanced Transportation Management System ATMS since 2012. Parsons role has included the design, implementation, deployment and test of our original ATMS, as well as support and advisement as a technology partner assisting with the advancement of our ATMS.

The Parsons-supplied ATMS currently enables DOTD to monitor, manage and control various field devices including closed circuit television cameras, dynamic message signs, automatic vehicle location (AVL) for Safety Service Patrol, ramp metering and vehicle detection devices. The system is distributed across five operational sites: New Orleans, Baton Rouge, Shreveport, Houma, and Lafayette, enabling DOTD to provide increased awareness and safety for millions of travelers. With Parsons oversight and advanced offerings, we expanded the capabilities of our ATMS in December of 2017 to include graphical support for dynamic message signs, advanced scheduler for saved response plans, Waze integration, visual device monitoring, and other valuable features.

The State of Louisiana's DOTD team is satisfied with Parsons performance during our tenure working together. Parsons' project managers and project team members demonstrate solid project management and communication skills; provide excellent customer service; and are responsive to open questions and concerns. The Parsons team is prompt in identifying and anticipating system problems and resolves issues promptly with appropriate process and communication.

Parsons has played a key role in the development, sustainment, and advancement of our ATMS. We have been pleased with the professionalism of the team. Please feel free to contact me Carryn.Sollie@la.gov for any additional questions you may have.

Regards,

Carryn Sollie

Carryn Sollie
ITS System Integration Manager
Louisiana Department of Transportation and Development

CHICAGO DEPARTMENT OF TRANSPORTATION

CITY OF CHICAGO

To whom it my concern,

Parsons has been retained by the Chicago Department of Transportation for the design, development, deployment, testing, commissioning and provision of maintenance and support services of the City's state-of-the-art Advanced Transportation Management System (ATMS). The scope includes supply and maintenance of communication equipment, design development and deployment of Parsons ATMS for ATMS applications (Event Management, CAD integration, CCTV integration, speed monitoring via multiple City sources, DMS management).

Parsons performance in working with the City has been professional and thorough. The Parsons' team members consistently provide good customer service. The team is responsive and prompt in bringing problems and issues forward as they arise and solving problems by working together with our (agency's) staff. The team is flexible and available whenever the needs arise.

Sincerely,

Abraham Emmanuel
Deputy Commissioner
Division of Traffic Safety & Technology
312-742-0804
aemmanuel@cityofchicago.org

STATE OF CALIFORNIA—CALIFORNIA STATE TRANSPORTATION AGENCY Gavin Newsom, Governor

**DEPARTMENT OF TRANSPORTATION**

DEPARTMENT OF ITS DEVELOPMENT
100 SOUTH MAIN STREET
LOS ANGELES, CA 90012
PHONE (213) 897-3656
INTERNET http://dot.ca.gov

*Making Conservation*
*a California Way of Life.*

May 22, 2020

**Subject: Parsons Reference Letter - Advanced Transportation Management System (ATMS) Development**

To Whom it May Concern:

As Project Manager for Caltrans District 7, I have worked with Parsons (formerly Delcan Corporation) for many years on various ITS projects and have always been extremely pleased with their performance, especially as it relates to development of our ATMS software, the cutover design and physical transition to our Interim TMC in 1999, the systems cutover of our new Los Angeles Regional Transportation Management Center (LARTMC). Parsons provided continued support and modifications of the software systems used within our LARTMC, most recently as it relates to enhancements for Active Traffic Management (ATM) and Integrated Corridor Management (ICM) functionality.

Parsons designed, developed and deployed our award-winning ATMS software through an earlier project valued at $6.9M (USD) and recently upgraded this system through the LARTMC efforts to a new browser-based user interface with a number of new features. This system controls and manages ITS components on 525 miles of freeway including devices such as 520 CCTV cameras, 1280 mainline vehicle detector stations, 10,500 vehicle detection sensors, 1020 ramp meters, 120 dynamic message signs, and 17 highway advisory radios. Since the development of this upgrade, Delcan has implemented a number of new feature enhancements including our Dynamic Lane Management System (DLMS) and they are currently working on software enhancements for Dynamic Corridor Congestion Management (DCCM) using the Parsons iNET™ ATMS.

With the help of Parsons, our district has been fortunate to win a number of state and national awards associated with our ATMS including the following:

- ***2013 - Caltrans Excellence in Transportation Award Winner***
- ***2011 California Transportation Foundation (CTF) Award Winner***
- ***2010 - California Transportation Foundation (CTF) Award Winner***
- ***2007 Best of ITS America Award Winner***
- ***2008 CELSOC Honor Award Winner***
- ***2008 California State IT Award Winner***
- ***2008 National NASCIO Award Winner***
- ***2008 ACEC Engineering Excellence Award***

***"Provide a safe, sustainable, integrated and efficient transportation system to enhance California's economy and livability"***

To further discuss, I can be reached at:


Caltrans District 7 - Office of ITS Development
100 S. Main St.
Los Angeles, CA 90012
(213) 897-8922
Allen_Z_Chen@dot.ca.gov


Sincerely,

Allen Chen 05/22/2020
Allen Chen
Project Manager
ITS Development

*"Provide a safe, sustainable, integrated and efficient transportation system to enhance California's economy and livability"*

STATE OF CALIFORNIA—CALIFORNIA STATE TRANSPORTATION AGENCY Gavin Newsom, Governor

**DEPARTMENT OF TRANSPORTATION**
DISTRICT 7
DIVISION OF TRAFFIC OPERATIONS/OFFICE OF ITS
100 SOUTH MAIN STREET
LOS ANGELES, CA 90012
PHONE (213) 897-1349
INTERNET http://dot.ca.gov

*Making Conservation*
*a California Way of Life.*

May 22, 2020

**Subject: Letter of Reference – Parsons ATMS**

To Whom It May Concern:

I am a project manager and contract manager for Caltrans District 7 in Los Angeles. I have had the pleasure of working with Parsons Corporation for many years on various ITS projects and have always been extremely pleased with their performance, especially as it relates to development of our Advance Transportation Management System (ATMS) software. Most recently, I have been a part of their work to modify our ATMS in support of the Caltrans Dynamic Corridor Congestion Management (DCCM), Decision Support System (DSS), Dynamic Corridor Ramp Metering System (DCRMS) and I-210 Connected Corridor Projects. Parsons staff have consistently delivered new groundbreaking approaches to ATMS and other new ITS technologies for our agency. I highly recommend them for delivery of the GDOT Next Generation ATMS.

To further discuss their qualifications, I can be reached at:

Leila R. Sy, P.E.
Senior Transportation Electrical Engineer
Office of Intelligent Transportation Systems (ITS)
213-893-1359 (office)
Leila.sy@dot.ca.gov

Sincerely,

Leila Sy

Leila R. Sy, P.E.
Senior Transportation Electrical Engineer
Office of ITS

*"Provide a safe, sustainable, integrated and efficient transportation system to enhance California's economy and livability"*

**DEPARTMENT OF TRANSPORTATION**
111 GRAND AVENUE
P.O. BOX 23660
OAKLAND, CA 94623-0660
PHONE (510) 286-5900
FAX (510) 286-5903
TTY 711
www.dot.ca.gov

*Making Conservation a California Way of Life.*

January 17, 2019

**RE: Reference Letter for Parsons– Caltrans D4 ATMS for I-80 Smart Corridor**

To Whom It May Concern:

As Corridor Manager for Alameda and Contra Cost County I-80 responsible for managing the Smart Corridor/ICM and Caltrans District 4 ATMS, I have worked with Parsons Corporation for many years on ITS projects that have involved enhancements to the ATMS software, system design and implementation. I have been extremely pleased with their performance. On the I-80 Smart Corridor project, Parsons was instrumental in helping Caltrans District 4 win the 2017 Operational Efficiency Award from the California Transportation Foundation (CTF).

Parsons designed, developed and implemented significant software and hardware enhancements that supported the operational management of several new traffic operations strategies along I-80 in the San Francisco Bay Area. These strategies included Active Traffic Management (ATM), Variable Advisory Speed, Signs (VASS), Adaptive Ramp Metering (ARM), and coordinated traffic signal control during major incidents.

In my opinion, Parsons's performance in working with Caltrans and other partner agencies has been professional, cooperative, and helpful in the delivery of the project. The Parsons' team members consistently provide good customer service and I would consider using Parsons on future projects. I can be contacted at the following:

David Man
Division of Traffic Operations
Caltrans District 4
111 Grand Ave
Oakland, CA 94612
(510) 286-4607
david.man@dot.ca.gov

Sincerely,

David S. Man

DAVID MAN, PE
Office Chief of Electrical Systems

*"Provide a safe, sustainable, integrated and efficient transportation system to enhance California's economy and livability"*

Oregon

Kate Brown, Governor

**Department of Transportation**
**Office of Intelligent Transportation Systems**
455 Airport Rd SE
Building K
Salem, Oregon 97301-4798
Telephone (503) 986-6756
Fax (503) 986-3055

January 17, 2019

To whom it may concern,

Parsons developed and installed the original ODOT ATMS over 10 years ago. The ODOT ATMS provides operational management of the Region 1 (Portland Metropolitan area) transportation network of devices which include Vehicle Detection Stations (VDS), CCTV cameras, Dynamic Message Signs (DMS), Variable Advisory Speed Signs (VASS), Automated Vehicle Location (AVL), and ramp meters. The ODOT ATMS also includes some advanced functionality such as Event Management and Adaptive Ramp Metering. I have worked with Parsons Corporation for many years related to their ODOT ATMS enhancements and maintenance. I have been extremely pleased with their performance and I have found their staff to be technically astute and responsive to our maintenance requests.

Parsons performance in working with ODOT has been excellent, cooperative, and supportive toward the delivery of ODOT's business objectives. The Parsons' team members consistently provide good customer service and I would consider using Parsons on future projects. My contact information is below:

Kyle Hedspeth
ODOT ATMS Support
(503) 986-6756
Kyle.HEDSPETH@odot.state.or.us

Sincerely,

Kyle Hedspeth

Kyle Hedspeth
ITS Technical Lead

MISSISSAUGA

December 11, 2017

To Whom It May Concern:

Parsons has been retained by the City of Mississauga for the design, development, deployment, testing, commissioning and provision of maintenance and support services of the City's state-of-the-art Advanced Transportation Management System (ATMS).

The scope of this includes supply and installation of a video wall system, traffic signal controllers, and travel time system. As well as design development and deployment of Parsons Intelligent NETworks platform; for traffic signal management and other ATMS applications (CCTV, vehicle detection, DMS management, arterial event management).

The City of Mississauga is very satisfied with Parsons performance throughout this project including that of the team members assigned to the project. Parsons' Project Manager and project team members demonstrate good project management and communications skills; provide excellent customer service and attitude towards the work and the City. Parsons' team is responsive and prompt in identifying and anticipating problems and shows a positive attitude towards resolving them.

The ATMS software is now deployed and Parsons will continue providing services under the contract until 2024.

A very positive working relationship has evolved throughout this project and Parson's team is seen as an invaluable extension of our own internal team here at the City of Mississauga.

Sincerely ,

Michael B. Flanigan
Project Manager, Traffic Management
Transportation and Works
City of Mississauga
905-615-3200 ext. 5134
Mike.Flanigan@mississauga.ca

March 15, 2013

To whom it may concern

The Region of Peel's Road Operations and Maintenance has been working with Delcan Corp. and Delcan Technologies Inc. to implement a GPS/AVL system in 67 winter fleet vehicles and Road Patrol system in 4 vehicles. The Project started in 2010 with a pilot project involving 6 vehicles and went to full implementation in 2012 for the remaining 65 vehicles.

The winter fleet is equipped with GPS/AVL system to track the vehicles travel history, the material and application rate of what is being put down on the roadway, blade position and weather/road conditions. The Patrol system has been customized to meet our daily requirements of patrolling the roads and documenting deficiency's as well as weather/road conditions.

The Delcan system has the ability to meet our daily operational needs and has proven that it is easy to use and data is accessible on a daily basis, as well as historically.

The Delcan project team has exceptional customer service, very easy to work with and very responsive to questions and troubleshooting. All staff assigned to this project have been knowledgeable.

The project schedule was extended from its original timelines mostly due to cellular issues, which Delcan was able to address through research with the cellular provider. The project is not fully finished but is nearing completion and we are satisfied with the service they have provided to date.

The GPS/AVL system that Delcan has provided is a system that we can use daily and is an important tool to track and prove where, when and what we have been doing on the roadways in Peel.

If you require further clarification of our project please contact me.

Eleanor Gillon
GPS/AVL Project Manager
Roads Operations and Maintenance
Region of Peel
905-791-7800 x3329
eleanor.gillon@peelregion.ca

**Public Works**
2 Copper Rd., Brampton, ON L6T 4W5
Tel: 905-791-7800 www.peelregion.ca

**Ministry of Transportation**

**Intelligent Transportation Systems Program**
6th Floor, Building D
1201 Wilson Avenue
Downsview, Ontario M3M 1J8

Tel: 416-235-4676
Fax: 416-235-4097

Ontario

Wednesday, August 26th, 2015

Richard Chylinski
Project Manager
Parsons Inc.
625 Cochrane Drive,
Suite 500
Markham, Ontario
L3R 9R9

**Re: Celebrating the Success of the Toronto 2015 Pan Am / Parapan Am Games**

Dear Richard,

The Toronto 2015 Pan Am / Parapan Am Games have been one of the largest and most complex special events ever held in Canada. The UTCC Monitoring System and key ITS equipment was critical to providing a unified reliable transportation network during the Games. Like any endeavour of this size, there were many challenges and difficulties, but you helped us overcome and support the City of Toronto, the GTHA and venues across the Province in hosting one of the most successful Pan Am / Parapan Am Games ever.

As we celebrate and reflect on the success of our Athletes and the Toronto 2015 Pan Am / Parapan Am Games; I would like to personally thank you for your contribution to the Transportation Team's impressive performance and achievements.

Thank you,

Stephen Erwin
Head

cc: Rex Lee
Andrew Beal

**Ministry of Transportation**
Operations & Deployment
ITS Section
Traffic Office, Central Region
159 Sir William Hearst Avenue, 6th Floor
Toronto ON M3M 0B7
Tel: 416 235-4501
Fax: 416 235-4097

**Ministère des Transports**
Opérations et déploiement
Section des STI
Bureau de la circulation routière,Région du Centre
159, avenue Sir William Hearst, 6e étage
Toronto ON M3M 0B7
Tél. : 416 235-4501
Téléc. : 416 235-4097

Ontario

December 7, 2017

To whom it may concern:

**Re: Letter of Reference - Parsons**

Parsons (previously Delcan) has been active in the deployment and expansion of the ministry's Intelligent Transportation System, known as COMPASS in Ontario for over 35 years. Parsons' role has included planning, preliminary design, detailed design, contract administration and system delivery.

Parsons performed a system manager role in the original Highway 401 COMPASS system delivery providing oversite and coordination of the entire project plus design and delivery of most components of the central software in the late 1980's. Since that time they have been continually involved in expansion and upgrading project for COMPASS throughout Ontario. The deployed systems included the control of various field devices, including closed circuit television camera, ramp metering, vehicle detection and variable message sign. The software provided included advanced decision support for operators and fully automated congestion management among other advanced features.

Parsons also delivered two key systems for border areas. These are the fully automated Queue Warning System that has significantly reduced queue end collisions on freeways approaching border crossings and the Border Advisory System that continually provides border delay information.

MTO's Intelligent Transportation Systems Section has a change management process that we use for all our consultant projects. Parsons has adopted our system to our satisfaction on the projects they have undertaken with us.

Parsons has played a key role in many of our systems and we have been very pleased with the professionalism of the Parsons staff during the development and delivery and ongoing operational support of these systems.

I would be happy to answer any other questions that you might have. Please feel free to contact me.

Yours sincerely,

Robert Chan, P.Eng.
Supervising Engineer
Operations & Deployment

### 1.2.2 Descriptions of past projects (§ 4.3.2.2)

**RFP Section: 4.3.2.2** Descriptions of past projects completed entailing the location of the project, project manager name and contact information, type of project, and what the project goals and objectives were and how they were met. (minimum 3 projects completed/in operation in the past 5 years)

The Parsons Team's descriptions of past project experience are located on the following pages.

# Louisiana Statewide Advanced Transportation Management System

CLIENT
Louisiana Department of Transportation and Development
LOCATION
Statewide, LA
DURATION
2012–Present
PROJECT MANAGER
Carryn Sollie, ITS System Integration Manager
Carryn.Sollie@la.gov

**Summary:** The Louisiana Department of Transportation and Development (DOTD) selected Parsons' iNET™ product as its choice for its new statewide ATMS. We installed, configured, customized, integrated, and provided maintenance/support services for the iNET™ software system.

**Goals and Objectives:** To provide improved operator efficiency by consolidating many of the functions, which used separate software applications, into a single platform. The enhanced software provided integrated controls as well as improved incident management and operations and maintenance capabilities that were not previously available to the traffic management centers. The system also consolidated the existing disparate systems.

**Solution:** The iNET™ platform was deployed for traffic management operations across the state of Louisiana with independent installations in Baton Rouge, New Orleans, Houma, and Shreveport. The solution is fully replicated across all four regional centers, each operating independently, providing the state with the ability to function autonomously in the event of a major communications outage.

DOTD selected several of the iNET™ ATMS modules to include CCTV, DMS, highway advisory radio (HAR), AVL, event management, travel times, response plans, automated incident detection (AID), and ramp meters.

### Specific project highlights include the following:

- ***Traveler information*** – We developed interfaces to DOTD's public traveler-information systems by publishing iNET™ ATMS traffic information to inform the public—initially, with Castle Rock's CARS, and, most recently, with IBI's traveler information system.
- ***Twitter integration*** – We developed an interface to Twitter, providing enhanced response plan functionality that directly tweets public-information messages seamlessly, which effortlessly supports the DOTD's social-media outreach using client-defined templates and rules.
- ***TrafficWare integration*** – We implemented an interface to the TrafficWare ATMS to provide a limited set of ramp-metering capabilities using iNET™; (specifically, interactive control of the ramp meters to adjust timings and to control vehicle flow onto roadways).
- ***Replicated/autonomous solution*** – We extended the iNET™ replication capabilities to provide a peer-to-peer database replication schema combining four separate installations into one single database for consolidated data views and reporting.

# Michigan Statewide Advanced Transportation Management System

CLIENT
Michigan Department of Transportation
LOCATION
Statewide, MI
DURATION
2008–Present
PROJECT MANAGER
Monica Coulter
CoulterM@michigan.gov

**Summary:** The Michigan Department of Transportation (MDOT) Statewide ATMS project completed by Parsons included project management, design, development, implementation, software, hardware, and ongoing support and maintenance for the ATMS. The solution is used in all TMCs in the state of Michigan.

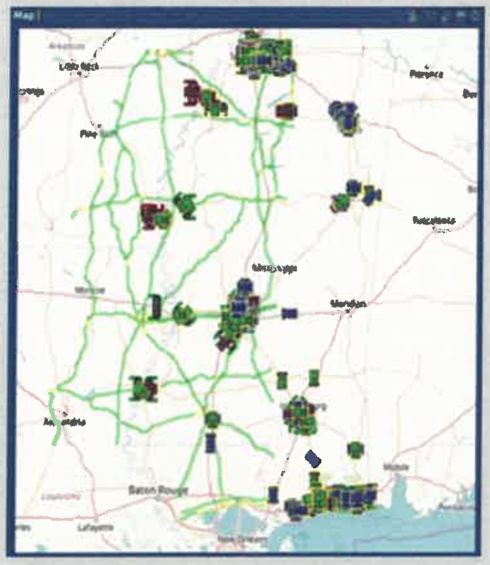
**Goals and Objectives:** To replace the ATMS platforms at the existing TMCs and to allow for future implementation and enhancements at other TMCs across the state. There are three TMCs in the state: the South Eastern Michigan Traffic Operation Center (SEMTOC), in the Detroit metro region; the Statewide Traffic Operations Center (STOC), in Lansing; and the Western Michigan TOC, in Grand Rapids. The SEMTOC manages highway traffic in parts of the metro region (Wayne, Oakland, and Macomb counties). The Western Michigan TOC manages highway traffic primarily in the region of Grand Rapids. The STOC manages traffic across the rest of the state.

**Solution:** The deployed iNET™ ATMS provides integrated control of DMS, CCTV and VDS, as well as integrated event management and automated response plans (for DMS, email, and ATIS notifications). The iNET™ ATMS design system completes center-to-center interfacing and connectivity to MDOT's public website and statewide traffic-data program.

**After initial deployment, we completed several functional enhancements including the following:**

- ***Truck parking*** – This customized upgrade to the state's existing ATMS collects lot statuses for field detection at the public lots and with a third-party vendor for private lots. Data gathered is integrated into the state's ATMS, and the status of the lots is distributed to the public via DMSs, dedicated short-range communication (DSRC) to in-vehicle devices in trucks, and website and third-party mobile application updates.
- ***ICM*** – Another recent upgrade to the Michigan ATMS has been the addition of a basic ICM solution. The ICM monitors and assists in traffic management along three corridors in western Michigan. This enhancement to the statewide ATMS allows a user to set up full ATMS responses as well as assign and save responses to events in a selected area. Responses include DMS messaging, trailblazer sign control, ATIS response, and suggested signal-timing changes.
- ***ATM*** – A module was added to support corridor ATM techniques including hard shoulder–running (HSR) lane control (LC) and variable speed limits (VSLs). The ATM module is integrated with the ATMS event-management and automated-response process allowing the state to proactively manage events using the assets in the corridor and throughout the region as needed. This project won the **2018 ITSA Best of ITS award**.
- ***Border wait time*** – The Border Wait Time project includes the design and deployment of a system that monitors traffic flow at the border crossings between Michigan and Canada. The system estimates wait times and makes information available to the state's ATMS and MiDrive websites.

# Mississippi Statewide Advanced Transportation Management System



CLIENT
Mississippi Department of Transportation
LOCATION
Statewide, MS
DURATION
2012–Present
PROJECT MANAGER
James Sullivan, State Traffic Engineer
jsullivan@mdot.ms.gov

**Summary:** Parsons was awarded the contract to be Mississippi's statewide ITS integrator to provide a fully functional and integrated statewide ATMS. Under this project, we developed, installed, maintained, and supported our ATMS software platform, iNET™, replacing the existing legacy applications used to support traffic management operations. We originally deployed the statewide ATMS to the regional TMCs in Jackson and Hattiesburg.

**Goals and Objectives:** To help address traffic management challenges, including the wide gap between rural, urban, and Gulf Coast tourist traffic, as well as the extreme coastal weather events, requiring contra flow from the Gulf Coast to interior Mississippi.

**Solutions:** The Mississippi DOT ITS system is a statewide network-based system with independent installations of the ATMS in Jackson and Hattiesburg. Each TMC runs autonomously and shares information and device control via a replicated environment, and it is used by remote centers in Southaven and Lyman.

**Specific project highlights include the following:**

- ***CAD*** –This project includes an interface to the Mississippi Highway Patrol to provide for earlier response times to mitigate potential secondary accidents
- ***Mississippi DOT Traveler Information Systems*** – These systems provide data that feeds mdottraffic.com, the 511 website, and the 511 phone system; displays ATMS DMS messages on the 511 website; and automatically imports incidents provided from other traffic systems.
- ***NOAA weather alerts*** – The project includes automated incident generation based on weather conditions and alerts provided by a NOAA weather data feed.
- ***Railroad integration*** – The project includes integration with programmable logic controllers (PLCs) along a railroad crossing in a prominent location in downtown Jackson used to notify TMC operations of potential road blockages.

# Georgia Statewide Advanced Transportation Management System

**CLIENT**
Georgia Department of Transportation
**LOCATION**
Statewide, GA
**DURATION**
1994–Present
**PROJECT MANAGER**
Mark Demidovich, Assistant State Traffic Engineer
mdemidovich@dot.ga.gov

**Summary:** Parsons has been involved with the GDOT NaviGAtor program since its inception and was instrumental in establishing Georgia as a national ITS leader for the 1996 Summer Olympics. We were the principal subcontractor for the NaviGAtor system/software support during the NaviGAtor Systems Integrator projects through 2008.

**Goals and Objectives:** To implement, integrate, maintain, and expand the capabilities of GDOT's second-generation ATMS. Our iNET™ solution replaced the legacy Georgia NaviGAtor ITS (which was originally deployed in 1996) and is currently deployed at the Georgia statewide TMC, in Atlanta. We were also responsible for integrating with several counties/cities throughout Georgia.

The following is a list of the participating TMCs:

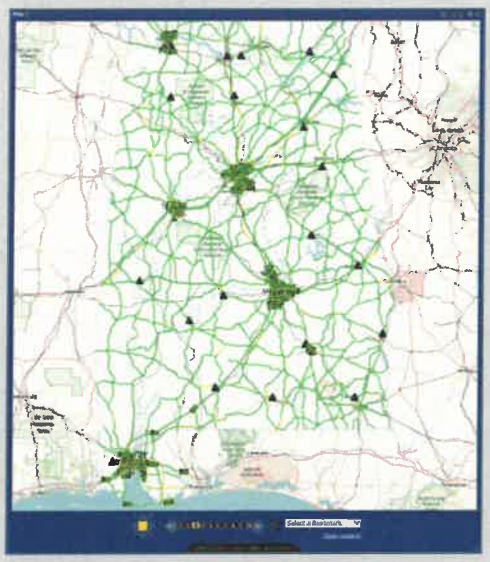
- City of Johns Creek
- Gwinnett County
- Cobb County
- City of Augusta
- City of Sandy Springs
- City of Roswell
- City of Alpharetta
- City of Columbus
- Clayton County
- Douglas County

**Solutions:** iNET™ is our premier web-based ATMS and serves as the foundation for the GDOT NaviGAtor system. This system is a state-of-the-art, off-the-shelf application specifically designed to assist in the management of traffic on freeways, tollways, and arterial roadways. The modular nature of iNET™ allowed for phased implementation of new features that GDOT brought on line over the last several years. GDOT's ITS inventory has expanded from a handful of changeable message signs, CCTVs, and vehicle-detection stations to reversible express lanes, lane-control signs for hard-shoulder operations, VSL signs for automated speed adjustments based on traffic volume and conditions, and full-graphic–capable DMSs. As the volume of traffic has significantly expanded in the Atlanta metropolitan region, iNET™ has grown and met the challenges of the increased functionality that GDOT has required of the system. GDOT's NaviGAtor ATMS enables the sharing of real-time information (incidents, congestion, device status, and video) between participating centers and facilitates traffic management functions at a variety of governmental levels (state, regional, city, county, transit authority, and other GDOT partners).

**Specific project highlights include the following:**

- ***Website/511 integration*** – We worked with GDOT and its 511/public website integrator to enable use of the iNET™ center-to-center interface for direct access to real-time system data.
- ***Automated location and dispatch system*** – We worked with the GDOT HERO department to furnish an in-vehicle solution that provides real-time dispatch and tracking of safety service personnel.
- ***Reversible lane operation*** – We provided a solution to operate two reversible-lane corridors in metro Atlanta. These corridors will integrate with more than 150 gate arms and with the State Road and Toll Authority (SRTA) system to reverse toll-road operations.
- ***Video distribution/sharing*** – We employed a sharing solution that includes a host of distributed systems that are integrated with the statewide NaviGAtor II system to enable sharing/control of local agency video.
- ***Multi-agency coordination*** – We provided various options for local municipalities to participate and join the statewide NaviGAtor II program by integrating local-agency system data and deploying standalone installations to various agencies.
- ***Graphics messaging*** – We developed and deployed a user-friendly solution to use the full functionality of the newest generation of the graphics-capable DMSs.

# Alabama Statewide Advanced Transportation Management System



CLIENT
Alabama Department of Transportation
LOCATION
Statewide, AL
DURATION
2012–Present
PROJECT MANAGER
Chris Hilyer, State TSM&O Administrator
hilyerc@dot.state.al.us

**Summary:** The Alabama DOT contracted Parsons to provide it with a traffic management solution to notify its motoring public of traffic incidents and delays in several urban regions. As the system grew in the state, we consolidated the five separate regional instances of the iNET™ ATMS into one statewide central solution.

**Goals and Objectives:** To deploy the base software platform; to provide software customizations; to integrate with existing roadway devices; and to provide support, maintenance, and training. The Alabama DOT statewide ATMS provided traffic management capabilities to Alabama DOT TMCs across the state (initially deployed to three of five regional centers).

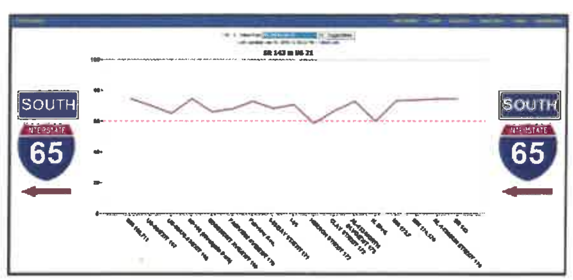
**Solutions:** Our iNET™ platform is used for traffic management operations across the state of Alabama, with initial deployments in the Montgomery, Birmingham, and Mobile divisions. During the first phase of the project, independent ATMS installations were deployed to each of the three regions to develop the state's traffic management operation. Most recently, Alabama expanded its initial statewide solution to include two additional regional TMCs, Tuscaloosa and Huntsville. In addition, we centralized the Alabama DOT ATMS to serve all five regional systems using a cloud-computing service hosted by Microsoft Azure in a 24/7 operating environment.

The Alabama DOT ATMS, known as ALGO, provides freeway and arterial traffic management capabilities statewide, as well as in the regional centers, enabling information sharing to facilitate traffic management functions at a variety of governmental levels (state, regional, city, county, and other Alabama DOT partners).

The Alabama DOT implemented several iNET™ modules to include CCTV, DMS, HAR, environmental sensor station (ESS) (road weather stations), response plans, and event management.

**Specific project highlights include the following:**

- ***Traveler information system integration*** – This project involved integration with ALGOtraffic.com for display on the website and through mobile application.
- ***Cloud-based solution*** – This project involved hosting of our iNET™ software on a Microsoft Azure government service account.
- ***Real-time speed dashboards*** – This project included graphical display of vehicle congestion information for corridors across the state.
- ***Waze integration*** – This project included bidirectional interface to exchange Waze incident data and Alabama DOT construction information.
- ***Statewide detection*** – This project involved more than 10,000 centerline miles of vehicle detection coverage using HERE data.



# Caltrans District 7 Advanced Transportation Management System – Los Angeles

CLIENT
California Department of Transportation
LOCATION
Los Angeles and Ventura Counties, CA
DURATION
1998–Present
PROJECT MANAGER
Allen Chen, Contract Manager
Allen.Chen@dot.ca.gov

**Summary:** Parsons designed, developed, and implemented the upgraded ATMS used in Caltrans District 7 in Los Angeles and Ventura counties. The ATMS integrated with many different devices types, a CAD interface, and a traveler information system. This was completed as part of a project to design and move operations to the new Los Angeles Regional Transportation Management Center (LARTMC).

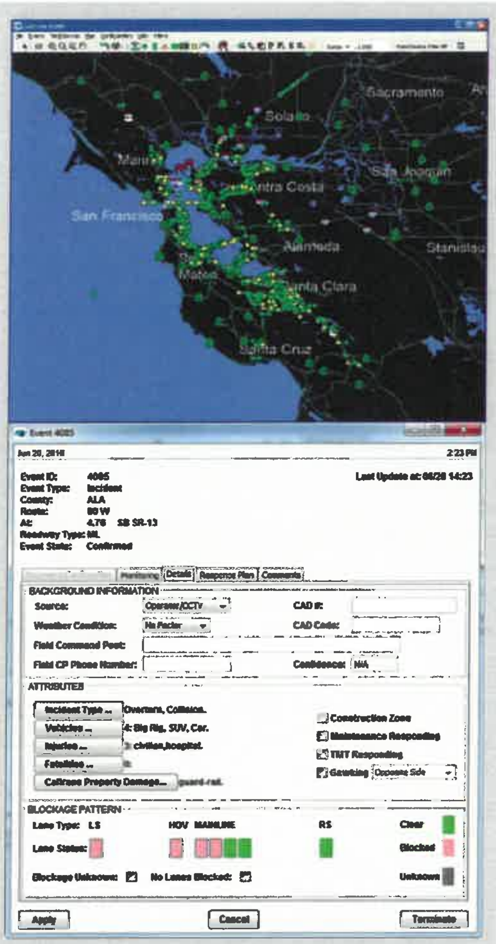
**Goals and Objectives:** To design the upgraded California Highway Patrol (CHP)/Caltrans TMC in Los Angeles. To design and deploy the new web-based ATMS software (version ATMS 2005), which included new functionality key to the joint operation of the LARTMC (functionality included VDS monitoring, event management and tracking, incident detection, response plans, and historical data archiving and reports). Integration included many different device types: dynamic-lane-management signs (DLMSs), ramp meters, VDS, DMSs, and HARs. The ATMS also included integration with a highway patrol CAD system and a travel information system. The design also included the systemwide communications design for Caltrans District 7 and District 12, including the preparation of detailed plans, specifications, and estimates (PS&E) packages.

**Solution:** We developed the ATMS software, providing a graphical user interface (GUI) to allow operators to control and monitor all traffic operations system elements. The ATMS contains an event management and tracking system and its corresponding response plans, integrated with more than 320 CCTV cameras, 120 CMSs, 1,300 vehicle detector stations, 1,120 ramp metering stations (RMSs), and 17 HAR stations. The system uses advanced algorithms to detect freeway traffic incidents and implements expert system technology to manage and track freeway events. Events included those received through the CAD interface with the highway patrol. In addition, we developed the system design documentation, plans, and specifications and installed and integrated all elements for the upgraded CHP/Caltrans District 7 TMC. The upgrade effort included the TMC facility design that renovated 13,400 SF of the Caltrans District 7 office.

**A summary of the key ATMS software functions is as follows:**

- Event management and tracking
- Expert system response plans
- Integration with CAD events from the CHP
- Integration with DLMS
- Integration with dynamic corridor ramp metering system (DCRMS)
- Traffic surveillance
- Integration with real-time device monitoring and control (VDSs, CCTVs, DMSs, RMSs, HARs, and lane-control signs)
- Calculation of real-time travel time
- Automatic incident detection
- Integration with planned lane closures
- Integration with ATISs
- Historical data storage and reporting

# Caltrans District 4 Advanced Transportation Management System – San Francisco Bay Area




**CLIENT**
California Department of Transportation

**LOCATION**
San Francisco Bay Area, CA

**DURATION**
2012–Present

**PROJECT MANAGER**
David Man, Division of Traffic Operations
David.man@dot.ca.gov

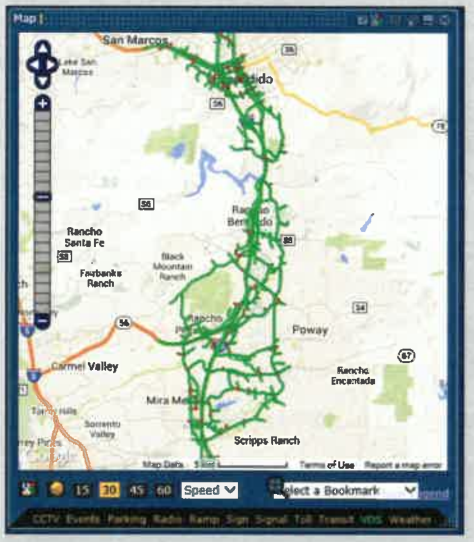
**Summary:** Parsons designed and integrated the ATMS for Caltrans District 4. Caltrans District 4 consists of nine counties: San Francisco, Alameda, Napa, Contra Costa, Santa Clara, San Mateo, Marin, Solano, and Sonoma. The scope of work includes the creation of the District 4 ATMS as a part of the existing 2007 ATMS, which includes functionality from Caltrans District 7 and District 11.

**Goals and Objectives:** To build the ATMS solution for District 4, including the following enhancements:

- Ability to track events for multiple agencies
- CAD events integration
- Access, control, and data exchange with HAR EMS, MLMS, VDS, and RMS
- CCTV control via the BAVU software
- CMS sign control via Vermac NTCIP and ADDCO protocol
- HAR integration
- FSP AVL
- 511 integration

**Solution:** We developed the system design documentation and installed and integrated all elements of the Caltrans District 4 ATMS. The effort included the development of several software detailed design and interface design documents. Additional items included the development of unique GUIs specific to Caltrans District 4 functionality for creating and saving special-event response plans and event tracking, controlling mainline metering stations, and incorporating external travel-time calculations.

# San Diego Integrated Corridor Management System

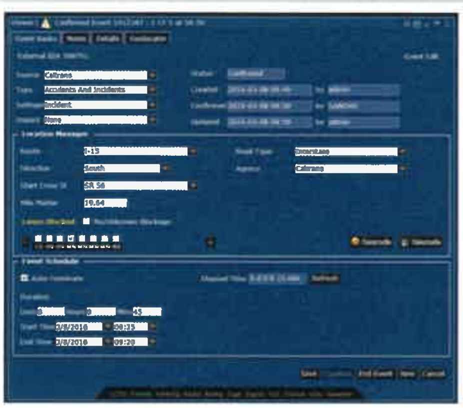


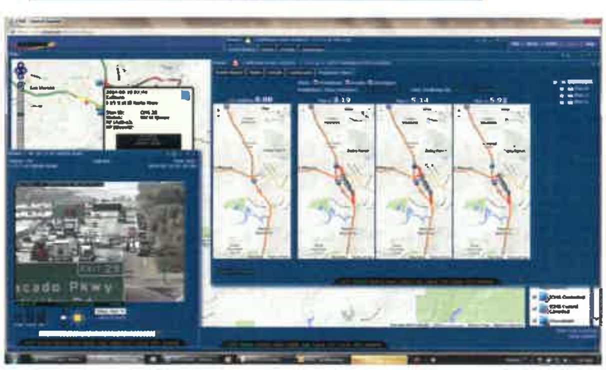

**CLIENT**
San Diego Association of Governments

**LOCATION**
San Diego County, CA

**DURATION**
2010–Present

**PROJECT MANAGER**
Alex Estrella, Senior Transportation Planner
alex.estrella@sandag.org





**Summary:** The I-15 ICMS corridor is a 21-mile segment of I-15 in San Diego County. The corridor currently includes an 8-mile managed-lanes facility. I-15 is the primary north–south highway in inland San Diego County, serving local, regional, and interregional travel. The corridor is a heavily used regional commuter route, connecting communities in northern San Diego County with major regional employment centers. It encompasses three cities (Escondido, Poway, and San Diego), as well as supports a major interregional goods-movement corridor connecting Mexico with California and Nevada.

**Goals and Objectives:** To design and integrate an ATMS solution for a federally funded ICMS pilot project. The purpose of the project was to help improve traffic conditions, reduce congestion, manage critical incidents, and create a more dynamic and flexible solution to increasing congestion and incidents.

**Solution:** We installed our iNET™ product to monitor and manage the various facilities and modes in this corridor and to recommend response-plan strategies, including event management and tracking, for various types of scheduled and unscheduled events. At the heart of the system is a real-time, multimodal decision support system (DSS) that involved integration between iNET™, network traffic-prediction tools, and a real-time microsimulation engine. Key innovative aspects of this deployment include the following:

- Development of an advanced response plan system that integrates traffic-prediction tools and online microsimulation tools to assess the most beneficial strategy
- Multi-agency ITS field-device control and monitoring, including vehicle detectors, DMS, CCTV cameras, HAR, ramp meters, and traffic signals
- Integration of an online microsimulation and modeling for real-time multistrategy analysis
- Incorporation of a predictive traffic analysis tool to assist with proactive traffic management of the corridor
- Implementation of congestion event-finding functionality
- Creation of regional data archive

**Project Awards:**

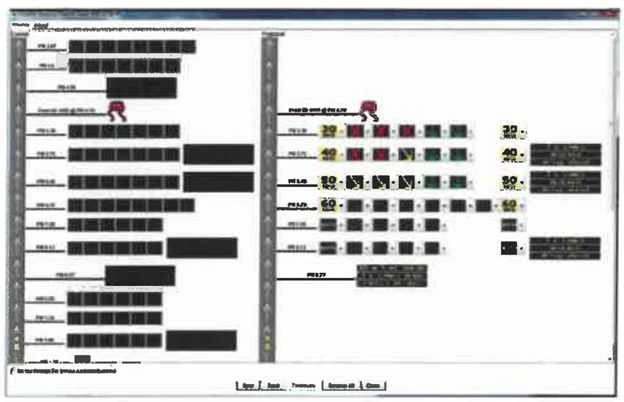
- Awarded the **2013 Best of ITS Award from ITS America**
- Awarded the **California Transportation Foundation Award for the Operational Efficiency Program of the Year for 2014 and 2016**

# I-80 Integrated Corridor Management System

**CLIENT**
Metropolitan Transportation Commission
**LOCATION**
Bay Area, CA
**DURATION**
2012–Present
**PROJECT MANAGER**
Jhay Delos Reyes, PE, Senior Transportation Engineer
jdelosreyes@alamedactc.org

**Summary:** For the I-80 ICMS project, Parsons is providing system integration services to integrate the Caltrans District 4 ATMS and East Bay Smart Corridor software applications with various field devices along the I-80 corridor from the Bay Bridge to the Carquinez Bridge. The project also includes implementing ARM and ATM strategies such as VSLs, queue warning, dynamic lane management (DLM), and alternate routing.

**Goals and Objectives:** To reduce congestion and improve safety along the I-80 corridor. The project scope included integration with ITS field elements, as well as software development and integration at the Caltrans District 4 regional TMC and local TMCs. The project will allow sharing of real-time traveler information among public agencies and the public, as well as the implementation of new traffic management strategies in the corridor.



**Solution:** We installed an ATMS solution that used features to allow the following:

- Event tracking for multiple agencies
- ARM using fuzzy logic
- Lane-use signals/dynamic lane management
- Variable advisory speed signs (VASS)
- Arterial traffic management system including traffic signal control and trailblazer sign control
- Enhancements to East Bay smart corridor system
- Caltrans District 4 ATMS enhancements, including new CCTV and DMS interfaces

# Illinois State Toll Highway Authority (ISTHA) Traffic and Incident Management System (TIMS)

**CLIENT**
Illinois State Toll Highway Authority
**LOCATION**
Downers Grove, IL
**DURATION**
2014–Present
**PROJECT MANAGER**
Elyse Morgan
emorgan@getipass.com

**Summary:** TIMS is recognized by ISTHA as a major accomplishment in incident management and public information. Based on this achievement, the Tollway has initiated a major ITS expansion program over the next 5 years through the Move Illinois Capital Program. This program includes the following 2016 assignments:

- Active traffic management integration
- Advanced traffic- and system-performance measurement
- Advanced ITS asset management
- New virtual weigh station and automated vehicle location interfaces

**Goals and Objectives:** To improve operations and the quality of services on the Tollway's more than 280 centerline miles of highways, ISTHA contracted with us to implement TIMS. TIMS integrates many subsystems to allow ISTHA to provide robust incident management from its central administration building.

**Solution:** Types and quantities of TMS/ITS devices include the following: the IPASS automatic toll collection system, 270 current and planned RTMS traffic detectors, 50 dynamic and 100 portable message signs, AVL information from more than 650 vehicles, more than 1,000 CCTV cameras, queue detection stations (user configurable), and five weigh-in-motion (WIM) stations.

The system features fully automated travel time data on DMSs and PCMSs; ***a two-way CAD interface***; an automatic event response plan system for DMS; email and Twitter; automatic incident detection (AID), and a two-way interface with www.travelmidwest.com.

The ***ATM*** functionality is complete, including flex-lane operations for transit, variable advisory speeds, end of queue management, and fully developed lane-control recommendations.

System users include traffic center operators, ITS maintenance, and toll operations.

**Project highlights include the following:**

This program won the **prestigious Best of ITS America award in the Public Safety category in 2004, and most recently garnered the Project of the Year award from ITS Midwest in 2015.**

# Virginia I-66 Active Traffic Management Project

CLIENT

Virginia Department of Transportation

LOCATION

Various Counties, VA

DURATION

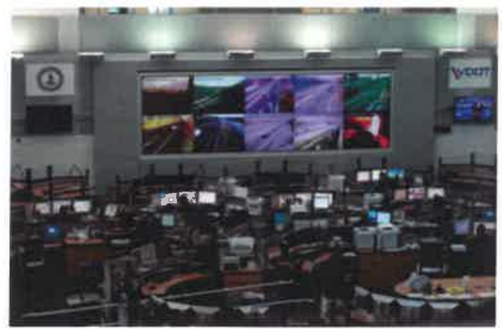
2011–2018

PROJECT MANAGER

Hari Sripathi, Emerging Technology Deployments Director
Hari.Sripathi@vdot.virginia.gov

**Summary:** Parsons provided the ATM software for the Virginia ATMS system along the I-66 corridor through Arlington, Fairfax, and Prince William counties from the Washington, D.C., line to Route 29 in Gainesville.

**Goals and Objectives:** To install software to control multiple types of devices to assist in improving the commute into and out of the Washington, D.C., area by improving safety and incident management by combining the use of ramp metering, variable speed signs, lane-use control signals, and dynamic shoulder lanes.



**Solution:** We installed our iNET™ ATMS software to enable the following ATM strategies:

- VSL
- DLM
- HSR
- ARM

Included with this system was the implementation of the Corridor Adaptive Ramp Metering Algorithm (CARMA) for the state's first ARM deployment. The system also includes interaction with the Citilog video analytics software for verification of vehicle presence in shoulder lanes.

The following field devices were integrated with this solution:

- 258 Ledstar VSL signs
- 13 Daktronics DMSs
- Seven Wapati ramp-metering system controllers
- 117 RTMS microwave radar sensors
- 13 microwave radar sensors
- 30 Autoscope CCTV cameras

# Louisiana DOTD 511 Traveler Information System

**CLIENT**
Louisiana Department of Transportation and Development
**LOCATION**
Baton Rouge, LA
**DURATION**
11 years
**PROJECT MANAGER**
Carryn Sollie, ITS Systems Integration Manager
carryn.sollie@la.gov

**Summary:** The Louisiana DOTD selected Castle Rock to design, develop, implement, and operate its first statewide 511 traveler information system, starting in 2005. Parsons and Castle Rock successfully partnered on the Louisiana integration to automate the flow of data from iNET™ into CARS for sharing with the public on 511. Louisiana's 511 deployment also included ferry information, NWS alerts, and real-time delays.

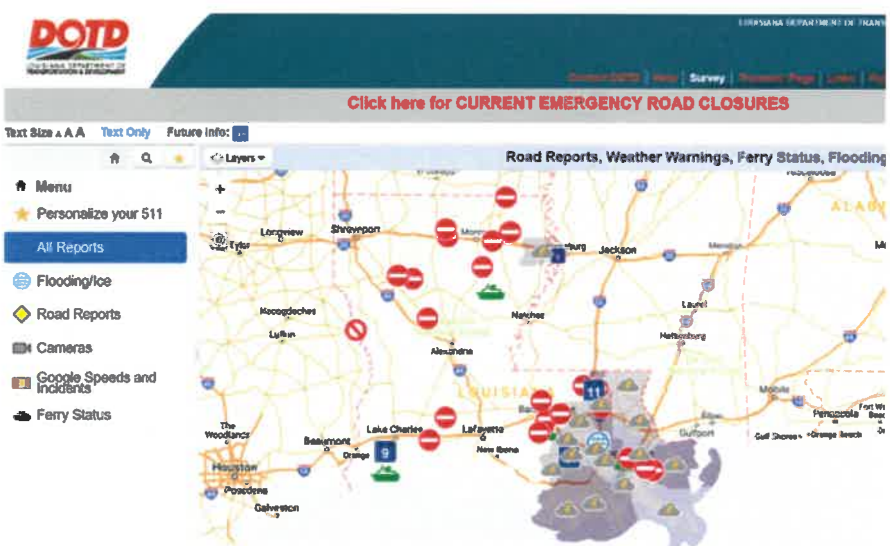
**Goals and Objectives:** To provide a regional 511 service for the state of Louisiana, driven by data from the Parsons iNET™ ATMS.

**Solution:** Castle Rock provided a full-suite 511 solution that includes the following services and capabilities:

- 511 phone
- 511 web
- 511 app
- Integration with iNET™ ATMS
- Ferry information integration
- Weather imports from NWS
- 511 data services and APIs

**Project highlights include the following:**

- Castle Rock and Parsons integrated iNET™ and CARS to enable automatic updates of ATMS events into Louisiana's 511 system.
- The DOTD 511 website, mobile app (iOS and Android), and phone system were used heavily during multiple hurricanes, tropical storms, and unusual winter (2017) storms.
- Castle Rock worked closely with DOTD to develop quick-entry tools to allow the State's ferry operators to create real-time ferry reports for the 511 website, mobile app, and phone system.



# Iowa DOT 511 Traveler Information System

**CLIENT**
Iowa Department of Transportation
**LOCATION**
Ames, IA
**DURATION**
13 years
**PROJECT MANAGER**
Sinclair Stolle, PE, Traffic Management Systems Engineer
Sinclair.stolle@iowadot.us

**Summary:** Castle Rock is Iowa's 511 vendor, having worked with the State since Day 1 of its traveler information platform. The State's 511 service has seen explosive growth, especially in the last 3 years, with tens of millions of visits per year. Much of the traffic is generated during the state's frequent winter-storm and spring-flooding events.

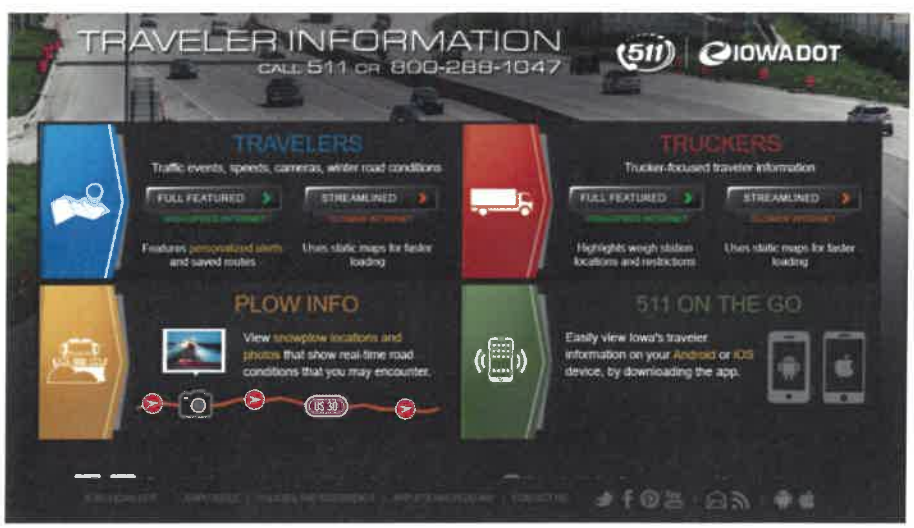
**Goals and Objectives:** To provide the traveling public with clear, consistent, reliable, and useful traveler information statewide—accessible by IVR phone system, website, mobile app, and social media. To provide open 511 data to third parties.

**Solution:** Castle Rock provided a full-suite 511 solution that includes the following services and capabilities:

- 511 phone
- 511 web
- 511 mobile app
- Text/email notifications
- Social media
- Road-condition reporting system
- Real-time truck parking
- Snow-plow integration

**Project highlights include the following:**

- Snow-plow AVL and dashcam integration
- Real-time truck-parking information
- Detour displays on 511 web and app
- Waze integration
- Winter road-condition reporting (website and mobile app)
- ATMS integration
- Third-party data feeds
- Specialized truckers website and mobile app



# Minnesota DOT 511 Advanced Traveler Information System

**CLIENT**
Minnesota Department of Transportation

**LOCATION**
Roseville, MN

**DURATION**
17 years

**PROJECT MANAGER**
Kelly Braunig, 511 Coordinator
kelly.braunig@state.mn.us

**Summary:** Castle Rock has been under contract with Minnesota DOT (MnDOT) since 1997 to provide ATIS services. This includes an IVR phone service, 511 web and mobile app products (www.511mn.org), and social-media feeds (https://twitter.com/mndottraffic). Personalized 511 is also included. Castle Rock has worked closely with MnDOT to develop specialized winter-road-condition reporting systems. Castle Rock also developed an innovative approach for adding dashcam images from its fleet of snow plows into 511. Most recently, Castle Rock worked with MnDOT to integrate and launch real-time truck-parking data from the MAASTO TPIMS' project into Minnesota 511.

**Goals and Objectives:** To provide the traveling public with clear, reliable, useful traveler information, accessible statewide by IVR phone system, website, mobile app, and social media. To explore automation for road-condition, lane-closure, and crash-event reporting.

**Solution:** Castle Rock provided a full-suite 511 solution that includes the following services and capabilities:

- 511 phone
- 511 web
- 511 mobile app
- Text/email notifications
- Social media
- Road-condition reporting system
- Real-time truck parking
- Snow-plow integration


**Project highlights include the following:**

- Real-time truck-parking information
- Snow-plow AVL and dashcam integration
- "Smart arrow board" integration for automated lane-closure and mobile worksite reports
- Automated road-condition reporting through MDSS imports
- Third-party data feeds
- Specialized truckers website and mobile app
- Smart RWIS integration

# Nebraska DOT 511 Traveler Information System


**CLIENT**
Nebraska Department of Transportation
**LOCATION**
Lincoln, NE
**DURATION**
5 years
**PROJECT MANAGER**
Jessica Sherwood, State Operations Center Manager
Jessica.sherwood@nebraska.gov

**Summary:** In 2014, the Nebraska DOT chose Castle Rock to replace its legacy 511 system.

In less than 6 months, Castle Rock deployed a new ATIS data-entry system for incidents, road work, and winter driving conditions. RWIS and CCTV integrations were included. The ATIS platform includes an automated IVR phone system, traveler information website (511.nebraska.gov), and downloadable app for iOS and Android. Personalized 511 services are also included.

Castle Rock has also developed a Waze data aggregator and importer module that integrates citizen reports from the Waze CCP feeds into Nebraska's ATIS platform.

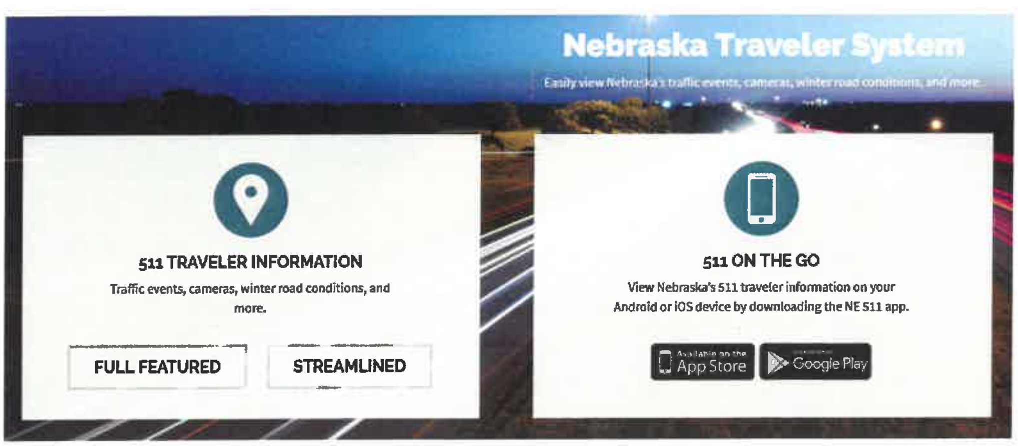
**Goals and Objectives:** To replace an inconsistent, legacy, and costly 511 platform with a new, streamlined, modern, and cost-effective integrated system.

**Solution:** Castle Rock provided a full-suite 511 solution that includes the following services and capabilities:

- 511 phone
- 511 web
- 511 mobile app
- Text/email notifications
- Road-condition reporting system

**Project highlights include the following:**

- Rapid migration of legacy platform to CARS-based 511
- Fast, effective operator training
- Modernization of 511 platform
- Dramatic increase in 511 platform usage



# Indiana DOT 511 Traveler Information System


**CLIENT**
Indiana Department of Transportation
**LOCATION**
Indianapolis, IN
**DURATION**
10 years
**PROJECT MANAGER**
Ed Cox, PE, Managing Engineer
ECox@indot.in.gov

**Project highlights include the following:**

- GIS ESRI roads and highways integration
- Truckers reports – OS/OW restrictions

**Summary:** Castle Rock was selected by Indiana DOT to deploy CARS as the system of record for providing event, construction, and winter-driving-condition information statewide to establish its 511 service.

In Indiana, CARS is also the system of record for size/weight restrictions statewide, feeding data into Indiana's oversized/overweight permitting system.

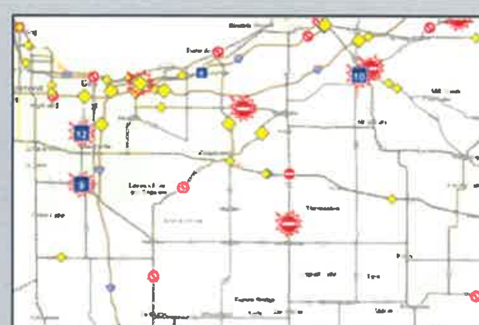
INDOT funded an effort with Castle Rock called CARS-GIS, in which Castle Rock built an importer that brings updates from INDOT's ESRI Roads and Highways system into the CARS location database.

**Goals and Objectives:** To establish a statewide 511 traveler information platform.

**Solution:** Castle Rock provided a full-suite 511 solution that includes the following services and capabilities:

- 511 phone
- 511 web
- Road-condition reporting system

**CARS 511**



The INDOT CARS Program contains information about road conditions, closures and width/weight restrictions. The interactive map provides information to motorists drive safely and efficiently.

# Idaho DOT 511 Traveler Information System

**CLIENT**
Idaho Department of Transportation
**LOCATION**
Boise, ID
**DURATION**
12 years
**PROJECT MANAGER**
Tony Ernest, Traveler Services Coordinator
Tony.Ernest@itd.idaho.gov

**Summary:** Castle Rock is the ATIS vendor for the Idaho Transportation Department (ITD). ATIS services are provided by 511 IVR/phone, website (511.idaho.gov), downloadable mobile app, and social media (https://twitter.com/statewideid511 plus a feed for each county). Personalized 511 is also included.

Idaho uses Castle Rock's CARS for its event, roadwork, restriction, AMBER Alert, and winter road-condition data entry. RWIS, cameras, and DMS are also integrated.

**Goals and Objectives:** To provide an innovative, reliable, and consistent 511 platform statewide.

**Solution:** Castle Rock provided a full-suite 511 solution that includes the following services and capabilities:

- 511 phone
- 511 web
- 511 mobile app
- Text/email notifications
- Social media
- Road-condition reporting system
- Snow-plow integration
- Rest areas and parking

**Project highlights include the following:**

- 511 user onboarding for mobile app
- NWS integrations (warnings and forecasts)
- Road-condition reporting (web and mobile app)
- Specialist truckers website and app with restrictions, ramps, spring breakup, weigh stations

# Colorado DOT 511 Traveler Information System

**CLIENT**
Colorado Department of Transportation
**LOCATION**
Golden, CO
**DURATION**
2 years
**PROJECT MANAGER**
Rob Bruening, ITS Project Manager
rob.bruening@state.co.us

**Summary:** In 2017, the Colorado DOT (CDOT) selected Castle Rock to replace its legacy 511 IVR and travel alerts email and text notification system.

Castle Rock migrated CDOT's legacy travel alerting system to the CARS platform to allow for flexible, personalized alerts as well as significant cost savings for SMS/text delivery. Castle Rock's work included migrating 35,000 existing GovDelivery subscribers to Castle Rock's CARS platform, mapping their "topic subscriptions" to individualized travel alert profiles, ensuring a smooth and seamless transition.

Castle Rock is also migrating CDOT's legacy 511 IVR to an automated, CARS-based one.

Colorado's operational use of CARS is very similar to the one proposed for WVDOT. All real-time data is managed through an ATMS importer that Castle Rock built, which pulls data from its ATMS (called CTMS) into CARS to support TlaaS.

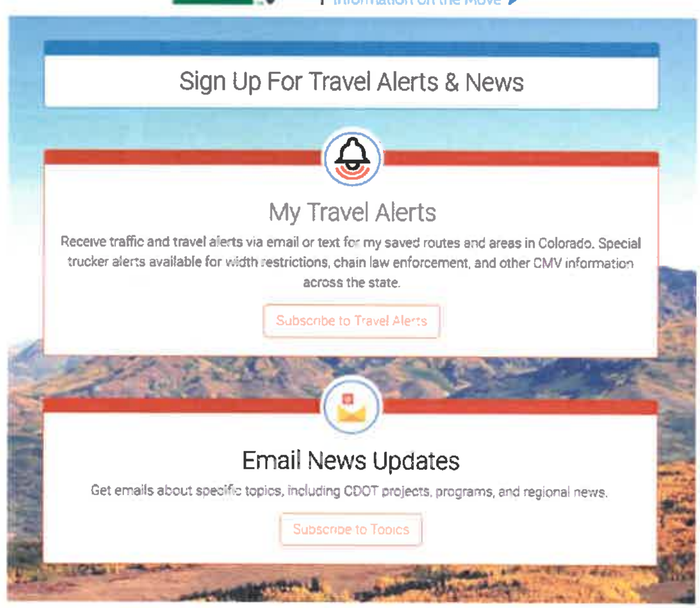
**Goals and Objectives:** To update the state's existing 511 IVR and travel-alert systems in order to improve operational efficiencies and reduce operating costs.

**Solution:** Castle Rock provided a full suite 511 solution that includes the following services and capabilities:

- 511 phone
- Migration of more than 30,000 accounts from the legacy text/email system to the CARS-based one
- Seamless transition of existing subscriber accounts to new CARS system
- Seamless transition of legacy 511 IVR to the new CARS-based one

**Project highlights include the following:**

- Migration of legacy platform with large numbers of users to CARS
- Automation of data-entry practices for 511 IVR and public text messaging
- Customized notifications for the public over text and email
- Notifications by custom area and custom commuter route on user-selected schedules
- High-volume messaging



# British Columbia Ministry of Transport and Infrastructure (MoTI) 511 Traveler Information System

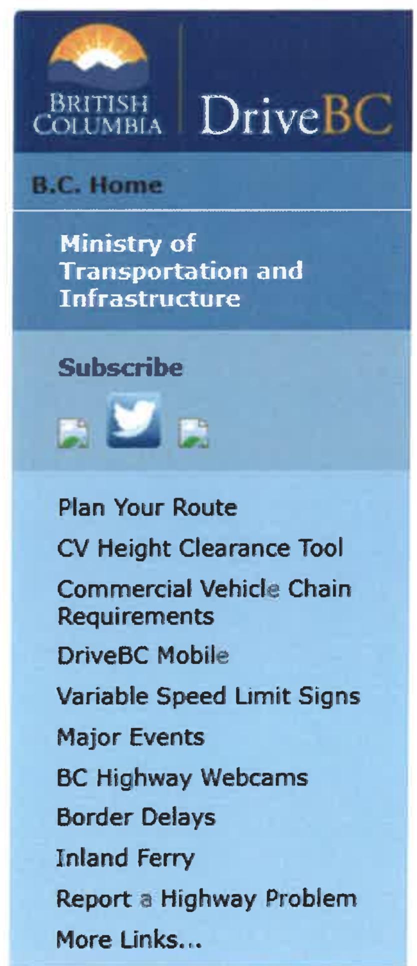
CLIENT
British Columbia Ministry of Transport and Infrastructure
LOCATION
Victoria, BC
DURATION
3 years
PROJECT MANAGER
Cynthia Kerwin, Director
cynthia.kerwin@gov.bc.ca

**Summary:** MoTI selected Castle Rock to build and deploy its DriveBC operator input tool. CARS is now the engine behind the province's 511 phone and web service.

**Goals and Objectives:** To replace a legacy road-condition–and event-reporting system with a new, web- and app-based interface. To provide data to third parties in an open interface.

**Solution:** Castle Rock provided a full-suite 511 solution that includes the following services and capabilities:

- 511 data entry
- 511 data services and APIs
- Social-media integration
- Road-condition reporting (winter conditions, spring restrictions)
- Third-party data feed




**Project highlights include the following:**

- Replacement of legacy system
- Road-condition reporting by web and mobile app
- Third-party data feed
- Mobile development

# 2. Project Goals and Mandatory Requirements (§ 4.2)

## 2.1 Approach and Methodology to Goals/Objectives (§ 4.2.1)

Requirement 4.2.1. Goals and Objective - The project goals and objectives are listed below.

This section of the RFP describes the approach that the Parsons team will use to meet these goals and objectives as well as the other system requirements detailed in the solicitation. Table 25 summarizes the three goals and how our team is ideal to meet or exceed these goals and objectives.

Table 25 – Meeting West Virginia's Goals and Objectives

| Goal #1 (§4.2.1.1) – Provide an Advanced Transportation Management System (ATMS), a 511 Traveler Information System, associated software development, and support services that will provide improved functionality to the West Virginia Department of Transportation for the purpose of managing the transportation system throughout the state and partnering with stakeholder agencies to improve emergency and event response and the overall transportation experience in West Virginia. |
|---|
| The Parsons team is renowned for having the most advanced ATMS and 511 solutions on the market today. Regarding ATMS, our delivery excellence and innovation has resulted in our receiving more than 50 different awards for ATMS deployments in the last 20 years, including 10 related to our iNET™ ATMS in the last 5 years. Key awards of note include the following:<br>• 2019 International Road Federation (IRF) Global Road Achievement Awards – Georgia DOT Northwest Corridor Reversible Lanes<br>• 2018 ITS America "Best of ITS Award" – Transportation Systems Operations<br>• US-23 Flex Route (Michigan Department of Transportation)<br>• 2018 ITS America Best of ITS Award – Transportation Systems Operations – US 23 Flex Route (Michigan DOT)<br>• 2017 ACEC – Engineering Excellence Honor Award – I-80 SMART Corridor ICM Project<br>• 2016 CTF – Operational Efficiency Program of the Year – San Diego I-15 ICMS<br>• 2015 ITE Project of the Year, SF Bay Area – I-80 ICM Project<br>• 2015 ITS America Best of ITS Award (Best New Product, Service, or Application) – Oregon DOT OR 217 Active Traffic Management<br>• 2015 InfoWeek Elite 100 Award – Parsons iNET™ ATMS<br>• 2015 CIO 100 Awards – Parsons iNET™ ATMS<br>• 2014 ITS America Best of ITS Award (Best New Innovative Practice) – Partnership Deployment – Mississippi River Bridges' Incident Management, Freight Movement, and Security ITS Project<br>• 2014 ITS America Best of ITS Award (Best New Innovative Practice) – Sustainability in Transportation – Michigan DOT Statewide AVL and MDSS Implementation |

Since 2018, Parsons has invested more than $6 million of R&D money into iNET™, all to provide more advanced functionality and technological improvements. West Virginia can take advantage of these enhancements along with the improvements of the many other iNET™ deployments worldwide.

Parsons' partner Castle Rock is widely recognized in the industry for providing the most innovative, human-centered, scalable 511 platform on the market. Castle Rock built its first 511 IVR system in 2002 and has since evolved its offerings to include coordinated 511 websites, mobile apps, and social media feeds.

The Castle Rock 511 platform will help West Virginia achieve its goals in the following ways:

- **A Coordinated, Consistent, Innovative 511 Platform** – Castle Rock has built all of the planks of its 511 platform—IVR, website, mobile app, social media—in house, with our on-site engineering team. We have made a point of presenting travel information across these channels in a clear, consistent, coordinated and inter-linking fashion. States that have used different vendors for different aspects of their 511 systems often wind up with an inconsistent, uncoordinated 511 presence.
- **A 511 Built for Winter** – Castle Rock provides comprehensive 511 services for many states that experience severe winters and other weather events. We have evolved our platform to get people the information they need over 511 during these events, at scale. In addition, we have built easy-to-use tools for DOTs to create winter road condition information updates at the pace demanded by the public.
- **Rural Expertise** – Our 511 systems get high usage in many largely rural states. We know we can't count on all users to have high-bandwidth Internet usage—or any internet or cellular coverage at all. We have taken care to design our systems so that all members of the public have access.
- **Connection to a 511 Peer Network** – Castle Rock brings all of its 511 state clients together in monthly phone calls and an annual meeting to share information, coordinate activities, review progress, and to keep the platform moving forward. Participation is optional, of course, but we would warmly welcome West Virginia's presence in the group.

**Goal #2 (§4.2.1.2) – Provide a seamless transition between the current operating environment and user experience to any new software or system version implemented so as not to disrupt transportation operations and management activities in WVDOT and partner agencies.**

Parsons and Castle Rock have successfully implemented numerous system transitions for some of the most complicated, large-scale ATMS and 511 systems in the world, including several statewide ATMS/511 solutions, Parsons successfully transitioned Atlanta, San Francisco, Oakland, Los Angeles, Chicago, San Diego, Portland, Toronto, Michigan, Louisiana, Alabama, Mississippi, San Jose, Washington, Macau, and Hong Kong. Castle Rock has migrated Nebraska, Colorado, Oregon, San Diego, and British Columbia away from legacy platforms onto a CARS-based one, always with the goal of making it as easy and effortless as possible for the agency.

The process by which the system will be transitioned will be described in detail in the SDTP. This document will analyze the systems to transition as well as the types and sources of data, interfaces, and communications. The plan will align with the agreed software releases and milestones, so that ATMS and 511 data is available to support the software development, deployment, testing, and acceptance for each milestone. Techniques and tools for automating the data migration will be discussed in the SDTP, so that existing tools can be reused, and new tools created as necessary.

**Goal #3 (§4.2.1.3) – Provide a cost-effective solution that meeting the needs of WVDOT and that has low, overall ongoing life-of-ownership costs for the term of the contract.**

The Parsons team's approach for the West Virginia ATMS and 511 systems is extremely cost-effective in terms of upfront costs as well as ongoing O&M costs for the following reasons:

- **Platform independent** – iNET™ is based on a J2EE architecture and can run on any platform that supports Java. Because iNET™ can be used in different environments, this requires less planning and provides the flexibility to install and maintain the application based on existing IT infrastructure.
- **Little to no third-party COTS software** – iNET™ is designed to require no third-party COTS software other than a database tool like MS SQL Server, Oracle, or MySQL. In many cases we can use free versions of these tools or we can leverage existing available licenses from WVDOT.
- **Open source** – Using IT open-source solutions allows for technology agility, customizability, community support, interoperability, and auditability. The iNET™ application server being based on open source also keeps the overall cost down, while ensuring quality based on thousands of developers and hundreds of production deployments that participate in the development and maintenance of the enterprise system.
- **Modularity** – As a modular application, when changes to one functional area are required, the other modules are not usually impacted. This allows for the flexibility of replacing, deleting, or upgrading one module in the system without impacting the entire system. One advantage of this approach is that it minimizes (or eliminates) disruption to production systems by removing the need for entire system restarts. Another advantage to the modular approach is that it minimizes the risks associated with system upgrades. For example, if only one module is enhanced, there is no risk to other modules during an upgrade. The third advantage to a modular approach is that if a module has a severe error and is not functional, only the features related to that module become unavailable; the rest of the system remains functional. If this should happen, an administrator can restart one module to restore functionality without disrupting the entire system.
- **Configurability** – iNET™ was designed to allow for customizations. The application is highly configurable, with the ability to turn on/off features through administrative interfaces. When modifications are made to the system or to individual features, these modifications are immediately available without a system restart. This flexibility allows for clients to make system modifications, add and remove features, and set thresholds and alarms without code changes or system restarts. Administrative user interfaces allow for dynamic system modifications without code changes or disruption to the production environment.
- **Leverage Group Buying Power for Google Maps and AWS Cloud** – Castle Rock's 511 platform is used by multiple states with very high-volume usage, especially during winter storms, floods, and other events. As a result, the usage of third-party tools such as the Google APIs for Maps and AWS cloud services are accessed at high-volume discounts, which are passed along to the agencies. By partnering with other CARS states, West Virginia will be the recipient of these high-volume discounts, which it would not get on its own, given its usage footprint.
- **Cost-optimized cloud architecture** – 511 usage fluctuates steeply, depending on what's going on in the region. Castle Rock has optimized its 511 hosting platform to *scale out and scale back automatically* on the AWS cloud. This allows us to keep costs down for DOTs, while also *always being able to perform and respond when 511 usage strikes*. No busy signals, no 511 gateway errors, and no slow-performing websites when major events occur and people look to 511 for information.
- **No-bursting IVR Costs** – Unlike other IVR platforms, Castle Rock's 511 phone system is built on a distributed platform with an virtually unlimited use of simultaneous phone ports. There are no bursting costs for our phone system—whether the platform answers 50 calls at once or 5,000, the per-minute call fees are the same.

## 2.2 Approach and Methodology to Compliance with Mandatory Project Requirements (§ 4.2.2)

**Requirement 4.2.2. Mandatory Project Requirements -** The following mandatory requirements relate to the goals and objectives and must be met by the Vendor as a part of its submitted proposal. Vendor should describe how it will comply with the mandatory requirements and include any areas where its proposed solution exceeds the mandatory requirement. Failure to comply with mandatory requirements will lead to disqualification, but the approach/methodology that the vendor uses to comply, and areas where the mandatory requirements are exceeded, will be included in technical scores where appropriate. The mandatory project requirements are listed below.

The Parsons Team ATMS solution currently meets 99.3% of the system requirements identified in the RFP, to include the majority of the desired system requirements. The remainder of the requirements will require some level of customization and testing in the current iNET™ ATMS solution. Table 26 depicts the requirements groupings.

**Table 26 – West Virginia ATMS and 511 Platform Requirements Met by the Parsons Team**

| Requirement Category | Total Requirements | Total Met by Parsons Team | % Met Today | % Met at Completion |
|---|---|---|---|---|
| General System Requirements | 6 | 6 | 100.0% | 100.0% |
| Traffic Display Maps GUI | 20 | 20 | 100.0% | 100.0% |
| Device Control – Dynamic Message Sign | 38 | 37 | 97.4% | 100.0% |
| Device Control – CCTV/Camera | 35 | 34 | 97.1% | 100.0% |
| Device Control – RWIS | 14 | 14 | 100.0% | 100.0% |
| Event/Incident Management & Reporting | 61 | 61 | 100.0% | 100.0% |
| Traveler Information | 55 | 55 | 100.0% | 100.0% |
| Integration with Other Systems | 15 | 14 | 93.8% | 100.0% |
| Operator and User Features | 64 | 64 | 100.0% | 100.0% |
| Data Collecting and Archiving | 38 | 38 | 100% | 100.0% |
| Log Reports System Reports | 14 | 14 | 100.0% | 100.0% |
| Security and Administration | 19 | 19 | 100.0% | 100.0% |
| Performance | 21 | 21 | 100.0% | 100.0% |
| **Totals** | **400** | **397** | **99.3%** | **100.0%** |

Parsons has deployed the vast majority of the requirements listed in the West Virginia ATMS and 511 Platform RFP for the 50+ ATMS solutions we have installed over the past two decades. In many cases, we have deployed them for as many as 70+ ATMS solutions. The strength of Parsons' ITS sector lies in its ATMS deployments, especially for freeway and highway management systems, and it is the reason we have received 40 prominent awards for our ATMS implementations.

The Parsons team has met or implemented the majority of the West Virginia DOT's ATMS and 511 Platform for 50+ other ATMS solutions installed by Parsons. In many cases, we have deployed them for as many as 70+ ATMS solutions.

## 2.2.1 General System Requirements

This section describes the Requirements in more detail our ability to meet the requirements. The requirements that are currently met either Out-the-Box or through System Configuration, contain a description and a screen shot is provided to graphically demonstrate the requirement(s) in the iNET™ ATMS Solution. For those requirements that need development or customization, a description of our approach is included.

*REQUIREMENT 4.5.1.1: The ATMs solution shall be compatible with State of West Virginia software standards and security policies. The ATMS Solution shall be compatible with Microsoft products and State of West Virginia's acceptable user policy. Here's the link for those policies: West Virginia IT Policies: https://technology.wv.gov/security/Pages/policies-issued-by-the-cto.aspx*
*Security Policy: ttps://technology.wv.gov/SiteCollectionDocuments/Policies%20Issued%20by%2 0the%20CTO/2017/PO1001_Security_Sept2017.pdf*

Parsons has reviewed PO1001_Security_Sept2017.pdf. Our deployment will be compatible with the State of West Virginia software standards and security policies. Parsons deploys iNET™ and supporting systems with audit logging, code-protection (antivirus, HIDS etc.) and follows a secure development life cycle to ensure security of systems. Parsons will work with WV IT to address any findings from West Virginia IT groups regular security scans.

*REQUIREMENT 4.5.1.2: Functionality of the proposed ATMS and 511 software and systems must be equivalent to or exceed the current functionality as described in the Background and Current Operating Environment Document and in any specific answers to questions submitted to WVDOT through this RFP process.*

The Parsons team's proposed ATMS and 511 software and systems will meet and exceed the current functionality described in the Background and Current Operating Environment Document and will also satisfy many of the Future ATMS Functionality Desired described in the RFP. Our ATMS offering has 34 modules, many of which are not required to meet the West Virginia system requirements, but can be provided and integrated now or in the future. Specifics of how we will meet and exceed requirements is described in the sections below.

*REQUIREMENT 4.5.1.3:The ATMS Vendor is required to maintain connectivity and key data transfer functionality, during any new or upgraded ATMS software and 511 system installations, between the WVDOT TMC located in Charleston, WV and the remote users and offices that provide information to and/or receive information from the TMC and associated ATMS and 511 software and systems. This includes the current E-911 centers located across the state that provides incident data directly to the ATMS platform and the event/incident window.*

Throughout the implementation and upgrade to the new ATMS and 511 platform, the Parsons team will maintain all connectivity and data transfer functionality between the ATMS software and 511 installations between the WVDOT TMC in Charleston, WV and remote users and offices that provide data to/from the TMC and associated ATMS and 511 systems. This includes connections to the E-911 centers throughout the state. We will develop a system transition and migration plan that ensures this connectivity.

*REQUIREMENT 4.5.1.4: The Vendor must provide a non-revocable and perpetual license to the WVDOT and its current in-state partner agencies for the use of the ATMS software and its associated systems.*

Parsons will provide a non-revocable and perpetual license to the WVDOT and its current in-state partner agencies for the use of the ATMS software and its associated systems. WVDOT may continue to use the ATMS software after the term of the contract has expired. With the multiagency iNET™ license that we are offering, there is no limit on the number of West Virginia transportation agencies that can use this license (at no additional cost), nor is there a limit to the number of servers that it can be installed upon or the number of users and devices that can be accessed.

With the multiagency iNET™ license that we are offering, there is no limit on the number of West Virginia transportation agencies that can use this license (at no additional cost), nor is there a limit to the number of servers that it can be installed upon or the number of users and devices that can be accessed.

*REQUIREMENT 4.5.1.5: The ATMS Vendor will be required to develop agreements with third-party data providers, software providers, or other system providers required to make the ATMS functional.*

Interfacing with external or third-party systems allows ATMS operations to have better situational awareness in the region and improve the ability to track and manage events, traffic congestion, weather, arterial signal timing, and other ITS field infrastructure. We will execute all of the necessary third-party agreement to make this project a success.

To interface with a new third-party system, a custom Center-to-Center (C2C) interface can be created within iNET™. Because of the modular architecture of iNET™, the C2C interfaces are standalone applications that do not rely upon the core modules. The custom C2C Interface connects to the third-party system, accesses and processes the data, and then places the information on the internal message bus within iNET™. New interfaces do not require code changes to the core module code base. Once the data is placed on the internal message bus, the data is available to the map and user interface (UI) viewers and is also archived/available for reporting. The data is available for use by all modules within iNET™ for additional processing when necessary. System configuration properties can be modified to control access endpoints to third-party systems, frequency of data exchange, as well as how and if the data is used within the ATMS.

Advantages to iNET™ Third-Party Interfaces:

- **iNET™ already has a multitude of third-party interfaces including INRIX, HERE, Verizon, Waze, Google, WebEOC, CAD, PeMS, weather feeds, etc.**
- **Standalone Applications make development quicker.**
- **Modular architecture means no code changes to core modules to support most new interfaces.**
- **Data from third-party systems is automatically available to all ATMS modules for processing, archival and algorithms where applicable.**

## THIRD-PARTY DATA SERVICES

Parsons has already integrated to third-party traffic data services including ingesting data from systems to include INRIX, WAZE, HERE and Verizon. As an example of this integration, See figure below for data integration with National Weather Service and HERE.

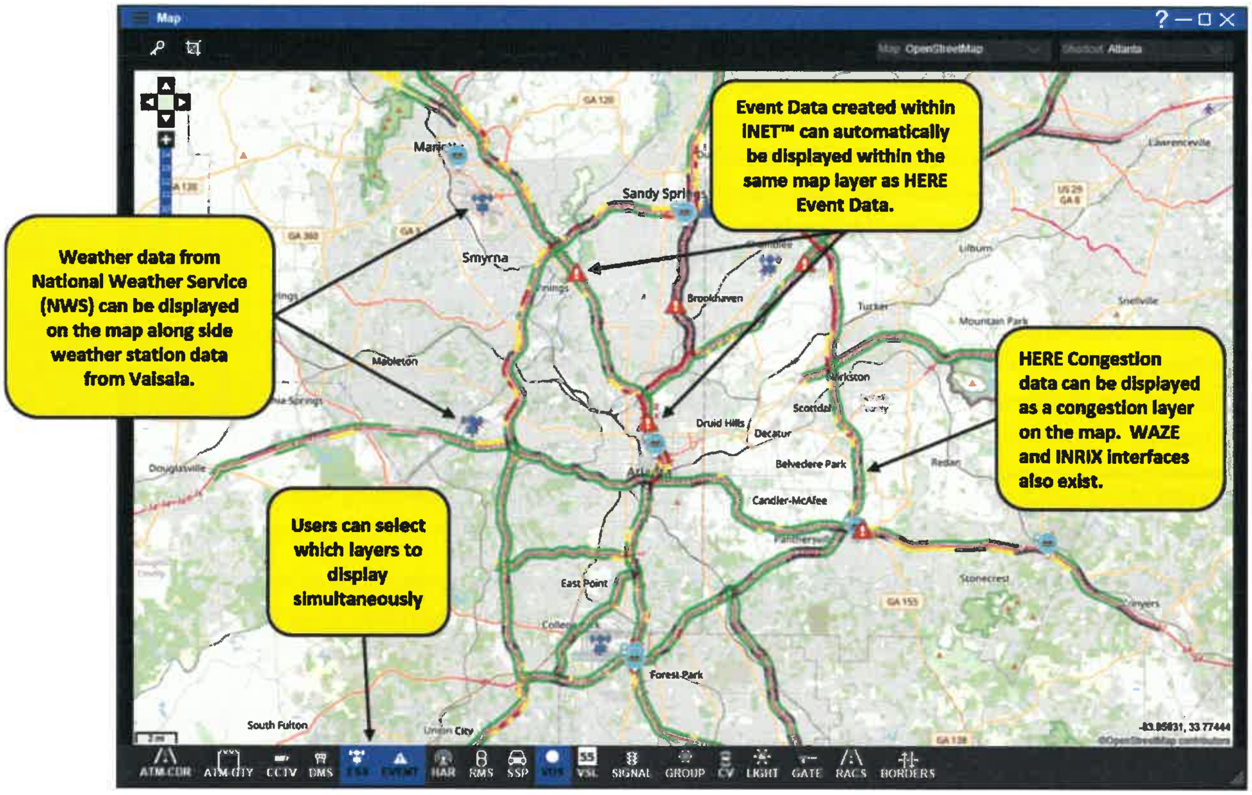



Figure 67 – Integrated Data from the National Weather Service and HERE

The iNET™ ATMS will be extended to include an interface to share data back to third-party software for WAZE, TomTom and INRIX for both congestion and event data.

## CAD INTERFACES

iNET™ includes interfaces to various CAD systems including *New World* and *Central Square* allowing ATMS operators to view and manage event data from local and state law enforcement agencies. The interfaces to the CAD systems are C2C standalone processes that run within the ATMS application. A system poller is created that allows Administrators to define the frequency of the interface updates between ATMS and the CAD system. The interface can be "read only" or implemented as a two-way interface. For installations that are FBI *Weapons Integrated* we will setup a secure one-way interface and work with our cybersecurity experts alongside West Virginia State Police to gain approvals on the deployment architectures.

When events are received from the CAD system, a system alert appears in the operator alert UI. The operator with security access privileges is given the option to view the event, and/or create a corresponding event, within the ATMS. This can be done with a single mouse click and all relevant and necessary event information will be created within the ATMS. Figure 68 shows where Alerts from third-party systems would appear.

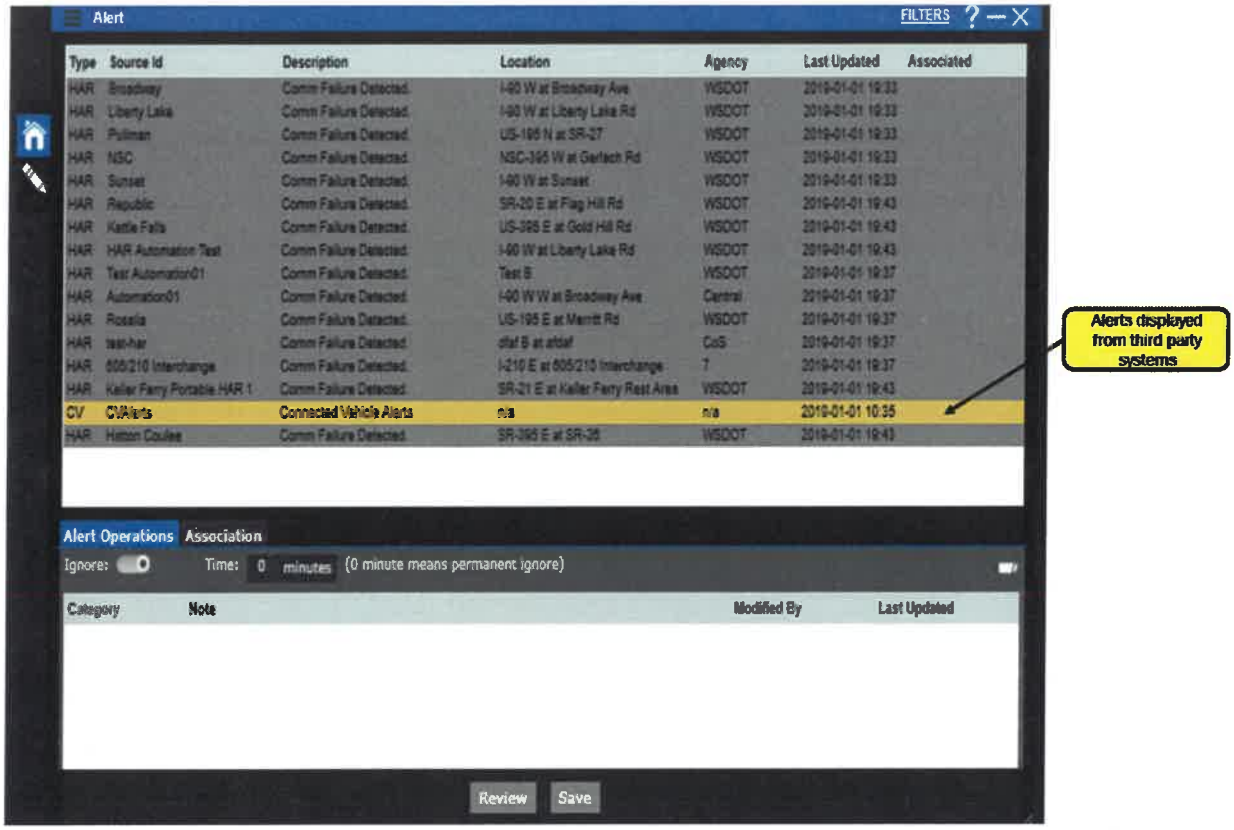



Figure 68 – Alerts Displayed from third-party Systems

The CAD event is treated as any other ATMS created event and appears on the Event Map layer, the system List UI, and has an associated Event Details UI. Events in the ATMS can be displayed and sorted by date/time or by location using the UI filtering option. Figure 69 shows a list of events integrated from other systems.

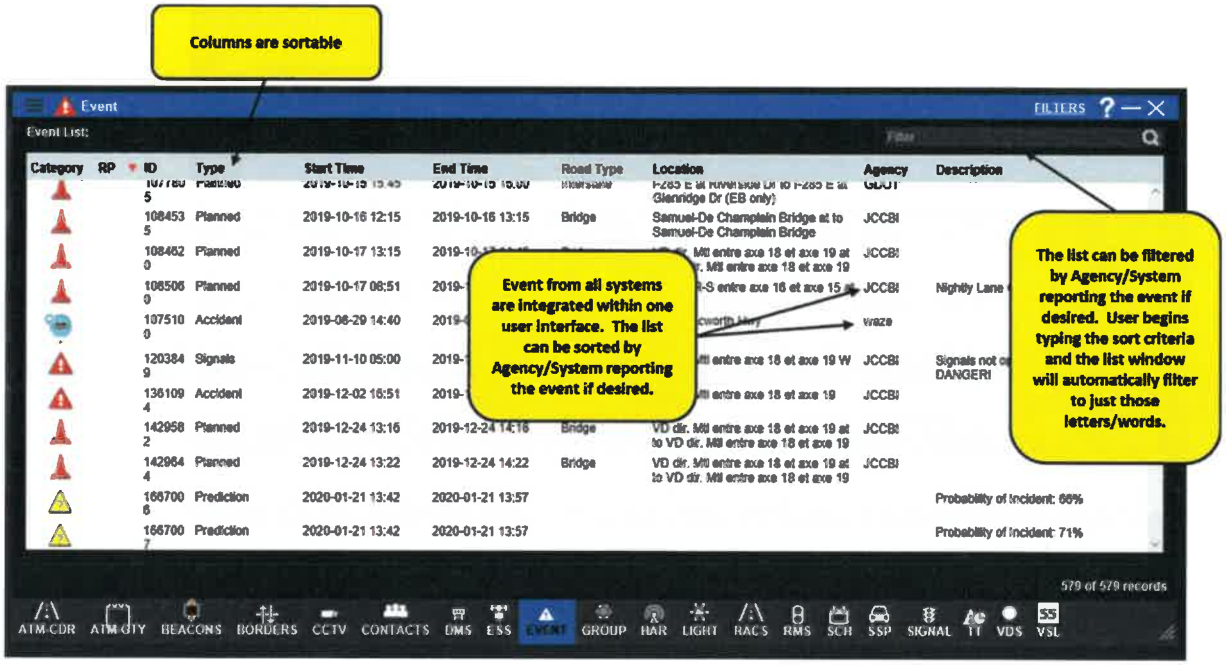



Figure 69 – Integration with other Systems

## WEATHER DATA INTERFACES

iNET™ supports interfaces to several weather data sources including Vaisala, WeatherBug, and National Weather Service. Once the data is brought into the ATMS, it is integrated within the map, UI, and List viewers allowing operators with approved access to view and manage weather data from different sources. Figure 70 displays information from the National Weather Service.


Figure 70 – Integration with National Weather Service

*REQUIREMENT 4.5.1.6: A copy of all manuals, diagrams, design documents, requirements documents, testing documentation, training materials, change configuration documentation, upgrades and other material associated with the ATMS software and all associated connections shall be provided to the WVDOT at Final Acceptance and as necessary through the term of the contract.*

All documentation which includes manuals, diagrams, design and requirements documents, testing and training documents, change configuration documents, and other materials associated with the ATMS software will be provided to WVDOT as the schedule dictates throughout the term of the contract. In addition, Parsons will host a SharePoint site where all documentation deliverables will be managed. We can also make all of these documents accessible via the ATMS application itself.

## 2.2.2 Traffic Display Maps/GUI

*REQUIREMENT 4.6.1.1: The ATMS shall display responder information tied to appropriate highway segment on the TMC operator GUI/traffic conditions map.*

Our system currently shows responder information on the user interface which includes the location for service patrol vehicles and tow truck operators, as examples. The figure below reflects how mapping layers and responder zones are configured and reflected on the user interface. This figure represents how towing responder zoned are displayed.

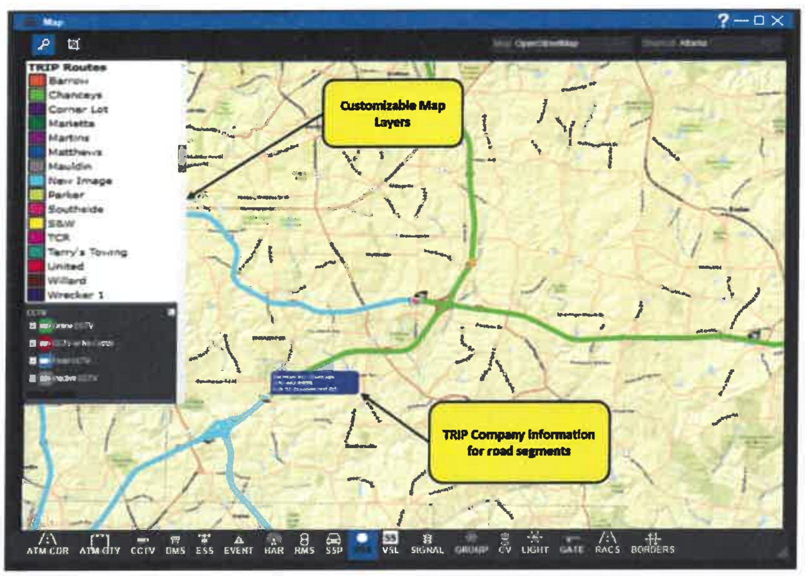



Figure 71 - Custom Map Layers

The iNET™ ATMS Map module is designed to support the addition of custom map layers that may be used for a variety of traffic management functions. iNET™ allows custom layers to be added as necessary. In the example in Figure 71, we have a layer of information which includes emergency responder information, such as the contact information for the company responsible for a segment of roadway.

We will meet and exceed the six (6) requirements noted below through the implementation of our iNET™ Map Module. See detailed explanation on how our map module meets or exceeds these requirements below.

*REQUIREMENT 4.6.1.2: The ATMS shall support an interactive base map for displaying the ITS devices statewide.*

*REQUIREMENT 4.6.2.2: The ATMS map should display all major freeways and streets with graphical representation for each roadway classification.*

*REQUIREMENT 4.13.1.7: The ATMS user interface shall include map display for both local and remote workstations.*

*REQUIREMENT 4.13.2.6: Flow maps displayed on the ATMS user interface should integrate freeway and arterial conditions on one common map display.*

*REQUIREMENT 4.6.1.3: The ATMS map shall support pan and zoom capabilities throughout the State of West Virginia and into adjoining states.*

*REQUIREMENT 4.13.1.8: User interface maps shall be GIS based to enable smooth and continuous scrolling and zooming.*

> Users are able to select from multiple map types and display configuration sinclude aerial maps, terrain, 2D mapping or 3D mapping They can select from different map sources such as Google, Bing, ESRI, OpenStreets or DM Solutions

The requirements above will be met through the installation of our iNET™ Map module. iNET™ can support different map types which are user selectable. Map selection types include Bing, ESRI, Google, OpenStreets, DM Solutions or other GIS sources that may be desired. The map is GIS-based using standard GIS files to render a to-scale map. The map can be accessed locally or through a remote session. The various maps can be accessed from the map shortcut drop-down menu. Map shortcuts (or bookmarks) can also be configured to focus on a roadway, corridor, or region. Users with permission can add, name, delete, and rename the bookmarks.

Commonly used predefined map regions will be provided. These maps all use consistent graphics and icons to label the major interstates and arterials and to depict other information, such as lakes and mountains.

iNET™ has a main map window which features multiple mechanisms for pan and zoom. Panning the map is simply achieved by click and drag using the mouse and by way of the pan tool (arrows) in the upper left. In addition to the pan and zoom tool on the upper left of the window, a user can double click on any location on the map and the map will zoom in and center on that location. The scroll wheel on the mouse also allows for zooming in and out. A zoom rectangle allows the user to draw a rectangle on the map and it will pan and zoom to that location. See figure below for example screen shot representing our mapping functions.

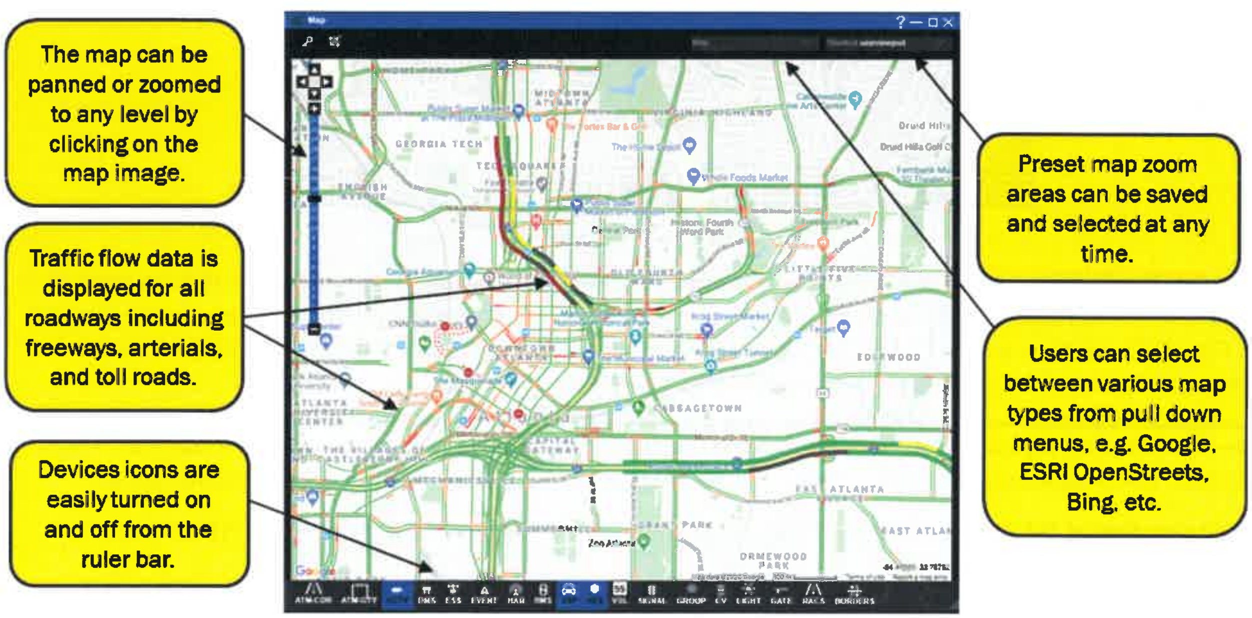
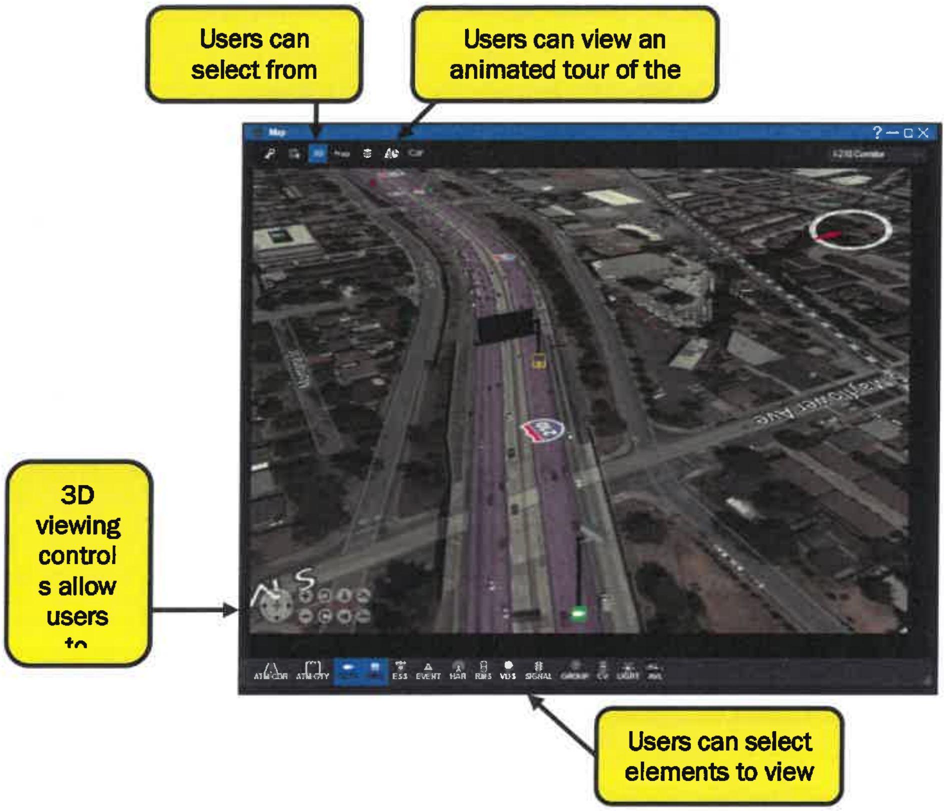



Figure 72 – Base Map with Freeway and Arterial Flow Data

In addition to meeting the requirements, iNET™ offers the ability to view a 3D map. Each user is able to select from 2D or 3D, whichever is their preference, and save it in their profile. See figure below for 3D mapping view.




*REQUIREMENT 4.6.1.4: The ATMS shall display real-time traffic conditions using a standard color coding of green for uncongested conditions through yellow and amber for moderate congestion to red for high congestion on freeways and roadways shown on the map. Real-time latency shall be no more than 5 minutes.*

The iNET™ ATMS, supports display of both real-time and predicted traffic conditions. Our solution supports display of traditional speed thresholds with red, yellow and green segments and is updated typically every 30 seconds. The Administrator can also change the thresholds to customize the application.

The figure below is a representation of live region-wide traffic monitoring data within iNET. Users can view traffic conditions on a region-wide level or zoom to a specific detailed area. The color-coded segments represent the congestion level, e.g. red means gridlocked roads. Users can click on individual traffic monitoring sensors to received detailed lane-by-lane data, vehicle volumes, occupancies and vehicle classification information (car, truck, motorcycle, etc.)

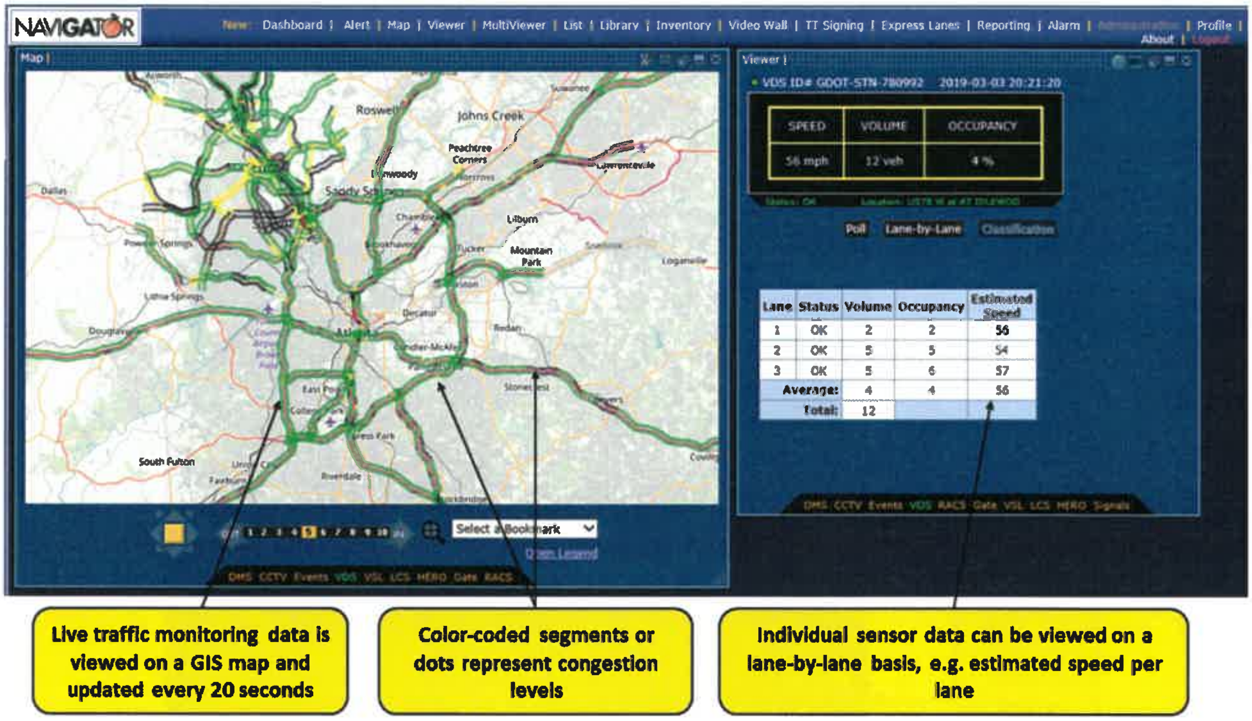



Figure 73 - iNET Traffic Monitoring - Real Time

The figure below is a representation of traffic monitoring prediction. Using analytic algorithms and machine learning, iNET™ can predict traffic congestion levels 15, 30, 45 and 60 minutes into the future. A feature that is particularly useful immediately after a major incident occurs.


Figure 74 - iNET Traffic Prediction

We will meet the three (3) map display requirements noted below through the implementation of our iNET™ Map Module and ITS device icon layering features. See detailed explanation on how we meet or exceed these requirements below.

*REQUIREMENT 4.6.1.5: The ATMS shall provide an icon for each type of ITS device identified as part of WVDOT ITS.*

*REQUIREMENT 4.6.1.6: The ATMS shall provide a layer for each type of ITS device identified as part of the WVDOT ITS.*

*REQUIREMENT 4.6.1.7: The ATMS map shall provide declutter features to provide appropriate number or size of icons as maps are zoomed in or out consistent with layer selection.*

The figure below represents the map and the features that are used display and to turn on and off device icon layers. Each ITS device icon layer can be turned on or off using the ruler bar at the bottom of the map or by clicking on the hide able legend bar. There are map decluttering features that can be set by device and there are also automatic map decluttering features.

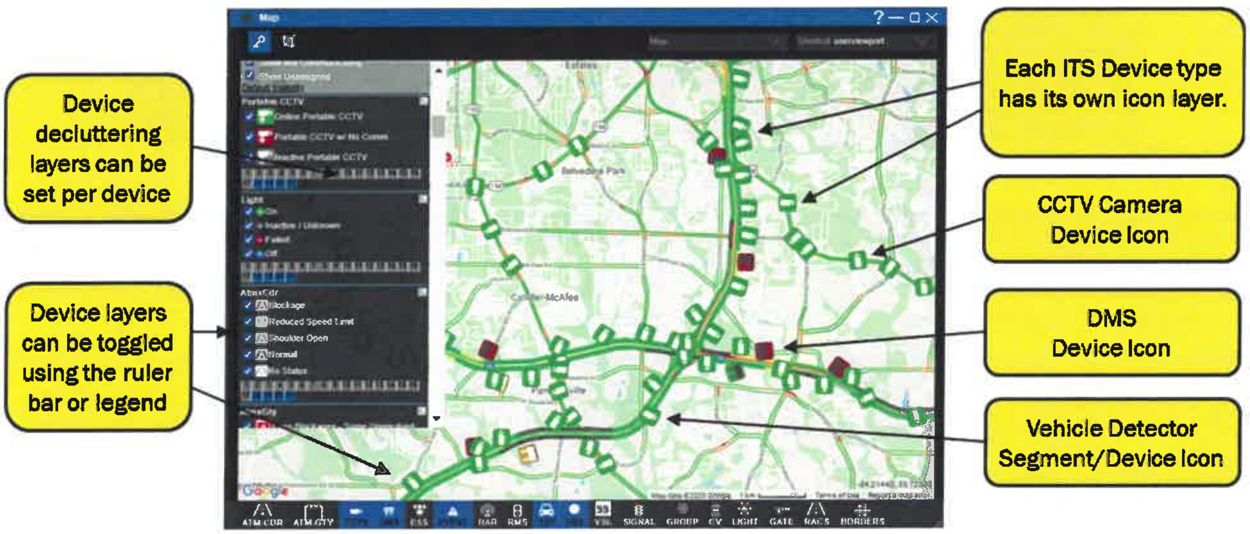



Figure 75 - ITS Device Icon Display

*REQUIREMENT 4.6.2.1: The ATMS should have the ability to integrate and share data with neighboring states including CCTV video.*

Since iNET™ is a web-based platform West Virginia DOT can coordinate with sister state agencies and provide them with a permissions-based account to log into iNET™ to share data and utilize CCTV assigned to the profile and access the data that is allowed by the assignment of profile permissions. We currently have multiple iNET™ deployments that allow and enable the sharing of video with multiple agencies simultaneously. iNET™ can consume video from multiple other agencies and can distribute video to other agencies by setting permissions to allow those other agencies to view and/or control those videos. The figure below represents an iNET™ multiviewer displaying video from multiple agencies simultaneously.


Figure 76 - Multiagency Video and Data Sharing

*REQUIREMENT 4.6.2.2: The ATMS map should display all major freeways and streets with graphical representation for each roadway classification.*

The response to this requirement was provided with the explanation of our map module above.

We will meet the eight (8) traffic measurement display requirements noted below through the implementation of our iNET™ Vehicle Detection System (VDS) Module. See detailed explanation on how we meet or exceed these requirements below.

*REQUIREMENT 4.6.2.3: The ATMS should allow user selection of type of traffic measurement for near real-time traffic condition display including speeds, volume, occupancy, and (optionally) a combined traffic metric.*

*REQUIREMENT 4.6.2.4: The ATMS should allow selection of numerical limits associated with each display color for each type of traffic measurement by a user with sufficient authorization. These parameters should be applied to all traffic condition map/GUI displays.*

*REQUIREMENT 4.6.2.8: The user interface map display should display icons representing locations of traffic data sensors connected to the ATMS.*

*REQUIREMENT 4.6.2.9: The user interface map should enable operators to select traffic data sensors to view the most recent data recorded from the sensor.*

*REQUIREMENT 4.6.2.10: The user interface map should enable operators to select traffic data sensors to view archived data recorded from the sensor within user defined parameters.*

*REQUIREMENT 4.6.2.11: The ATMS base map should show traffic speeds by lane or as an average across all lanes in each direction (station) at user option.*

*REQUIREMENT 4.6.2.12: The ATMS base map should show traffic volume by lane or as a total across all lanes in each direction (station) at user option.*

*REQUIREMENT 4.6.2.10: The user interface map should enable operators to select traffic data sensors to view archived data recorded from the sensor within user defined parameters.*

The requirements listed above will be met by through the implementation of our iNET™ Vehicle Detection System (VDS) Module. The VDS module will manage communication with VDS type field devices, pulling in volume, speed, and occupancy. Vehicle classification and diagnostics are supported if reported by the sensor type, e.g. microwave radar or video analytics sensors. This module will interface inductive loops, magnetometers, radar sensors, video image sensors, Bluetooth sensors, WiFi sensors, cellular probe data feeds and other real-time GPS data feeds (e.g. Inrix, Here, Verizon and Waze).

Key VDS Module capabilities will include:

- Support of full standard protocols (e.g. NTCIP 1209) and vendor proprietary protocols
- Support for any current in-pavement, non-intrusive, cell probe and GPS probe-based devices/interfaces that are used to detect roadway congestion levels
- A map congestion display using color-coded segments or color-coded points/dots
- Displays speed, volume, occupancy and vehicle classification
- Data views as station-level averages or lane-by-lane
- User configurable polling rates
- Speed threshold alarming
- VDS device failure alarms

The iNET™ map displays traffic data and roadway congestion as line segments or vehicle detection points with color-coded icons based on traffic conditions. A red segment indicates traffic congestion; a green segment depicts traffic is flowing. Numerical limits can be assigned to each color by a user with permissions. The map can be configured to display traffic speed, volume, occupancy, or congestion level. Figure 77 below demonstrates the speed flow congestion levels.

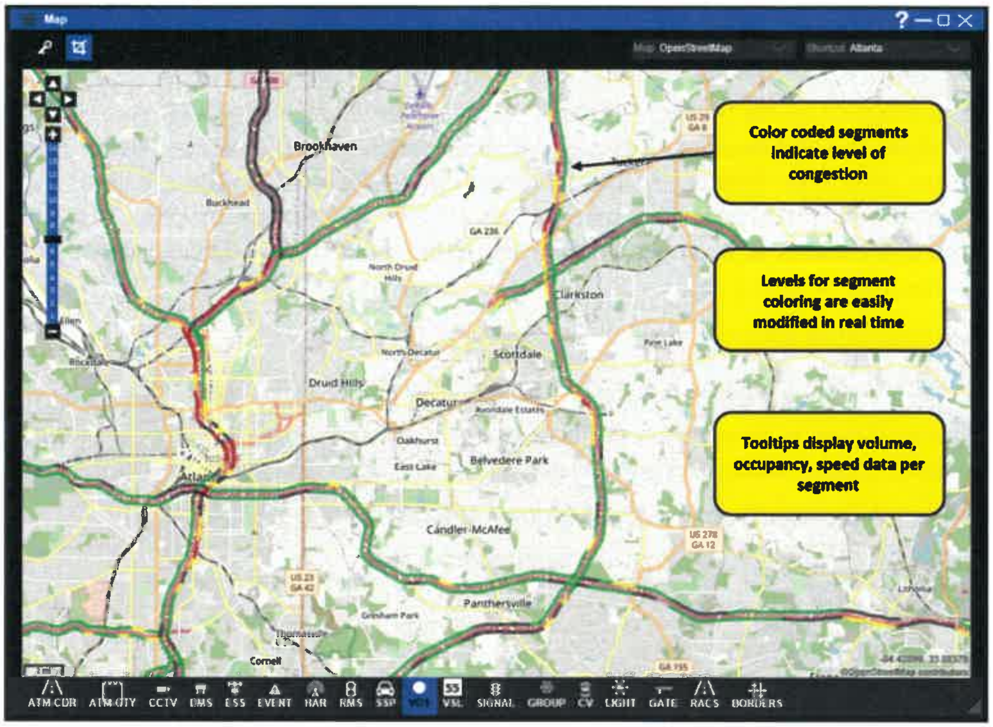



Figure 77 – Main map with Real Time Speed Data

The iNET™ ATMS map allows users to view and select individual traffic data sensors and pull up a view showing real-time data provided by the native sensor (e.g. volume, occupancy, speeds, and vehicle classification, if available). See figure below.

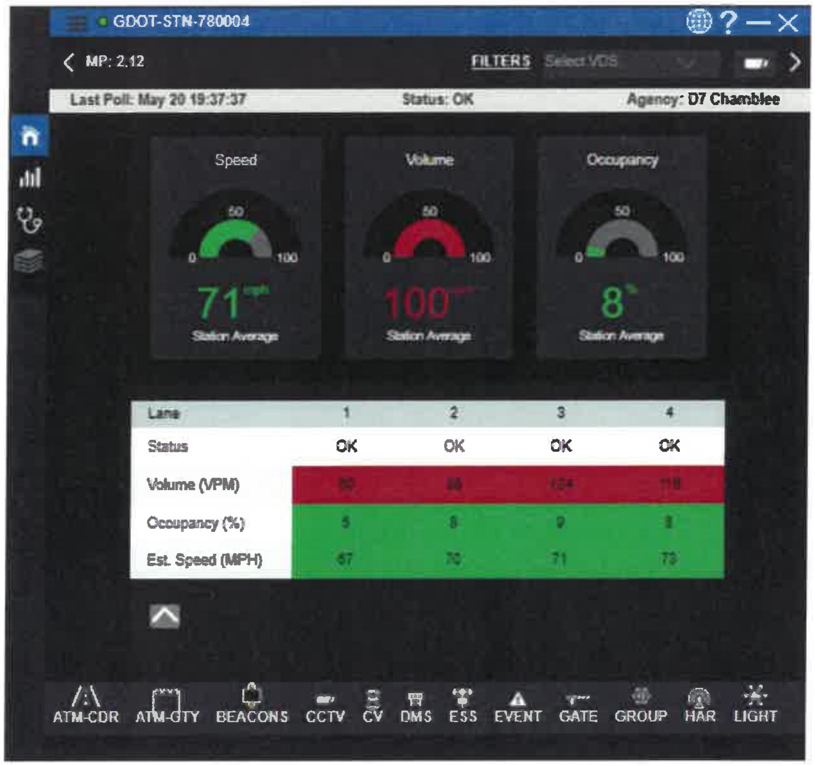



Figure 78 - Live VDS Data Viewer

The user interface display below represents how vehicle detection system data (Volume, Occupancy and Speed) can be viewed and adjusted.

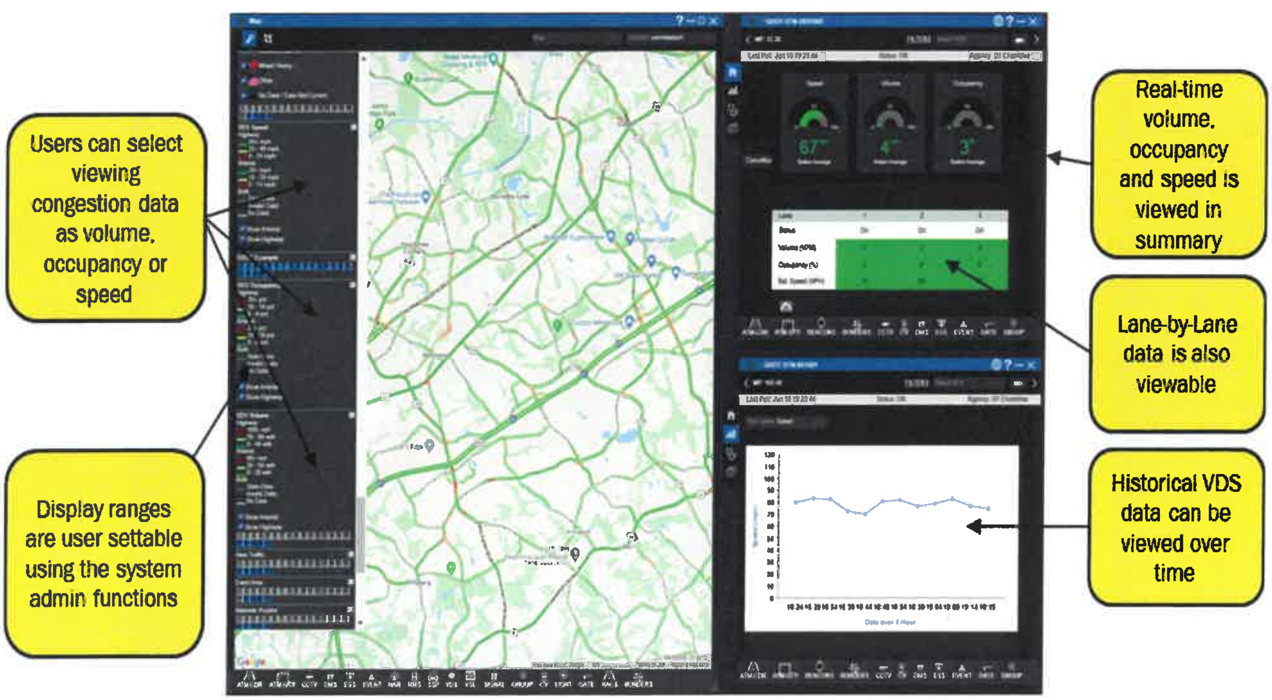



Figure 79 - Vehicle Detection Information Displays

*Requirement 4.6.2.5: The ATMS should depict summary device status using coloration of appropriate ITS device icon with the corresponding ITS field device.*

The figure to the right represents how each device icon is given various colors to represents its status, e.g. operational, available, failed, etc.

*REQUIREMENT 4.6.2.6: The ATMS should be able to display detailed device information appropriate to the individual type of device upon selection of an icon from the map/GUI.*

Each individual device type can be opened and detailed information can be displayed to represent all information on that device including its live data, device controls, inventory information and device diagnostics.

*Requirement 4.6.2.7: The ATMS base map should display neighboring states a minimum of 25 miles outside of state border or have the ability to pan to adjacent states.*

iNET™ Map module is not limited any one geographic location. By using third-party map data such as Google Maps, OpenStreet Maps, Bing, and others the iNET™ map module has the ability to view all surrounding states as well as the ability to pan to other states.

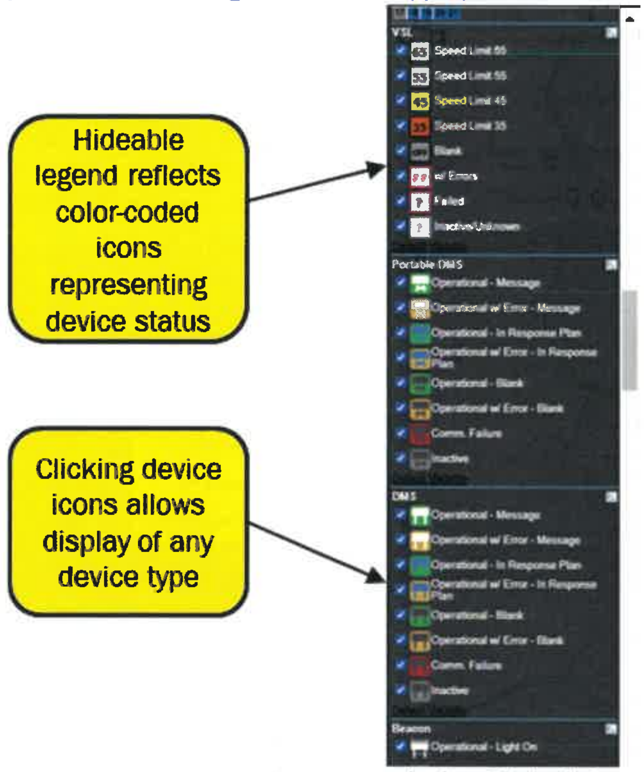



Figure 80 - Device Icon Display Legend

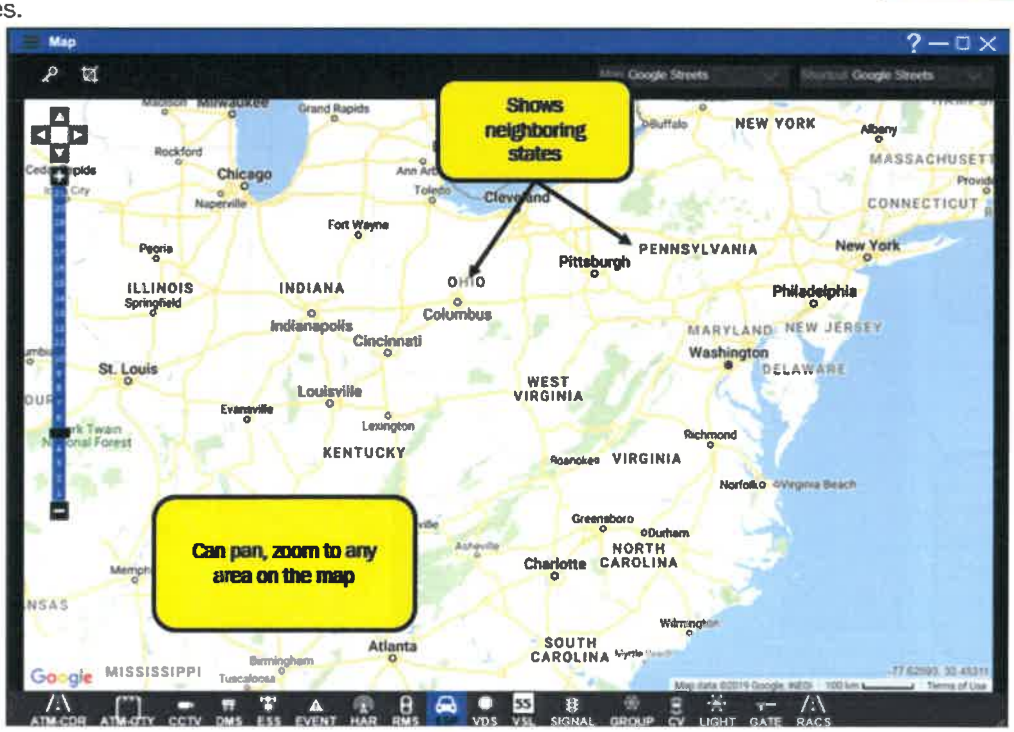



Figure 81 - West Virginia and Surrounding States

## 2.2.3 Device Controls-Dynamic Message Sign

We will meet the requirements listed below through the implementation of our iNET™ Dynamic Message Sign (DMS) Module. See detailed explanation on how we meet or exceed these requirements below.

*REQUIREMENT 4.7.1.1: The ATMS shall include and interface for Dynamic Message Sign (DMS) control and management.*

*REQUIREMENT 4.7.1.2: The ATMS shall communicate with each DMS connected to the ATMS to receive all parameters describing the DMS, as contained in NTCIP messages (as defined by NTCIP Object Definitions).*

*REQUIREMENT 4.7.1.3: The ATMS shall display the parameters for each DMS as received from the standardized NTCIP message. The ATMS will adapt entered text and message library text to fit the specific DMS configuration, unless restricted by size.*

*REQUIREMENT 4.7.1.4: The ATMS shall include the capability for operators to control the messages that are displayed on fixed and portable DMS connected to the ATMS.*

*REQUIREMENT 4.7.1.5: The ATMS shall include logic to manage multiple agencies and users who might simultaneously attempt to control a common DMS.*

*REQUIREMENT 4.7.1.7: If a conflict between requested messages arise, the owning agency will have priority.*

*REQUIREMENT 4.7.1.11: The ATMS shall provide a mechanism for authorized users to control the messages displayed on DMS from remote locations.*

The requirements listed above will be met through the deployment of the iNET™ DMS Module. The iNET™ DMS module provides a comprehensive set of features to monitor, manage, and control all of the dynamic message signs in the system. Parsons is considered an expert in in this area, having successfully integrated with many different vendors for more than 25 years. The locations of the signs, as well as access to the signs, are available directly from the system map. The color coding of the icons indicates the sign's current status, and icon tooltips are available for viewing the current message on the sign.

The control dialog (See figure below) enables users with the correct permissions to view the current status of the sign; view the current message; and generate, modify, and remove messages to be posted to the sign. These messages include color graphics and fonts. Time stamps are available for viewing the last poll time and when messages were posted to the sign. The system uses a locking feature to manage multiple parties trying to control a sign. The user holding the lock is identified by user ID on the Control dialog. Users with higher priority are the only ones who can override the locking feature of a lower-priority user.
Messages can be generated using free form text in the message editor box using alphanumeric text, punctuation symbols, and graphic images across multiple message phases, but will be limited to the sign's capabilities. The sign's capabilities, which include the number of phases, lines of text, and characters per line, are enforced by the system. Messages can be created using a character on just one line of text, and then sent to the DMS. A countdown of remaining characters is available. Horizontal and vertical justification features are available to format the message. In addition to the formatting, users can set or change the priority of a DMS message, the message duration, flash rate, and blank-out time. For signs with color graphics capability, users can set the font size, font color, image size and color, and brightness level. Messages can also be removed or terminated. Any actions taken on a sign by a user are logged for retrieval by the reporting feature.

At the heart of the DMS module is the DMS queue. Each DMS has its own message queue. While some slots in the message queue are system-driven, others, such as the Override queues, have configurable priority schemes. Users with permission can manipulate the position of the message on the Override queue, as well as remove messages from the queue. These messages can be sent to the sign immediately, or they can be scheduled using the date, time of day, day of week, or season. The system automatically replaces the posting of lower-priority messages with higher-priority messages and chooses the newest message should the priorities be equal. These messages are stored in their respective positions in the message queue until they are either removed or their scheduled duration expires. The system retains all the messages in all the DMS message queues should a restart be required, and the system resends the top-priority message to a sign when the status changes from inactive to operational.

**Benefits of iNET™ DMS Module:**

- Multiple ways to send a message to a group of DMS
- Color graphic messages can be sent to a group of DMS
- System confirms the sign configuration is able to post the desired message
- Users are notified if a message is not able to be posted to a sign
- The DMS library contains preconfigured messages, which have been previously spell checked and compared to the approved words list. Messages can easily be retrieved from the DMS library for quick access

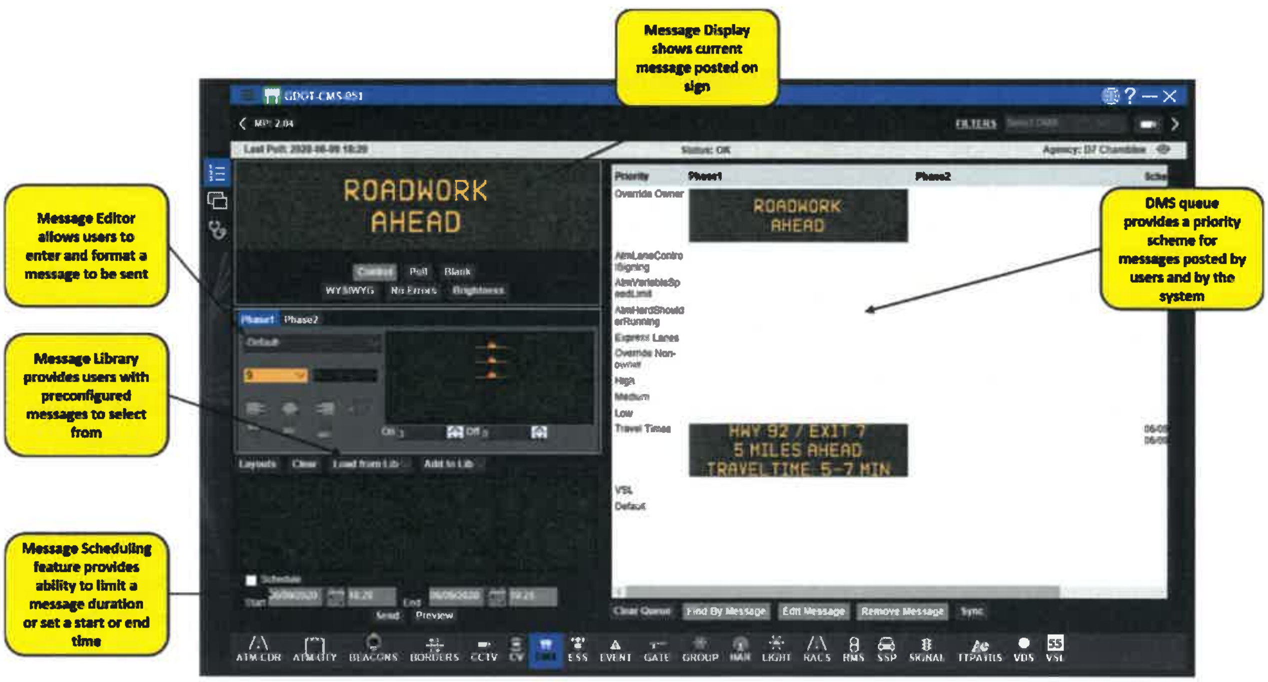



Figure 82 - DMS Viewer for Sign Control

*REQUIREMENT 4.7.1.6: DMS control shall be dependent on appropriate user permissions.*

iNET™ DMS module comes with several permissions (see figure below) for controlling the signs:

- DMS Diagnostics Use: allows a user to run diagnostics on the sign
- DMS Inventory Edit: allows a user to add, modify, or delete signs from the system
- DMS Library Edit: allows a user to add, modify, use, or delete messages contained in the message library
- DMS Library Use: allows a user to only use the messages in the library
- DMS Manual Control: allows a user to manually control the sign.


**Figure 83 – DMS Privileges**

*REQUIREMENT 4.7.1.8: If a conflict between requested messages arise and all conflicting requests are from the same agency, the system. will grant the request of the user with the highest priority.*

The Parsons iNET™ ATMS has a full priority queuing administrative feature that allows priorities of users/agencies to be assigned. iNET™ can be configured to support priority access for DMS. As an example, the following screen represents a configuration of CCTV priorities for various agencies/groups.

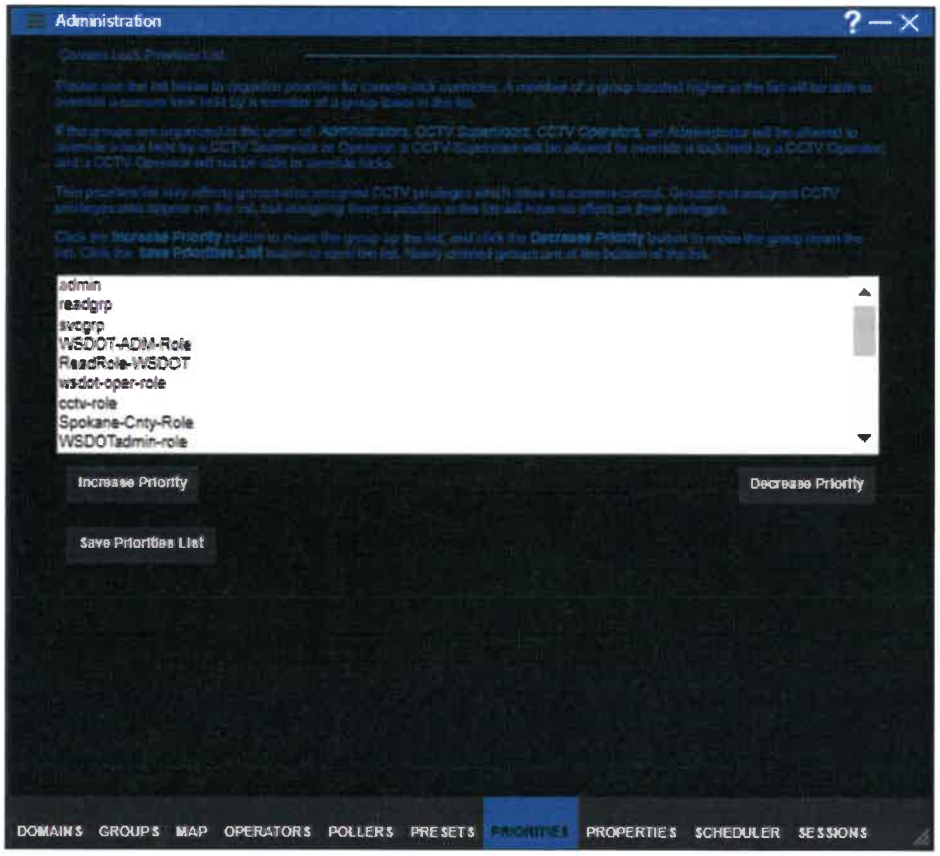



**Figure 84 - Device Priority Configuration**

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*REQUIREMENT 4.7.1.9: The ATMS shall have the capability to alert an operator with an agency that owns a DMS if another agency posts a message to the DMS.*

This requirement is fully met and demonstrated in the above Section for Device Controls – Dynamic Message Sign Mandatory Requirements.

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*REQUIREMENT 4.7.1.10: The ATMS shall have the capability to alert an operator who has posted a DMS message if another operator has overridden the message by posting another message.*

This requirement is fully met and demonstrated in the above Section for Device Controls – Dynamic Message Sign Mandatory Requirements.

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*REQUIREMENT 4.7.1.12: The ATMS shall include the capability for automated message creation.*

Through the Decision Support System (DSS) module, the system can automatically select which signs and which messages should go on those signs. The figure below represents the results from a system generated response plans reflecting this automated message creation functionality.

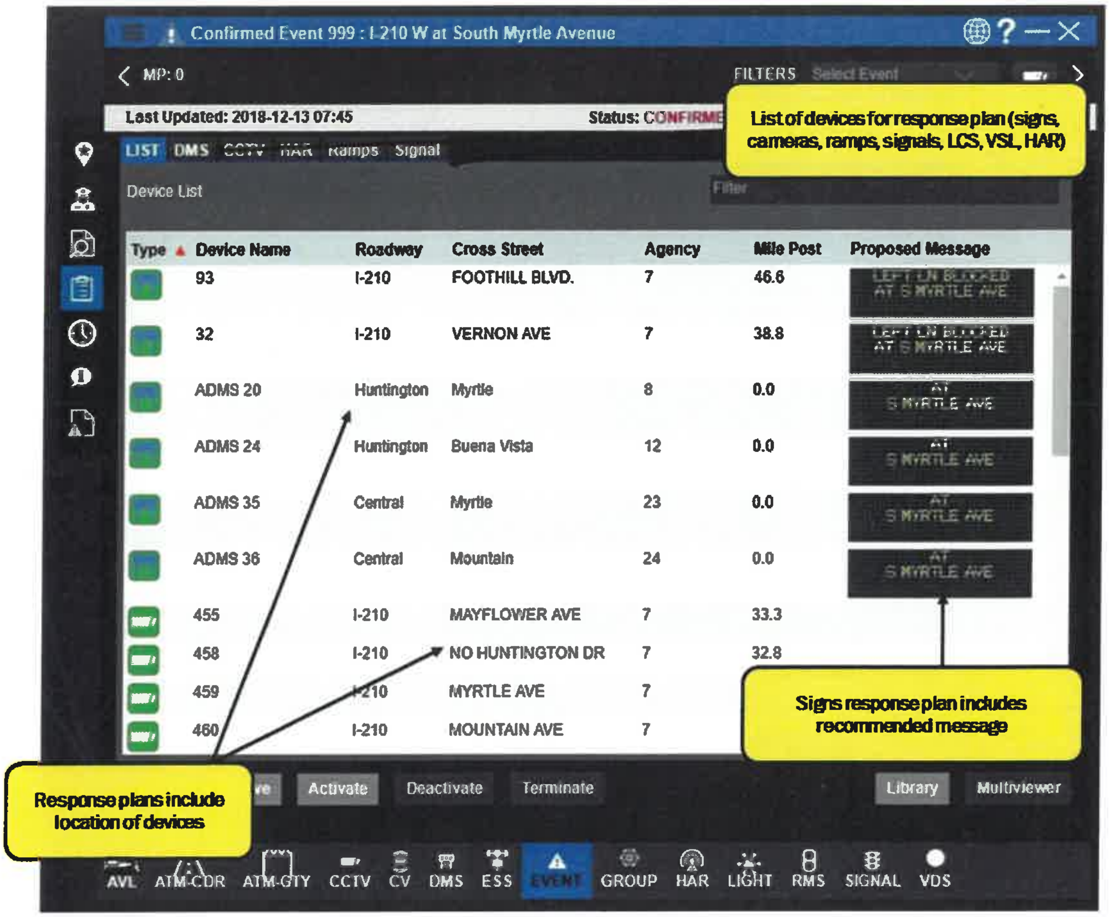
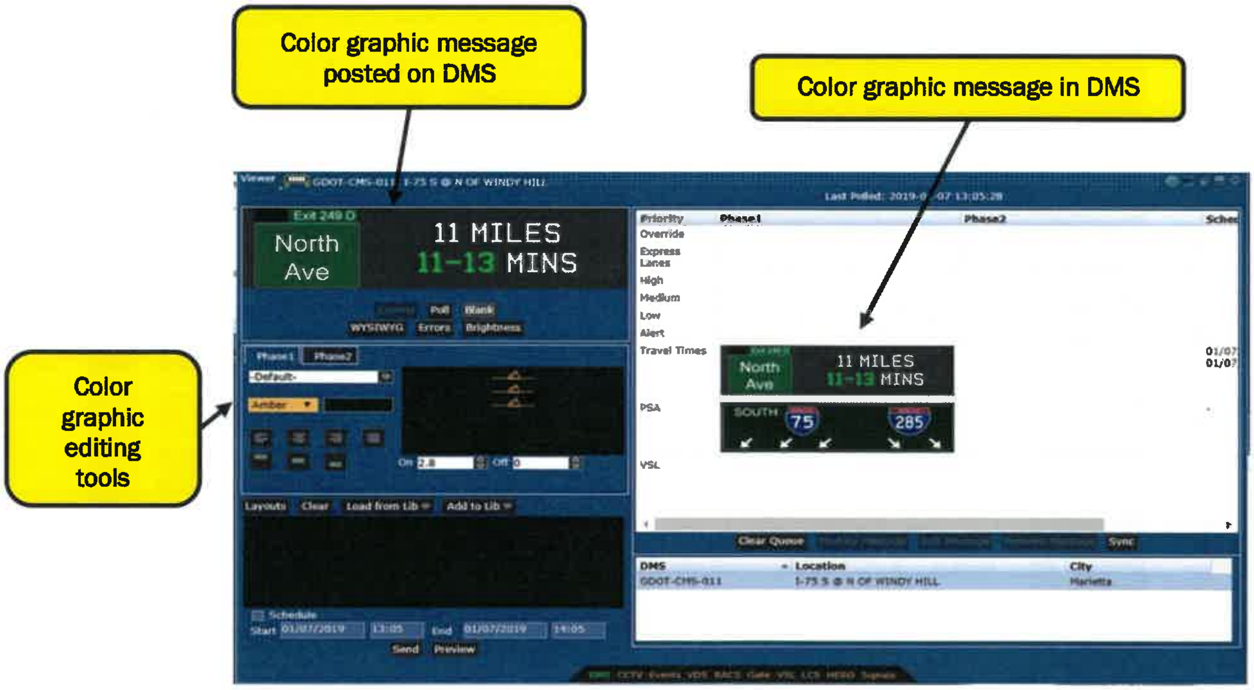



Figure 85- DMS Response Plan Creation

*REQUIREMENT 4.7.1.13: The ATMS shall include logic to manage conflicts between automatically generated messages (e.g. travel time displays etc.) and manually generated messages.*

The figure below represents how messages are displayed in the queue including travel time messages. All message conflicts are managed through this queuing mechanism. Messages highest in queue are sent first and then the messages in lower queue are sent (after the highest queued messaged is removed).




We will meet the DMS Travel Time requirements listed below through the implementation of our iNET™ Travel Time (TT) Module. See detailed explanation on how we meet or exceed these requirements below.

*REQUIREMENT 4.7.1.14: The ATMS shall include the capability to automatically generate messages for DMS to display Travel Times, as collected/calculated by the ATMS.*

*REQUIREMENT 4.7.1.23: The ATMS shall be able to display a predefined travel time message to a selected set of DMS and update the travel time estimate dynamically without user interaction.*

*REQUIREMENT 4.11.1.46: The ATMS should include capability of generating the messages to display travel time estimates for DMS locations in the network.*

*REQUIREMENT 4.11.1.47- The ATMS should provide a mechanism to automatically post travel time estimates to DMS.*

*REQUIREMENT 4.17.3.1.1: The ATMS shall include capability to generate real-time travel times for defined roadway segments on Interstate and Expressway routes.*

The iNET™ Travel Time module can estimate travel times in real time using analytic and predictive algorithms. Once all the travel time paths and targets are set, the travel times and messages are automatically sent to the signs without user intervention. See figures below. The iNET™ Travel Time module incorporates data from various sources which we have integrated for various other customers. Independent of the type of detection device, iNET™ generates travel times along a corridor segment (link) from all sources of detection configured in the system. The travel time messages are created automatically.

The figures below displays the travel time list of the routes, the numeric travel times, the average speed as well as the source of the data.

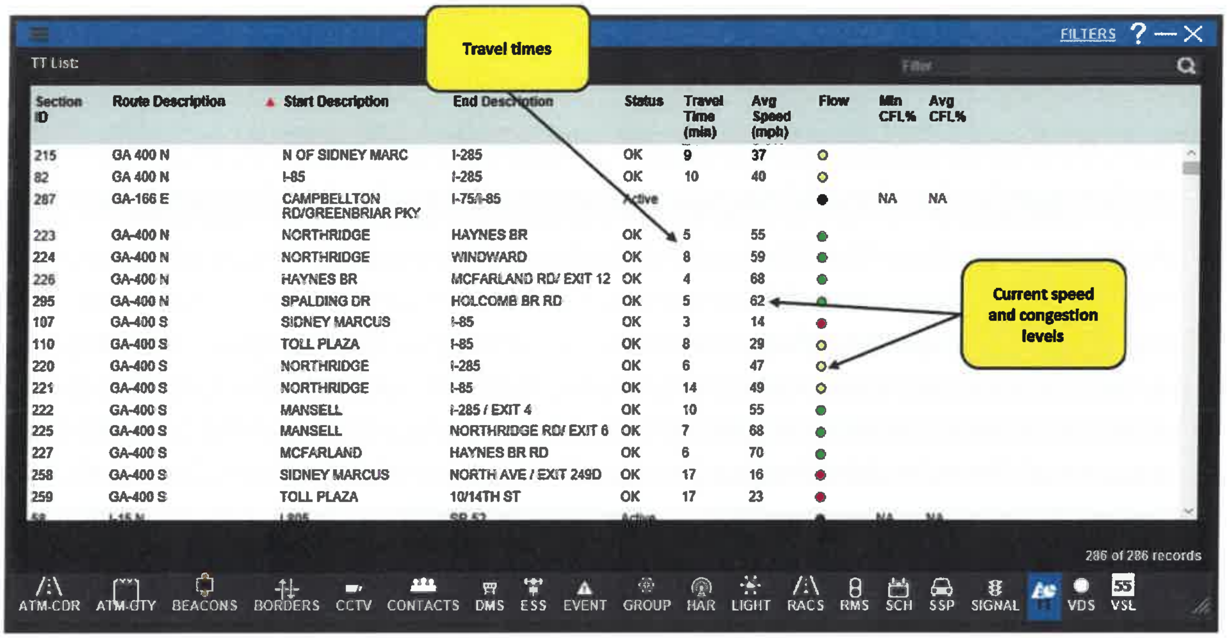



Figure 86 -Travel Time List

The travel time configuration window displays the start and end point, as well as all detectors associated with a travel time route. For each detector, its location, type of detector, and speed is also displayed.

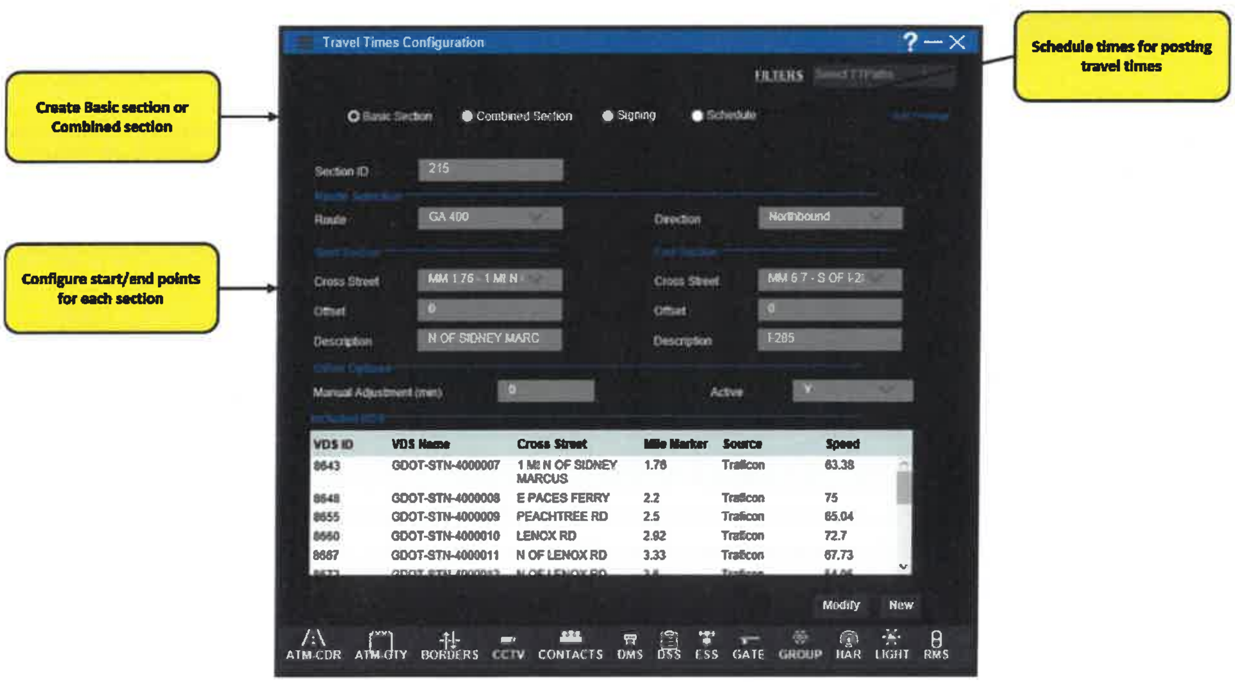



Figure 87 – Travel Time Configuration

iNET™ generates travel times and average speeds for all travel time segments configured in the system. Travel time configuration (See Figure below) is accomplished by creating segments by point and click on the main map or via an inventory configuration window is used to select the start and end point of a given roadway in one direction. Travel times along one corridor can be configured as a basic 'section'. iNET™ provides user the ability to combine basic sections to generate a travel time segment along one or more roadways for longer routes. Once a travel time is configured, a user will have the ability to target a DMS for posting a travel time message to a sign on a specified scheduled.

Travel time information in iNET™ can be presented in various ways to include in a list with real time information (as depicted above), and in the DMS posting of the travel time message (See figure below).


Figure 88 – Travel Time Message Display

We will meet the DMS requirements listed below through the implementation of our iNET™ Dynamic Message Sign (DMS) Module which contains the DMS library feature. See detailed explanation on how we meet or exceed these requirements below.

*REQUIREMENT 4.7.1.15: The ATMS shall include DMS message libraries.*

*REQUIREMENT 4.7.1.16: The ATMS shall allow authorized users to select a message from any of the DMS message libraries.*

*REQUIREMENT 4.7.1.17: The ATMS shall allow authorized users to generate a message from free text.*

*REQUIREMENT 4.7.1.18: The ATMS shall allow for additional DMS message libraries to be generated by authorized users or edits to be made to the DMS message libraries.*

*REQUIREMENT 4.7.1.19: All messages from all the DMS message libraries shall be accessible from a master DMS message library.*

*REQUIREMENT 4.7.1.24: The ATMS user shall be able to save a new message in a message library.*

*REQUIREMENT 4.7.1.25: The ATMS user shall be able to choose a predefined message from message library, edit, and resave the message.*

*REQUIREMENT 4.7.1.26: The ATMS shall provide assistance in selecting standard DMS messages from the message library.*

*REQUIREMENT 4.7.1.28: ATMS users shall be able to delete a message from the message library.*

The DMS module contain standard feature to create DMS library messages and save these messages under different categories. Any number of categories can be created, and any number of messages can be recalled or saved, See figure below for location to access library messages.

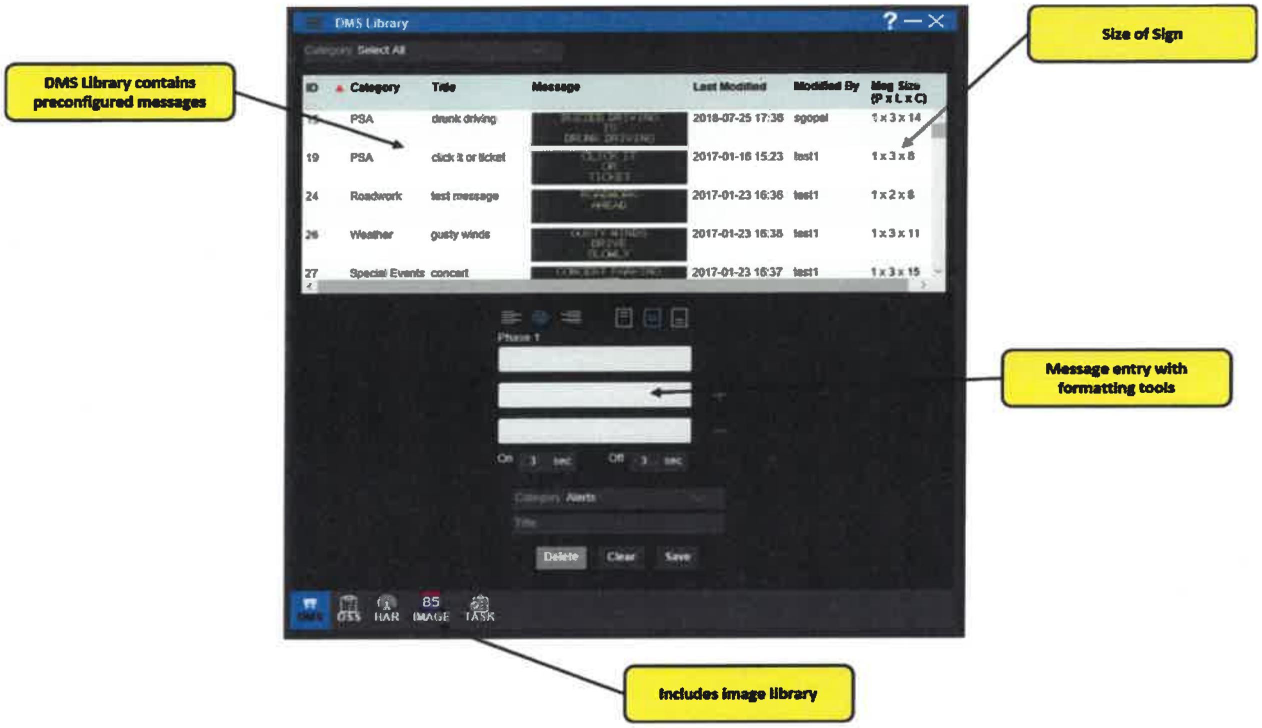



Figure 89 - DMS Library Viewer

*REQUIREMENT 4.7.1.20: The ATMS shall allow authorized users to select that a DMS message be displayed on multiple selected DMS without needing to re-enter the message for each sign selected.*

This requirement is fully met and demonstrated in the above Section for Device Controls – Dynamic Message Sign Mandatory Requirements.

*REQUIREMENT 4.7.1.21: he ATMS shall allow authorized users to select a DMS message, either standard or custom, for display on all signs controlled by the ATMS.*

This requirement is fully met and demonstrated in the above Section for Device Controls – Dynamic Message Sign Mandatory Requirements.

*Requirement 4.7.1.22: The ATMS shall communicate with all legacy field devices currently used by WVOOT and future DMS procurements.*

This requirement is fully met and demonstrated in the above Section for Device Controls – Dynamic Message Sign Mandatory Requirements.

*Requirement 4.7.1.27: The ATMS shall be able to send a message to one or more signs simultaneously.*

The figure below represents the multiple DMS feature.


*REQUIREMENT 4.7.1.29: The ATMS shall be able to terminate messages.*

This requirement is fully met and demonstrated in the above Section for Device Controls – Dynamic Message Sign Mandatory Requirements.

We will meet the DMS protocol requirements listed below through the implementation of our iNET™ Dynamic Message Sign (DMS) Module. See detailed explanation on how we meet or exceed these requirements below.

*REQUIREMENT 4.7.1.31: The ATMS shall provide the ability to control and retrieve information from a DMS via NTCIP 1203vl.*

*REQUIREMENT 4.7.1.32: The ATMS shall provide the ability to control and retrieve information from a DMS using permanent DMS protocol(s).*

*REQUIREMENT 4.7.1.33: The ATMS shall provide the ability to control and retrieve information from a DMS using portable DMS protocol(s).*

iNET™ has been successfully integrated with the following DMS vendors, to name a few, and will maintain communication with legacy devices currently being used by WVDOT and future DMS procurements. iNET™ fully supports NTCIP 1203v1 and NTCIP 1203v2.

- ADDCO, Inc.
- Display Solutions
- LEDSTAR, Inc.
- Signalisation Ver-Mac, Inc.
- SWARCO
- AMS
- IDC
- Mark IV
- Skyline Products, Inc.
- Wanco
- Daktronics, Inc.
- IDI
- SES
- Solar Technology, Inc.

*REQUIREMENT 4.7.1.34: The ATMS shall support storage and display of messages including uppercase alphanumeric characters and at minimum the following special characters: #@&8+< >!?./- and arrows.*

iNET™ fully supports all special characters and graphics.

*REQUIREMENT 4.7.1.30: The ATMS shall support daily automated diagnostic of DMS, including alarm generation based on diagnostic results, results logging, and results archival.*

The figure below shows the Diagnostics feature which allows users with permission to run the following diagnostic tests on signs that support the feature:

- **Temperature:** Retrieves the temperature from sensors allocated to the sign
- **Fan:** Checks for fan failures
- **Power:** Checks status of power supplies
- **Pixels:** Determines which pixels failed and displays a pixel status map


**Figure 90 – DMS Diagnostics**

*REQUIREMENT 4.7.1.35: The DMS Interface shall provide an interface for sequencing up to three-line message panels as well as full matrix DMS , including graphics.*

This requirement is fully met and demonstrated in the above Section for Device Controls – Dynamic Message Sign Mandatory Requirements.

*REQUIREMENT 4.7.1.36: The ATMS shall support the use of full color DMS and graphics.*

iNET™ supports displaying message containing uppercase alphanumeric and special characters such as: #@&*+<>!?./- and arrows, and supports sequencing up to three-line message panels, as well as full matrix DMS. iNET™ provides the ability to monitor/control color DMS capable of color graphics. The system includes a graphic editor/creator and provides a preview of the preview of the message prior to posting a color/graphics message to a sign. Figure 91 and Figure 92 show iNET™ color and graphic messaging capability.

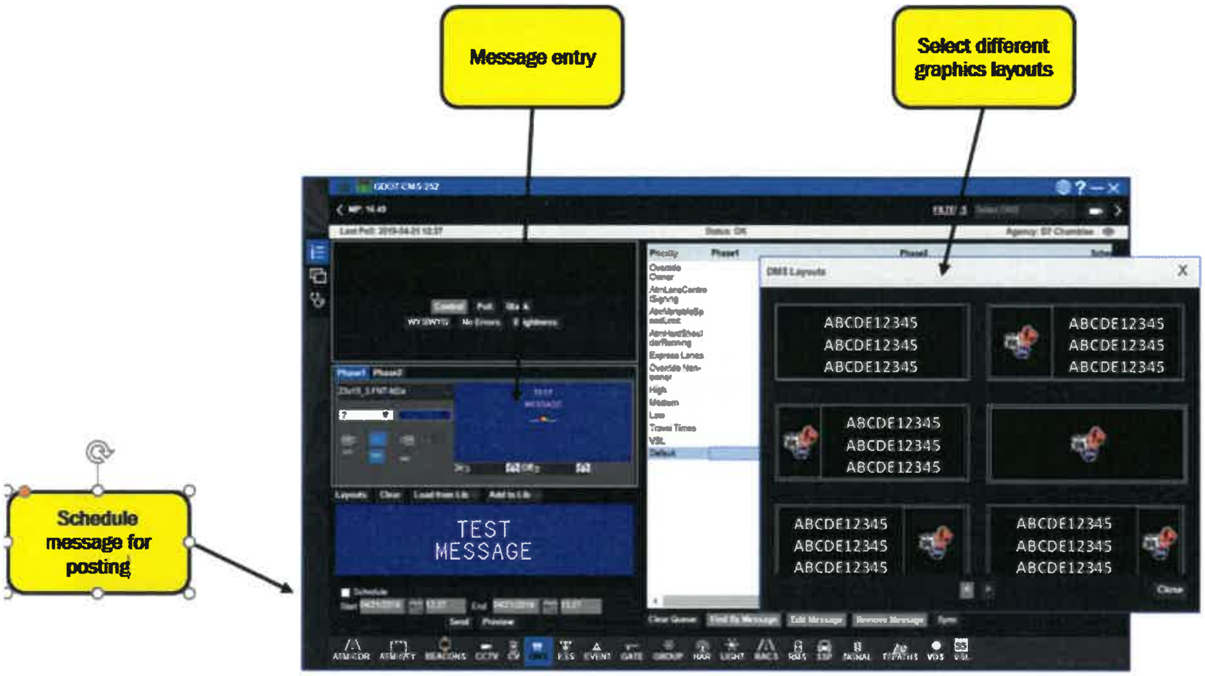



Figure 91 – DMS Editor and Control (Colors, Layouts)


Figure 92 -DMS Editor and Control (Layouts, Graphics)

The system can post color graphic messages to signs that support the feature. Figure 29 shows how the user can select from a library of different graphics to format the message.


Figure 93 – Graphics Selector

Users can manually generate a color graphic message, or one can be selected from the library. Figure 94 displays a posted graphics message.


Figure 94 – Generating Graphics Message

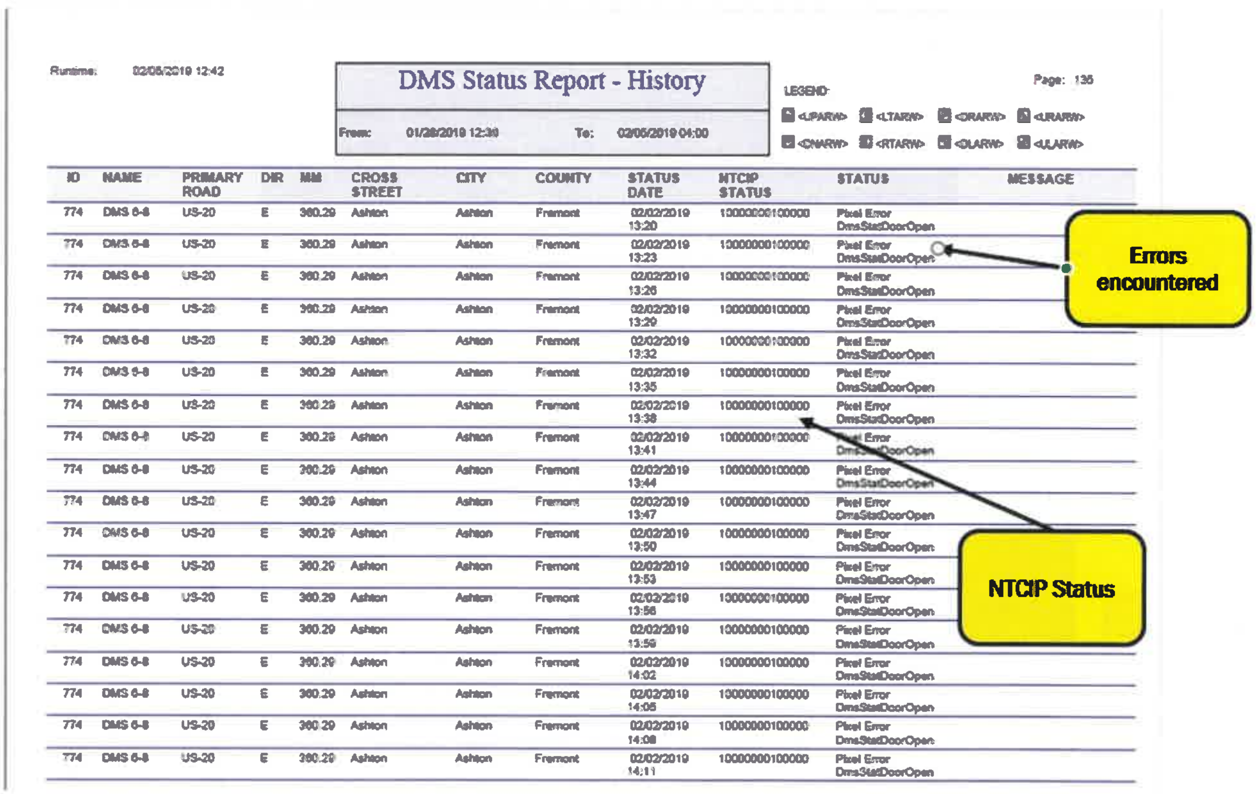
A user can post a single message to multiple signs by using the Multiple DMS feature, available on the Multiple tab on the left. By clicking the checkbox of the desired signs, a single message will be sent to the entire group of signs. The date and time selected will apply to all signs in the selected group. The signs that appear in the list have already been grouped during configuration and the list only contains those grouped signs which the user has permissions for.

*REQUIREMENT 4.7.2.1: The ATMS may have a master library of DMS messages that may be sorted by the capability of DMS that an operator is placing a message on. When the operator selects a certain DMS, the message library available to that DMS may be restricted by the size and capability of that DMS.*

The iNET™ ATMS DMS message library is extensive and enables operators to sort or group like messages for immediate access. iNET™ also provides a fully automated response plan capability that recommends messages based on templates maintained in the library. Parsons will enhance the library capability to filter the message library available based on DMS size and capability to ensure full compliance.

*REQUIREMENT 4.7.2.2: The ATMS should support retrieval and display DMS status reports including at a minimum sign display content, illumination, pixel failures, power status communication status, and temperature, Fan error and humidity are highly desired, if available from field hardware.*

iNET™ DMS Status reports include current DMS status and historical status. Any errors encountered by the sign during the given time period is reported in Figure 95 is an example of a DMS status report with errors.



Runtime: 02/06/2019 12:42

DMS Status Report - History

From: 01/28/2019 12:30 To: 02/06/2019 04:00

LEGEND: <UPARW> <LTARW> <DRARW> <URARW> <DNARW> <RTARW> <DLARW> <ULARW>

Page: 136

| ID | NAME | PRIMARY ROAD | DIR | MM | CROSS STREET | CITY | COUNTY | STATUS DATE | NTCIP STATUS | STATUS | MESSAGE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 774 | DMS 6-8 | US-20 | E | 360.29 | Ashton | Ashton | Fremont | 02/02/2019 13:20 | 10000000100000 | Pixel Error DmsStatDoorOpen | |
| 774 | DMS 6-8 | US-20 | E | 360.29 | Ashton | Ashton | Fremont | 02/02/2019 13:23 | 10000000100000 | Pixel Error DmsStatDoorOpen | |
| 774 | DMS 6-8 | US-20 | E | 360.29 | Ashton | Ashton | Fremont | 02/02/2019 13:26 | 10000000100000 | Pixel Error DmsStatDoorOpen | |
| 774 | DMS 6-8 | US-20 | E | 360.29 | Ashton | Ashton | Fremont | 02/02/2019 13:29 | 10000000100000 | Pixel Error DmsStatDoorOpen | |
| 774 | DMS 6-8 | US-20 | E | 360.29 | Ashton | Ashton | Fremont | 02/02/2019 13:32 | 10000000100000 | Pixel Error DmsStatDoorOpen | |
| 774 | DMS 6-8 | US-20 | E | 360.29 | Ashton | Ashton | Fremont | 02/02/2019 13:35 | 10000000100000 | Pixel Error DmsStatDoorOpen | |
| 774 | DMS 6-8 | US-20 | E | 360.29 | Ashton | Ashton | Fremont | 02/02/2019 13:38 | 10000000100000 | Pixel Error DmsStatDoorOpen | |
| 774 | DMS 6-8 | US-20 | E | 360.29 | Ashton | Ashton | Fremont | 02/02/2019 13:41 | 10000000100000 | Pixel Error DmsStatDoorOpen | |
| 774 | DMS 6-8 | US-20 | E | 360.29 | Ashton | Ashton | Fremont | 02/02/2019 13:44 | 10000000100000 | Pixel Error DmsStatDoorOpen | |
| 774 | DMS 6-8 | US-20 | E | 360.29 | Ashton | Ashton | Fremont | 02/02/2019 13:47 | 10000000100000 | Pixel Error DmsStatDoorOpen | |
| 774 | DMS 6-8 | US-20 | E | 360.29 | Ashton | Ashton | Fremont | 02/02/2019 13:50 | 10000000100000 | Pixel Error DmsStatDoorOpen | |
| 774 | DMS 6-8 | US-20 | E | 360.29 | Ashton | Ashton | Fremont | 02/02/2019 13:53 | 10000000100000 | Pixel Error DmsStatDoorOpen | |
| 774 | DMS 6-8 | US-20 | E | 360.29 | Ashton | Ashton | Fremont | 02/02/2019 13:56 | 10000000100000 | Pixel Error DmsStatDoorOpen | |
| 774 | DMS 6-8 | US-20 | E | 360.29 | Ashton | Ashton | Fremont | 02/02/2019 13:59 | 10000000100000 | Pixel Error DmsStatDoorOpen | |
| 774 | DMS 6-8 | US-20 | E | 360.29 | Ashton | Ashton | Fremont | 02/02/2019 14:02 | 10000000100000 | Pixel Error DmsStatDoorOpen | |
| 774 | DMS 6-8 | US-20 | E | 360.29 | Ashton | Ashton | Fremont | 02/02/2019 14:05 | 10000000100000 | Pixel Error DmsStatDoorOpen | |
| 774 | DMS 6-8 | US-20 | E | 360.29 | Ashton | Ashton | Fremont | 02/02/2019 14:08 | 10000000100000 | Pixel Error DmsStatDoorOpen | |
| 774 | DMS 6-8 | US-20 | E | 360.29 | Ashton | Ashton | Fremont | 02/02/2019 14:11 | 10000000100000 | Pixel Error DmsStatDoorOpen | |



Figure 95 – DMS Status Report with Errors

## 2.2.4 Device Control – CCTV/Camera

We will meet the CCTV Video 16 requirements listed below through the implementation of our iNET™ Video Module. See detailed explanation on how we meet or exceed these requirements below.

*REQUIREMENT 4.8.1.1: The ATMS shall provide a mechanism for operators to view real-time video from CCTV cameras.*

*REQUIREMENT 4.8.1.2: The ATMS shall provide a mechanism for operators to control CCTV cameras (pan, tilt, zoom).*

*REQUIREMENT 4.8.1.5: The ATM shall include fine control of pan, tilt and zoom for CCTV cameras.*

*REQUIREMENT 4.8.1.6: The ATMS shall enable all users and TMC partner agencies with an ATMS client or workstation to view and control CCTV, according to their assigned user permissions.*

*REQUIREMENT 4.8.1.9: The ATMS shall control and allow viewing from both digital and analog cameras.*

*REQUIREMENT 4.8.1.13: The ATMS shall include capability to block selected cameras from selected viewers, while enabling other viewers to continue to view the camera video.*

*REQUIREMENT 4.8.1.14: The ATMS shall communicate with all legacy field devices currently used WVDOT.*

*REQUIREMENT 4.8.1.15: The ATMS solution shall control the distribution of all traffic images for internal and external use on the public website and 511 app.*

*REQUIREMENT 4.8.1.16: The ATMS solution shall collect and report current camera status, e.g. communication, image status, and PTZ status.*

*REQUIREMENT 4.8.1.20: The ATMS shall display camera ID within the video image consisting of the name of the camera location at administrator option.*

*REQUIREMENT 4.8.1.21: The ATMS shall provide for the display of a camera control ID of the party controlling the camera control ID of the party controlling the camera when not in a preset position at administrator option.*

*REQUIREMENT 4.8.1.24: The ATMS shall allow pan-tilt-zoom (PTZ) and focus and iris control by any authorized user.*

*REQUIREMENT 4.8.1.25- The ATMS shall validate that users have authorized access and priority for full camera control.*

*REQUIREMENT 4.8.1.27: The ATMS shall allow for camera view access by television media with appropriate rights and restrictions.*

*REQUIREMENT 4.8.2.5: The ATMS should interface to cameras operated by TMC partners on arterial roadways. The ATMS should interface to cameras operated by TMC partners on arterial roadways.*

*REQUIREMENT 4.8.2.6: The ATMS should provide an interface that allows operators to manage, control, and display multiple closed circuit television cameras including pan-tilt-zoom functions and manual camera functions available from the camera vendors where applicable. Camera image display must include simultaneous display of all cameras up to the number of monitors in the TMC.*

The iNET™ Video Module will be implemented to meet the requirements in below. The iNET™ Video Module enables access to CCTV cameras and will provide the ability to view real-time traffic flow. This module will provide the capability to control cameras using drag/hover/slide manipulations and can be configured to route video to designated monitors and across the network. The ability to view and control cameras will be controlled by a security mechanism that authenticates and authorizes users to ensure that only trusted access will be available. This includes remote users from TMC partner agencies, arterial partner agencies, or the television media. Each user is given a specific set of privileges so that access to some features can be granted, while others are restricted. See below for the control window for cameras.

The Video/CCTV module is a very flexible, scalable, and event driven subsystem. This module will handle multiple simultaneous users in multiple regions (both local and remote) and will interface to CCTV cameras using Cohu, Pelco P, Pelco D, Javelin, Coaxatron, H.264, and NTCIP protocols. Users can create up to 64 presets and create up to 50 or more video tours, four of which can be executing simultaneously on the users' desktop. The system can handle multiple simultaneous digital videos (eight or more) in multiple digital video formats including H.261, H.262, MPEG2, MPEG4, and MJPEG. Analog video is also integrated.

The CCTV module provides PTZ control that is managed by using a mouse and clicking on the video stream image, whereby movement (direction and speed) of the camera is relative to the center point of the image. In addition, the CCTV user interface allows PTZ control via the use of on-screen controls (arrow, zoom buttons), keyboard controls (number keypad), and mouse zoom (in and out) ability for finer control. The username of the person controlling the camera is displayed in the 'Last PTZ By:' field. iNET™ manages and controls the distribution of all video images and streams for internal and external use on public websites and 511 app.

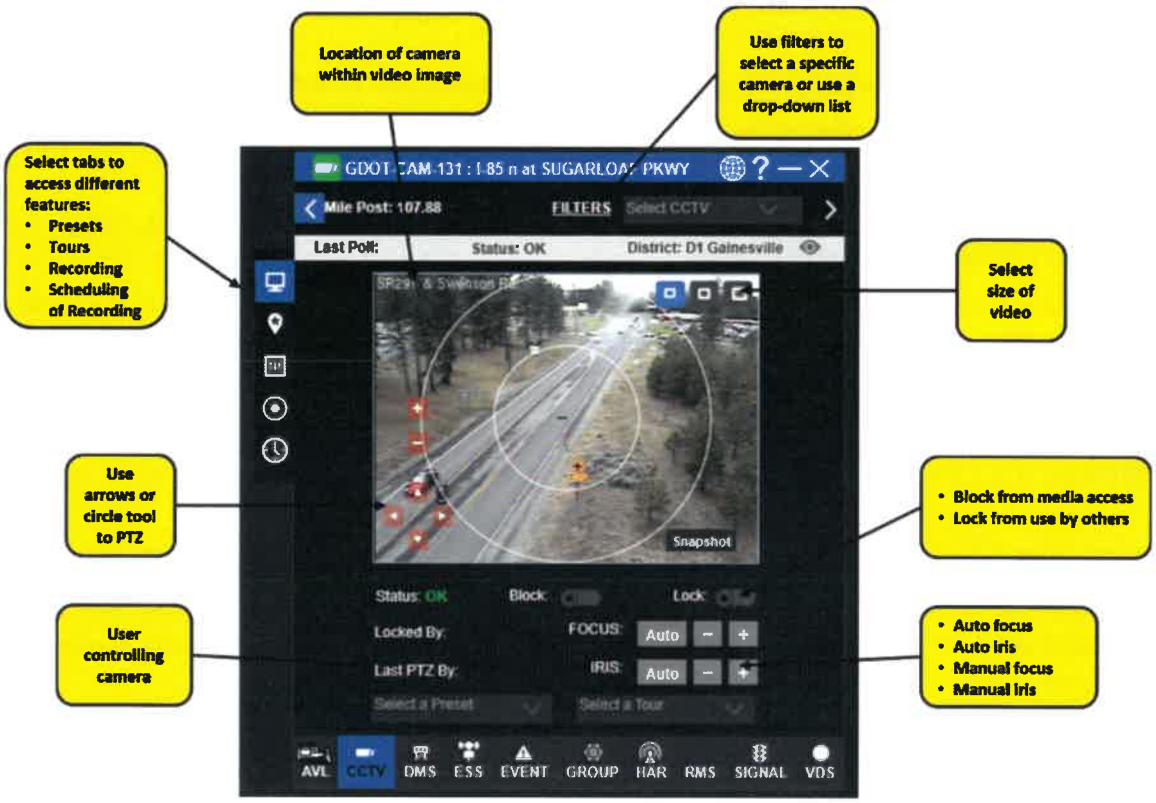



Figure 96– Real-Time Video Window with Presets, Tours, Recording and Playback

Key Video Module capabilities will include:

- Support of full NTCIP 1205
- Interfaces with both digital and analog cameras, including any legacy devices currently being used
- Allows viewing of up to 18 simultaneous streaming videos in a single browser window
- Create multiple unique video tours for cameras, preset positions or a combination
- Set/create camera presets
- Priority access to view or control cameras based on user login level

- Video locking and camera override
- Provide for camera control using cursor hover/drag/slide over video image or using pan, tilt, zoom, focus and iris control buttons
- Default preset timeouts
- Provides CCTV snapshot captures
- Has video wall routing and control
- Allows digital video serving and recording
- Provides camera device system monitoring to confirm correct operation of communications, video streams and control functions
- Provides cameras user activity logging
- Provides CCTV usage and failure/status reporting
- Device communication status and PTZ actions are saved into the data archive for reports

iNET™ allows multiple CCTV monitoring and control windows to be open simultaneously and can easily support a many camera streams open at any one time by. Each individual monitoring and control window can be resized for a small, medium, or large display of a cameras video stream. In addition, Parsons provides a multi-viewing capability (see figure below) that allows multiple streams to be grouped together and made available for monitoring:

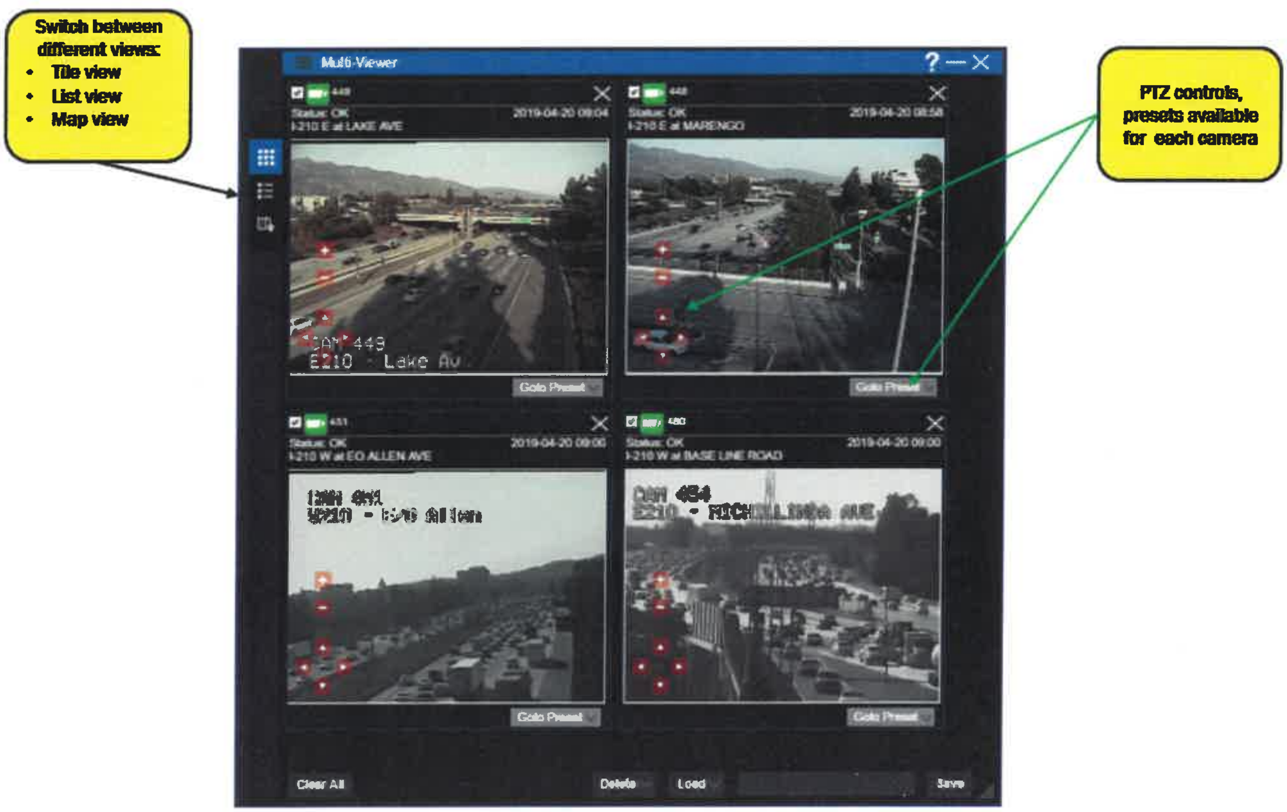



Figure 97 – Multi-viewer (CCTV example) for Several Simultaneous video streams

*REQUIREMENT 4.8.1.3: The ATMS shall include capability to set camera pre-sets.*

The iNET™ video module contains a preset feature (See figure below), which are defined settings for the camera which represent often-used camera views. Each camera can have as many as 20 different presets, each containing a different view. These presets are named and saved to the database, and in the event that the system loses connection with the device, the presets will retain their settings.


Figure 98 – CCTV Presets

We will meet the video tour requirements listed below through the implementation of our iNET™ video Module which contains the CCTV tour feature. See detailed explanation on how we meet or exceed these requirements below.

*REQUIREMENT 4.8.1.4: The ATMS will allow an operator to develop camera tours made up of views and presets from operator configurable cameras.*

*REQUIREMENT 4.8.1.23: The ATMS shall be capable of at least four independent camera tours consisting of display to a user-selected video monitor consisting of a user-selected camera and (optional) preset for display of a user-selected duration. (Note: The current ATMS system utilizes additional screens connects to the operator's workstation)*

CCTV tours (See figure below) are a mechanism which enables the user to sequence through a set of cameras images from different cameras at user-defined intervals. For example, a camera tour can be configured to display images from 5 different cameras at 20 second intervals in sequence. The tours can be made up of views from where the camera is configured at the moment, or the tour can be made of a camera preset. iNET™ supports well over 100 tours. These tours can be displayed on a workstation or on a video wall.

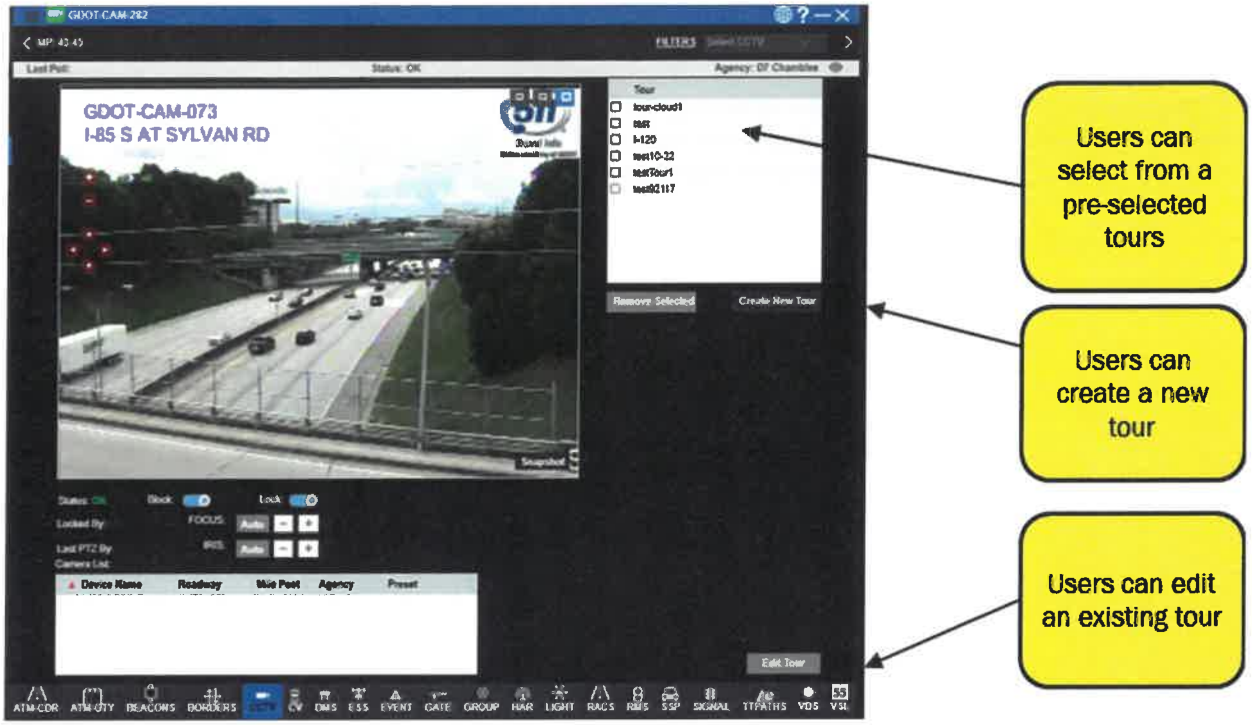



Figure 99 - INET Video Tours

*REQUIREMENT 4.8.1.7: The ATMS shall determine rights and privileges of camera control based on permission and priority assigned to users by an administrator.*

The iNET™ video module contains permissions for users to:

- PTZ a camera
- Edit the database configuration record for the device
- Block a camera from view
- Manage and use presets
- Manage and use CCTV tours
- View a camera
- Control video onto a video wall

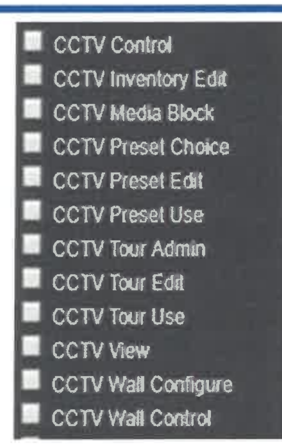



Figure 100 - CCTV Privileges

*REQUIREMENT 4.8.1.8: The ATMS shall provide video recording capabilities.*

The CCTV Recording feature (see the figure below) of iNET™ takes the video from each camera and stores it on the server for future recall and playback. Only users with the appropriate permissions are able to record the video.

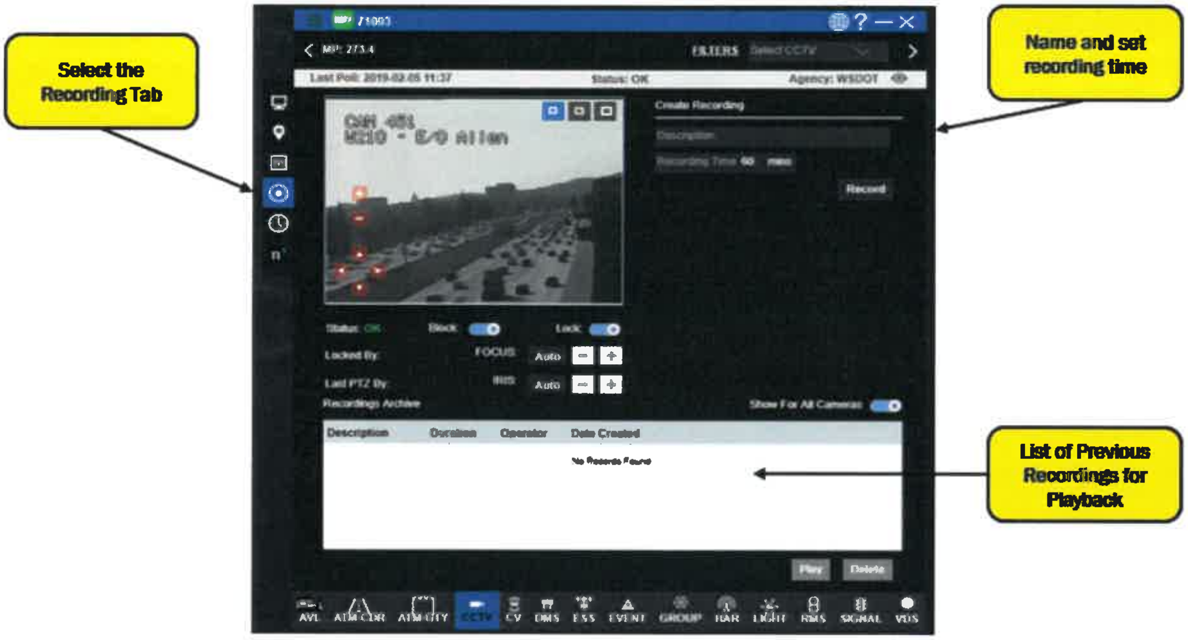



Figure 101 – CCTV Recording Feature

*REQUIREMENT 4.8.1.10: The ATMS shall interface with the workstation and video wall controller for the TMC video wall for viewing capability by operators. (Note: The current manufacture protocol in the existing ATMS system is VICADS version 4.1)*

The Video Wall window (Figure 102) allows the user to place video streams from CCTV cameras onto the Video Wall display. Commonly used layouts (Window Groups) are pre-configured into the system, but the camera streams can be changed within the layouts. By dragging a CCTV icon from the map or list windows to a cell on the video wall layout, the video from the camera will display on its corresponding monitor on the video wall. CCTV tours can also be placed onto the video wall. Operators are also able to change the video wall layout in addition to selecting which feeds go onto the monitors of the video wall.

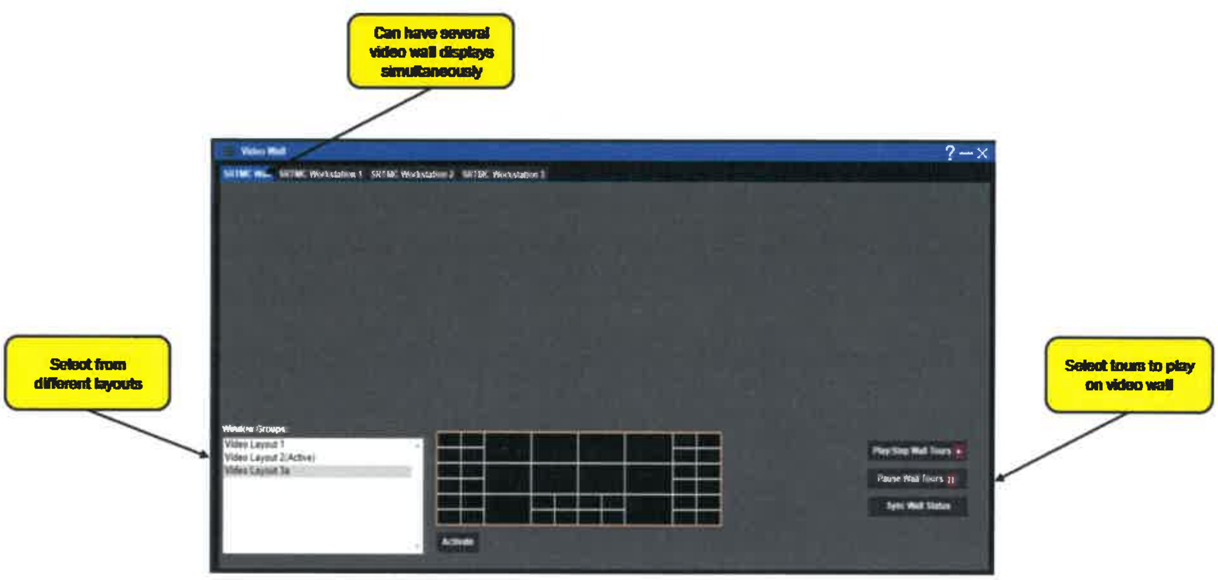



Figure 102 – Video Wall Window

In addition to the handling simultaneous streaming to individual workstations, the CCTV module is capable of also simultaneously managing the video wall.

*REQUIREMENT 4.8.1.11: The ATMS shall enable operators to select the configuration of the video wall.*

This requirement is fully met and demonstrated above.

*REQUIREMENT 4.8.1.12: The ATMS shall enable operators to select what camera feeds are displayed on specific portions of the video wall.*

This requirement is fully met and demonstrated above

*REQUIREMENT 4.8.1.17: The operator shall be able to select a camera from the CCTV menu or GUI map.*

Just like any other device, cameras can be selected from the main map window, as shown in Figure 103, or from the summary list window, as shown in the figure below.

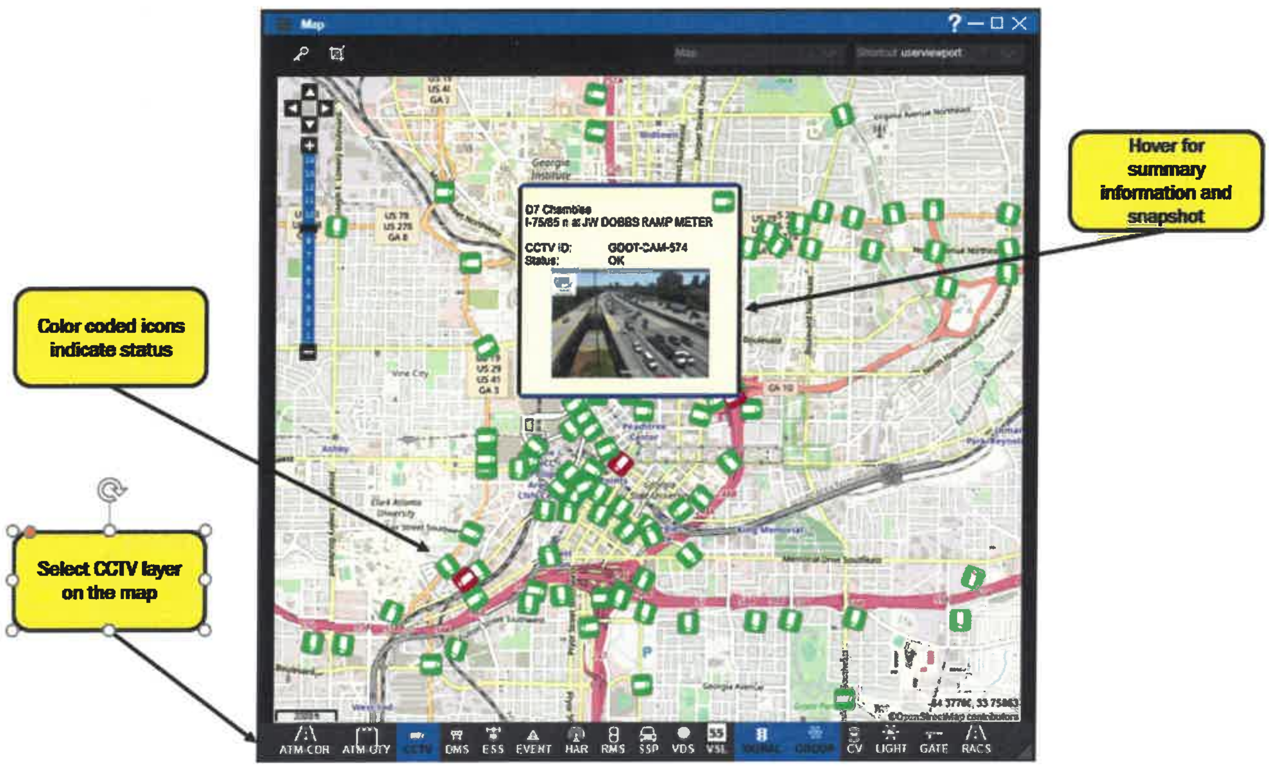



Figure 103 – CCTV selectable from Map

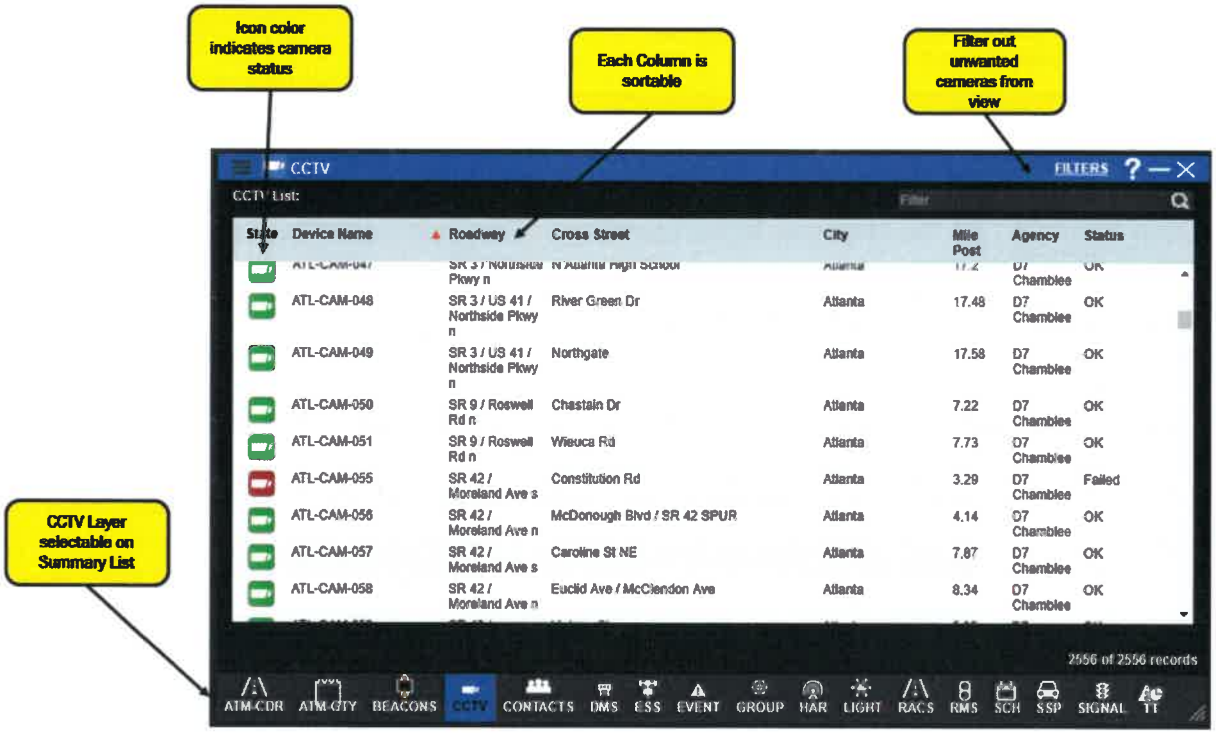



Figure 104 – CCTV selectable from Summary List

*REQUIREMENT 4.8.1.18: The ATMS shall provide a demand indicator on the user's screen that will display when another authorized user requires control of the camera PTZ.*

This requirement is fully met and demonstrated in the above Section for Device Controls –CCTV Mandatory Requirements.

*REQUIREMENT 4.8.2.7: The ATMS should allow reclamation of control of a camera being demanded by other users based on user privilege levels.*

The CCTV module contains a locking feature that allows a user to indicate to others that they require use of the camera. By clicking on the 'Lock' button, other users are prevented from panning, tilting, or zooming the camera. The 'Locked By:' field will populate with the username of the person who control to use the camera. Two mechanisms exist to prevent a person from permanently locking a camera: a user with higher priority is able to 'unlock' the camera, and there is a timeout feature which is set by the administrator which releases the lock after a configurable amount of time. See Figure 105 for the Locking feature.

*REQUIREMENT 4.8.1.26: The ATMS interface shall provide a mechanism for capturing still and moving video images from CCTV video streams in standard format such as JPEG and publishing them to the traffic web page.*

The Snapshot feature enables users to capture a still image from a video stream for publishing to a web page.

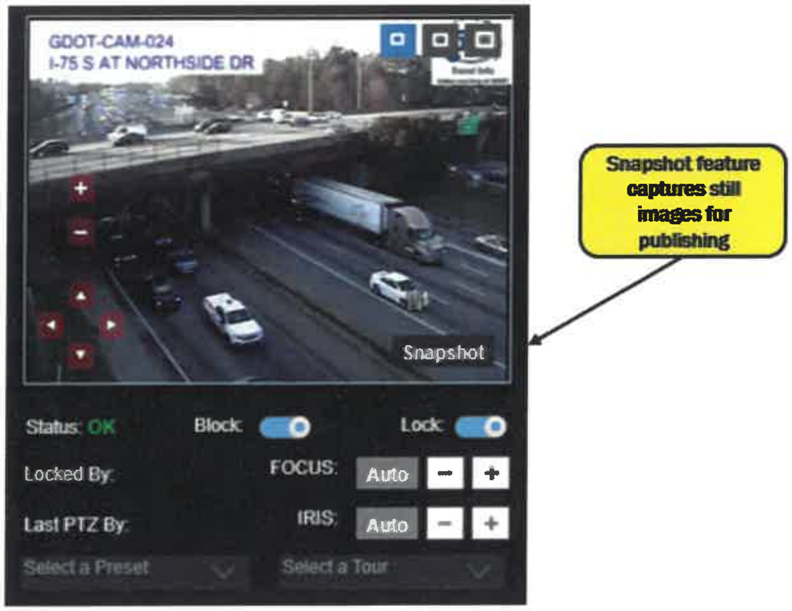



Figure 105 – CCTV Snapshots

## 2.2.4.b. Desirables

*REQUIREMENT 4.8.2.1: The ATMS should include capability to set camera pre-sets by time of day/day of week, season of the year, and by independent user.*

This requirement is fully met and responded to in the Device Control – CCTV/Camera – Desirables section above.

*REQUIREMENT 4.8.1.19: The ATMS shall provide preset positions and the capability of programming a minimum of four ( 4) PTZ preset positions. The presets shall not be deleted/lost if the A TMS or camera software loses connection to the device.*

This requirement is fully met and demonstrated in the above Section for Device Controls – CCTV Mandatory Requirements.

*REQUIREMENT 4.8.1.22: The ATMS shall provide a selectable time-out feature which is a programmable interval (range of 2 to 30 minutes) or event identification in which the camera must automatically return to a preset default position after the last camera control commands is received or the event is terminated.*

This requirement is fully met and responded to in the Device Control – CCTV/Camera – Desirables section above.

*REQUIREMENT 4.8.2.2: The ATMS should manage conflicts between pre-sets selected by multiple users.*

CCTV presets can be set by time of day/day of week, season of the year, and by users with permissions (Figure 106). The scheduler can be activated for any preset for any camera in the system. Conflicts between presets are managed by the permissions of the users. Those users with higher priority, will control the preset. By scheduling the camera preset to be active 24/7, the camera will always return to a default preset after a configurable time-out, after any manual control commands are issued.

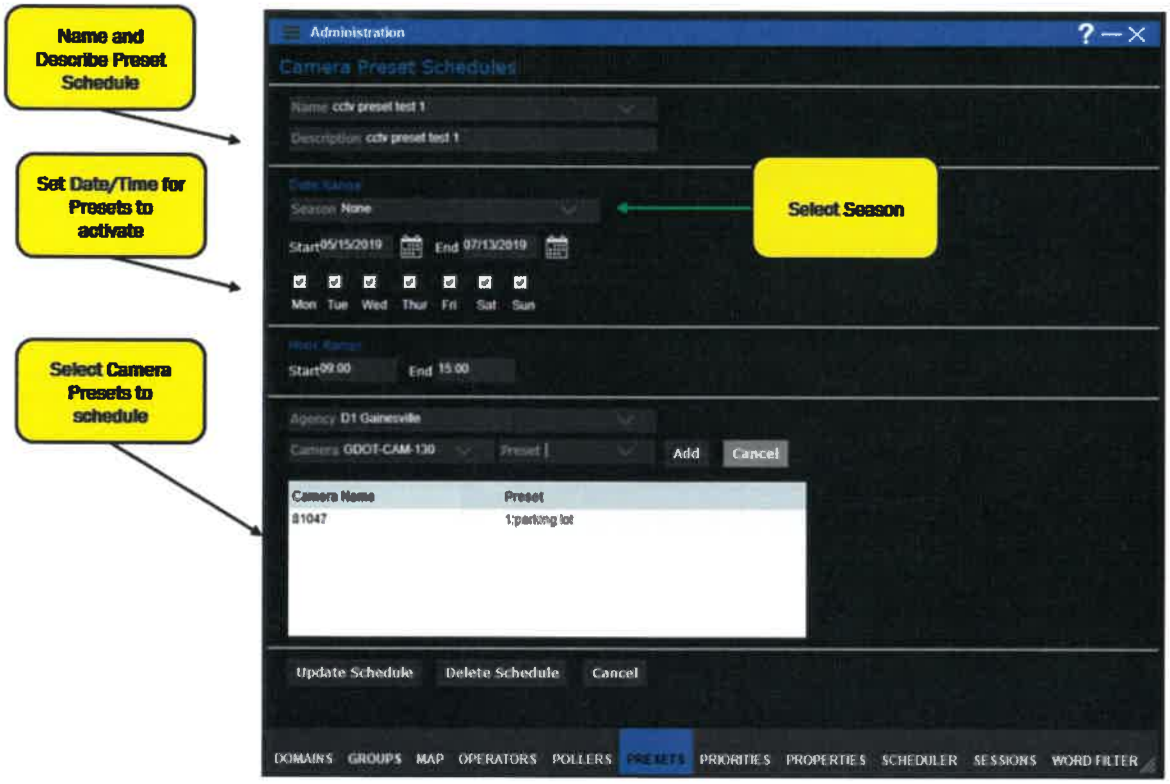



Figure 106– CCTV Preset Scheduler

*REQUIREMENT 4.8.2.3: CCTV control from users accessing the ATMS from within the TMC should have a latency of no more than 0. 5 second (current ATMS is configured to meet this requirement) as defined by the time an operator executes a control command and when an operator is able to visually verify the command was completed on a workstation or video wall.*

This requirement is fully met and responded to in the Device Control – CCTV/Camera – Desirables section above.

*REQUIREMENT 4.8.2.4: CCTV control from users accessing the ATMS from remote access should have a latency of no more than 0.5 second as defined by the time an operator executes a control command and when an operator is able to visually verify the command was completed on a workstation or video wall.*

iNET™ CCTV control functions have been stress-tested and video latency is well within the 0.5 second requirement for both operators in the TMS and remote users.

*REQUIREMENT 4.8.2.8: The ATMS should display the name of camera preset selected within the video image when pointed using the preset capability at administrator option.*

When an operator selects a CCTV and utilizes the Preset feature and the CCTV device being operated has been configured to display the stored preset name or ID when use iNET™ will show that on the CCTV viewer screen as part of the video image.

## 2.2.5 Device Control – RWIS

### 2.2.5.a. Mandatory Requirements

We will exceed the three (3) requirements noted below through the implementation of our iNET™ ESS Module and Alert Module. See detailed explanation on how our modules meet or exceed these requirements below.

*REQUIREMENT 4.9.1.1 -The ATMS shall monitor weather data from the field devices and set threshold levels for conditions that must be posted on the GUI and integrated with the notification system.*

*REQUIREMENT 4.9.1.2: The ATMS shall accept weather sensor data coming from existing and future environmental sensors and systems.*

*REQUIREMENT 4.9.2.1: The ATMS should enable viewing of RWIS cameras.*

The Environmental Sensor System (ESS) module enables users to observe real-time weather conditions, such as surface conditions, temperatures, wind speed, and wind direction, from roadside ESS stations and other weather service feeds, such as the National Weather Service. Color-coded icons on the map (Figure 107), quickly alert the user to potentially hazardous weather conditions. As stated in the earlier sections, each icon is selectable for viewing the Control dialog, or for dragging and dropping into a Control dialog. When an icon is selected, the system will display the Control dialog for that device, with detailed device status and control features. If a weather station has a camera, the images are available on the same user interface (Figure 108).

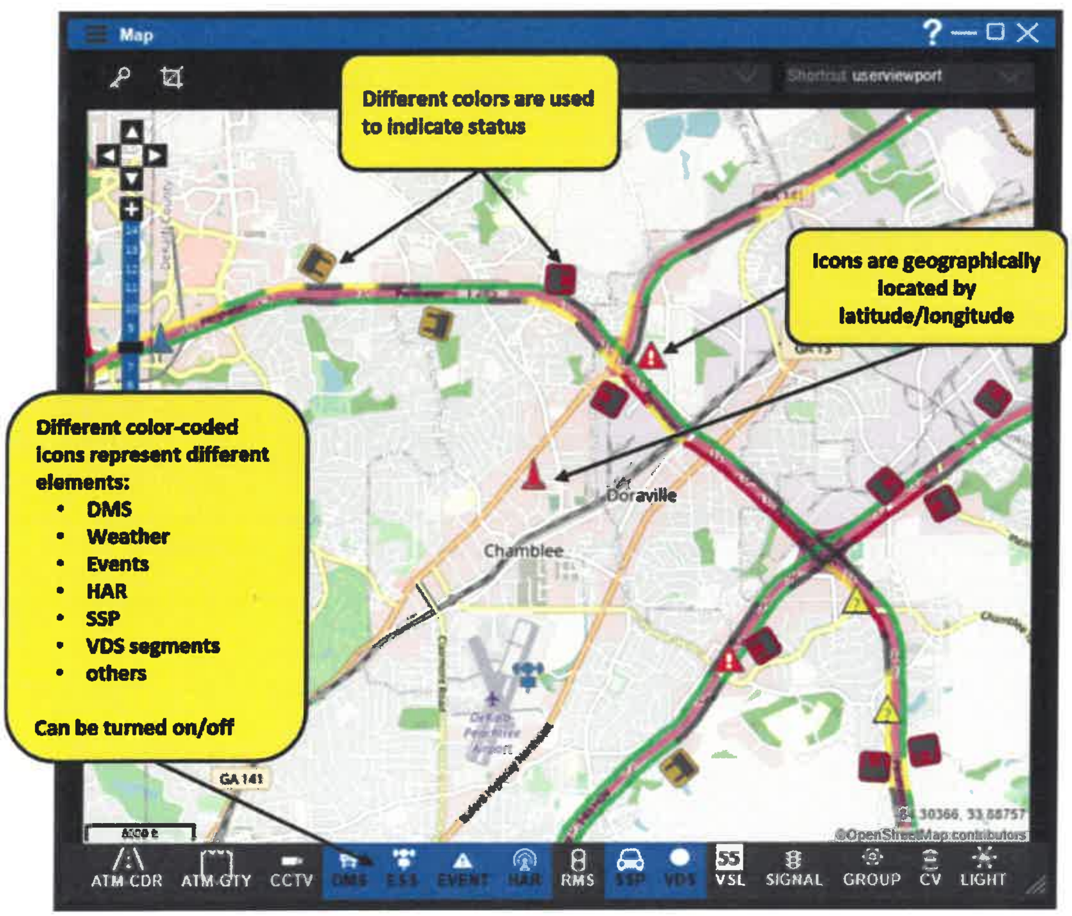



Figure 107 – Main Map with Icons for Each Device Type


**Figure 108 – Weather Information**

We will exceed he eight (8) requirements noted below through the implementation of our iNET™ ESS Module and Alert Module. See detailed explanation on how our modules meet or exceed these requirements below.

*REQUIREMENT 4.9.1.3: The ATMS shall log RWIS data for operational retrieval and reporting purposes.*

*REQUIREMENT 4.9.1.4: The ATMS shall support daily automated diagnostics for field RWIS devices, including alarm generation based on diagnostic results and results logging.*

*REQUIREMENT 4.9.2.2: The ATMS should provide an alert to operators when user defined thresholds are met, e.g. The pavement temperature drops below 32 degrees F.*

*REQUIREMENT 4.14.3.1.2: The ATMS shall provide a single integrated interface, available from any TMC workstation, that allows operators to set threshold conditions for various devices or other used definable conditions such that when threshold conditions are met or exceeded, alarms will be generated notifying the operator of the presence of such condition. At a minimum, data elements available for alarm generation will include traffic measurements, detected incidents, weather measurements, and device status.*

*REQUIREMENT 4.14.3.1.3: The ATMS shall provide the mechanism for users to select filters for alerts and notifications.*

*REQUIREMENT 4.14.3.1.4: The alert and notification filters shall be based on type of filter, device, type of device, time of day, and jurisdiction.*

*REQUIREMENT 4.14.3.1.6: The ATMS shall allow authorized users to set alert and notification thresholds by time of day.*

*REQUIREMENT 4.14.3.1.7: The system shall be able to generate alerts and notification based on traffic conditions (traffic speeds, volume levels, congestion levels) and event triggers (incidents, construction and maintenance activities, special event activities, etc.)*

The iNET™ Alert window allows users to view the health of the system. The Alert window reports any device failures, severe weather conditions, as well as severe traffic conditions. For alerts due to weather conditions or alerts due to traffic conditions, an ATMS event can be generated directly from the Alert window. Alerts are categorized by priority: Severe, High, Moderate, and Low. The priority is used to color code the alerts shown in the table on the Home tab of the Alert Window. The user is also able to filter alerts and notifications based upon priority, as well as agency. Alerts and their associated thresholds are able to be configured based upon different values (air temperature, pavement temperature, etc.)

The severity field is used when an Event is generated based on a received alert. The severity of the alert will be used to populate the Priority field of the generated event. Any communications or device errors reported by the device will also raise an alert. All weather data, along with the device or communication errors are logged and available in the status and data reports. Figure 109 shows the configuration feature for setting alert thresholds. Only users with the proper permissions are allowed to set thresholds.

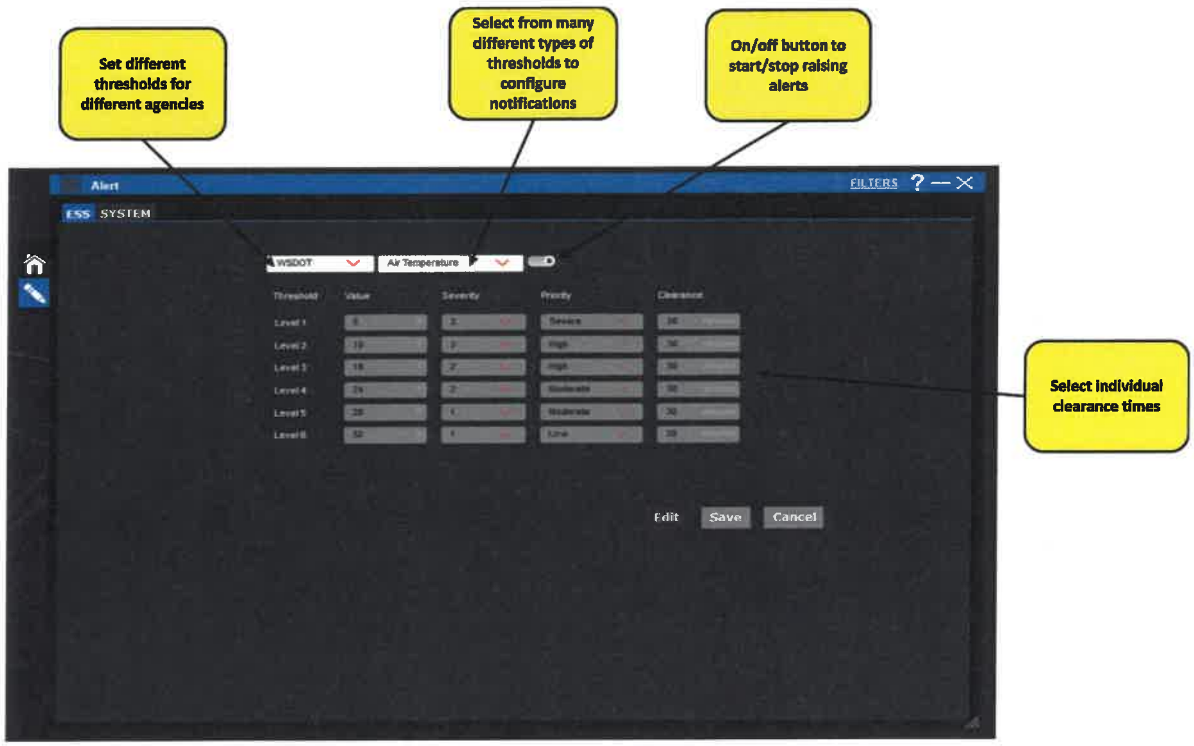



**Figure 109 – Alert Threshold Configuration**

We will exceed the requirement noted below through the implementation of our iNET™ ESS Module and Alert Module. See detailed explanation on how our modules meet or exceed this requirement below.

*REQUIREMENT 4.14.3.1.8: The ATMS shall be able to send out internal notifications regarding an event to up to 100 recipients. Notification to include select information captured in the event log. Notifications shall be completed within 5 minutes of initiation of procedures (process only not inclusive of conveyance method and receiver's email system delays).*

As alerts are generated, they are posted to the Alert screen, where they can be viewed as seen in Figure 110. Notifications are also sent out to those users who have subscribed to the alerts through the Contact Notification feature (Figure 111). No limit is set on the number of people who can receive notifications. Notifications are set per user, which include filters to reduce the number of notifications. A schedule of work hours can be set for a user is able to receive notifications.

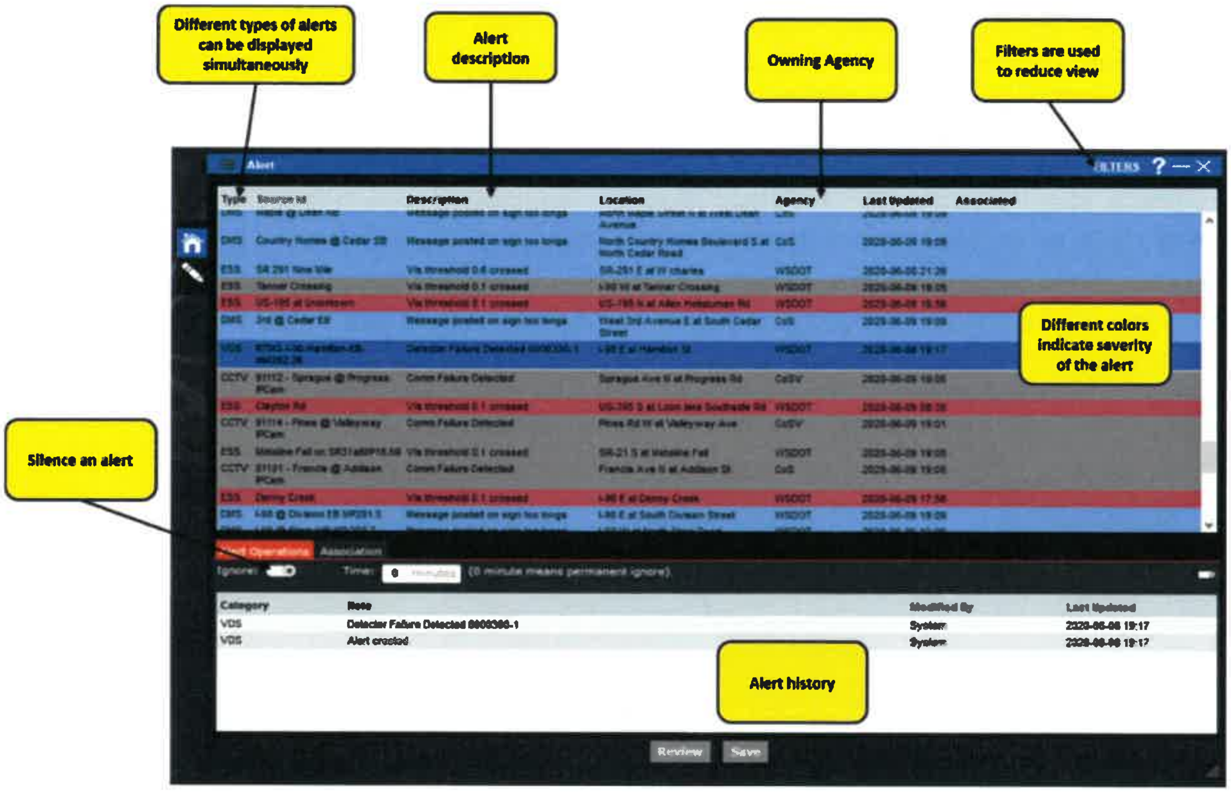



Figure 110 – Alert Window

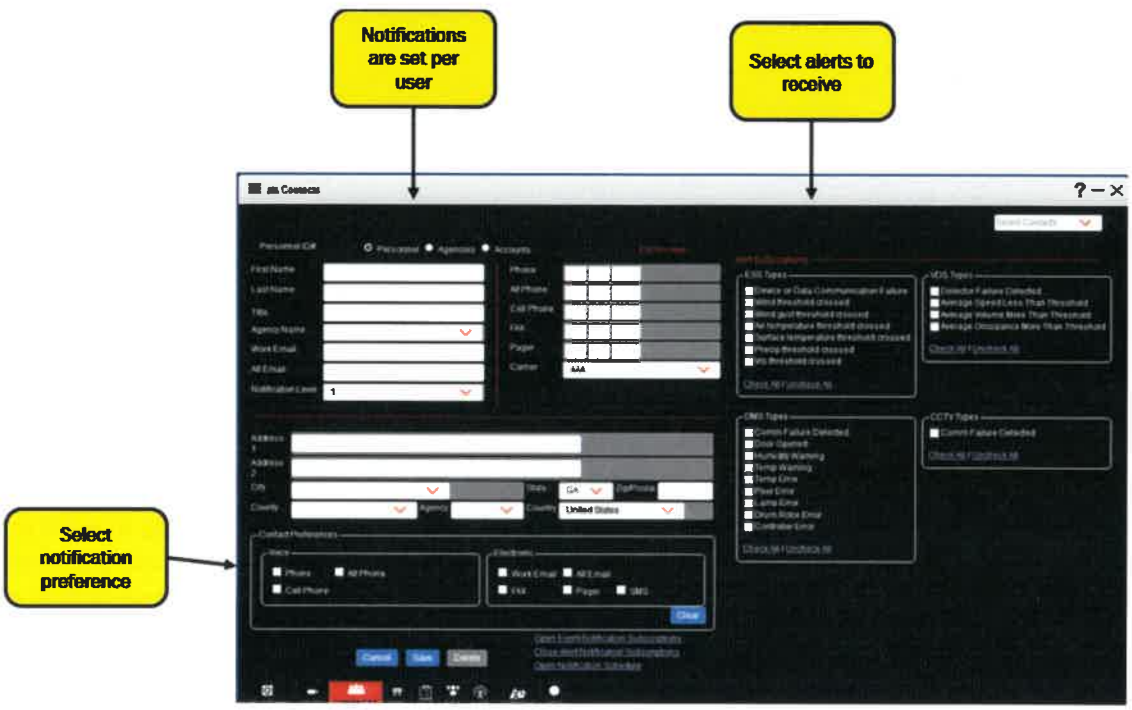



Figure 111 – Alert Notification Subscription

We will exceed the requirement noted below through the implementation of our iNET™ ESS Module and Alert Module. See detailed explanation on how our modules meet or exceed this requirement below.

*REQUIREMENT 4.9.1.3: The ATMS shall log RWIS data for operational retrieval and reporting purposes.*

Similar to other device modules, the iNET™ weather module comes complete with a status and data report. As stated above, all weather data is logged and is available for the reports. A sample data report is provided below in Figure 112.

**Weather Data Report**

ESS Report - Current

Page: 5

| | | | | | |
|---|---|---|---|---|---|
| Last Update: | 01/24/2012 13:42 GMT | Relative Humidity: | 97 % | Speed Average: | 12.53 mph |
| Status: | - | Barometric Pressure: | 0 | Speed Gust: | 14.54 mph |
| | | Precipitation Intensity: | | Dir Minimum: | - |
| | | Precipitation Type: | | Dir Average: | West |
| Air Temp: | - | Precipitation Rate: | 0 iph | Dir Maximum: | - |
| Dew Temp: | 29.48 F | Precipitation Acc: | 0 iph | Visibility: | 0 m |

| Sensor # | Surface Temp | On Bridge | Freeze Temp | SubSurf Temp | Chem Factor | Chem | Depth | Ice | Water Level |
|---|---|---|---|---|---|---|---|---|---|
| 1169 | - | No | - | 31.82 F | - | - | - | - | - |
| 1169 | - | No | - | 31.82 F | - | - | - | - | - |

| | | | | | |
|---|---|---|---|---|---|
| Last Update: | 01/24/2012 13:52 GMT | Relative Humidity: | 98 % | Speed Average: | 11.41 mph |
| Status: | - | Barometric Pressure: | 0 | Speed Gust: | 15.88 mph |
| | | Precipitation Intensity: | | Dir Minimum: | - |
| | | Precipitation Type: | | Dir Average: | Northwest |
| Air Temp: | - | Precipitation Rate: | 0 iph | Dir Maximum: | - |
| Dew Temp: | 30.02 F | Precipitation Acc: | 0 iph | Visibility: | 0 m |

| Sensor # | Surface Temp | On Bridge | Freeze Temp | SubSurf Temp | Chem Factor | Chem | Depth | Ice | Water Level |
|---|---|---|---|---|---|---|---|---|---|
| 1169 | - | No | - | 31.82 F | - | - | - | - | - |
| 1169 | - | No | - | 31.82 F | - | - | - | - | - |

Figure 112 – iNET™' s Weather Report

### 2.2.5.b. Desirables

These requirements are covered in other sections.

## 2.2.6 Data Sensors

### 2.2.6.a. Mandatory Requirements

We will exceed the six (6) requirements noted below through the implementation of our iNET™ VDS Module, Alert Module, and C2C Module. See detailed explanation on how our modules meet or exceed these requirements below.

*REQUIREMENT 4.9.3.1 -Although WVDOT does not currently have any data collection sensors in use, they desire this functionality in the future. A detector device control application should be available if and when WVDOT installs detectors.*

*REQUIREMENT 4.9.3.2: The ATMS should have the ability to integrate with and accept data from third-party data providers such as Waze, HERE, INRIX, etc. or approved equal.*

*REQUIREMENT 4.9.3.5: The ATMS should update the 511 website interface with information including a summary of individual traffic variables (speed, volume, occupancy, or a combined congestion metric).*

*REQUIREMENT 4.9.3.6: The ATMS should update the ATMS traffic conditions map/GUI with measurements from traffic sensors and derived traffic variables on a frequency of once per minute or more frequent with data that have been collected two minutes or less prior.*

*REQUIREMENT 4.9.3.7: The ATMS should automatically measure or calculate volume, traffic speeds, and occupancy.*

*REQUIREMENT 4.9.3.8: The ATMS should calculate and be able to display vehicle classification information.*

The Vehicle Detection System (VDS)/Congestion Monitoring module integrates with a wide variety of vehicle detection technologies, including various vehicle detection sensor types and probe-based data feeds. The VDSs can also be viewed as icons on the map for a graphical summary view (Figure 113). The colored icons represent the congestion level. The data is updated once per minute, or as frequently as the data becomes available.

This module allows users to view real-time roadway traffic conditions by analyzing traffic speed, volume, occupancy, and vehicle classification information (see Figure 114). This module has been integrated with Waze, HERE, and INRIX data.

The Center-to-Center module within iNET™ is used to propagate the VDS information, as well as any other information, to external systems. Castle Rock's web interface includes a summary of the individual traffic variables in the interactive legend.

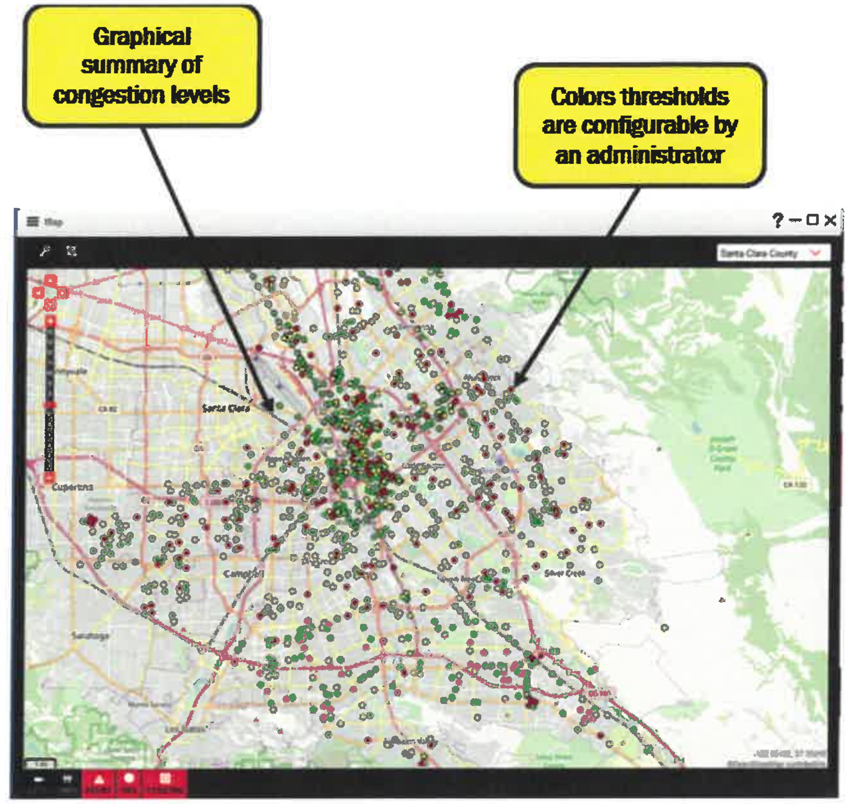



Figure 113 – VDS Status on the Map

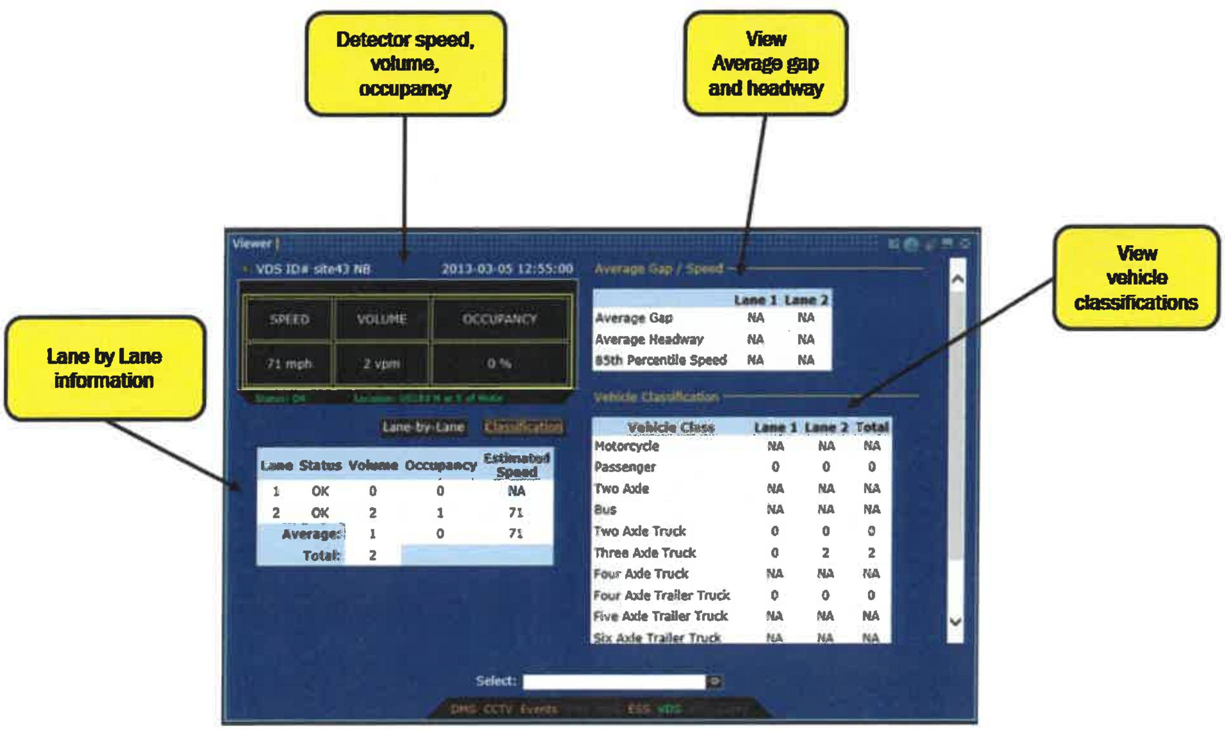



Figure 114 – Detector Station Information

We will exceed the two (2) requirements noted below through the implementation of our iNET™ VDS Module, Alert Module, and C2C Module. See detailed explanation on how our modules meet or exceed these requirements below.

*REQUIREMENT 4.9.3.3: The ATMS should provide an interface that allows operators to manage and view a summary of information from roadway sensors to the present status of the entire roadway network including a summary of individual traffic variables (speed, volume, occupancy, or a combined congestion metric) and the status (functional or nonfunctional) of all traffic sensors.*

*REQUIREMENT 4.9.3.4: The ATMS should display an alarm notification when traffic speeds drop, volume rises, or occupancy increases beyond configurable thresholds.*

The VDS List window displays a summary of the detector stations in a tabular format (Figure 115). This list can be sorted by any column and can be filtered by clicking on the column heading. The colored icons represent the congestion level at that location.

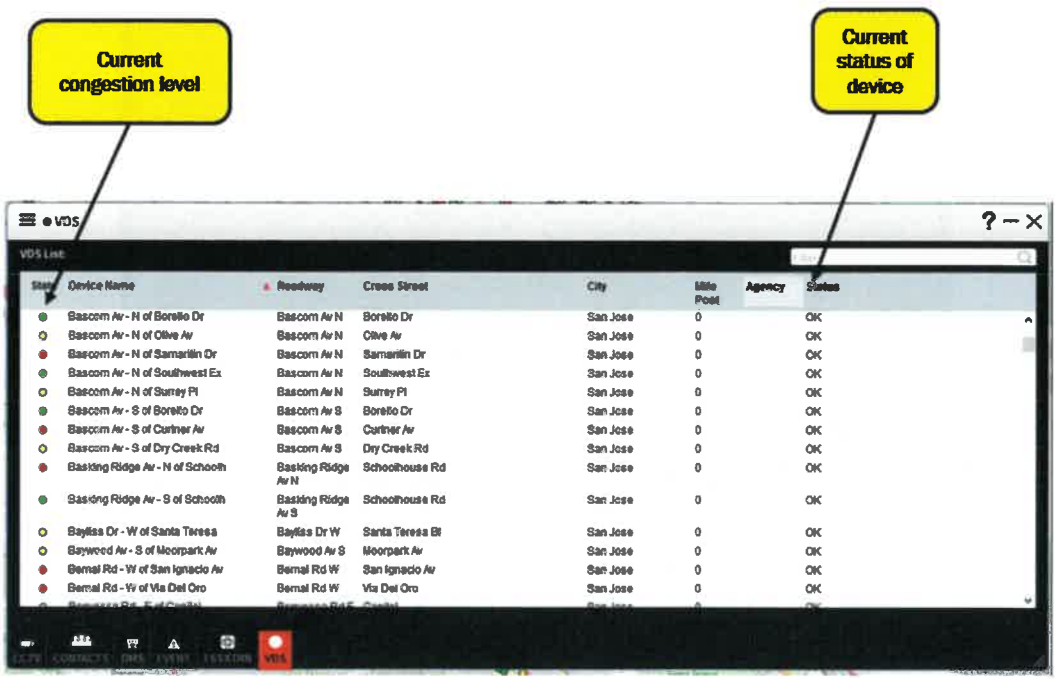



Figure 115 – Detector Station Summary List

Similar to the other devices, the Alert window will display any errors or data conditions (Figure 116) for detector stations. The VDS alerts can be configured to alarm when the volume, occupancy, or speed reaches a specific threshold (Figure 117). The configuration parameters for these error or data condition thresholds are available to those users with permission.


Figure 116– VDS Detector Alerts

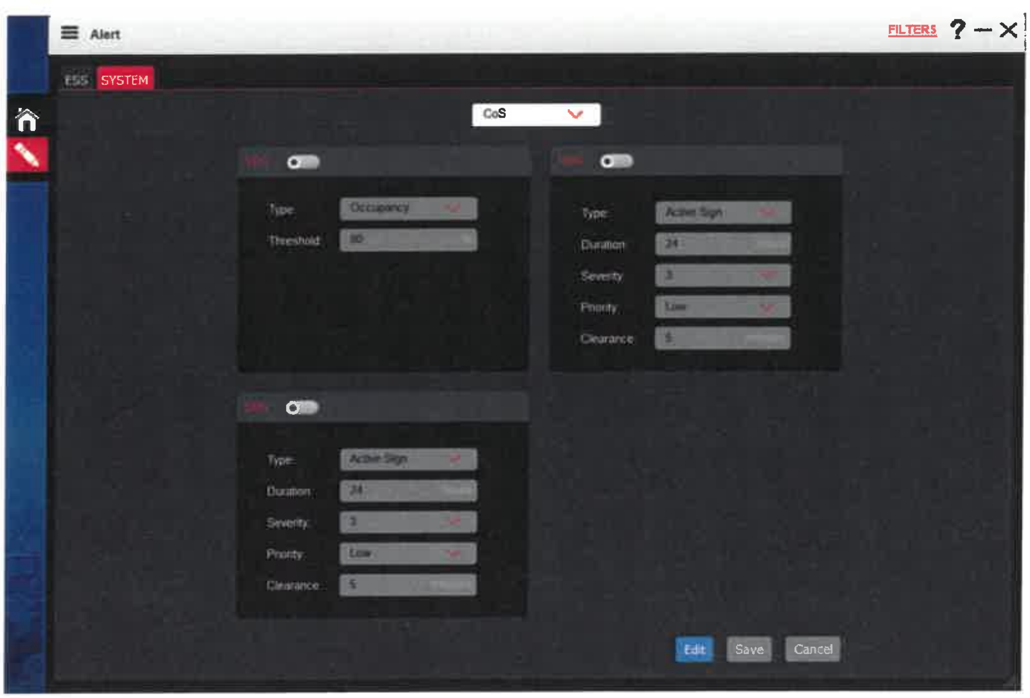



Figure 117 – Alert Threshold Configuration for VDS

## 2.2.7 Event/Incident Management & Reporting

### 2.2.7.a. Mandatory Requirements

We will exceed the nine (9) requirements noted below through the implementation of our iNET™ Event Management and Response Plan/DSS Modules. See detailed explanation on how our modules meet or exceed these requirements below.

*REQUIREMENT 4.10.1.1.: The ATMS shall provide a mechanism for operators to manage incidents and events through a dialog box or user interface.*

*REQUIREMENT 4.10.1.2: The ATMS shall store and provide operators with access to event information (incidents, construction/maintenance, parking, etc.) as entered by users.*

*REQUIREMENT 4.10.1.3: The ATMS shall provide a mechanism for operators to enter/create new incidents or events. Data to be entered may include, but not be limited to: type, location (jurisdiction, route, milepost, direction, lat-long, exit number), source, details, impacts, agencies to notify, response, narrative/comments, activity log, lane configuration, lane impacts, and severity.*

*REQUIREMENT 4.10.1.4: Users shall have the option to select from pre-defined phrase to describe the incident or event.*

*REQUIREMENT 4.10.1.7: Users shall be required to specify the location of the incident either through data entry or pin-dropping on a map such that the ATMS can capture the location of the incident relative to the route, direction and location (milepost and/or lat-long)*

*REQUIREMENT 4.10.1.11: Authorized users shall be able to edit incident reports created by any user in the system.*

*REQUIREMENT 4.10.1.12: Authorized users shall be able to edit incident reports received by the ATMS from external systems*

*REQUIREMENT 4.10.1.14: Authorized users shall be able to create construction/maintenance event reports in the ATMS.*

*REQUIREMENT 4.13.1.11: The ATMS user interface maps shall display active incidents (construction, incidents, etc.).*

For the iNET™, all events, including road closure events and unscheduled events, appear on the map (Figure 118) and the event list viewer (Figure 119). This enables the staff to monitor operations easily and efficiently. Events, both unscheduled and scheduled, are displayed on the map with unique icons. These event icons can be displayed on either the list or the map by toggling on the display via the switcher bar (lower bar on the viewer) or by selecting the icon display from the legend.

Event management is not required to be performed by the operator who created the event. iNET™ allows any operator who has the appropriate permissions to modify any editable fields of an existing event and terminate an existing event no matter the source. Incidents in general, whether entered by an operator or received by the external system, can be edited directly in the event management system using the native event viewer screens or via the reporting system.

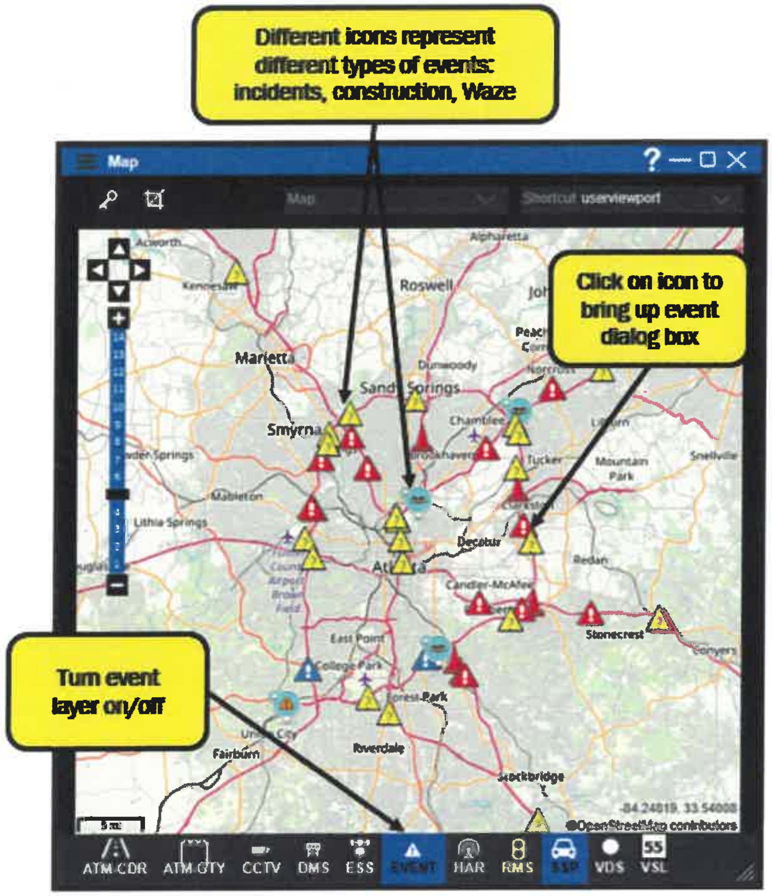



Figure 118 – Event Icons on the Map

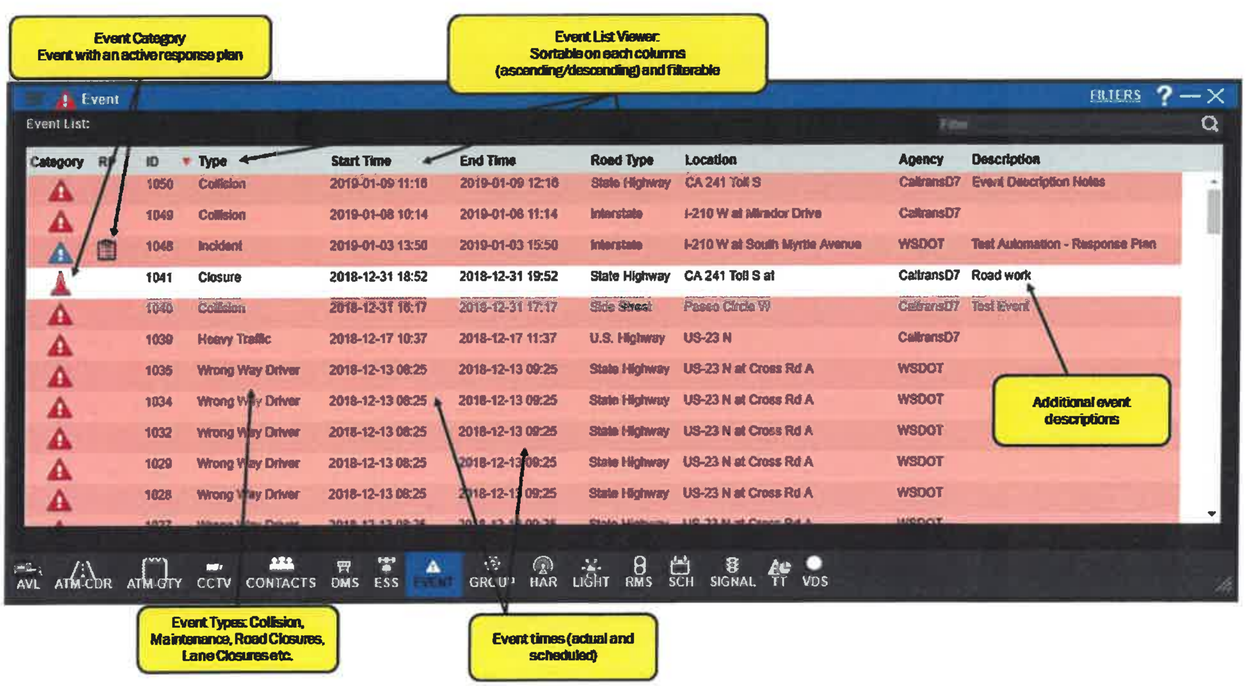



Figure 119 – Event List Viewer

We will exceed the three (3) requirements noted below through the implementation of our iNET™ Event Management and Response Plan/DSS Modules. See detailed explanation on how our modules meet or exceed these requirements below.

*REQUIREMENT 4.10.1.5: Users shall have the option to enter free text to describe the incident or event.*

*REQUIREMENT 4.10.1.15: Authorized users shall be able to edit construction/maintenance events reports, including changing the status from active to inactive.*

*REQUIREMENT 4.10.1.6: Users shall have the option to enter free text to describe the incident or event for descriptions posted to 511.*

*REQUIREMENT 4.10.1.21: The ATMS shall maintain an incident log that records the date/time stamps of operator's actions and data entry.*

*REQUIREMENT 4.10.1.36: ATMS events can be programmed for future events and associated DMS devices and message to be used with that future event.*

To create an event for the iNET™, the operator with permissions can simply right-click the location from the map (Figure 120, or select the roadway location (roadway interchanges, sections, cross-streets) from the drop-down selection on the event viewer, as shown in Figure 121, right mouse click from the event viewer. If selected from the map, the location details are automatically populated in the event viewer. Location details include street names, city, county, state, latitude, longitude, and milepost. If the operator manually creates the event from the event viewer, the location details, including latitude and longitude, are selectable from drop-down menu selections.

The event viewer, Figure 122 also allows the operator to select the type of event, active or inactive status, duration of the event, event severity/priority, and specific lanes on a roadway, as well as the specific roadway itself. In the event viewer, the event type drop-down allows the operator to select the event type. This selection will enable the event to be either an "unscheduled" or "scheduled" event type. The operator also has the option to select a previously created scheduled or planned event and copy this to create a new scheduled or planned event.

The event viewer also allows the operator to select the type of event active or inactive status, duration of the event, event severity/priority, and specific lanes on a roadway, as well as the specific roadway itself. In the event viewer, the event type drop-down allows the operator to elect the event type. This selection will enable the event to be either an "unscheduled" or "scheduled" event type. The operator also has the option to select a previously created scheduled or planned event and copy this to create a new scheduled or planned event.

For a scheduled or planned event, the iNET™ has a number of statuses that can be assigned. These statuses include the following:

- Unconfirmed or "pending" – the planned event has been created in the iNET™ system but has not been activated.
- Confirmed or "active" – the planned event has been created and is now an active event, i.e. the scheduled start time has passed, and the operations staff has verified that the planned event has occurred.
- Terminated or "completed" – the planned event has ended and is now closed/completed/terminated, i.e. the scheduled end time has elapsed, and the operations staff has verified that the planned event has completed.

During the life cycle of the event, the operator is able to change/modify the details of the event, including entering freeform text concerning the event in the event description field and the duration of the event (Figure 123). This includes the lane blockage, as well as additional responders responding to the event, etc. Each of these changes are automatically date/time stamped and stored in the event datafile and will be reviewable using the iNET™ reporting event functionality. Modifications to an existing created event are able to be performed by any operator with permissions. Event management is not required to be performed by the operator who created the event. iNET™ allows any operator who has the appropriate permissions to modify any editable fields of an existing event and terminate an existing event.

An example of an event modification that is permissible is the activation of an unconfirmed event. The status is unconfirmed or "inactive". The creating operator is unable to complete the confirmation of that event, but a different operator with permission is able to change the status of the event from the unconfirmed state (inactive) to confirmed (active).

During the event creation/confirmation, the operator has the ability to create an event message that can be sent to an external system, such as a 511, as well as to other contacts or contact groups. iNET™ will automatically create the message with the event details such as event ID, location. lane blockage, event detected time, event detection source, comments, and any CCTV snapshots related to the event. The operator has the option to modify the message before sending to the contacts or contact groups.

As stated earlier, the iNET™ saves any event field that is associated with an event, whether it is a planned or unplanned event. All data is date/time stamped automatically before being saved to the datafile, including when the event occurs; when the event is scheduled, actually started, reported, verified, and terminated; and when the roadway is cleared.

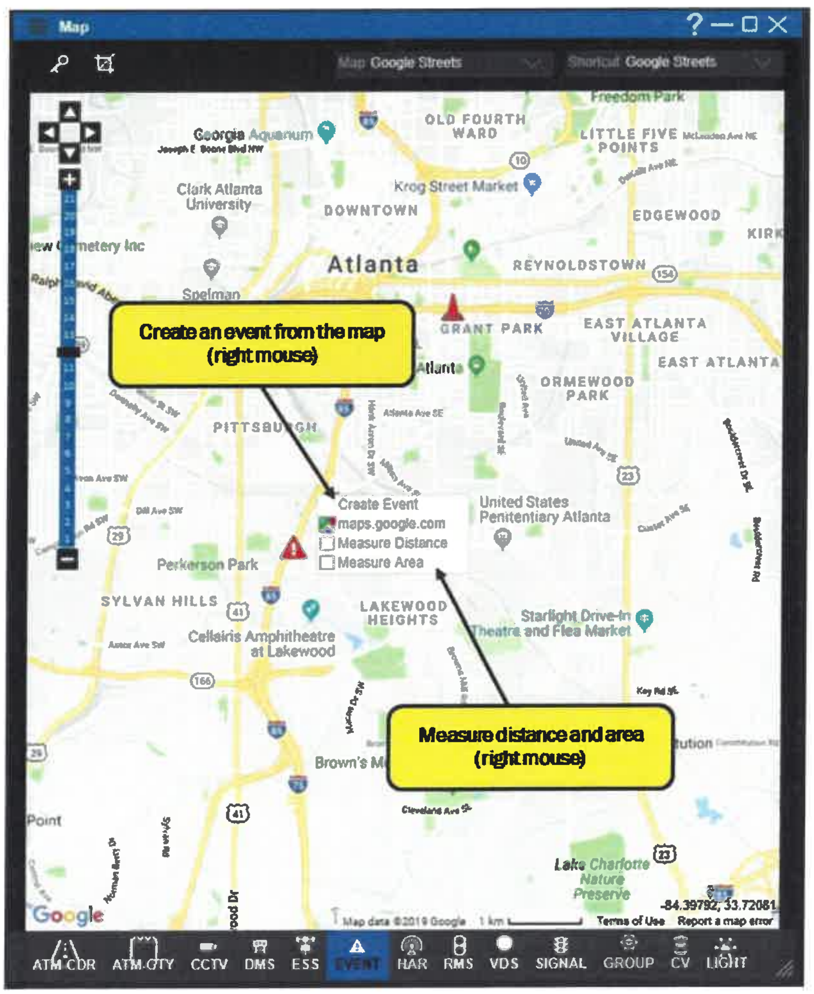



Figure 120 - Event Creation from Map

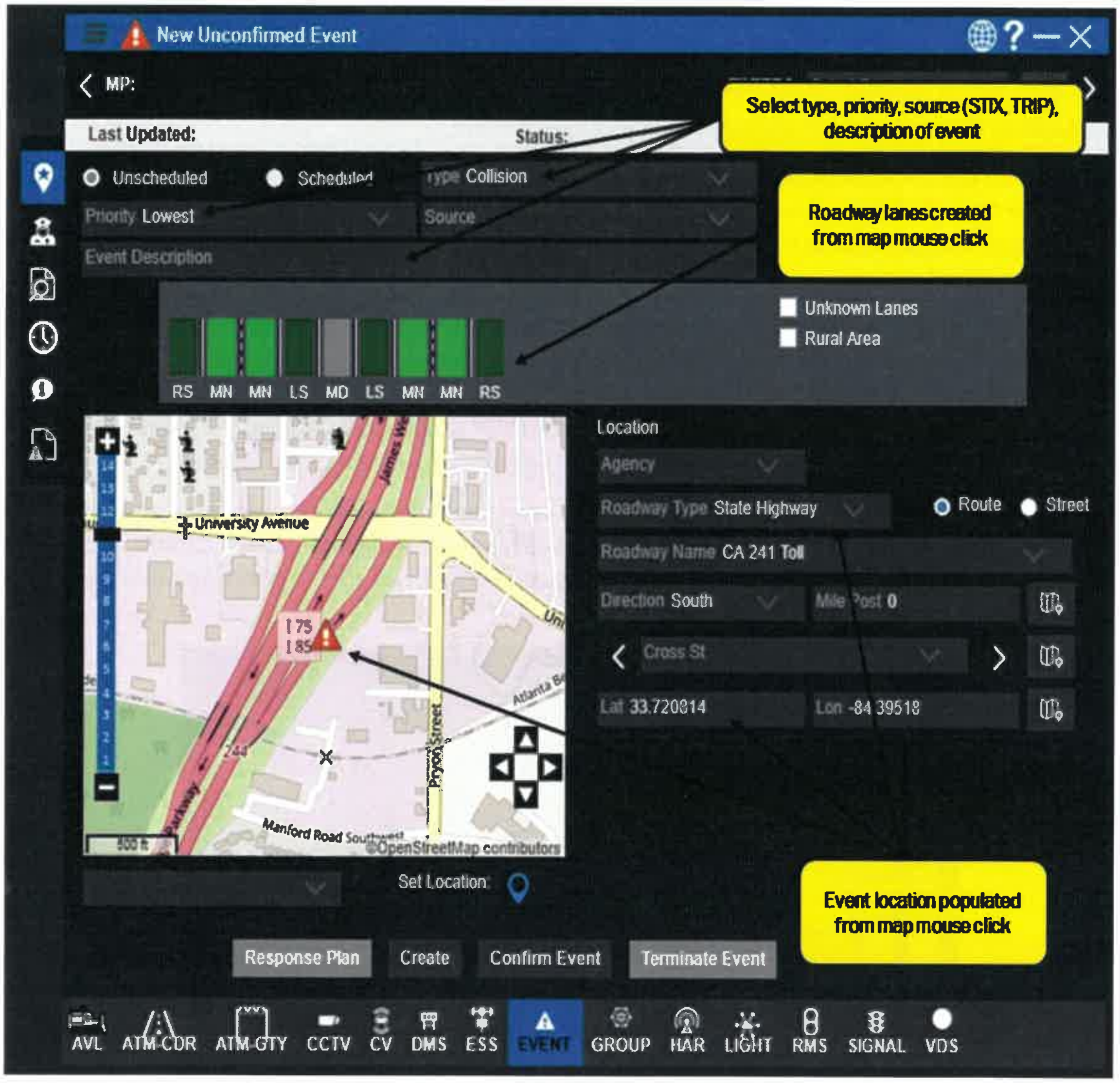



Figure 121 – Event Viewer Populated from Map Creation

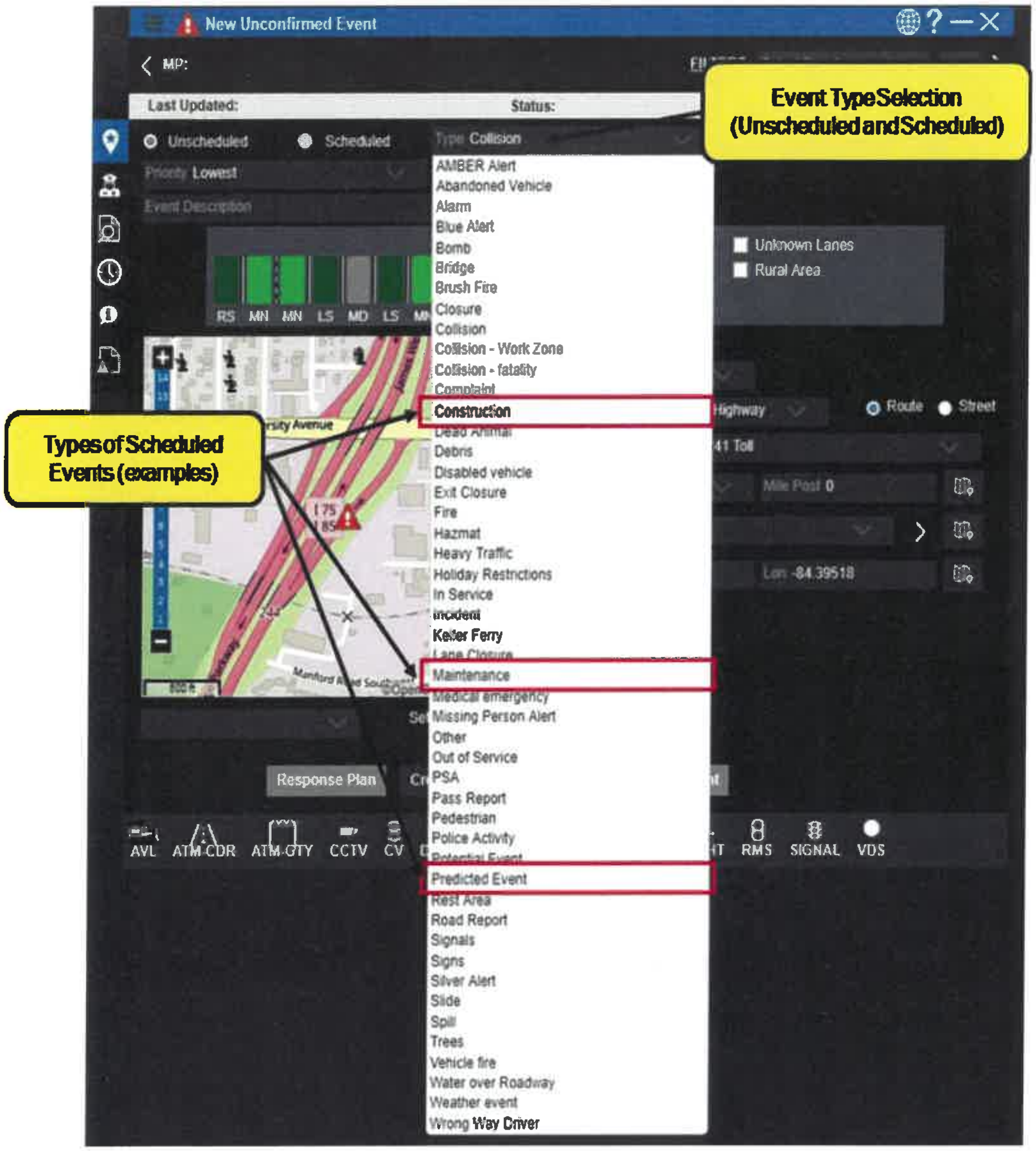



Figure 122 – Event Types

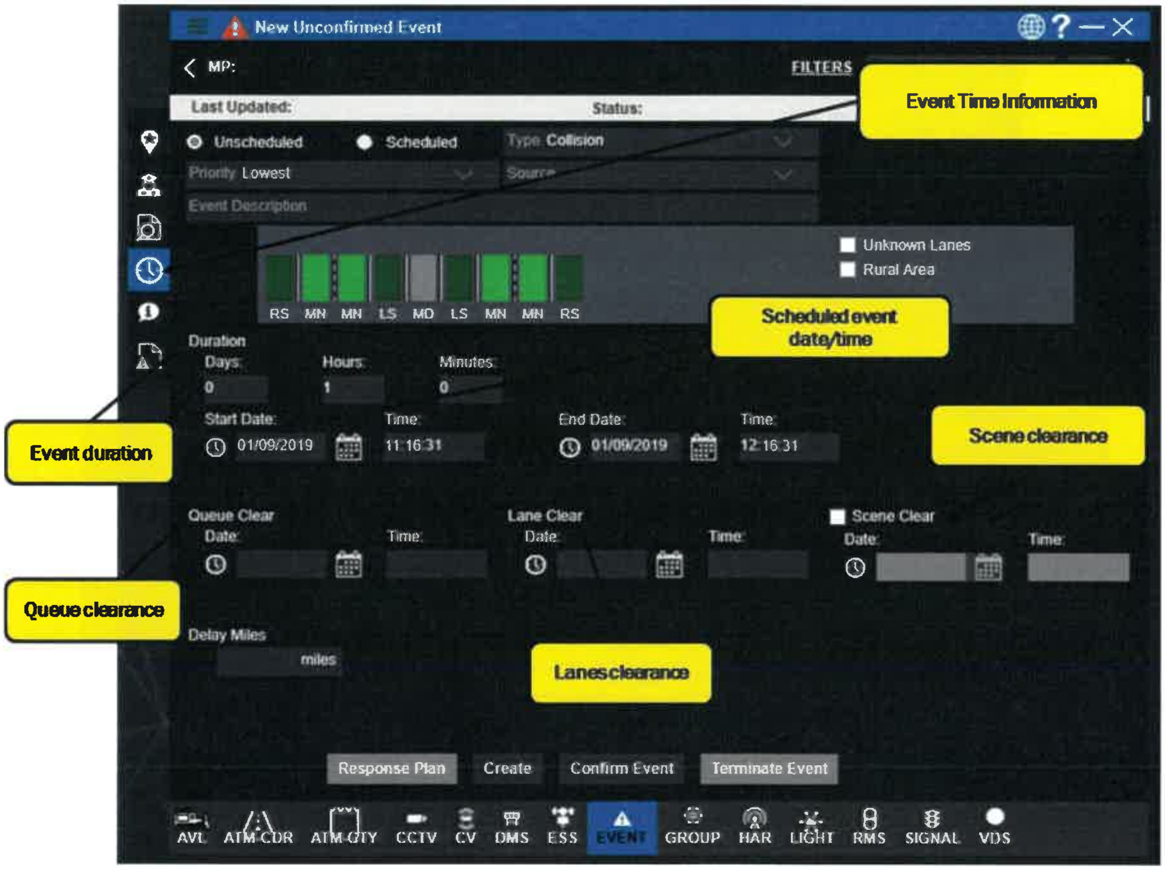



Figure 123 – Event Duration Tab

We will exceed the requirements noted below through the implementation of our iNET™ Event Management and Response Plan/DSS Modules. See detailed explanation on how our modules meet or exceed these requirements below.

*REQUIREMENT 4.10.1.17: The ATMS event management system shall include capability to generate and send alerts to WVDOT partner agencies and personnel.*

*REQUIREMENT 4.13.1.3: The ATMS user interface shall display alerts and notifications to users.*

iNET™ allows configuration of alert notifications for individual users the different subsystems installed. iNET™ system alert notifications can be received either by email, or text messaging. Users will only receive email or text notifications for those alarms that are selected/configured per user. The notification mechanism for iNET™ allows for enabling alerts for recipients (either users of the system or external contacts).

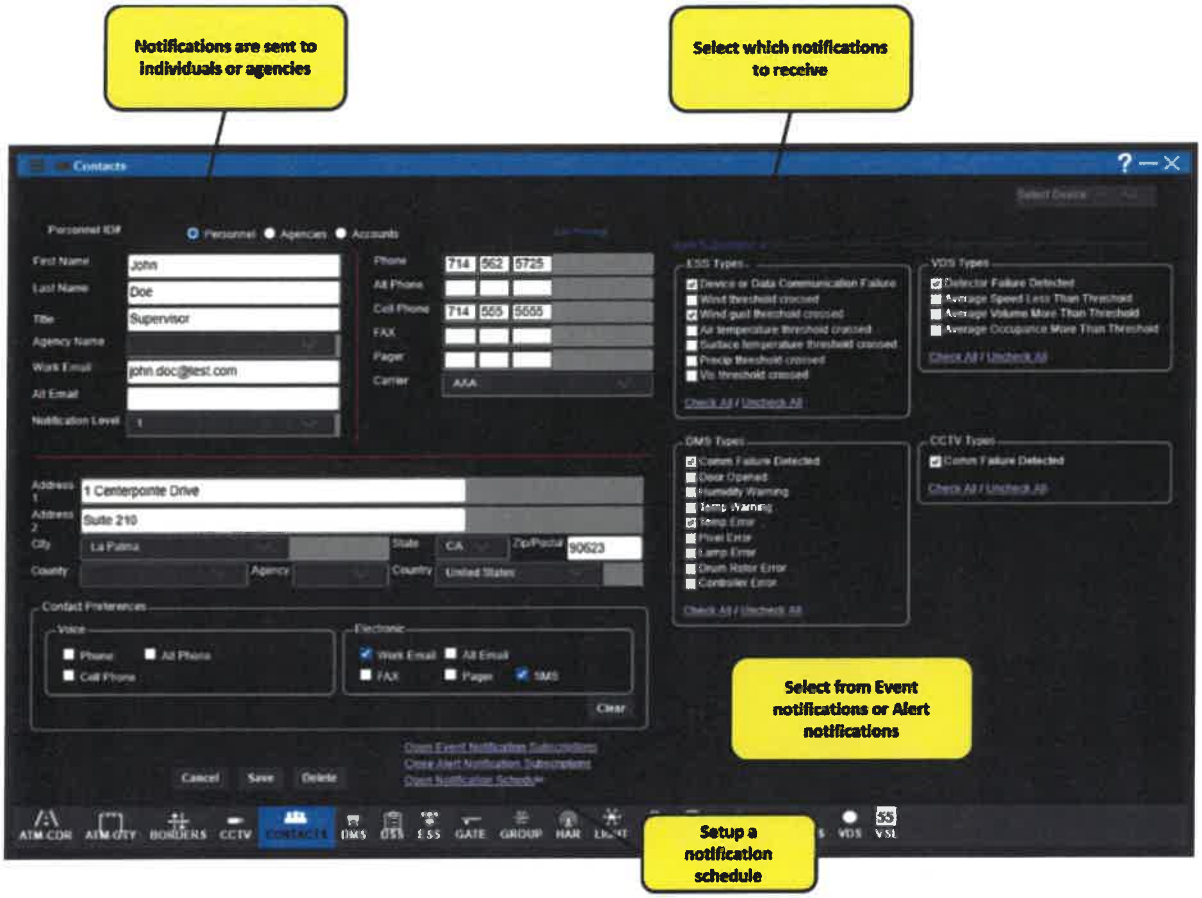



Figure 124 – Configuration of Alarm Notifications

## PARKING

We will exceed the requirements noted below through the implementation of our iNET™ Event Management and Response Plan/DSS Modules. See detailed explanation on how our modules meet or exceed these requirements below.

*REQUIREMENT 4.10.1.22: The ATMS shall provide a mechanism for entry and edit of truck parking information from existing truck parking systems on I-81 and future systems. (Note: Currently the entry and edit of truck parking information is a function used in the existing ATMS system.*

*REQUIREMENT 4.10.1.23: he ATMS shall include capability of accepting truck parking occupancy data for parking lots*

*REQUIREMENT 4.10.1.24: The ATMS shall accept and handle truck parking occupancy data for multiple lots and distinguish the lots in display to operators.*

*REQUIREMENT 4.13.1.35: The user interface shall enable operators to view parking information made available to the ATMS.*

To enter a new information or edit an existing information, the operator with permissions can access the parking inventory screen within ATMS and fill out all the fields such as the location details, number of parking spaces, etc. as displayed in the Parking lot inventory screenshot below. The operator can also associate cameras with a parking lot that are used by operators to monitor and verify the counts of the empty and used parking spaces.

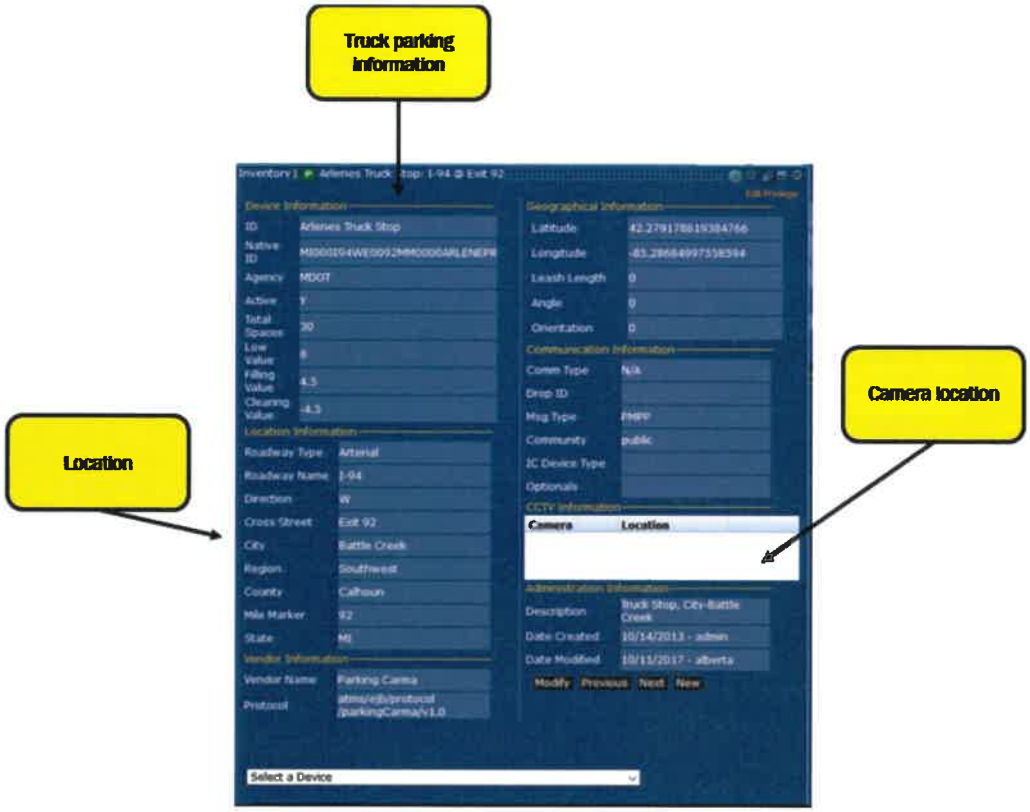



Figure 125 – Parking Lot Inventory

The Parking lot viewer screen displays the real time Parking lot information, including the total and occupied spaces, received from other truck parking systems such as the I-81 and other future systems. The operator with permission can access the Parking Viewer screen to enter new data or edit an existing one. The DMS signs that are listed in the screenshot are associated upstream signs that displays real time parking lot information.


Figure 126 – Parking Lot Viewer

The screenshots in Figure 127 are examples of live parking lot messages displayed on the DMS signs upstream of the parking lots.


Figure 127 – Parking Lot DMS

To access a Parking lot from multiple lots, the operator can either select from a list of Parking lots or from the main map with in the ATMS. The occupancy data will be displayed within the viewer for the selected Parking lot. The occupancy data can also be seen by hovering over the parking lot icon on the map. These Parking lots are distinguished from one another in display to the user with a unique parking lot name and associated location.

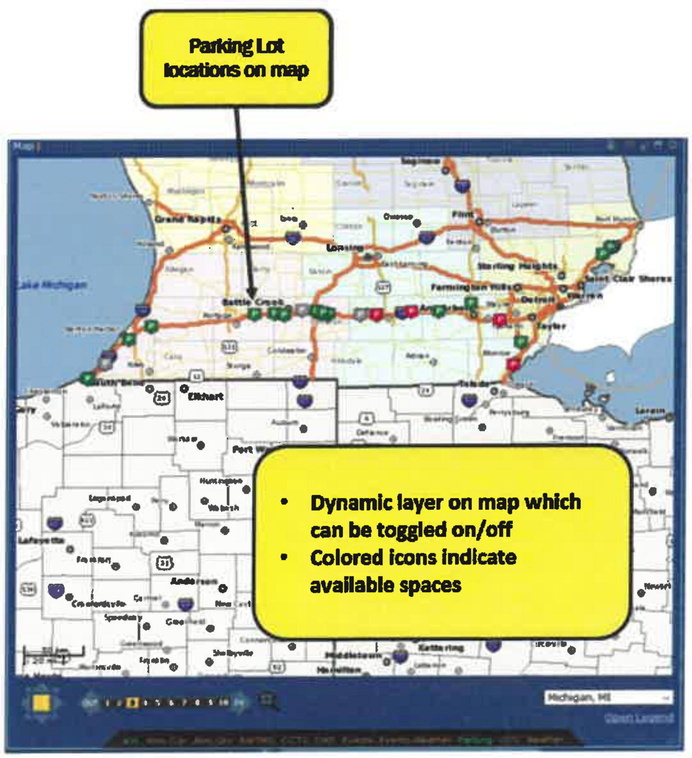



Figure 128 – Parking Lot Layer on Map

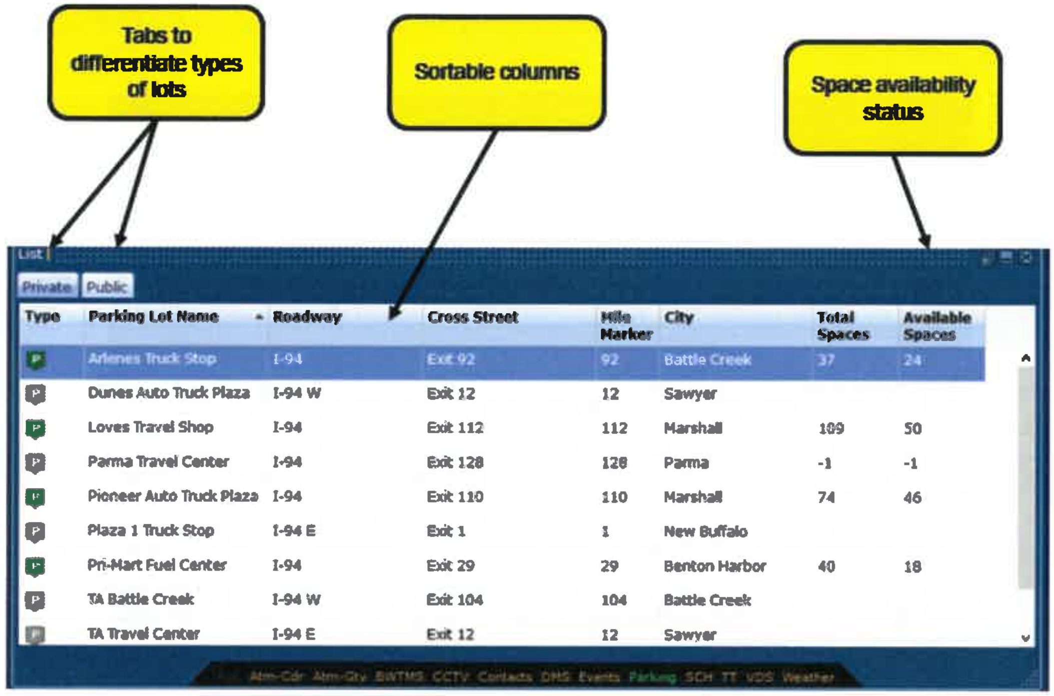



Figure 129 – Parking Lot - List View

## EXTERNAL SYSTEMS

We will exceed the requirements noted below through the implementation of our iNET™ Event Management and Response Plan/DSS Modules. See detailed explanation on how our modules meet or exceed these requirements below.

*REQUIREMENT 4.10.1.25: The ATMS shall include capability to receive incident reports from external systems.*

*REQUIREMENT 4.10.1.26: The ATMS shall include functionality to receive incidents from various 911 centers and law enforcement CAD systems and software.*

*REQUIREMENT 4.13.1.34: The thresholds controlling the AMS event management plans shall be adjustable by operators or administrators.*

iNET™ has interfaced with third-party traffic data services including ingesting data from systems to include INRIX, WAZE, and HERE.

iNET™ includes interfaces to various CAD systems allowing ATMS operators to view and manage event data from local and state law enforcement agencies. The interfaces to the CAD systems are C2C standalone processes that run within the ATMS application. A system poller is created that allows Administrators to define the frequency of the interface updates between ATMS and the CAD system. The interface can be “read only” or implemented as a two-way interface. When events are received from the CAD system, a system alert appears in the operator alert UI. The operator with security access privileges is given the option to view the event, and/or create a corresponding event, within the ATMS. This can be done with a single mouse click and all relevant and necessary event information will be created within the ATMS. The implementation of the current CAD interface satisfies all CAD interface requirements.

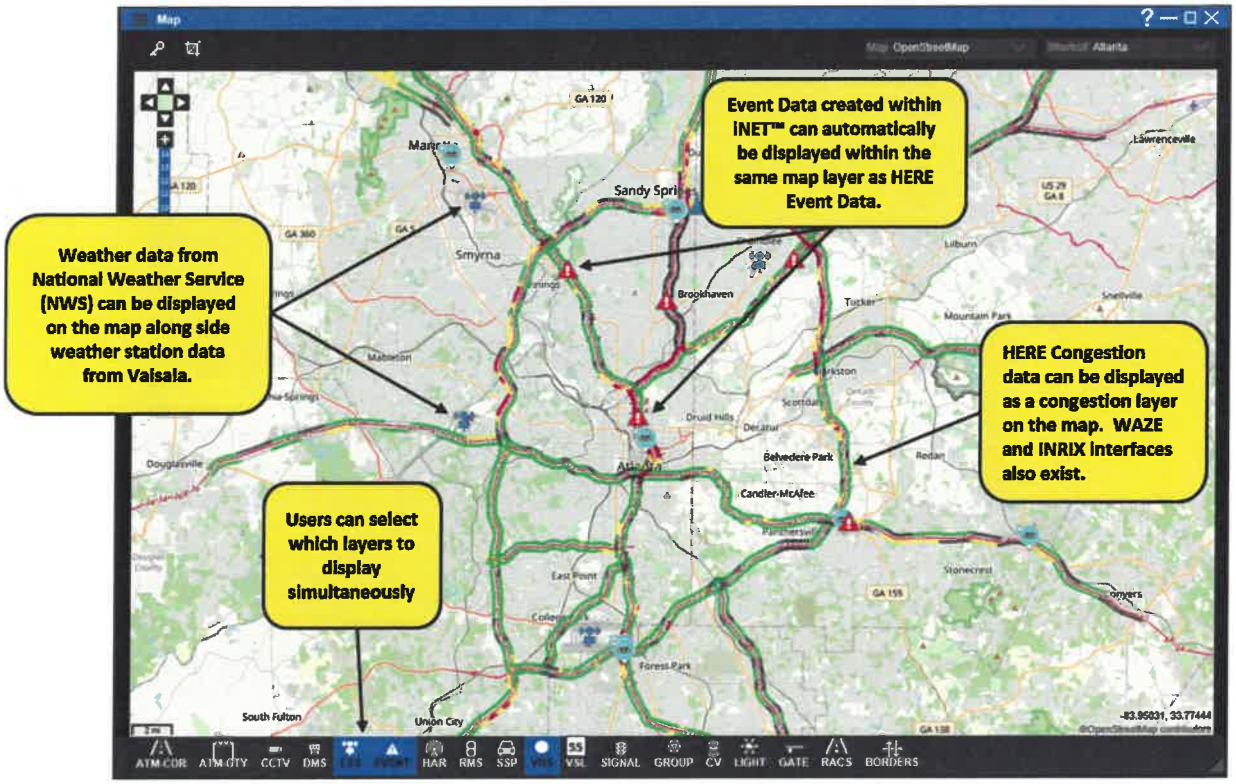



Figure 130 – Third-Party Traffic Data

iNET™ will be extended to include an interface to share data back to third-party software for WAZE, TomTom and INRIX for both congestion and event data.

iNET™ includes interfaces to various CAD systems allowing ATMS operators to view and manage event data from local and state law enforcement agencies. The interfaces to the CAD systems are C2C standalone processes that run within the ATMS application. A system poller is created that allows Administrators to define the frequency of the interface updates between ATMS and the CAD system. The interface can be "read only" or implemented as a two-way interface. When events are received from the CAD system, a system alert appears in the operator alert UI. The operator with security access privileges is given the option to view the event, and/or create a corresponding event, within the ATMS. This can be done with a single mouse click and all relevant and necessary event information will be created within the ATMS. The implementation of the current CAD interface satisfies all CAD interface requirements.

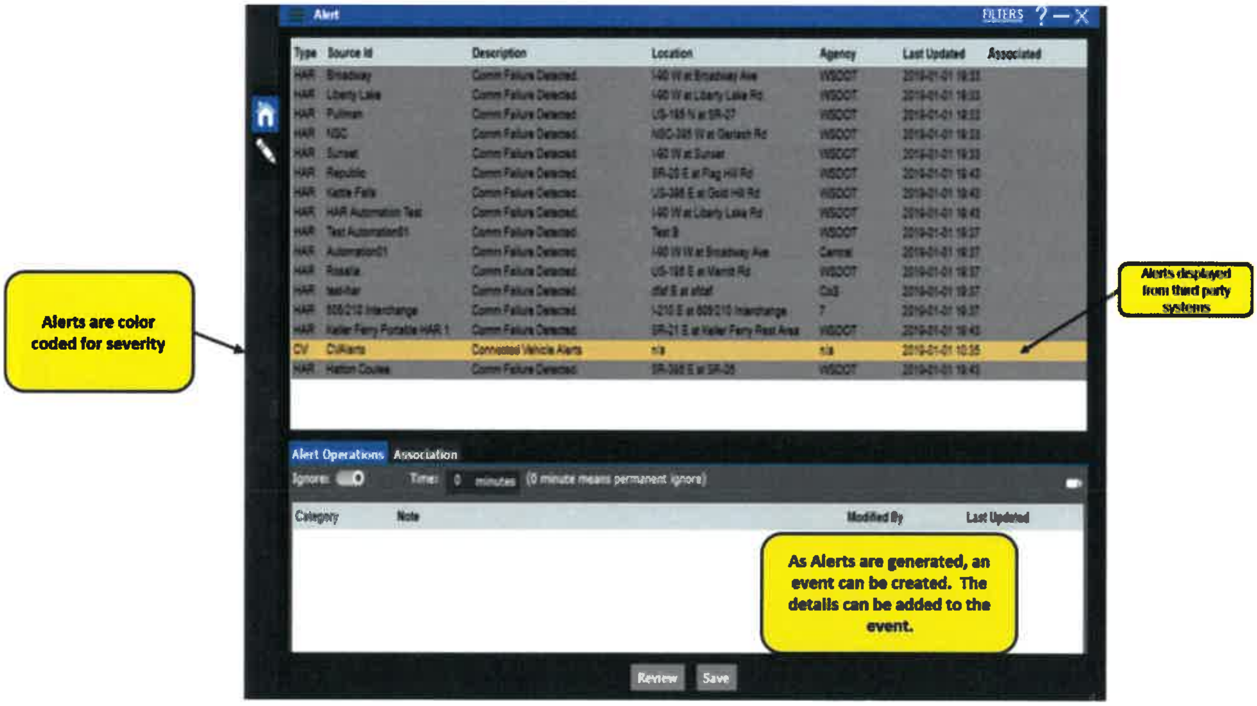



Figure 131 – CAD Interface

The CAD event is treated as any other ATMS created event and appears on the Event Map layer, the system List UI, and has an associated Event Details UI. Events in the ATMS can be displayed and sorted by date/time or by location using the UI filtering option.

## AUTOMATIC EVENT DETECTION USING MACHINE-LEARNING TECHNIQUES

The iNET™ Transform Event Management and Automatic Incident Detection (AID) Modules are capable of automatically detecting events on roadways, typically freeways, highways or toll roads and alerting the user by placing an unconfirmed icon on the map using its GIS location. Once an event is detected, it tracks the queue to suppress secondary alarms for the same event. The Automatic Event Detection function uses several algorithms, including (1) All Purpose Incident Detection (APID), (2) a low speed detection algorithm, (3) integration with 3rd-party video analytics cameras/systems, (4) Embedded video analytics, and (5) Machine Learning. The first two traditional methods focus on detecting traffic change by analyzing limited traffic variables. The ML method is more flexible in detecting the hidden patterns in recurrent/non-recurrent events.

6. APID Algorithm: The APID algorithm considers prevailing congestion levels, compares upstream and downstream stations for differences in occupancy, tests individual stations for rates of increase and decrease in occupancy and tests upstream stations for extraordinary increases in occupancy.
7. Integration with third-party: iNET™ is integrated with 3rd-Party Video Image Detection Systems such as Citilog, Trafficon, Miovision, etc. When a potential incident is identified from one of these systems (e.g. stopped vehicle, collision, etc.) and icon will automatically appear on the iNET™ user interface.
8. The low speed detection algorithm: This comparative algorithm compares the value of measured speed to a pre-established threshold value. An incident alarm is prompted when the measured traffic parameter exceeds a pre-configured threshold.
9. Embedded Video Analytics: We have integrated the Parsons Polaris Alpha video analytics solution directly with iNET™. It can be used to find wrong way drivers, stopped vehicles as well as count vehicles, pedestrians and bikes using existing video streams fed into iNET™.

10. Machine-Learning Method: When a large amount of historical data is available, the neural networks-based machine-learning model embedded in iNET™ can be used to improve Automatic Event Detection performance by self-learning event classification from historical feature representation. The Machine-Learning method includes two major parts: ML model training and ML model deployment.

    - **ML Model Training:** The historical event log together with the historical event pattern representation data (such as traffic detector volume/occupancy/speed data, weather data, and Road Weather Information System (RWIS) data) are firstly pre-processed to handle missing, noisy, or erroneous data. The cleaned and structured training data are then fed into the ML engine. The machine learning algorithms are applied interactively until a good ML model is achieved.
        - **ML Model Deployment:** In the production environment, the deployed ML model receives the real-time event pattern representation data as input and generates the potential event alerts as output.
            - With new data continuously archived to the training data base, the entire process, as shown in Figure 1 will be repeated at regular interval to keep the ML model up to date.
        - **Cloud Platform:** Since the deployment of ML applications based on big data analysis is resource-intensive, iNET™ integrates with Amazon SageMaker, an Amazon-operated Machine learning as a Service (MLaaS) cloud platform, to cover most infrastructure issues associated with data pre-processing, model training, and model evaluation.

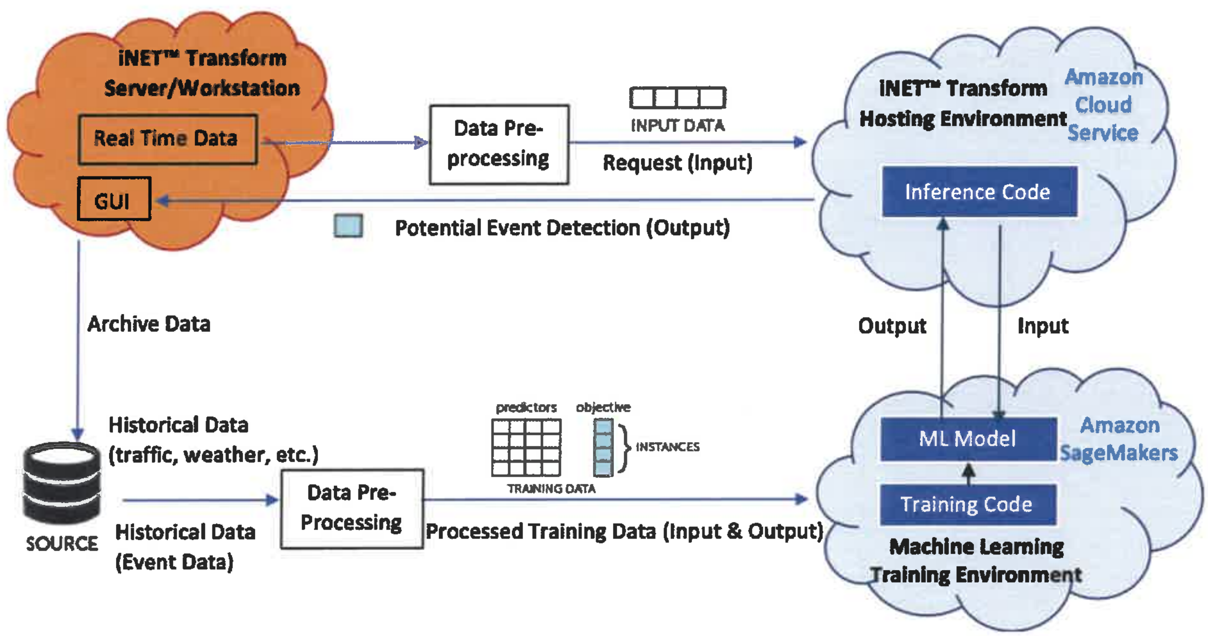



Figure 132 – iNET™ Machine-Learning Based Automatic Event Detection Function

For each potential event detected from the ML model, iNET™ will provide the following information for the system operators to further track and confirm/unconfirm the event.


Figure 133 – Potential Event

The Corridor Heatmap, which provides visualization of traffic condition (Volume, Occupancy, or Speed) over the past 30 minutes in relation to distance along the corridor.


Figure 134 – Corridor Heat Map

The Corridor Summary Diagram, which illustrates the change of Volume, Occupancy, or Speed along a configurable road section over time, associated with the trend of event detection probability over space and time.


Figure 135– Corridor Summary

Detector Station Summary Diagram, which illustrates the change of the Volume, Occupancy, or Speed at the detector station where a potential event is detected over time, associated with the trend of event detection probability at this location over time.

## RESPONSE PLANS

We will exceed the requirements noted below through the implementation of our iNET™ Event Management and Response Plan/DSS Modules. See detailed explanation on how our modules meet or exceed these requirements below.

*REQUIREMENT 4.10.1.29: The ATMS shall provide a mechanism for operators or administrators to create and edit action plans to include recommended activities to be performed for a variety of types of incidents and other events (special events, weather events, construction activities, maintenance activities).*

*REQUIREMENT 4.10.1.30: The ATMS event management plans shall include both automated and manual activities (manual are displayed to operators for them to perform).*

*REQUIREMENT 4.10.1. 31: The event management plans shall evaluate current incident/event reports against thresholds and recommended one or more activities to operators.*

*REQUIREMENT 4.10.1.32: When activities are recommended to operators, operators shall have a mechanism to accept, decline, or edit and accept the recommendations.*

*REQUIREMENT 4.10.1.33: The ATMS shall perform the activities that are recommended and accepted (with or without editing) by operators/*

*REQUIREMENT 4.10.1.34: The thresholds controlling the ATMS event management plans shall be adjustable by operators or administrators.*

*REQUIREMENT 4.10.1.35: The thresholds controlling the ATMS event management plans shall allow for time of day, day of week, time of year settings.*

*REQUIREMENT 4.10.1.37: The ATMS event management plans shall include control of DMS.*

*REQUIREMENT 4.10.1.40: The time of day messages in event management plans shall be able to be overridden by authorized users.*

*REQUIERMENT 4.10.1.41: The ATMS event management plans shall include standard operating procedures to operators to follow, based on the type and location of the event.*

*REQUIREMENT 4.10.1.46: The ATMS shall provide users the ability to assign (add/remove) field devices to an event. The field device shall remain assigned to that event until the event is terminated, the device is removed, or the device is added to another event.*

*REQUIREMENT 4.10.1.51: The ATMS shall identify DMS devices for use in display of specific message set(s) in response to an event*

*REQUIREMENT 4.10.1.52- The ATMS shall provide a user interface to accept, modify or decline the identified ITS devices suggested by the system in response to an event.*

*REQIUIREMENT 4.10.1.53: The ATMS shall provide a user interface to initiate or inhibit display of DMS messages with and allow user modification of DMS messages in response to an event.*

*REQUIREMENT 4.10.2.6: The ATMS event management plans should include user creation of detour routes*

*REQUIREMENT 4.13.1.37: The ATMS shall provide prescribed response scenarios or automation tools to assist users in controlling multiple devices quickly, consistently, and with limited manual input.*

Parson's iNET™ contains a Decision Support System (DSS) that can be customized to meet the needs of any region. The DSS is setup to provide operators a plan of device control and usage for events that occur on the roadways. The DSS recommendations to operators are based the location of the event, the number of lanes affected, the type of events, and available devices within range of the event. Some of the more commonly used in DSS plans are Changeable Message Signs, CCTV, Highway Advisory Radios, Ramp Meters, and Signals.

When an event is created that impacts the motoring public it is imperative that they be notified as soon as possible. To that end iNET™ event management module provides a system that assists operators in determining the best message to post and to what devices along with any other device that can help mitigate the adverse traffic impacts. Every event type has a Response Plan tab and button that when selected by the operator will create default sign and HAR messages.

When an operator selects the Response Plan button the event management modules uses the rules for the DSS to decide on a course of action. Based the location of the event, the severity of the event and the location and types of devices in proximity to the event a recommended plan of action is given to the operators.

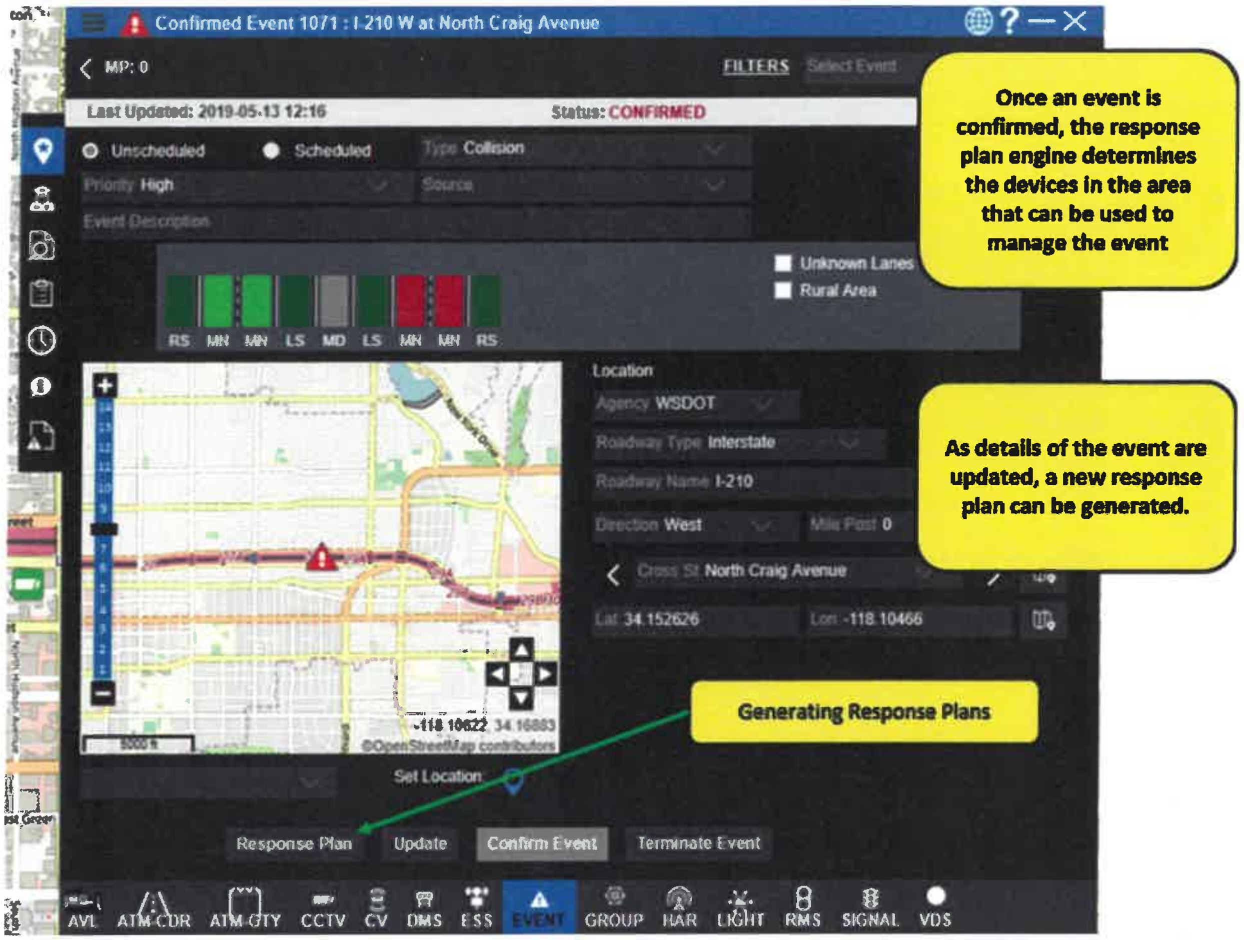



Figure 136 – Response Plan Generation

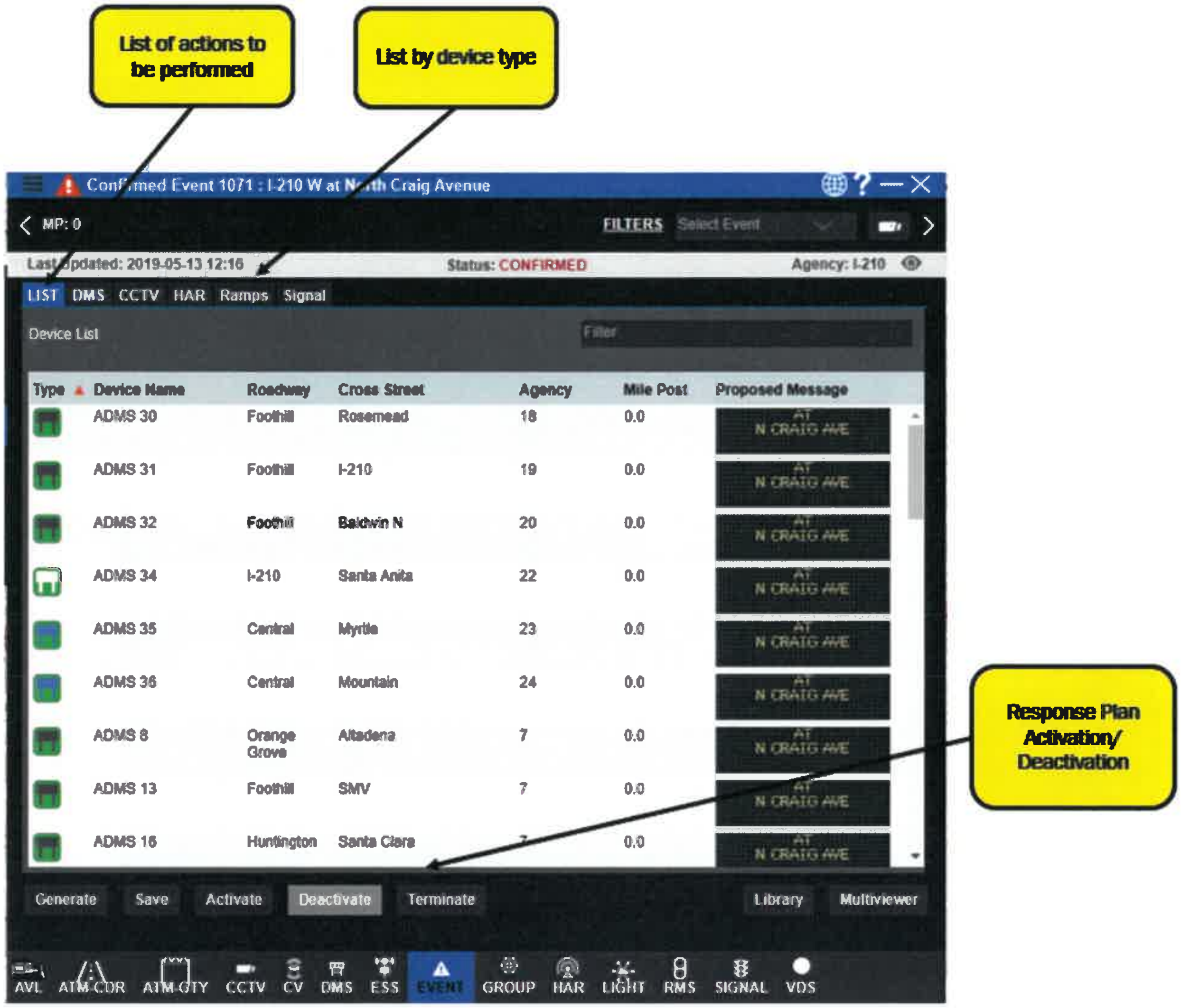



Figure 137 – Recommended Actions

When the list of recommended is published for the operator they can select Activate to immediately push out the recommended messages and device actions, such as signal and ramp meter changes, or they can edit individual components to customize the response that is utilized. Once the response plan meets the standards that the operators need they click Activate to implement the response plan with recommended, edited, or any combination of the two.

The iNET™ response plan feature operates using the severity of the incident to determine how from the location of the event to include devices. Parson's has the ability to set the thresholds based on WVDOT requirements for each severity level of events.

When operators generate a response plan, the plan will not be implemented until the operator selects the Activate function. There is no need to reject a plan that has been generated it only exists as a recommendation until the operator selects Activate and will not impact the management of the event in any way.

When an operator selects Activate, iNET™ will automatically send all messages to the required signs designated in the response plan either by the system or the operator and activate any other device, such as ramp meters, or signals.


Figure 138 – Editing Recommended Messages

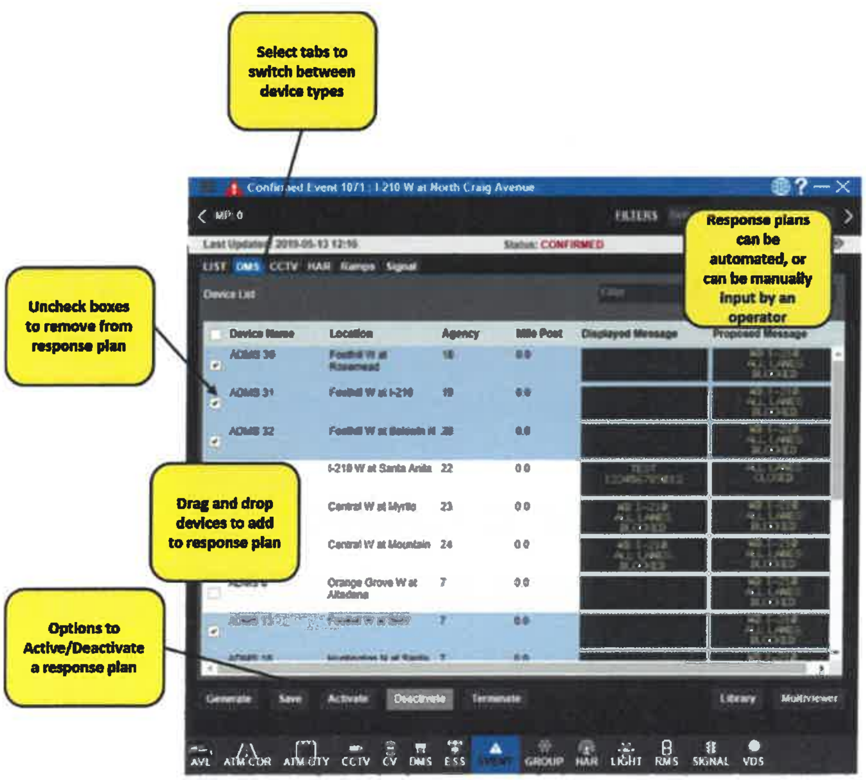



Figure 139 – Adding and Removing DMS from Response Plan

An event never remains the same from the beginning to the end. Details change during the lifecycle of an event such as lanes clear, additional responders are dispatched to the scene, etc. During the lifecycle of the event, the operator is able to generate a new response plan at any time. After modifying the details of the event, whether it's the lane blockage or responders, the operator is then able to view the revised response plan recommendation from the response plan viewer and select the "Generate" button. iNET™ will re-evaluate the event and determine a new response plan and associated response plan elements based upon the changes to the event. The Operator may also override a response plan if another event is at a high severity or if a message is manually place on the DMS.

At the end of the event, the operator will enter the date/time for the Lane Clear and the Queue Clear, deactivate the response plan, and then terminate the event. This will release the devices used by the event, and then remove the event from the display of the map and the list viewer.

We recognize the need to differentiate each instance of iNET™ based on operational needs. iNET™ is designed by DOT SOPs that are configurable in our system to ensure that the consistent standards and practices are performed. This includes but is not limited to configuration of types, location, lane blockage, and severity. As our client's SOPs evolve so does the ATMS. Any configurable fields can be changed to match.

## SYSTEM ADMINISTRATION

*REQUIREMENT 4.10.1.34: The thresholds controlling the ATMS event management plans shall be adjustable by operators or administrators.*

The iNET ATMS allows users with specific permissions, usually System Administrators to create, modify, and/or delete event types. This is done through the Administration viewer and the Domains tab, shown in the figure below.

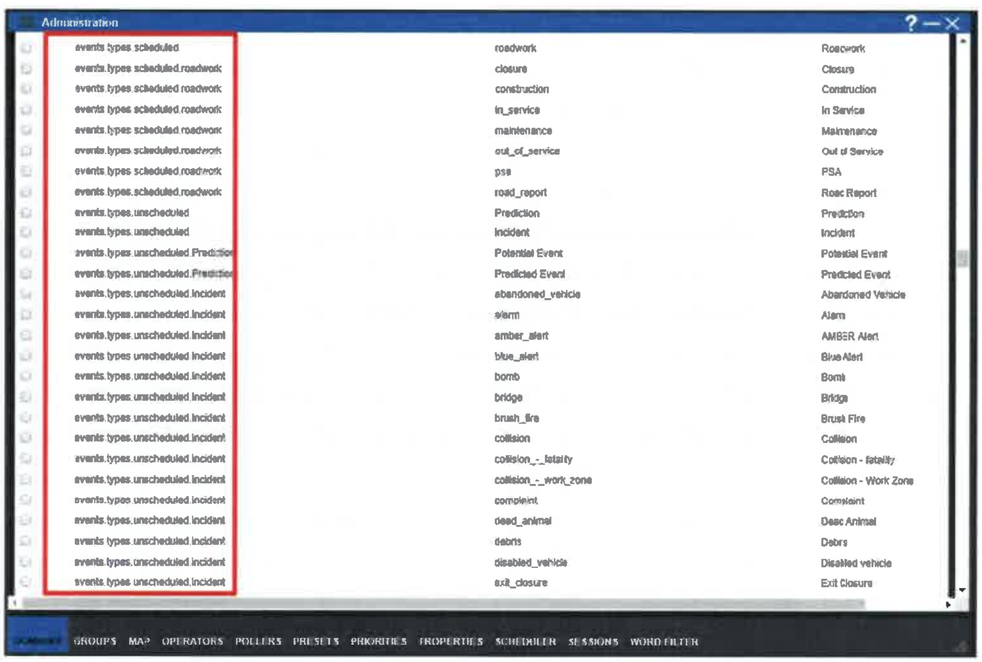



Figure 140 - Event Properties

This same functionality will also allow the System Administrator or specific use to create, modify and/or delete sub-event types Again, this is performed through the Administration viewer and the Domains tab. The iNET ATMS allows user with specific permissions to modify thresholds (distance, adjacent freeways, etc) for response plans. The user is also able to modify the message templates for the DMS messages, shown in

Figure 142 as well as configuring the automated response plans in the general settings tab, shown in Figure 143.


Figure 141 – DSS Parameters

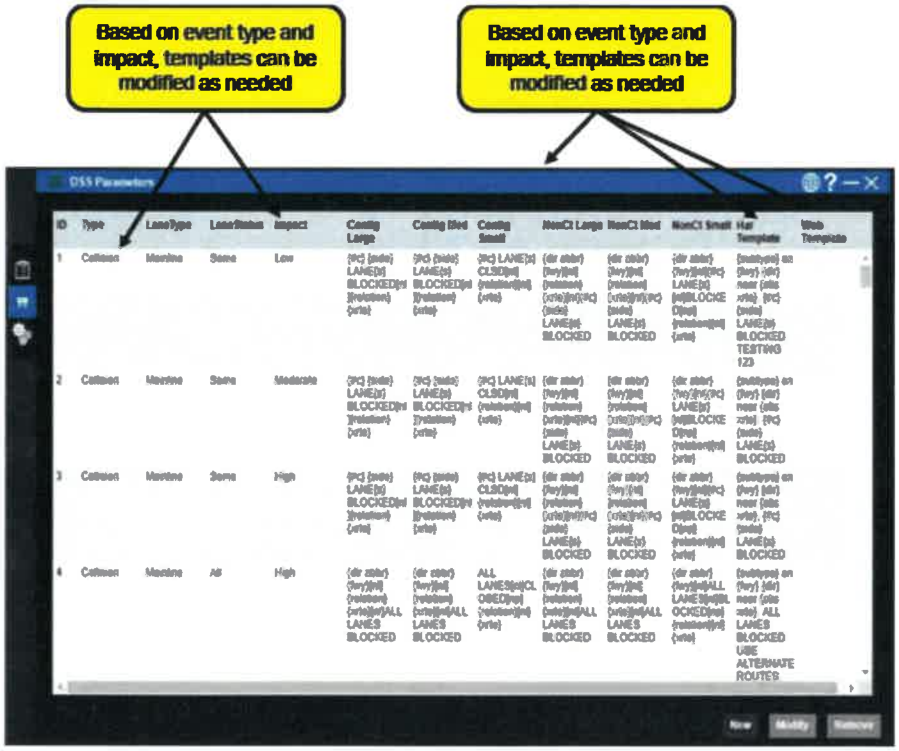



Figure 142 – DSS Message Templates

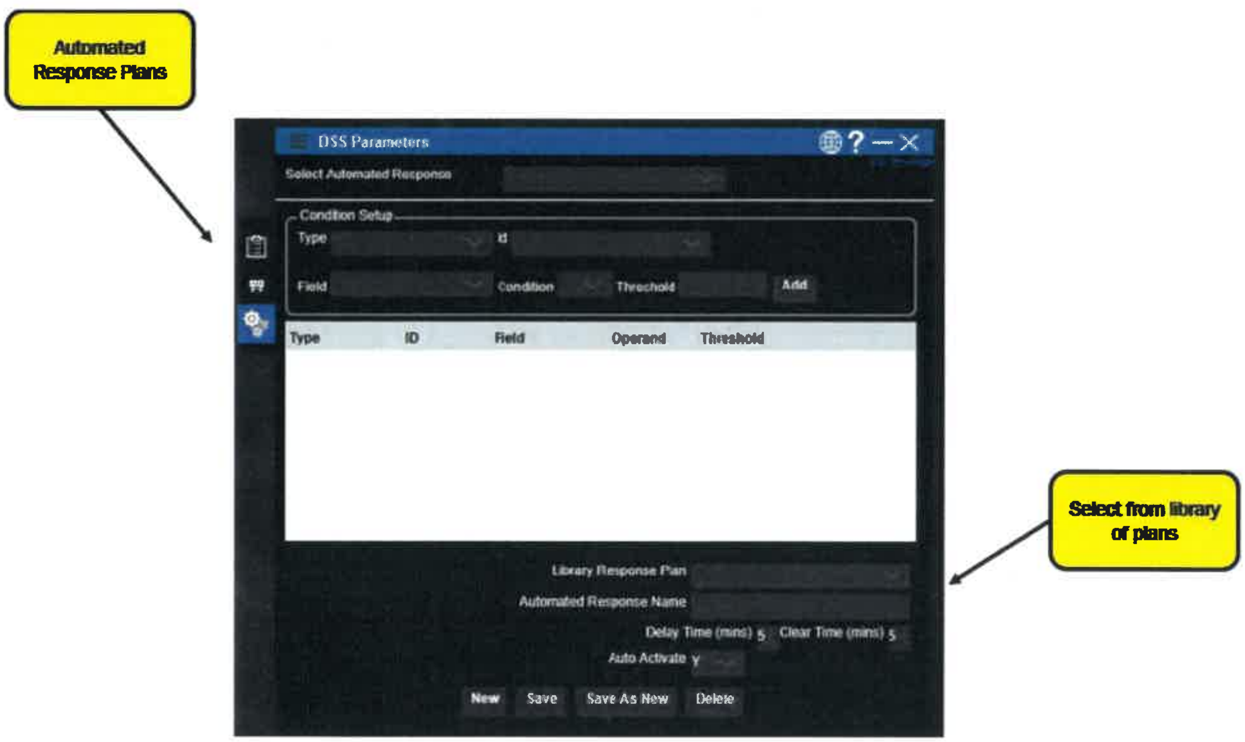



Figure 143 – DSS Parameters – Settings

We will exceed the requirements noted below through the implementation of our iNET™ Event Management and Response Plan/DSS Modules. See detailed explanation on how our modules meet or exceed these requirements below.

*REQUIREMENT 4.10.1.35: The thresholds controlling the ATMS event management plans shall allow for time of day, day of week, time of year settings.*

*REQUIREMENT 4.10.1.36: ATMS events can be programmed for future events and associate DMS devices and messages to be used with that future event.*

*REQUIREMENT 4.10.1.38: The DMS event management plans shall automatically recommend messages to be displayed on signs based on incident and event attributes.*

*REQUIERMENT 4.10.1.39: The ATMS event management plans shall allow authorized users to program messages for DMS and 511 to be presented by time of day.*

*REQUIREMENT 4.13.1.37: The ATMS shall provide prescribed response scenarios or automation tools to assist users in controlling multiple devices quickly, consistently, and with limited manual input.*

*REQUIREMENT 4.10.1.37 The ATMS event management plans shall include control of DMS.*

*REQUIREMENT 4.10.1.51: The ATMS shall identify DMS devices for use in display of specific message set(s) in response to an event.*

*REQUIERMENT 4.10.1.52: The ATMS shall provide a user interface to accept, modify or decline the identified ITS devices suggested by the system in response to an event.*

*REQUIREMENT 4.10.1.53: The ATMS shall provide a user interface to initiate or inhibit display of DMS messages with and allow user modification of DMS messages in response to an event.*

*REQUIREMENT 4.10.1.42: The ATMS shall have the ability to automatically send an event alert message to selected recipients upon incident confirmation via automated event notification.*

*REQIUREMENT 4.10.1.48: The ATMS shall distribute all event data to WVDOT authorized users.*

The iNET™ ATMS Decision Support System/Response Plan module includes thresholds that control event management plans based on time of day, day of week and time of year settings. These thresholds are available to administrators for configuration.

There are times that operations will need to schedule response plans to be implemented "automatically". These cases could be for Public Service Announcements (PSA) that need to be posted on signs or messages to be broadcast over advisory radios for several days. The operator, or any user with privileges, can implement this scheduling functionality using the response plan scheduler to automatically schedule specific response plans and activate them with minimal user interaction. The operations select the predefined response plan from the response plan library, selects the specific calendar entries, and saves the entry. At the corresponding start date/time, the scheduled response plan will be implemented and at the corresponding end date/time, the response plan will be deactivated.

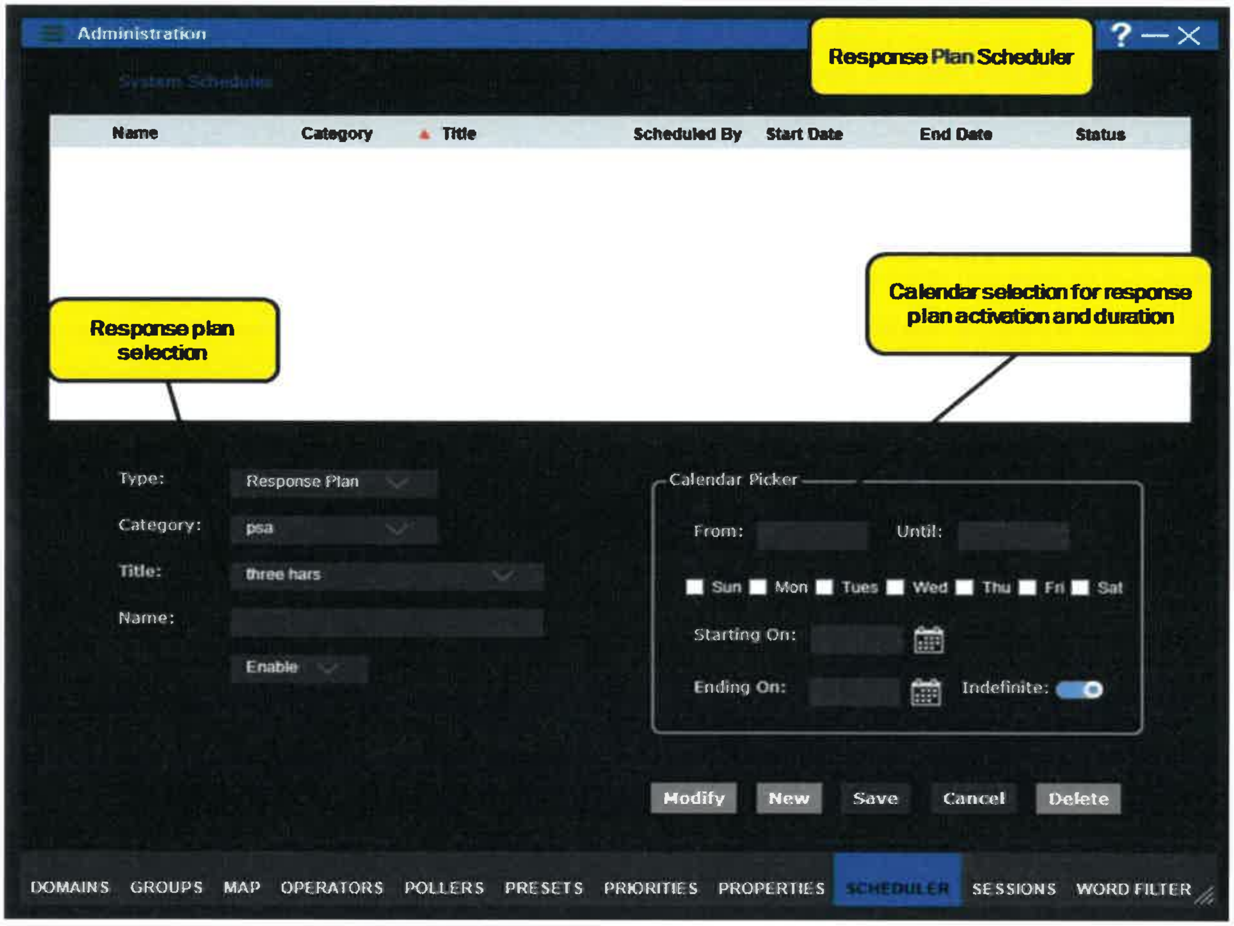



Figure 144 – Response Plan Scheduler

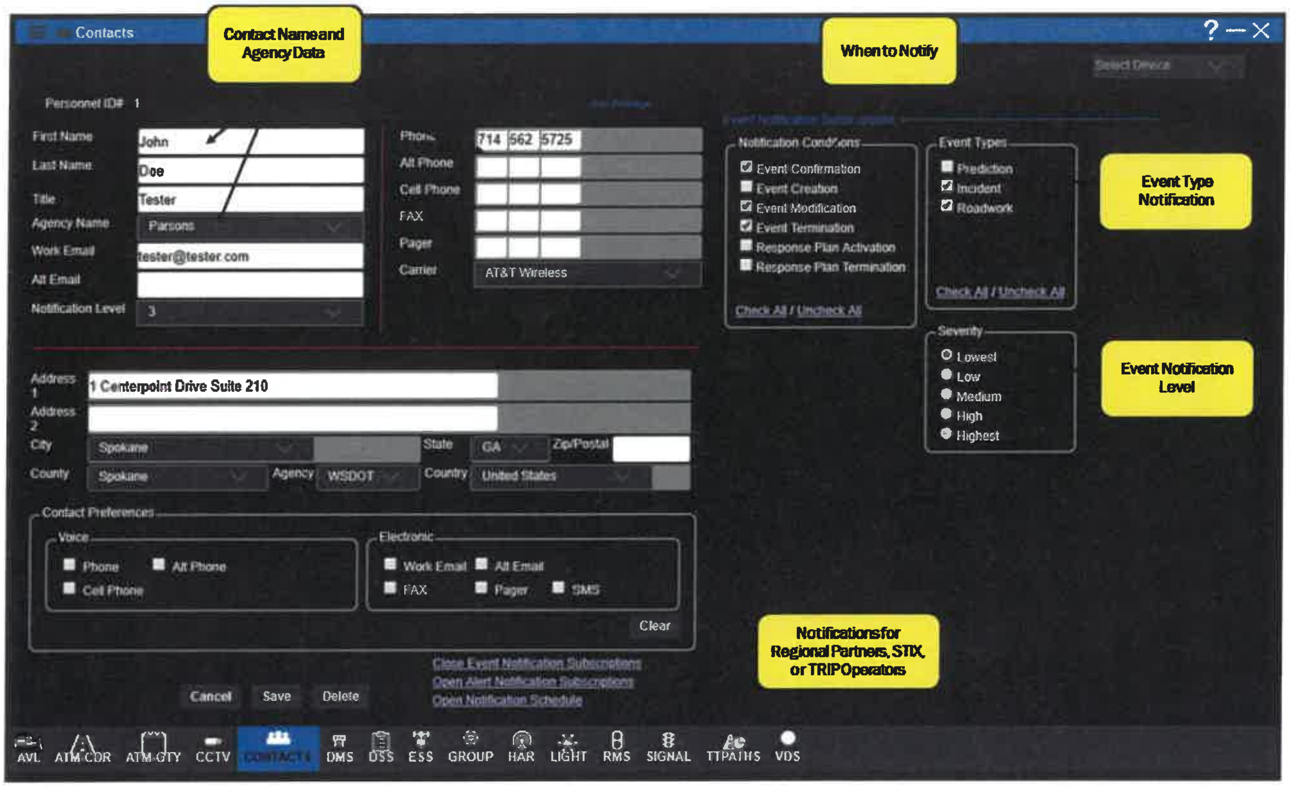



**Figure 145 – Contact Notification Viewer**

We will exceed the requirements noted below through the implementation of our iNET™ Event Management and Response Plan/DSS Modules. See detailed explanation on how our modules meet or exceed these requirements below.

*REQUIREMENT 4.10.1.47: The ATMS shall provide users the ability to reactivate a terminated event.*

*REQUIREMENT 4.10.1.49: The ATMS shall provide the user with a request to confirm before an event is terminated.*

*REQUIREMENT 4.10.1.54: The ATMS shall provide the ability to create test events that are not transmitted outside of the TMC or to devices for the purpose of training of operators.*

iNET™ provides users the ability to reactivate a terminated event.

Whenever an authorized user attempts to terminate an event they will receive an dialog box that requests that the user confirms that they do indeed want to terminate the event and identifies the event being terminated.

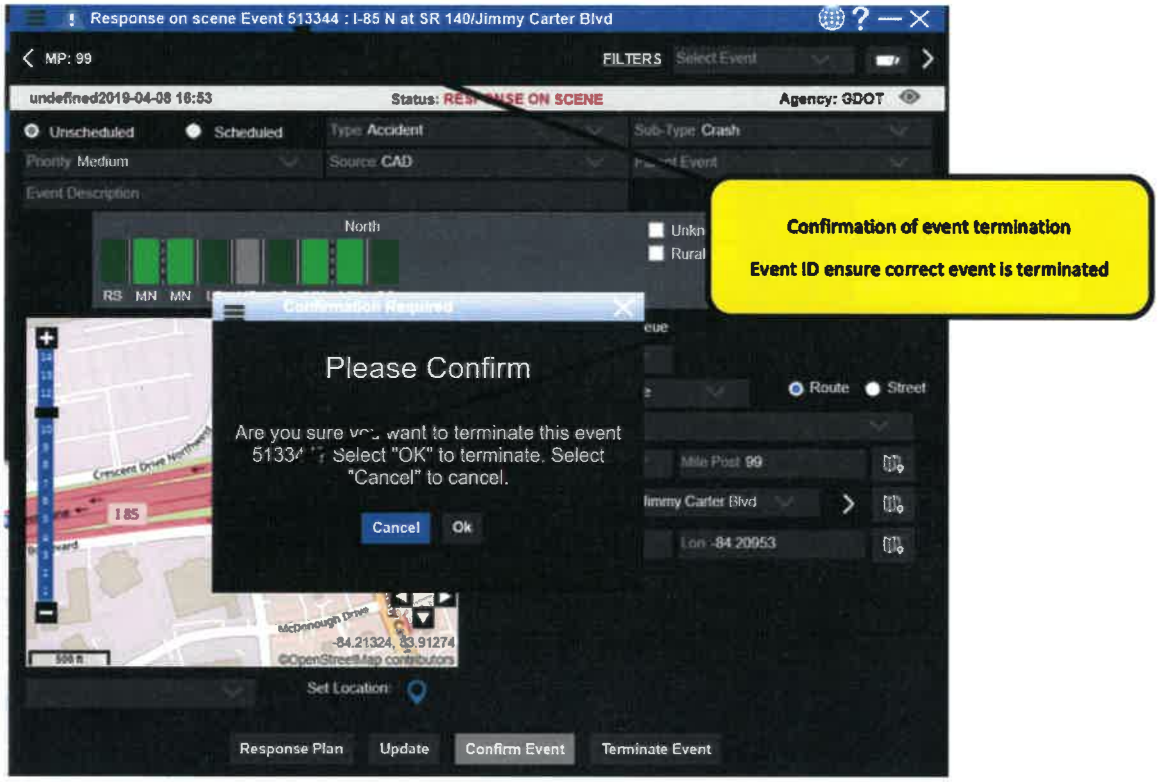



Figure 146 – Event Termination Confirmation

As providers of ATMS solutions to multiple agencies across the world we understand the need of our client agencies to have access to a training environment in order to train new employees in the use of the ATMS and to provide a platform for refresher training when new upgraded features are released. As part of our ATMS solution we will set up and maintain a training environment that the WVDOT TMC employees can access in order to conduct training for new hires and to assist with deployment of new features and upgrades. A core component of success is to get the feedback from the end users when testing features and a platform that allows them conduct testing and training without impacting real world motorist is a recognized necessity. The training environment can be set up to mimic the production environment with device simulators that will allow all functions that are normally found in the production system. Data feeds for field devices that provide information only to the system and are not controllable can be fed in to simulate the real-world environment as well.

## 2.2.7.b. Desirables

*REQUIREMENT 4.10.2.2: The ATMS should provide a mechanism for entry and edit of holiday based restrictions as a specific type of incident/event.*

The iNET™ ATMS provides a mechanism for entry and edit of holiday-based restrictions as a specific type of incident/event. The iNET™ Event Management module allows for custom incident/event types to be configured.

*REQUIREMENT 4.10.2.3: The ATMS should allow multiple authorized users to edit event data at the same time and save dynamically. A conflict resolution scheme is to be proposed.*

When you have several operators working to manage incidents, roadwork, or other event on multiple roadways and responding to calls from the public reporting incidents or requesting information the TMC floor can become a hectic place and you can run into times when operators are trying to update multiple events, often at the same time as another operator who is unaware of the another person editing the same event. In this case Parsons has implemented a Smart Event solution. As operators edit an event the system keeps track of the ongoing changes. If a second operator attempts to change the same event and attempts to save the changes the first operator will be notified that another operator has made a change to the field they are working on and at that point the operator will need to decide which change to keep.

If one operator makes changes that does not affect what the second operator does the system will update and refresh the event with no adverse effect to either operator, thus limiting the number of popups that can cause confusion on an operator's screen.

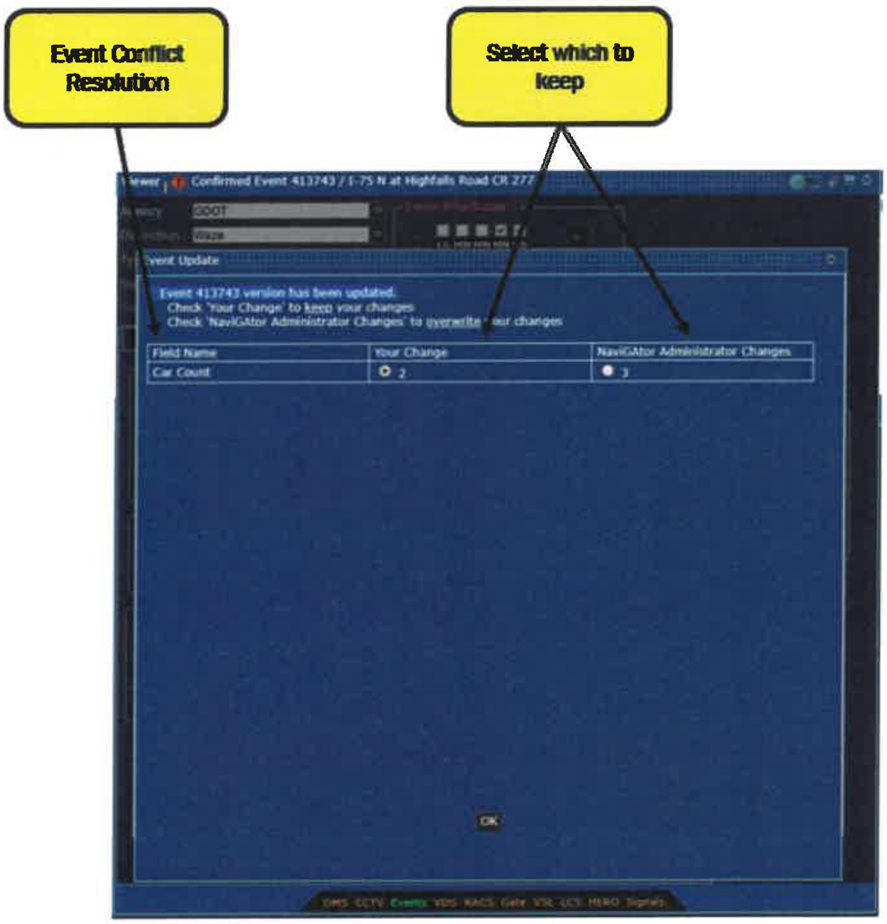



Figure 147 – Event Conflict Resolution

*REQUIREMENT 4.10.2.4: The ATMS should provide a mechanism for entry and edit of permanent freight specific information related to height, width, and load rating as it pertains to specified routes, locations and/or direction of travel.*

iNET™ allows an operator the ability to specify restrictions to height, width and weight for the life of an event. The Restrictions are tied to the event and include a start and ending location. The operator can select one or more restrictions for the event. The numerical amount for each restriction is a free form text box for feet, inches or pounds. The restriction fields are configurable by an Administrator to capture necessary restrictions for operations.

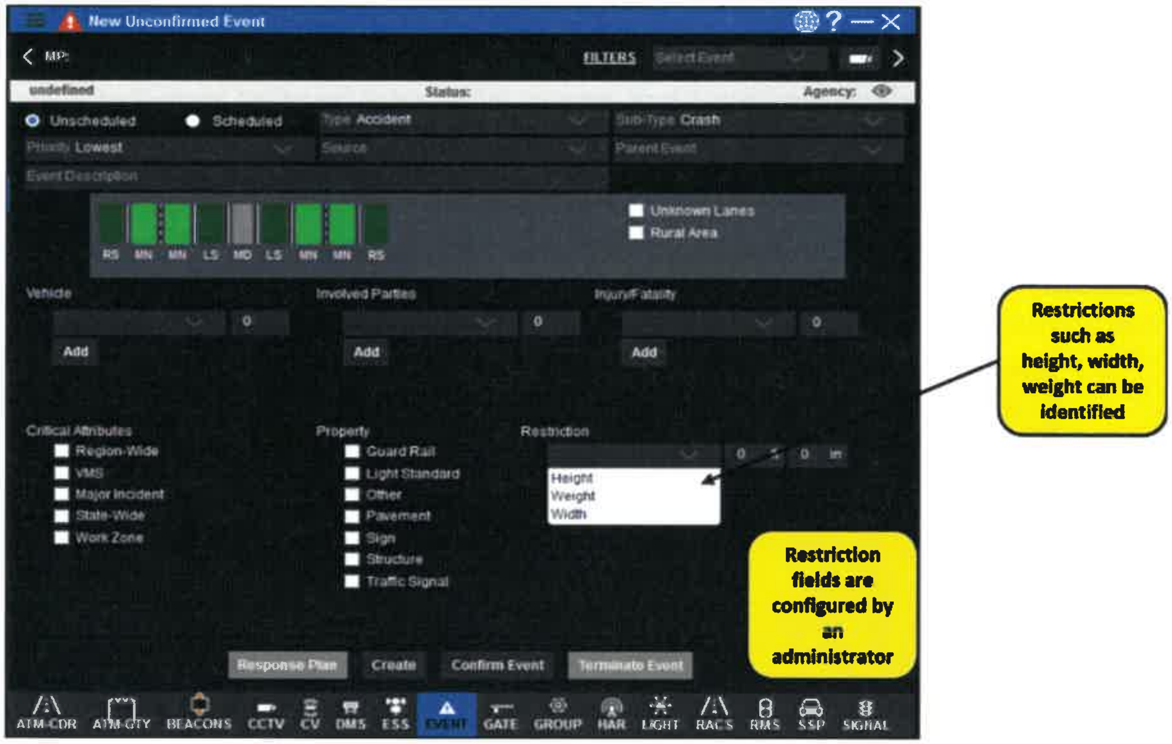



Figure 148 – Permanent Restrictions

*REQUIREMENT 4.10.2.5: The ATMS should include capability for operators to enter temporary weight, width, and height restrictions for commercial vehicles.*

An event may occur that requires temporary restrictions on the roadway for which an operator can add and remove the restrictions based on the event need. When the restriction is no longer applicable to the event the operator can remove the information from the details tab of an event viewer.

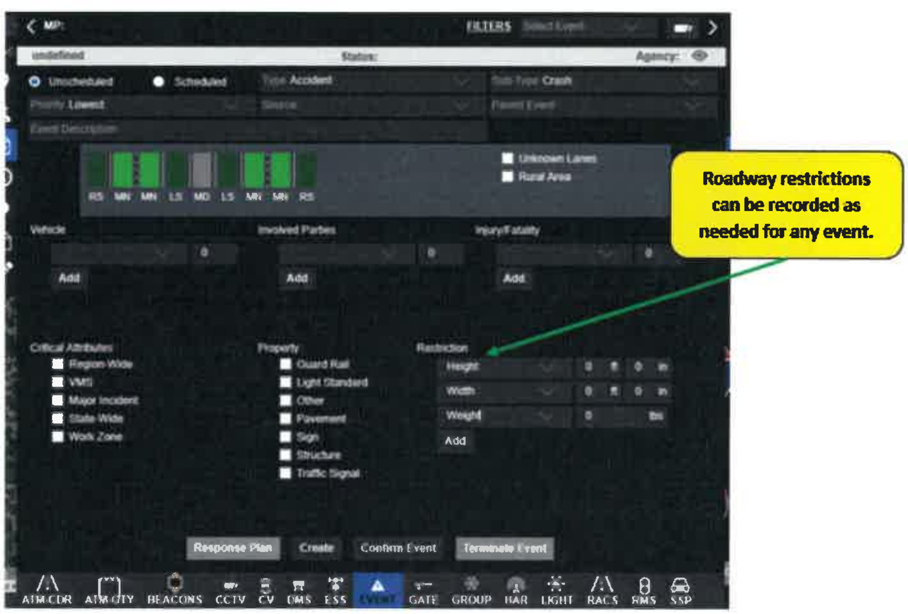



Figure 149 – Temporary Restrictions

## 2.2.8 Traveler Information

### 2.2.8.a. Mandatory Requirements

We will exceed the 16 requirements noted below through the implementation of Castle Rock's applications. See detailed explanation on how we will meet or exceed these requirements below.

*REQUIREMENT 4.11.1.1: The ATMS shall provide a data stream to be accessed by the 511 website to share data for display on the 511 website and 511 app.*

*REQUIREMENT 4.11.1.2: The data sharable with the 511 website and 511 app shall include all traveler information reports (incidents, construction, events, freight, parking) entered, received, or edited in the ATMS.*

*REQUIREMENT 4.11.1.9: The ATMS shall be upward expandable to cover increased coverage areas.*

*REQUIREMENT 4.11.1.13: The ATMS Vendor shall provide a telephony and web-based 511 system to meet or exceed the capabilities of the current 511 system used by WVDOT.*

*REQUIREMENT 4.11.1.16: The ATMS shall provide a mobile application with a hands-free option for the 511 system in order to maintain adherence to restrictions on use of phones while driving in West Virginia.*

*REQUIREMENT 4.11.1.17: The ATMS shall provide a mechanism for automatically publishing data and video images from multiple sources to the WVDOT 511 as well as various traveler information websites at specific intervals.*

*REQUIREMENT 4.11.1.18: The ATMS shall transmit highway conditions reporting data to the 511 system.*

*REQUIREMENT 4.11.1.19: The ATMS shall display condition and device data for 511 website distribution with maximum of 5 minutes of data latency.*

*REQUIREMENT 4.11.1.20: The ATMS shall provide a graphical map of the state or selected region for displaying the WBVDOT's ITS devices and select summary and status information suitable for 511 website display compatible with common web browsers.*

*REQUIREMENT 4.11.1.21: The 511 map shall display for internet distribution all major freeways and streets within the state's boundaries with distinct graphical representation for each roadway classification.*

*REQUIREMENT 4.11.1.22: The 511 map shall display near real-time traffic speeds using a standard color coding of green for uncongested conditions through yellow and amber for moderate congestion to orange and reds for high congestion on freeways located within the state. This data can come from third-party providers.*

*REQUIREMENT 4.11.1.32: The 511 system shall have the ability to add additional routes in the future beyond what is covered by current 511 system now.*

*REQUIREMENT 4.11.1.35: No Adobe flash content is to be used on the 511 website, 511 mobile website or 511 application.*

*REQUIREMENT 4.11.1.38: The 511 mobile website and the 511 app shall have a warning banner regarding use while driving and disclaimer similar to one used on the current WV511 app.*

*REQUIREMENT 4.11.1.39: The 511 website and 511 app shall be updated as necessary as operating systems used by mobile phone providers are updated. Vendor is to verify impacts to functionality if new OS releases are anticipated and maintain functionality through updates to software as required with new OS updates or versions.*

*REQUIREMENT 4.11.1.40: The 511 website shall be capable of being imbedded into other HTML documents, or mirrored by other websites, with 511 logos intact as an Inline Frame (Iframe) or similar.*

Castle Rock is an industry leader in providing coordinated, consistent traveler information via 511 phone, website, mobile app (iOS & Android, and social media). Castle Rock's system supports all of the current 511 functionality and more. Castle Rock's 511 telephony system is fully coordinated with the website and mobile app. The information is consistent across all channels. So, for example, floodgates are automatically updated and consistent across phone, web, and app.

The 511 web and app display the highway conditions graphically, while the 511 phone system announces them verbally. Road condition reports also get tweeted and emailed/texted out to users who have signed up for subscriptions. The content is clear and consistent across all 3 channels: web, app, and 511 phone.

Castle Rock's CARS back-end engine will regularly import data from iNET™'s data stream in order to show clear, consistent traveler information across all 511 channels. Information will be updated within *1 minute or less* on all 511 channels upon being detected in the iNET™ data stream. Our website, mobile app, and IVR phone system all update within ***seconds*** of receiving updated data from the ATMS or other feeds. The traffic maps on the 511 website and mobile app refresh immediately upon the third-party source updating itself. We can poll the source feeds at specific intervals, as needed. Again, the content is clear and consistent across all 3 channels: web, app, and 511 phone.

Our 511 downloadable app (iOS & Android) includes a hands-free, eyes-free option. It tells the user about approaching highway events as the user moves through the state. Our website and mobile app include a scrolling emergency banner. In addition, where we have integrated truck parking information, which provides real-time updates about truck parking availability at approaching rest areas.

Our system works cleanly across all common web browsers. Castle Rock's 511 website, mobile website, and mobile apps do not use Adobe Flash. During our 17 years of building, updating, improving, and operating 511 websites and mobile apps, we have encountered and needed to respond to changes in underlying operating systems and run-time environments. We adapt our software as needed to changing OS releases as part of our M&O services.

The Castle Rock's 511 website has been embedded into other HTML documents and websites, fully intact, by some of our other clients–e.g., Sacramento. It is easily adaptable.

The CARS-based 511 website and mobile app use Google as a background map, which displays all major freeways and streets within West Virginia, with distinctive styling for each roadway classification. Search boxes allow users to zoom into a region of the state, a custom route, or jump to a specific highway.

Google's traffic layer, using a standard color coding of green for uncongested through yellow and amber for moderate congestion to orange and reds for high congestion on freeways within the state, is used to display real-time traffic speeds to users of our 511 website and mobile app (Figure 150).

CARS is able to increase coverage areas to whatever coverage areas that are supported by the ATMS. The coverage area can be expanded over time. This functionality includes the addition of other routes dependent upon the future. Adding routes is a service included as part of the annual M&O services, with no additional funding needed.

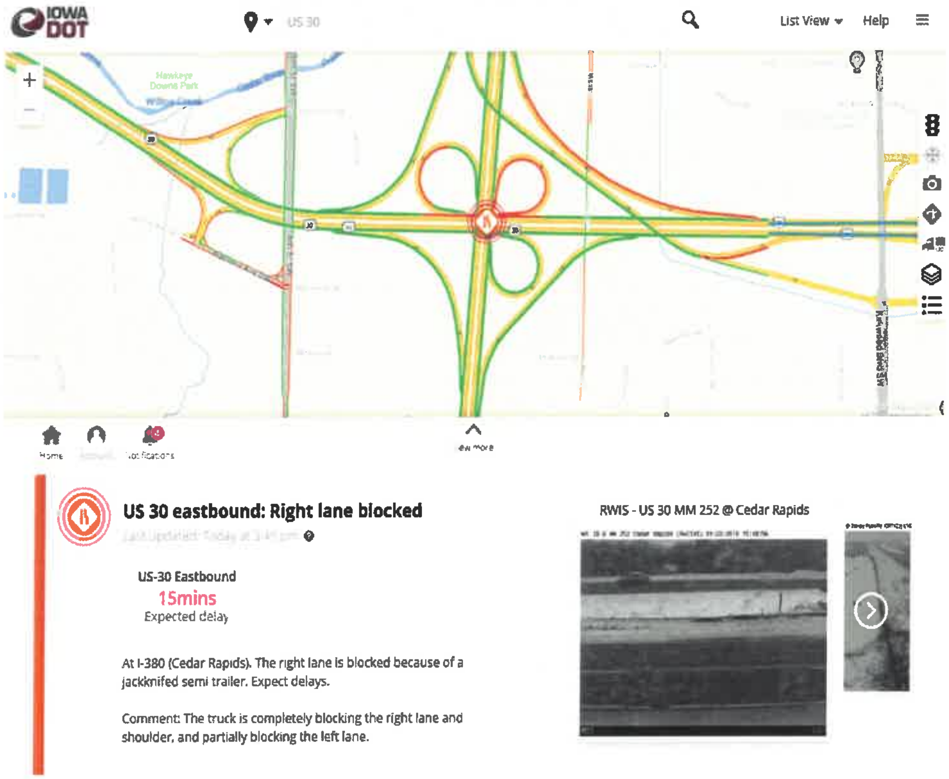



**Figure 150 - Event Traffic Speeds**

We will exceed the two (2) requirements noted through the implementation of Castle Rock's applications. See detailed explanation on how our modules meet or exceed these requirements below.

*REQUIREMENT 4.11.1.23: The 511 map display shall provide map navigation tools (zoon in/out icons, window box, layer control toggles, status of equipment).*

*REQUIREMENT 4.11.1.25: The 511 website shall provide a menu to select which ITS devices to display (layer control).*

We leverage Google-based map navigation controls on our 511 website and mobile app, which support zoom in, zoom out, and window box functions. We have custom-built layer control toggles into both the website and the app, that allow for layers to be switched on/off for the display of ITS equipment (Figure 151 and Figure 152). Our 511 map displays also use distinctive icons to communicate the status of equipment such as DMS and CCTV (e.g., slashed out icons if comms are lost). Please see Figure 153.


**Figure 151 - RWIS Station**

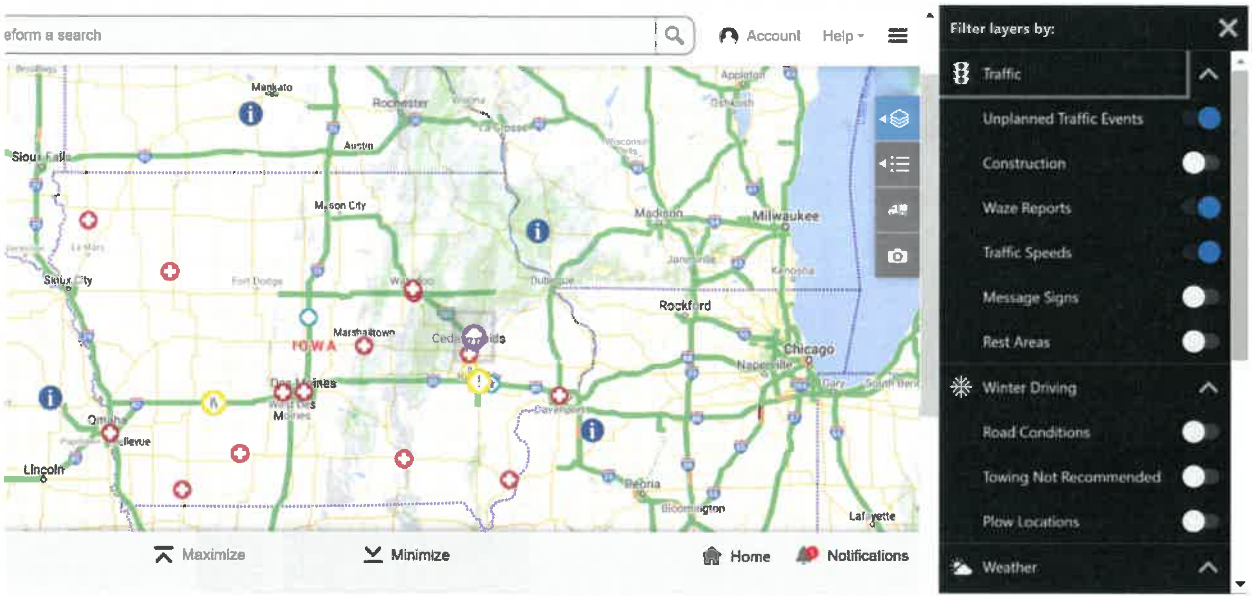



Figure 152 – Layers control for enabling/disabling layers on the map

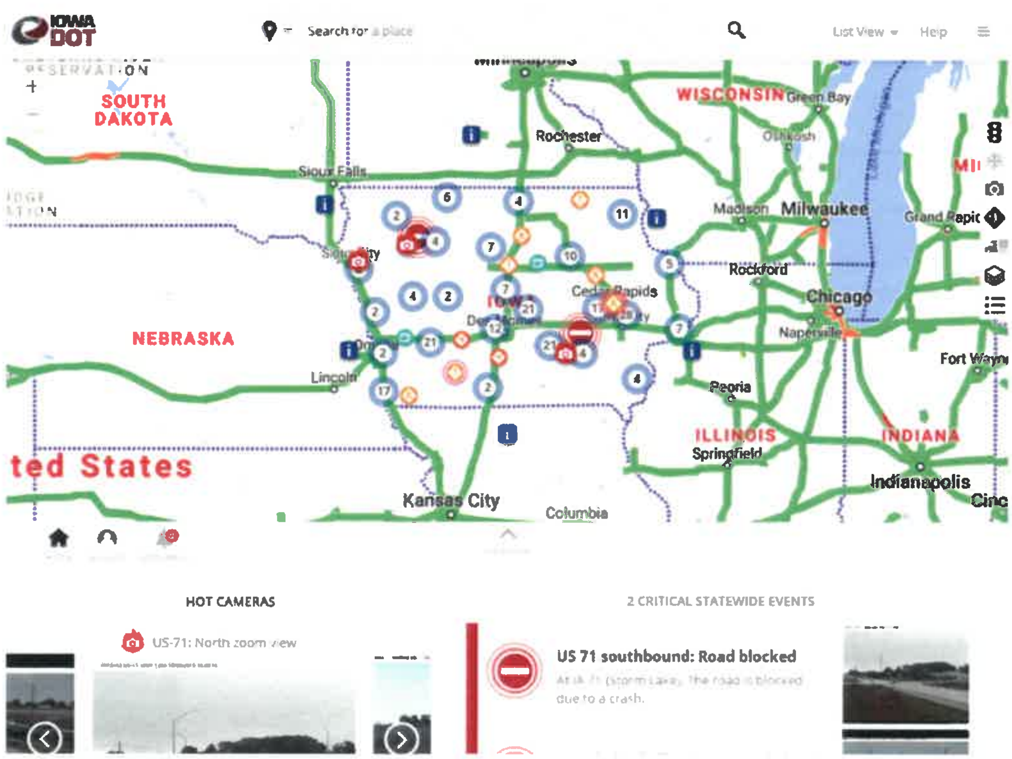



Figure 153 – Statewide Traffic Speeds

We will exceed the two (2) requirements noted through the implementation of Castle Rock's applications. See detailed explanation on how our modules meet or exceed these requirements below.

*REQUIREMENT 4.11.1.26: The 511 website shall provide a legend to explain which ITS devices are being displayed.*

*REQUIREMENT 4.11.1.27: The 511 map shall provide a legend to explain the near real-time traffic speed colors being displayed.*

Our 511 website includes an interactive layer control that clearly spells out all icon variations that may appear on the map (Figure 154). A similarly designed, interactive legend is available in our 511 mobile app. These legends include a clear explanation of the colors being displayed on the map. This is especially important because color-coding is used for displaying traffic speeds, road condition reports, and weather radar (Figure 155).


Figure 154 – Web and App Legends


Figure 155 - Website Legend

We will exceed the requirements noted through the implementation of Castle Rock's applications. See detailed explanation on how our modules meet or exceed this requirement below.

*REQUIREMENT 4.11.1.2: The data sharable with the 511 website and 511 app shall include all traveler information reports (incidents, construction, events, freight, parking) entered, received, or edited in the ATMS.*

Castle Rock's 511 web and app displays all traveler information reports including incidents, construction, events, CVO/freight, parking, etc. from the ATMS in a clear and consistent fashion. The content is also coordinated with the 511 phone and social media postings (see below).

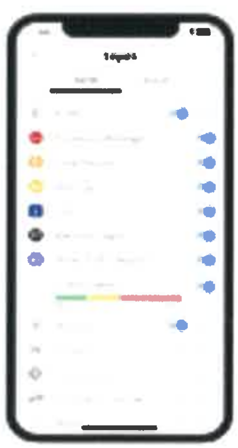


Figure 156 – App Layer Filters

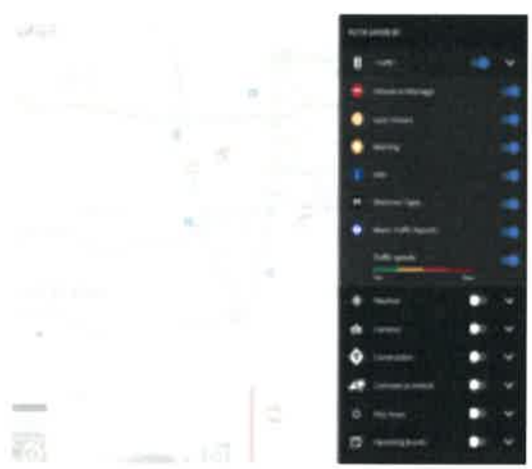


Figure 157 – Web Layer Filters

We will exceed the six (6) requirements noted through the implementation of Castle Rock's applications. See detailed explanation on how our modules meet or exceed these requirements below.

*REQUIREMENT 4.11.1.3: The data shareable with the 511 website and 511 app shall include CCTV video images captured by cameras connected to the ATMS.*

*REQUIREMENT 4.11.1.24: The 511 map shall display for internet distribution the appropriate information being supplied by corresponding ITS devices including at minimum full motion video images from cameras, sign display for DMS, and data from RWIS.*

*REQUIREMENT 4.11.1.29: The ATMS shall be capable of distributing color and black and white video images to WVDOT's 511 website.*

*REQUIREMENT 4.11.1.31: The 511 shall graphically provide the location of each camera and a representation to show the user what direction the camera is facing*

*REQUIREMENT 4.11.1.34: The 511 website shall allow users to select cameras and DMS for a specified region of the state or by major roadway and accident or construction/work zone information for a specified region of the state or by major roadway.*

*REQUIREMENT 4.11.1.41: The camera image displayed on the 511 website and exported to external users shall have a customizable graphic overlay that will identify the source of the images.*

CARS-Web allows users to see cameras, DMS, accidents, construction/work zones,-as well as RWIS, rest areas, snow plows, and other layers, by the following options:

- region of state
- specific roadway
- custom, personalized route
- custom, personalized area

The 511 web and app also support both video stills and streaming video (Figure 158 and Figure 159). Our 511 website and mobile app can display both color and black-and-white video images. Our website and mobile app platforms plot icons at the location of each camera site. If there is more than one camera view at a particular site, we either rotate through the different views when the user clicks on the site or provide a "collage" of each of the views. As such, our software doesn't currently indicate the direction in which the camera is pointing, but this functionality can be made for WVDOT. Additionally, our current clients add a customizable graphic overlay to the camera images when they are exported to external users using the CCTV software, we can easily add a WVDOH-specified overlay in the web and app.

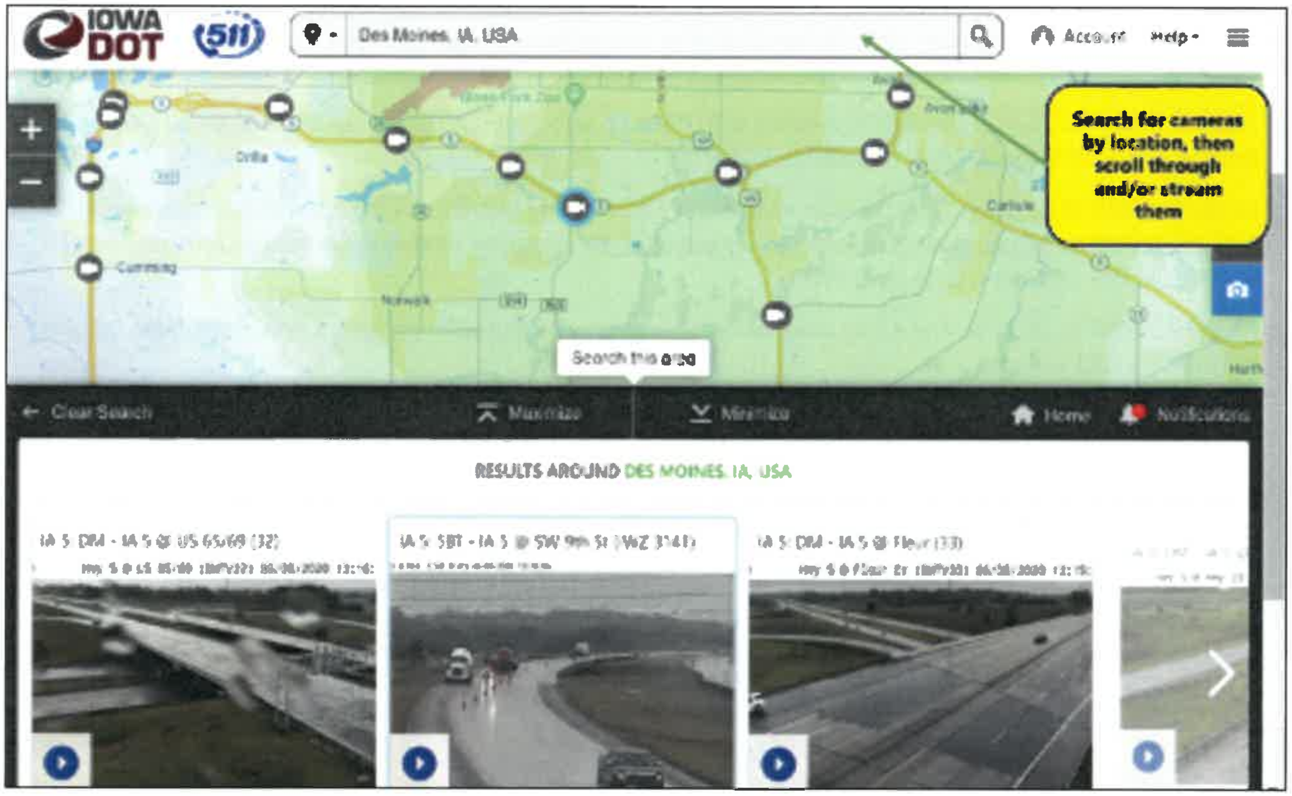



Figure 158 – Searching and viewing cameras on 511 website

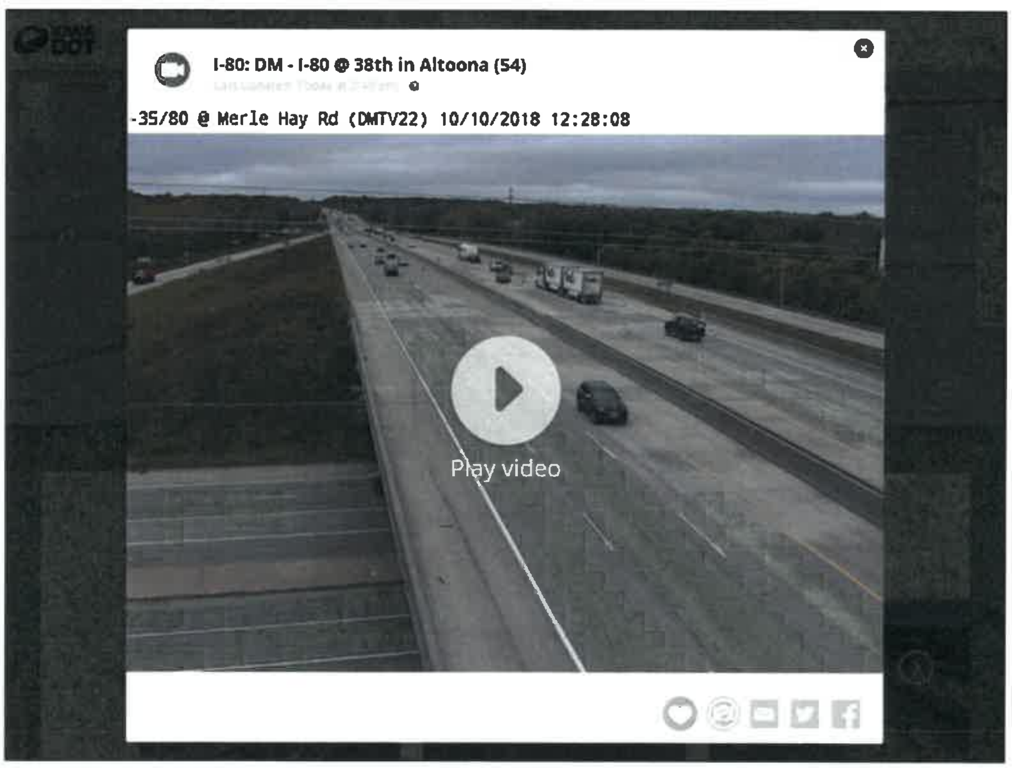



Figure 159 – CCTV Video Overlay

We will exceed the requirement noted through the implementation of Castle Rock's applications. See detailed explanation on how our modules meet or exceed this requirement below.

*REQUIREMENT 4.11.1.2: The data sharable with the 511 website and 511 app shall include all traveler information reports (incidents, construction, events, freight, parking) entered, received, or edited in the ATMS.*

There is also a special "Truckers" button on the 511 website that will help freight operators easily get the information they are looking for e.g., size/weight restrictions, truck parking, weigh stations, etc. (Figure 160).

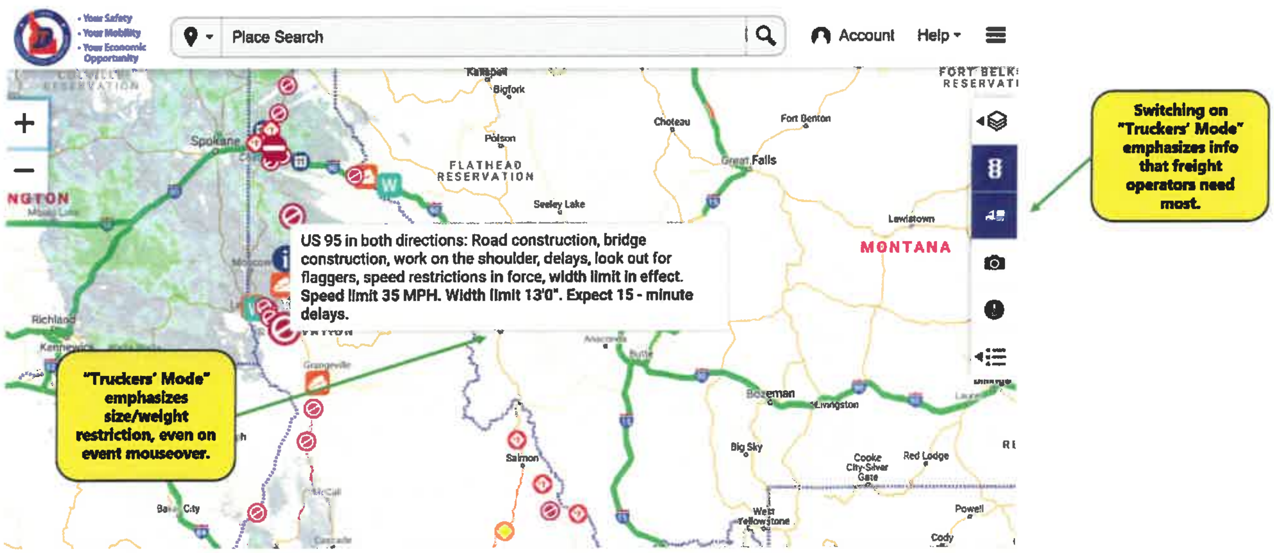



Figure 160: "Truckers' Mode" on 511 website

We will exceed the requirement noted through the implementation of Castle Rock's applications. See detailed explanation on how our modules meet or exceed this requirement below.

*REQUIREMENT 4.11.1.4: The data shareable with the 511 website and 511 app shall include DMS messages posted to the DMS connected to the ATMS.*

Besides the camera being available on the 511 website, we include easy-to-read, easy-to-click DMS displays on the 511 web and app that distinguish beautifully between active and inactive designs. The screens shown below (Figure 162 and Figure 162) show Iowa's website, with DMS and radar switched on.

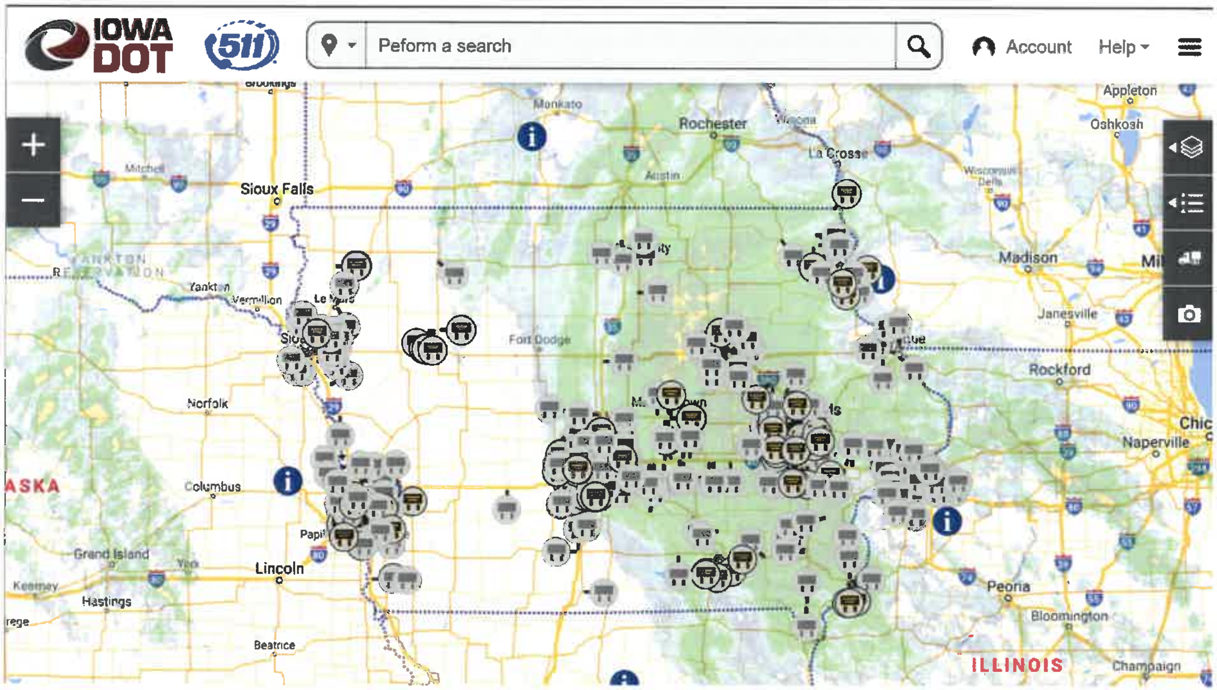



Figure 161 - DMS Sign View on Website Map

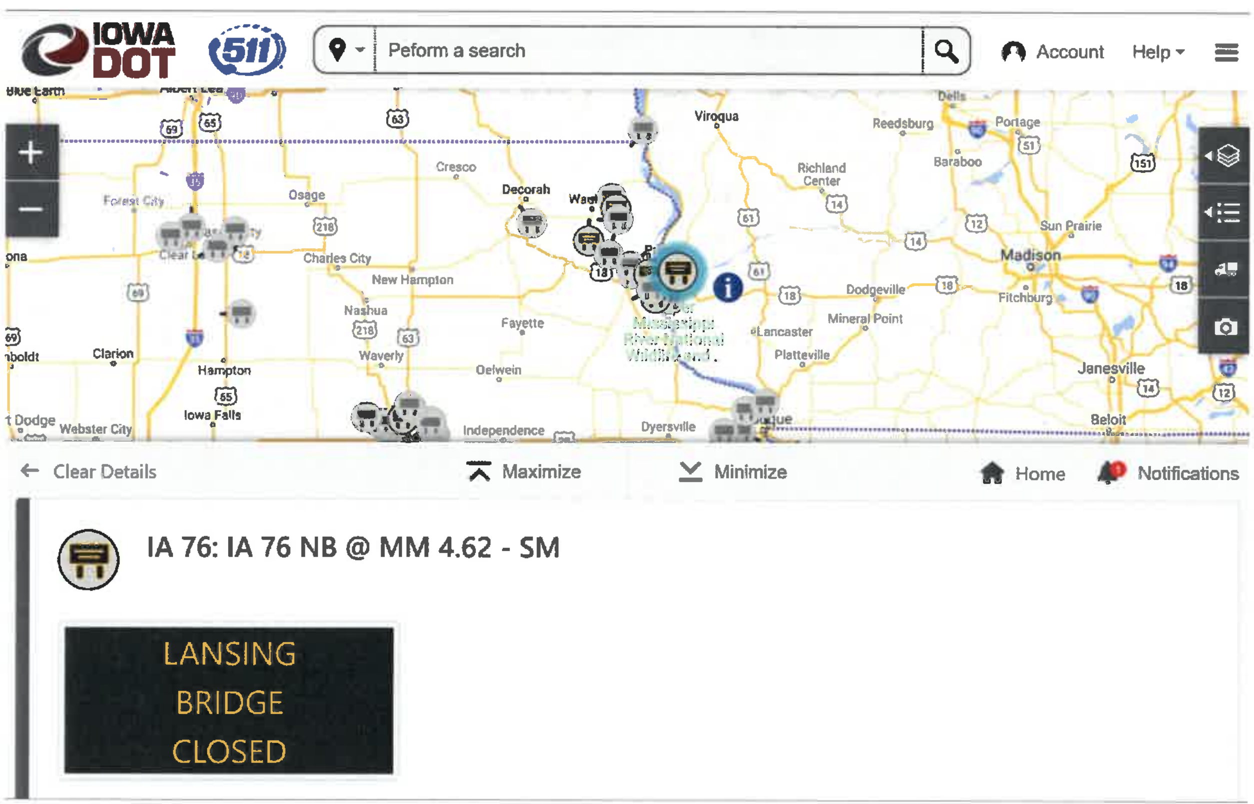



Figure 162 – DMS Signs View

We will exceed the requirement noted through the implementation of Castle Rock's applications. See detailed explanation on how our modules meet or exceed this requirement below.

*REQUIREMENT 4.11.1.10: The ATMS shall provide for a highway conditions, including trend data, reporting system that can be accessed by authorized users with ATMS software or application access.*

As discussed earlier, CARS-Segment is our tool for entering road conditions data by segment, statewide. Reports can be entered through a laptop or via our iOS and Android app.

Highway conditions are presented in clear, readable "stories" on the 511 web and app. The system automatically pulls in traffic, RWIS, and snowplow camera images along the route and integrates them into the display. Users only need to click once to see both the report and the images (Figure 163).

Our back-end CARS-Wx module automatically polls forecast data from the NWS National Digital Forecast Database to generate trending data. These are appended automatically to the road condition reports created by operators with the CARS-Segment date entry tool. We have also developed similar trend data by polling MDSS and other road forecasting systems.

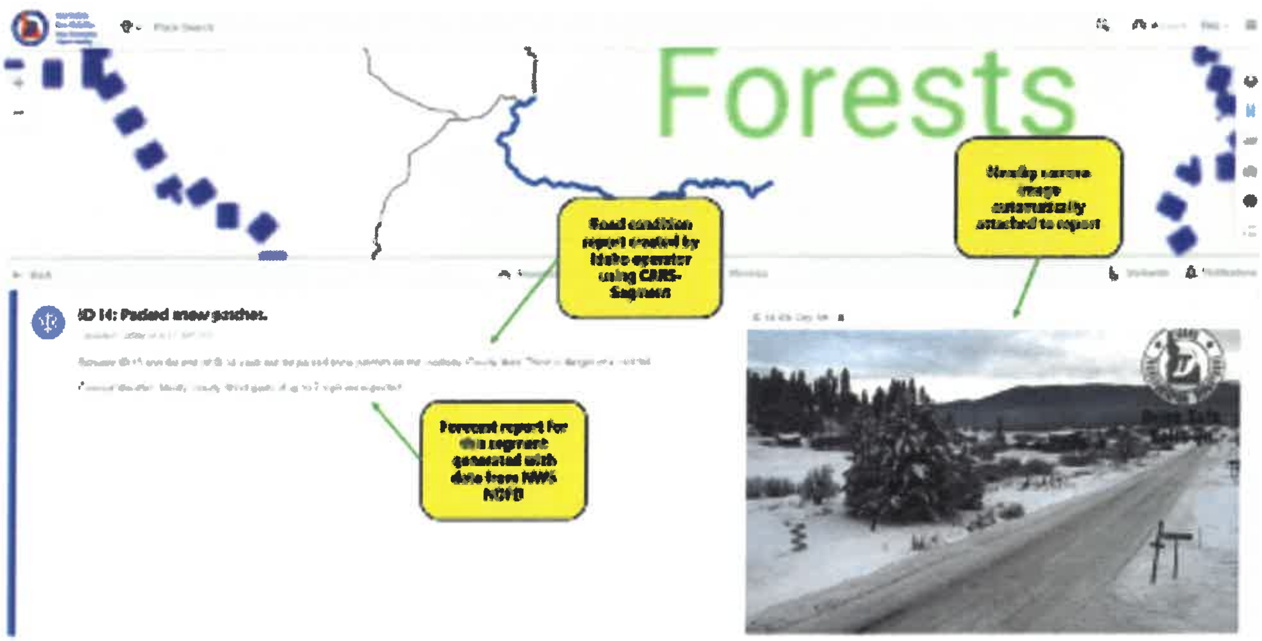



Figure 163 – Road Condition Report

We will exceed the two (2) requirements noted through the implementation of Castle Rock's applications. See detailed explanation on how our modules meet or exceed these requirements below.

*REQUIREMENT 4.11.1.11: The ATMS highway conditions reporting system shall have the ability to enter road conditions for multiple locations or the entire state or an entire district all at once versus having to enter conditions for each segment of road one by one.*

*REQUIREMENT 4.11.1.36: The 511 website shall provide a link to specific WVDOT construction projects/special projects/studies information sites.*

Castle Rock's CARS-Segment module allows WVDOT operators to quickly and easily to enter road condition reports for a single segment, multiple locations, a maintenance garage area, a district, or the entire state with a few clicks. Roadway segments can be selected by highway, county, district, and/or maintenance area (Figure 164). We also offer a web-based, visual map tool that will help WVDOT define and update its roadway segment reporting segments as they change over time (Figure 165).

The module is available both through a responsive, web-based interface and a downloadable ioS/Android app.

The "links" feature on the CARS Web 511 site allows the WVDOT to link to construction project, special projects, studies information or other sites. In addition, out platform allows DOTs to add an attachment or a link to individual construction event reports, if desired.


Figure 164 -Road Conditions Configuration

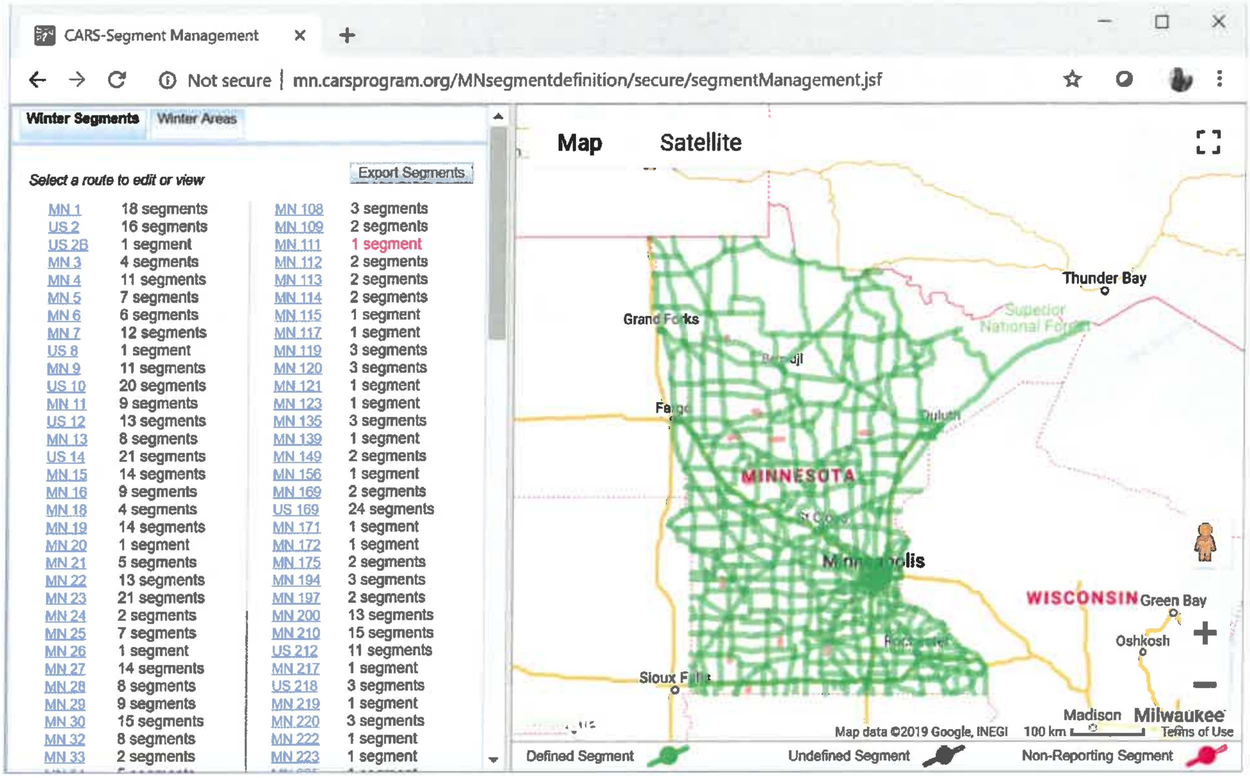



Figure 165 – Roadway Definition Configuration

We will exceed the requirements noted through the implementation of Castle Rock's applications. See detailed explanation on how our modules meet or exceed this requirement below.

*REQUIREMENT 4.11.1.12: The ATMS shall have the ability to create warnings of commercial vehicle and oversize/overweigh restrictions due to closures, width restrictions/height restrictions, construction and maintenance.*

Castle Rock's CARS-Web and CARS-App modules include features that help truckers find the information they need, including OS/OW restriction real-time truck parking, weigh stations, runway ramps, roundabouts, and spring breakup restrictions. As discussed earlier, Truckers' mode can be switched on by clicking the truck icon. Users can also switch on and off individual trucking layers using the menu shown in Figure 166.


Figure 166 – Commercial Vehicle Layer Filters

We will exceed the two (2) requirements noted through the implementation of Castle Rock's applications. See detailed explanation on how our modules meet or exceed these requirements below.

*REQUIREMENT 4.11.1.33: The 511 website shall provide a linked text based list of primary website content for selection by users.*

*REQUIREMENT 4.11.1.37: The 511 website shall be smart phone/mobile phone accessible and shall be adapted to work in both a desktop and mobile format with all content that is available on desktop version available on mobile version.*

Castle Rock's newest version of our 511 website (which we call "OneWeb") is fully responsive and adapts itself to desktop and mobile screens. It also includes a text-only function that allows users to select and view information without the map, icons or other graphics (Figure 167).


Figure 167 – OneWeb

We will exceed the four (4) requirements noted through the implementation of Castle Rock's applications. See detailed explanation on how our modules meet or exceed these requirements below.

*REQUIREMENT 4.11.1.13: The ATMS Vendor shall provide a telephony and web-based 511 system to meet or exceed the capabilities of the current 511 system used by WVDOT.*

*REQUIREMENT 4.11.1.14: The 511 system shall the ability to provide public safety alerts and announcements at the beginning of a call based on the location entered or statewide on all calls.*

*REQUIREMENT 4.11.1.15: The ATMS shall transfer data useful for traveler information into WVDOT's 511 system for access by the general public. Data shall include at a minimum event related data provided by the highway condition reporting system, relevant data obtained from ITS field devices, NWS weather alerts, weather forecast, and estimated travel times.*

*REQUIREMENT 4.11.1.16: The ATMS shall provide a mobile application with a hands-free option for the 511 system in order to maintain adherence to restrictions on use of phones while driving in West Virginia.*

## 511 TELEPHONY SYSTEM

As stated earlier, the Castle Rock 511 telephony system is fully coordinated with the website and mobile app. The information is consistent across all channels. Statewide emergency messages are the first thing any caller to a Castle Rock 511 IVR deployment. We also support regional or floodgate messages.

Castle Rock's Traveler Information System includes layers for offering events, ITS field devices, NWS weather alerts (displayed as shaded, clickable areas), weather forecasts (incorporated into road condition reports), and estimated travel time.

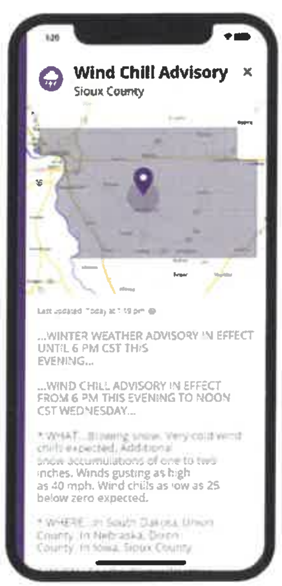



Figure 168 – NWS Alert

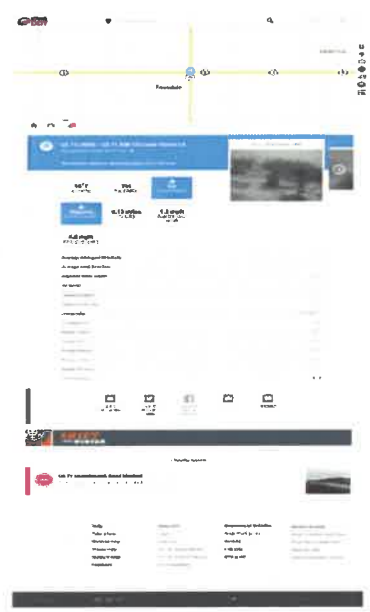


Figure 169 – RWIS Station in Alert

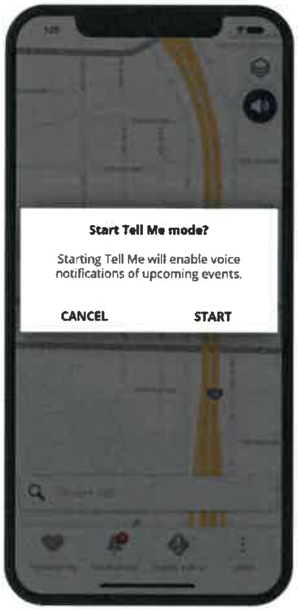



Figure 170 – Starting Hands-Free

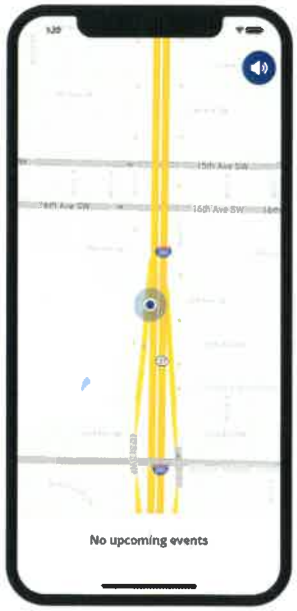



Figure 171 – No Upcoming Events

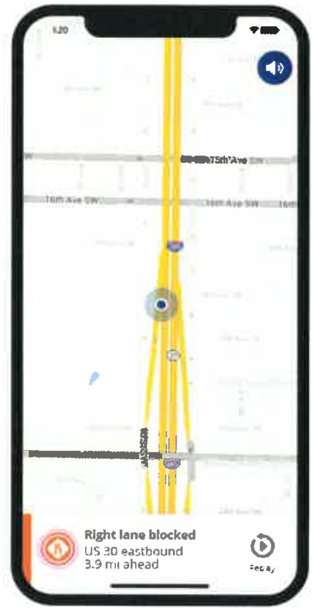



Figure 172 -Upcoming Events

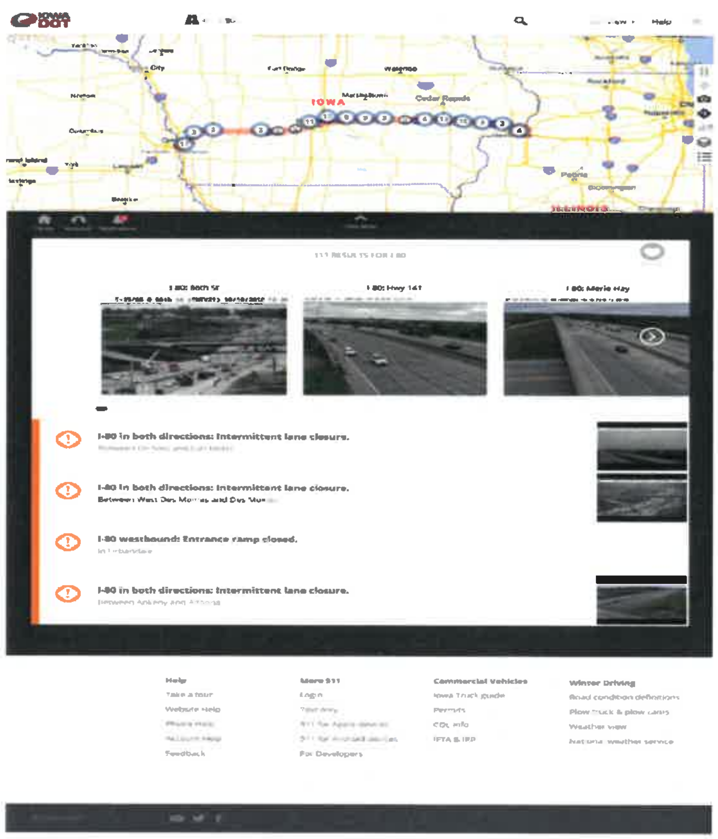



Figure 173 – Roadway Results

We will exceed the requirement noted through the implementation of Castle Rock's applications. See detailed explanation on how our modules meet or exceed this requirement below.

*REQUIREMENT 4.11.1.30: The 511 telephony system, including the 511 system as well as the communication capability, shall have the ability to handle an average of 200 to 300 calls per day and allow for a peak usage of 5,000 to 6,000 calls per day. Vendor is to propose how they would meet this requirement or provide an alternate solution.*

We operate our IVR on a distributed bank of telephony servers offered by Verizon. We have yet to hit an upper limit on number of calls we can answer simultaneously in a day. Our usage statistics prove that we fully satisfy the average of 200–300 calls per day and a peak usage of 5,000-6,000 calls per day this requirement. In December 2009, our 511 call center answered 821,273 calls. We also routinely handle 12,000+ calls a day. In December 2012, when a historic storm swept through Iowa, we answered approximately 22,000 calls per day.

As a more recent example, the daily stats are for Nebraska in February 2018. This month nicely demonstrates the variability of usage on a normal day vs storm day within a single state.

| DAY | # OF CALLS | DAY | # OF CALLS | DAY | # OF CALLS |
|---|---|---|---|---|---|
| Feb 1 | 332 | Feb 11 | 790 | Feb 20 | 3,392 |
| Feb 2 | 150 | Feb 12 | 265 | Feb 21 | 473 |
| Feb 3 | 216 | Feb 13 | 153 | Feb 22 | 3,706 |
| Feb 4 | 1,759 | Feb 14 | 157 | Feb 23 | 2,053 |
| Feb 5 | 2,699 | Feb 15 | 255 | Feb 24 | 5,061 |
| Feb 6 | 2,015 | Feb 16 | 189 | Feb 25 | 363 |
| Feb 7 | 1,065 | Feb 17 | 163 | Feb 26 | 184 |
| Feb 8 | 369 | Feb 18 | 414 | Feb 27 | 153 |
| Feb 9 | 2,314 | Feb 19 | 5,218 | Feb 28 | 212 |
| Feb 10 | 3,000 | | | | |

We will exceed the four (4) requirements noted through the implementation of Castle Rock's applications. See detailed explanation on how our modules meet or exceed these requirements below.

*REQUIREMENT 4.11.1.5: The ATMS shall provide a data stream to be accessed by third-party traveler information dissemination entities.*

*REQUIREMENT 4.11.1.6: The data sharable with the third-party Information Dissemination entities shall include all traveler information reports (incidents, construction, events, freight, parking) entered, received, or edited in the ATMS.*

*REQUIREMENT 4.11.1.7: The data shareable with the third-party Information Dissemination entities shall include CCTV camera images captured by cameras connected to the ATMS.*

*REQUIREMENT 4.11.1.8: The data shareable with the third-party Information Dissemination entities shall include DMS messages posted to DMS connected to the ATMS.*

### 511 THIRD-PARTY INFORMATION DISSEMINATION

The CARS platform includes a third-party data feed that allows outside systems and developers to integrate WV's 511 data into their own platforms and systems. Data are available via an XML feed or JSON a REST API.

An example of the REST API console (for roadway events) is shown in Figure 174. CARS-API includes all of these traveler information reports (incidents, construction, events, freight, parking) and updates them in real-time for third parties to consume.

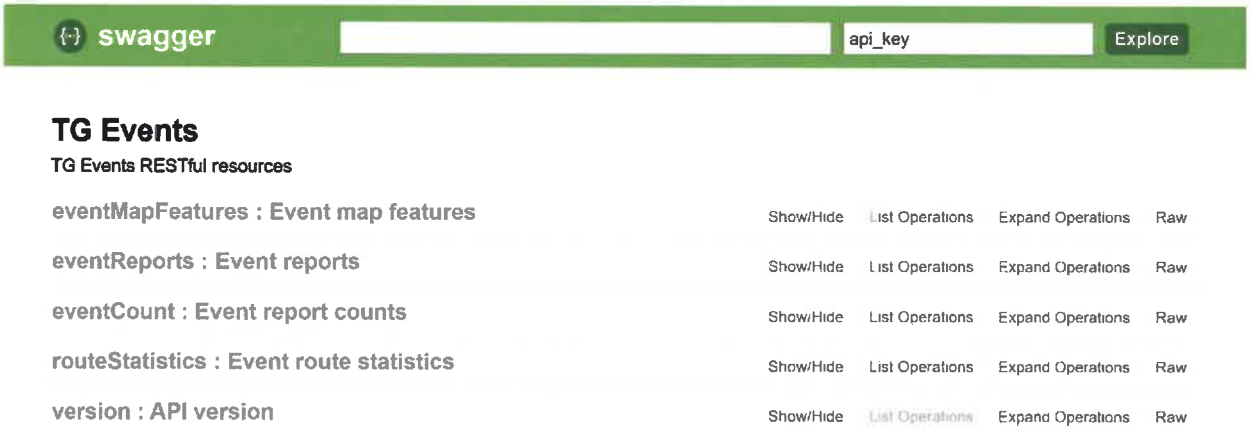



Figure 174 – API Console

Other information contained in the CARS-API includes an inventory of cameras in the state, including links to get the most current image captured by the ATMS. Cameras can also be requested by individual ID or geographic filter. The CARS API also includes an inventory of DMS in the state, as well as the current message being displayed on the sign. A sample of camera inventory is shown in Figure 175, while a sample of DMS inventory is shown in Figure 176.


Response Body


```
{
  "id": 1,
  "public": true,
  "name": "Little Chicago",
  "lastUpdated": 1591736789768,
  "location": {
    "fips": 27,
    "latitude": 44.4783,
    "longitude": -93.291808050313,
    "routeId": "I-35",
    "linearReference": 70.16,
    "localRoad": false,
    "cityReference": "3 miles south of the Elko New Market area"
  },
  "views": [
    {
      "name": "00",
      "type": "STILL_IMAGE",
      "url": "https://mncam.carsprogram.org/MN/Vid-000330002-00-00.jpg",
      "imageTimestamp": 1591736660000
    },
```


Figure 175 - CARS Camera Inventory Data Feed Output Sample

Response Body


```
      "longitude": -93.247218165132,
      "latitude": 44.8805960716231,
      "cityReference": "in Richfield",
      "fips": 27,
      "perpendicularRadiansForDirectionOfTravel": 3.137645374619176,
      "signFacingDirection": "S",
      "locationDescription": "MN 77 S at East 66th Street, MP 9.5 (Richfield)"
    },
    "properties": {
      "maxSignPhases": 3,
      "phaseDwellTime": 2500,
      "phaseBlankTime": 0,
      "maxLinesPerPage": 3,
      "maxCharactersPerLine": 16,
      "sizeKnown": false,
      "signType": "VMS_IMAGE_TRAVEL_TIME"
    },
    "id": "minnesotasigns*V77501",
    "status": "DISPLAYING_MESSAGE"
  },
```


**Figure 176 – CARS DMS Inventory Data Feed Output Sample**

## 2.2.8.b. Desirables

*REQUIREMENT 4.11.1.42: The data shareable with the 511 website and 511 app should include freeway traffic speed indicators.*

*REQUIREMENT 4.11.1.43: The data shareable with the 511 website and 511 app should include arterial traffic speed information gathered by the ATMS or third-party provider.*

*REQUIREMENT 4.11.1.44: The data shareable with the third-party information Dissemination entities should include freeway occupancy (if available).*

*REQUIREMENT 4.11.1.45: The data shareable with the third-party Information Dissemination entities should include arterial traffic speed information gathered by the ATMS (if available).*

*REQUIREMENT 4.11.1.48: The ATMS should have the ability to push commercial vehicle and OS/OW restrictions to subscribers.*

*REQUIREMENT 4.11.1.49: The ATMS highway conditions reporting system should be able to provide roadway condition reporting to local roads in addition to major US and state routes.*

*REQUIREMENT 4.11.1.50: The 511 website should provide for individual public users to create user accounts and customize travel route alerts to notify them of incident, events, or unusual congestion along their designated travel route(s) and display specified camera images related to that route.*

*REQUIREMENT 4.11.1.51: The ATMS should allow selection of numerical limits associated with each display color for each type of traffic measurement by an ATMS user with sufficient authorization. These parameters should be applied to display generation for the 511 website.*

*REQUIREMENT 4.11.1.52: The 511 website should incorporate a banner scrolling along the bottom of the WV511.org page that will allow ATMS*

*REQUIREMENT 4.11.1.53: The 511 phone system to have a comprehensive vocabulary for text to voice system or more intuitive interpretation of what the operator types into the system. (e.g. if the operator types "S B", 511 system should know that means southbound versus having to type the words out).*

*REQUIREMENT 4.11.1.54: The ATMS should require varying levels of administration rights on the 511 website from view only to super user.*

*REQUIREMENT 4.11.1.55: The data shareable with the third-party Information Dissemination entities should include freeway traffic speed. (if available)*

With the Castle Rock CARS application, the 511 website and 511 mobile app will display the freeway traffic speeds as color-coded lines, as provided by Google. Google also contains the traffic speed data for many arterials. Those will be visible on the 511 website and mobile app as well. While most of our ATIS deployments use Google's traffic speeds for the traffic layer on the 511 website and app, our software also supports other traffic sources. For non-Google sources, system administrators can figure the speed thresholds for each display color. Otherwise, we just go with the Google settings.

Our 511 platform uses Google as the base map, which has built-in freeway traffic speeds. If freeway traffic speeds are available from the ATMS and are allowed to be shared with the public (due to terms and conditions), these data can be shared with the public through the third-party API. In the past, we have published these data either as spot observations or for pre-defined roadway segments. These freeway data elements, including occupancy, and the arterial traffic speed data elements will be made available via the CARS API, to third-party groups.

In our CARS-iNET™ integration in Louisiana, Castle Rock and Parsons built the functionality of varying levels of administration rights into the combined system such that dynamic content in the ATMS would be editable by superusers and then be carried over automatically to 511.

For our 511 phone system, the back-end CARS data engine standardizes all event locations and descriptions in order to provide clear, consistent announcements that are also fully coordinated with the website and mobile app. Whether the user hears about the report on the phone, web mobile app, or social media, the report will be clear and consistent.

Our ATIS platform supports the creation of events and roadway condition reports on local roads as well as major US and state routes.

Our website, mobile app, and phone system all have special functions optimized for truckers. Truckers can create a 511 account and sign up to receive alerts for events with OS/OW restrictions that fall along their routes or within their custom-defined geofences. Truckers can opt to receive these alerts by email or text message. These are shown below.

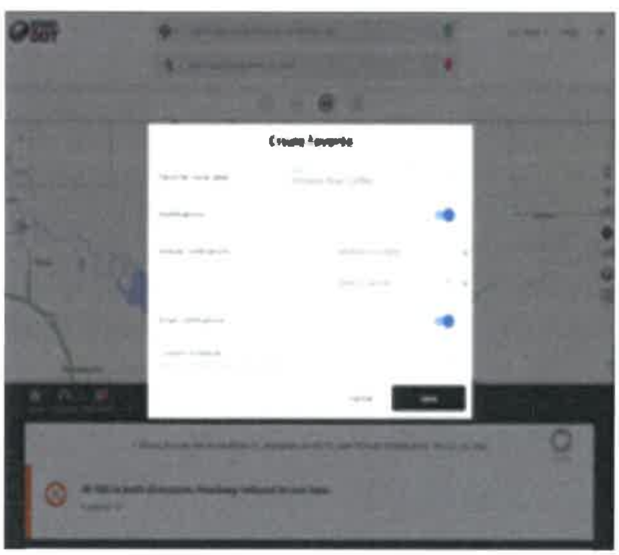


Figure 177 – Saving Route and Notifications

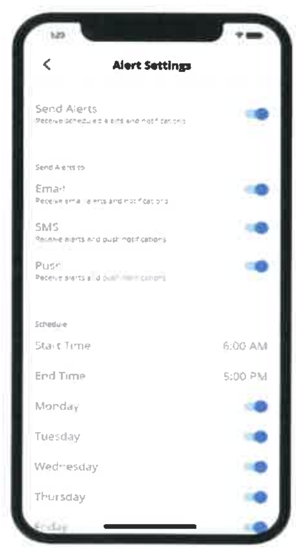



Figure 178 - Configure Alerts

Our "Your 511" account functionality–available both on the 511 website and mobile app–allows users to create personalized routes *and* areas. Users configure what types of alerts they want to receive on each route or area and can set the days of the week and hours during which they want to receive alerts. Creating routes is easy and can be done by entering a starting and ending address, as well as optional way points. Users can click and drag the map to make sure the custom route is the one the way. Users can create alerts for custom areas as well by clicking on the 511 website map to create a custom polygon shape.

The website and app allow you to see easily the incidents, events, and congestions specifically along your route, in the order you would encounter them. You can also pull up a list of the cameras along your saved route or in your customized area.


Figure 179 – OneWeb Login Screen

The CARS-Web traveler information site displays a scrolling banner or "ticker tape message" that includes information about high-priority events (e.g. unplanned road closures), as well as custom floodgate messages entered by operators during unique events (e.g., the Superbowl) or emergencies (e.g., winter storms, hurricanes, floods). The scrolling banner is also often used to communicate Amber or Silver alerts (Figure 180).

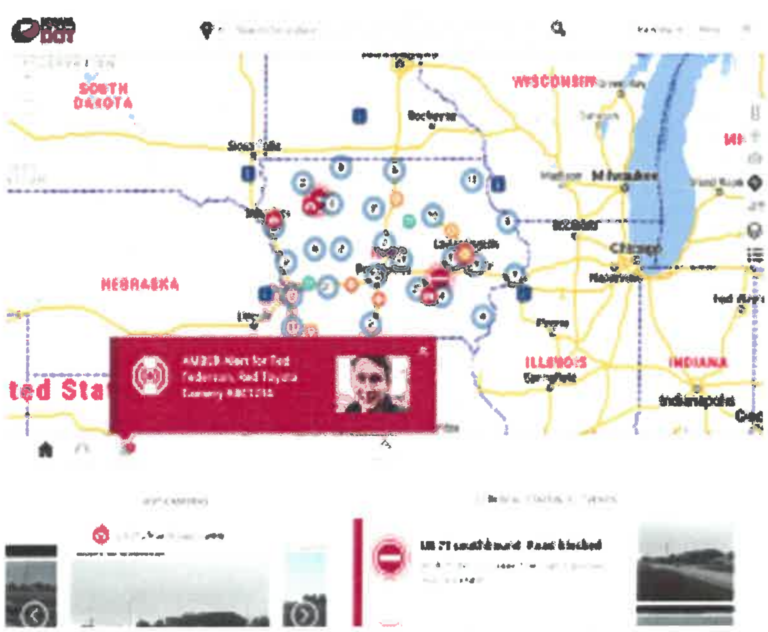



Figure 180 – Amber Alert Notification

## 2.2.9 Integration with External Systems

### 2.2.9.a. Mandatory Requirements

The following three (3) requirements will be met with the deployment of our extensive Vendor Driver protocol software, and through our existing vendor Interfaces, as well as our C2C TMDD Module. With the deployment of this software, iNET™ will communicate with existing external and third-party systems. The C2C module will interface with any existing system which uses the TMDD Standard. Existing Field Infrastructure that uses the Industry Standard NTCIP can be integrated with iNET™ without code modifications.

*REQUIREMENT 4.12.1.1: The ATMS shall establish and maintain connections with existing external systems.*

*REQUIREMENT 4.12.1.4: The ATMS shall incorporate center to center standards enabling standardized data exchange with other systems and agencies.*

*REQUIREMENT 4.12.1.5: The ATMS shall provide traffic data to West Virginia 511 system, website and 511 app.*

The Parsons team will establish and maintain connections with existing external systems. The Parsons team has extensive experience in building interfaces. Several mechanisms for building interfaces exist between iNET™ and other applications, which include using vendor specific protocols, using industry standards such as NTCIP and Traffic Management Data Dictionary (TMDD), or implementing custom interfaces to third-party systems. Interfaces support real-time data exchange with minimal if any system latency.

iNET™ has an extensive experience with As-Built Interfaces which are readily available:

- **Over 100 Vendor Specific Protocols**
- **Over 120 Custom Interfaces**
- **Over 10 Unique C2C TMDD Interfaces**
- **Over 200 Interfaces using ITS Standards**

Parsons has an extensive library of protocols available within iNET™. When a new interface is added to iNET™, the vendor specification along with a Parsons generated Interface Control Document (ICD) are written and stored in a content management system. In addition, iNET™ offers REST Interfaces for each module which allows other systems to connect to iNET™ for speed sensor, signal, weather, event, DMS, camera, HAR and travel time information. The following tables describe the types of interfaces Parsons has built for iNET™.

| INTERFACE TYPE | DESCRIPTION |
|---|---|
| **Vendor Specific Protocols** | These are Interfaces developed based on vendor specifications. As vendor software/firmware is updated and enhanced, vendors release new versions which may or may not be backwards compatible. iNET™ often supports multiple protocol versions of a vendor's software. Vendor protocols typically include Cameras, DMS, Traffic Signal Controllers and Traffic Sensors. |
| **Custom Interfaces** | Custom Interfaces are developed when an application or system does not follow an Industry Standard, and/or does not have a documented application interface to their product. Typical custom interfaces that iNET™ has incorporated are CAD, Video Walls, Third-Party Software and Disparate Legacy System utilizing older technology. |
| **ITS Standards Based Protocols** | Protocols developed and supported by the Industry such as NTCIP. iNET™ supports NTCIP Standards for Cameras, Signal Controllers, Ramp Controller Software, Traffic Controllers, Signs, and Weather. |
| **TMDD** | C2C Standards which support sharing information or field equipment device control between systems. iNET™ supports TMDD message libraries for Traffic Sensor data, DMS, Weather, Event, Response Plans, Cameras, and Signal Data. |

## HOW INTERFACES ARE DEFINED AND IMPLEMENTED

In the event, there is an existing interface that is unique and does not use an Industry Standard interface protocol, a custom new interface will be built. For new interfaces there is a four-phase design effort which includes the following:


1. Interface Requirement Definition – This phase includes a full review of client requirements to understand the goals and expectations of the interface. If available, any interface documentation provided by the third-party vendor or external system is reviewed and any system constraints are identified. If the interface is a two-way interface, a full understanding of what the expected data exchange is defined. Requirements for network connectivity between the systems is defined and any environmental constraints are documented.
2. Interface Top Level Design – This phase includes defining the behavior of the interface including the frequency of the data exchanged, the size of the data, system retries, and the type of interface, for example SOAP, FTP, REST, etc. During this phase the test approach for validating the interface is also defined.
3. Detailed Design – During this phase, detailed data characteristics are defined for how the data will be processed within ATMS and how the two-way interface will work (if applicable). Any network connectivity needs are addressed, and a detailed test plan created.
4. Interface Test Design – For this final phase of the design process, end-to-end system testing will be defined to include how the system will be tested and where the testing will be conducted with minimal or no impact to the field or other Production systems. Any safety issues in testing are identified and resolved and a full end-to-end test is conducted.
5. Associated Documentation – For each new interface, a set of documentation is created following the IEEE Standards for Software Engineering. The documentation created includes:
    a. Requirements Definition
    b. Interface Control Document
    c. Software Design Document
    d. Test Plan and Procedure

## INTERFACES CURRENTLY SUPPORTED IN INET™ ATMS

Below is a partial list of interfaces that have been built for iNET™ and third-party software, including CAD systems operated by other 911 centers and law enforcement agencies.

**Table 27 – Parsons ATMS Device/System Interfaces**

| FIELD DEVICES |
|---|
| **DYNAMIC MESSAGE SIGN (DMS)** |
| 3M |
| Addco |
| Adaptive (AMS) |
| Adaptive, AlphaXpress1175 v1.6.31 |
| American Dynamics |
| Daktronics, VF-2020-54x180-34RGB |
| Daktronics, VF-2020-96x288-20RGB |

| FIELD DEVICES |
|---|
| Daktronics, VF-2120-27x110-66A |
| Daktronics, VF-2420-27x60-46A |
| Daktronics, ED14489 - VFC-3000 FW \| 1.7.3453.4 |
| Display Solutions |
| FDS, Fiber Optic, 3-line, 18 char, rear access |
| Display model SR240 23715-20 |
| Lake |
| Ledstar, CTL23 \| MEMPHIS 25x3- V9.7 Jul 30 2008, CTL23 \| VMS89 27x125- V9.8 Jul 18 2009, CTL19 \| ATLANTA 21x3, VMS97 V2.6apr26; CTL24 FW VMS153C-56x270 V3.2 June 6,2012; VMS140 v2.8JUL25; CTL24 VMS-97R1 v3.2 March01,2013; CTL-24 (VMS-171-27x95) v3.2 May 20 CTL23 \| ATLANTA 15x3, CTL24 FW, |
| Mark IV |
| National Signal, Sunray 390 |
| Precision Solar |
| SESA, M5000/TSDMS v SCU6V3; M5000 TB-15-3564-3 SCU6V3 controller CP1L1.4.56 |
| SES America, M6000 |
| Skyline, SkylineOMSC-001 Firmware V04.030012;<br>Skyline NTCIP 5271 Firmware v03.07.0017 |
| SWARCO |
| Vermac |
| Wanco, WTMMB Full Matrix Firmware v2.66.0 |
| **DMS CONTROLLER** |
| Daktronics, VFC-3000 (Firmware 1.8.3896.1; 1.8.3936.2; 1.8.3936.28; 1.8.3896.7; 1.9.4588.11; 1.9.4588.15; 1.9.4588.16; 1.9.4588.19; 1.9.4588.22; 1.9.4588.26; 1.9.4588.28; 1.9.4588.32) |
| SES America, SCU-6 (Firmware: 20100713-v2.36, 20110222-v2.48) |
| FDS, RK60 |
| FDS, UC960 |
| **CCTV CAMERA** |
| Axis |
| Axis Q6032-E and Q604-E |
| American Dynamics |
| Bosch, 18X Enviro Dome |
| Bosch, 25X Enviro Dome |
| Bosch, Auto Dome VG4-A-9543 |
| Bosch, Auto Dome VG5-600 Series |
| Bosch, VG5-623-ECS |
| Bosch, VG5-613-ECS |
| COHU, Helios 3920HD, Helios 3930HD, Helios 3960HD, I-view II |
| COHU, 3925-3800 Series |
| COHU, 3925-38-PEND |
| COHU, iDome 3924-5200 |

| FIELD DEVICES |
| --- |
| FLIR |
| Pelco, Esprit ES3012, Spectra IV Models |
| Suqura |
| Vicon, SVFT-PRS35 v2.8.0 Jan 27 2012 12:46:53; SVFT-PRS35 NTC; SVFT-PRS36 2.8.1 oct 8 2012 15:24:07; SVFT-PRS36 2.8.1 (SurveyorVFT NTCIP 2.8.1(rohs); SVFT-PRS36-NTC NTCIP 2.8.1 |
| Videolarm |
| **CCTV ENCODERS** |
| Axis |
| Bosch, VIP X1600 XF Firmware: 43500400 |
| Bosch, VIP X1 XF IVA Firmware: 24500410 |
| Bosch, VideoJeet x10 Firmware: 56500410 |
| Bosch, VIP X1 Firmware: 04500252 |
| Comnet, CNVTX1 v5.0.1.0 July 2013, v5.0.2.1 |
| Coretec, VCX-7401 Firmware v11jb1, v1.2 build 4, v1.2f build 5, v1.3e build 6, Date: 10AUG14, v1.3j Build 3, v1.3m build 1, v1.3q build 1 |
| Impath, I5110-ET Firmware v3.2.7.13, v3.2.7.16, v3.2.7.16 Aug 7 2013, 21:41:03 |
| Optelecom |
| Siqura |
| Teleste IPE |
| Teleste MPC |
| **HAR TRANSMITTERS** |
| HIS, DCC3 Version: 0.5.21; 0.5.22; 0.5.24; 0.5.25; 0.5.26 |
| M.H. Corbin (Vaisala) |
| **HAR BEACONS** |
| HIS, RC200A |
| HIS, RC200 |
| **RWIS** |
| High Sierra |
| Lufft |
| Vaisala (SSI), RWS 110 SSI Road Weather Station LX version: 1.34; 1.35; 1.37; 1.38 |
| National Weather Service |
| **LCS** |
| Daktronics |
| **SCADA** |
| PLC (Modbus) |
| PLC (VersaMax) |
| **TRAFFIC SIGNAL** |
| Intelight, X3 |
| Peek, ATC-1000 |
| McCain, ATC |
| Econolilght, ASC/3 |

| FIELD DEVICES |
|---|
| **VDS** |
| BlueToad, REST(WS)/XML |
| Econolight Autoscope, Solo Terra |
| Econolight Autoscope, Rackvision |
| EIS, RTMS X2, X3, G4 |
| HERE |
| INRIX |
| Intelight, 2070/ATC |
| ISS/RTMS, X3, G4 |
| ISS/RTMS, X3 v5.1.0.0R10 Mar 22 2010; G4 v4.7.1.0; SX-300 G4 Protocol v8.0.3.0 |
| Iteris |
| Sensys |
| TrafficCast, BlueTOAD |
| TrafficCast, Dynaflow 3.0 |
| Trafficon, TrafficCam |
| Wapiti, 170 Traffic Controller |
| Wavetronix, SS105, SS125, SS105, SS125/126 |
| **VIDEO WALL** |
| Activu |
| Jupiter, PixelNet |
| **VSL** |
| IDC |

*REQUIREMENT 4.12.1.2: The ATMS shall operate and report system diagnostics to enable operators to confirm that communications to external systems are functioning properly.*

*REQUIREMENT 4.12.1.3: The ATMS shall operate and report system diagnostics to enable operators to confirm that communications to external field devices are functioning properly.*

All interfaces to external systems or field equipment are configured in iNET™ ATMS to have a rate of polling for retrieving the data. When the system or device responds to the poll, the response is evaluated, and status displayed in the System Alert Window. Some vendors provide very detailed diagnostic data with the status and other provide high level status only. Whatever the vendor provides is displayed on the Alert Window. An Operator can click on the Alert and view more details about the type, severity, and detail of the failure or warning. If no response is received from the vendor or third-party interface, a Communication Failure alert is displayed on the Alert window (Figure 181). From this window, operators are able to review, silence, or create events associated with the error. All diagnostics and errors are placed into the data archive for later recall by the reporting module. In addition, to the above processing, in many cases field equipment vendors provide a detailed diagnostic interface which offers more detail to warnings, malfunctions and errors. iNET™ supports these diagnostic interfaces where users with proper privilege can run a DMS Diagnostic Test and view the response. The processing for external and field interfaces within iNET™ satisfies the above requirements.


Figure 181 – Alert Window displays Device/Data Feed Errors

*REQUIREMENT 4.12.1.6: The ATMS shall have the ability to establish, maintain, and exchange data with CAD systems operated by 911 centers and law enforcement agencies within the State of West Virginia.*

*REQUIREMENT 4.12.1.7: The ATMS shall receive CAD incident reports and make them available to authorized users through the ATMS user interface.*

iNET™ includes interfaces to various CAD systems allowing ATMS operators to view and manage event data from local and state law enforcement agencies. The interfaces to the CAD systems are C2C standalone processes that run within the ATMS application. A system poller is created that allows Administrators to define the frequency of the interface updates between ATMS and the CAD system. The interface can be "read only" or implemented as a two-way interface. When events are received from the CAD system, a system alert appears in the operator Alert UI. The operator with correct security access privileges is given the option to view the event, and/or create a corresponding event, within the ATMS. This can be done with a single mouse click and all relevant and necessary event information will be created within the ATMS. Once the event is created in iNET™, all users with the correct privileges can View, Edit, Modify, or Terminate the event. The above requirements are met and exceeded in iNET™ and the figure below demonstrates how CAD Events are displayed when they enter iNET™.

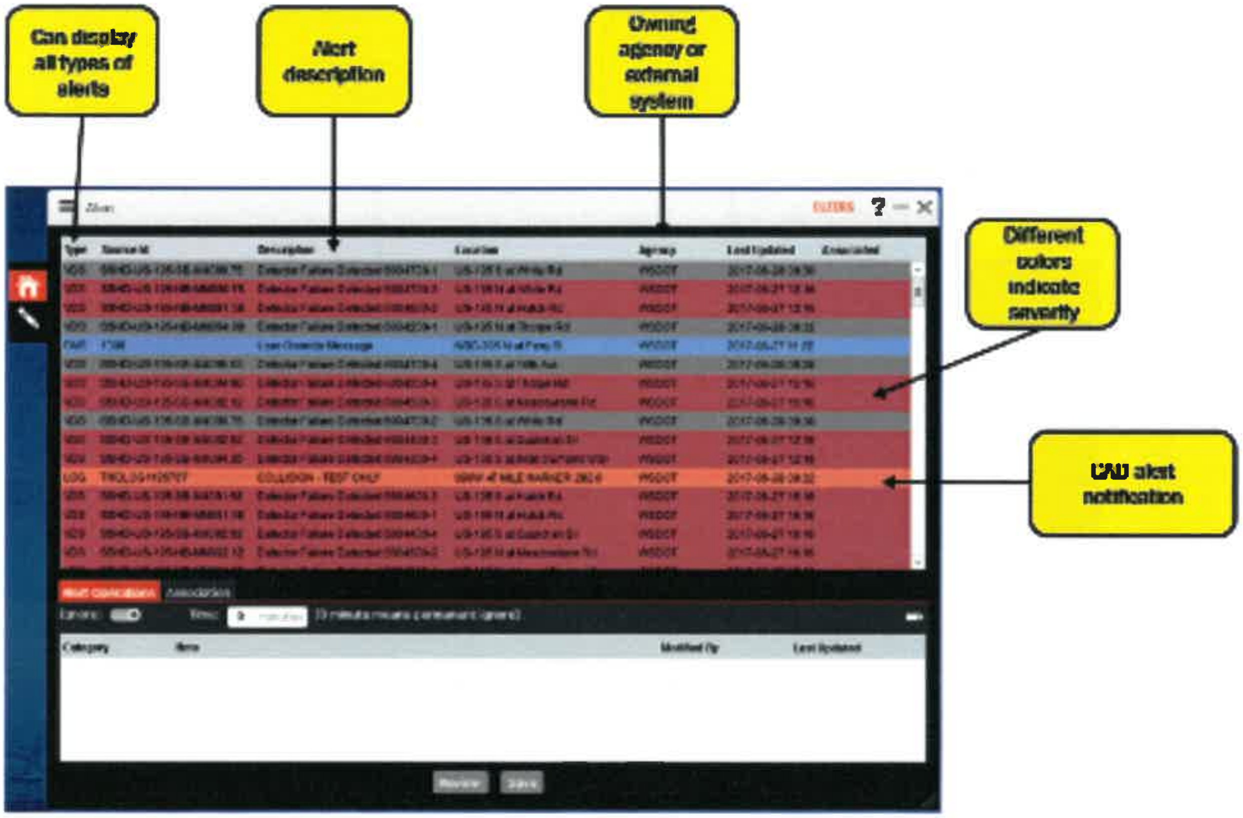



Figure 182 – CAD Alerts

The CAD event is treated as any other ATMS created event and appears on the Event Map layer, the system List UI, and has an associated Event Details UI. Events in the ATMS can be displayed and sorted by date/time or by location using the UI filtering option. See also Requirement 4.15.1.5.

*REQUIREMENT 4.12.1.8: The ATMS shall be able to share ATMS functionality with the WVPA (West Virginia Parkway Authority) offices.*

*REQUIREMENT 4.12.2.5: The ATMS should be able to share ATMS functionality with the West Virginia State Police Troop locations and dispatch centers.*

*REQUIREMENT 4.12.2.6: The ATMS should have the ability to integrate West Virginia weigh station offices through on-site video monitoring and providing access to the ATMS software application.*

West Virginia Parkway Authority manages a portion of the roadway and needs to have access to iNET™ ATMS. The iNET™ ATMS is able to share ATMS functionality with any partner agencies including West Virginia Parkway Authority, West Virginia State Police Troop locations and dispatch centers, and West Virginia weigh stations. Employees of partner agencies will be given user accounts, whose privileges will be configured to allow/deny privileges as needed. The flexible security assignments in iNET™ ATMS, allows user to be configured on a per device level or by Agency. If WVPA is set up as an individual Agency group, this group can be assigned a list of cameras, or any field equipment to manage. The ability to add users and agencies in iNET™ provides the flexibility to allow WVPA to manage ATMS from the remote locations and dispatch centers. The above requirements are met with this functionality. Please note this functionality addresses two of the Desirable Requirements as well.

*REQUIREMENT 4.12.1.9: The ATMS shall integrate with the current Citilog video analytics system in order to provide data related to wrong-way driver, incident and stopped vehicle detection.*

iNET™ has the ability to interact with the Citilog video analytics software and utilize the unique capabilities that Citilog offers in automatic incident detection and video analytics and was successfully deployed and utilized in the I-66 Active Traffic Management Corridor. When wrong-way detection or stopped vehicles are indicated through the interface, an alert will appear on the Alert Window. The Operator can then click on the Alert to see additional detail provided by Citilog, and also has the ability to create an associated event in the ATMS. The existing Citilog interfaces and the current Alert processing in ATMS will satisfy the following Requirement.

### 2.2.9.b. Desirables

*REQUIREMENT 4.12.2.1: The ATMS should integrate with external agencies' systems using standardized Center to Center communication protocols.*

The iNET™ Center-to-Center (C2C) module is the gateway through which to send and receive data to and from iNET and those systems that are external to it, such as other agencies and municipalities. This module is also used, as applicable, to exchange information between adjacent regions. This module manages interaction with legacy systems, partners, and agencies. Standard NTCIP 2306 and Standard Traffic Management Data Dictionary (TMDD) interfaces will be used, but other custom interfaces can also be created. The C2C Module satisfies the following requirement:

*REQUIREMENT 4.12.2.2: The ATMS should have the ability to integrate the fog warning/conditions system to activate a DMS.*

The iNET™ ATMS integrates with a fog light system which are a bank of lights which are used to illuminate areas of dense fog. The Fog Light viewer (Figure 183 – Fog Light Viewer Window) includes viewing and sending brightness levels to the fog lights, turning them on. The Fog Light viewer window is the central point for accomplishing these tasks. The Fog Light system is accessed by opening a Fog Light Viewer window, click the *Viewer* icon in the navigation menu. Then, click the FOG link in the lower switcher bar. This will display a blank FOG window. To view a particular Fog light, use the drop-down list to select the desired station. A Fog light icon may also be dragged and dropped from the map or list windows. The system can be configured to set ranges for Fog, precipitation and other weather conditions, and automatically generate a DMS message to warn motorists. This functionality, already a part of iNET™ ATMS satisfies the following requirement.

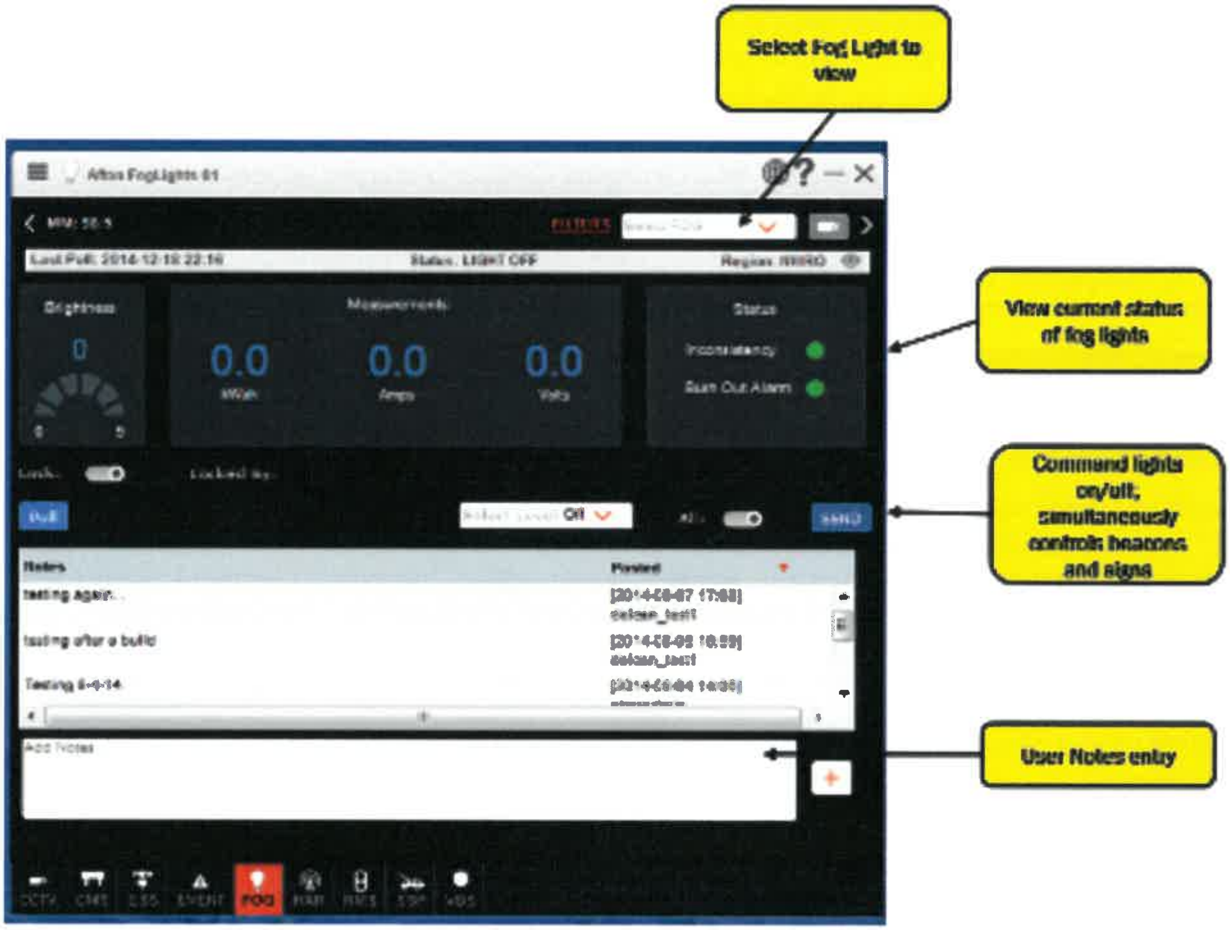



Figure 183 – Fog Light Viewer Window

In addition to the standard window header, the filtering tool bar, and the status bar, the Fog Light viewer contains the following items:

- Current brightness level: a brightness level of 0 indicates that the fog light is off. Five levels (1-5) of brightness can be set
- Electrical measurements from the fog light sensors
- Inconsistency, Burn Out alarms
- Lock button, and username of person who has a lock
- Poll button which allows the user to poll the fog light for status
- Brightness level selector and a Send button.
- A switch to designate 'all' fog lights are to be issued a command at once; this also activates any beacons/signs associated with the fog lights
- A section for notes

*REQUIREMENT 4.12.2.3: The ATMS should have the ability to access to OES flood gauge monitoring system. (IFLOWS) (Note: This desirable is for monitoring only)*

The iNET™ ATMS does not currently have an interface to the OES Flood Gate Monitoring System, however as mentioned above, Parsons has the vast experience to quickly develop and deploy new custom interfaces. The process for developing a new interface is described above in this section. Parsons also has existing interfaces to other Monitoring systems, which can be leveraged. With this custom interfaces, the following requirement will be met.

*REQUIREMENT 4.12.2.4: For optional interfaces not incorporated into the ATMS, the ATMS should provide a means to initiate the external software from within the ATMS and must log the initiation and termination of the external software.*

It is not always possible to build interfaces to all legacy and external systems. In many cases it is easier to access/launch the application from within iNET™. Due to the web-based architecture of iNET™ ATMS, and the Browser based UI, it is possible to launch other systems from within ATMS. Since all keystrokes are logged and archived, this launch to an external system, would be logged and available in the ATMS. Once the user exits, the external application, the ATMS UI will be available, and will also log the return/termination of the external interface. With this existing capability, the following requirement is met.

## 2.2.10 Operator and User Features

### 2.2.10.a. Mandatory Requirements

*REQUIREMENT 4.13.1.1: The ATMS shall enable multiple users to be logged in simultaneously.*

*REQUIREMENT 4.13.1.2: The ATMS shall enable users to access the system from locations remote from the TMC.*

iNET™ Transform features a browser-based thin client capable of seamlessly integrating a wide variety of ITS applications within a common user environment for the monitoring and management of ITS operations. The iNET™ Transform user interface can be accessed using current web browsers (including "Chrome, Firefox, and Microsoft Edge), which eliminates the effort required to install and maintain client software on user workstations. In addition, authorized access to the system can easily be extended throughout the region's network as needed to authorized users from the field, from home, or from within multiple agencies.

iNET™ does not limit the number of user accounts that can be added to the system. The system has been successfully stress-tested with over 500 simultaneous users and currently operates in production centers with over 150 simultaneous remote users on the average. Our Product Specification, current deployments, and system testing meet the above requirements.

*REQUIREMENT 4.13.1.3: The ATMS user interface shall display alerts and notifications to users.*

*REQUIREMENT 4.13.1.4: The ATMS user interface shall enable users to view the identification of other users that are logged in to the system.*

*REQUIREMENT 4.13.1.5: The ATMS shall alert operators when users log in or log off the system.*

*REQUIREMENT 4.13.1.6: The activities performed in the ATMS by other users shall be visible to all other users with the appropriate authority.*

The ATMS tracks all users who log into the system and the list can be found in the Administration window under Sessions. The system identifies who is logged on, where they are accessing the system from, and when they logged in. iNET™ has the ability to configure pop up alerts that will notify operators of things that are happening within the system. Parsons can configure the system to use the alert notification to display the user names of who logs on and off the system. System alerts and notifications can be configured in the system to display a small pop-up which slides on the lower right portion of the screen and then slides away. This feature is configurable and greatly resembles Email notifications in Microsoft Outlook. Please see figures below that demonstrate the above requirements.

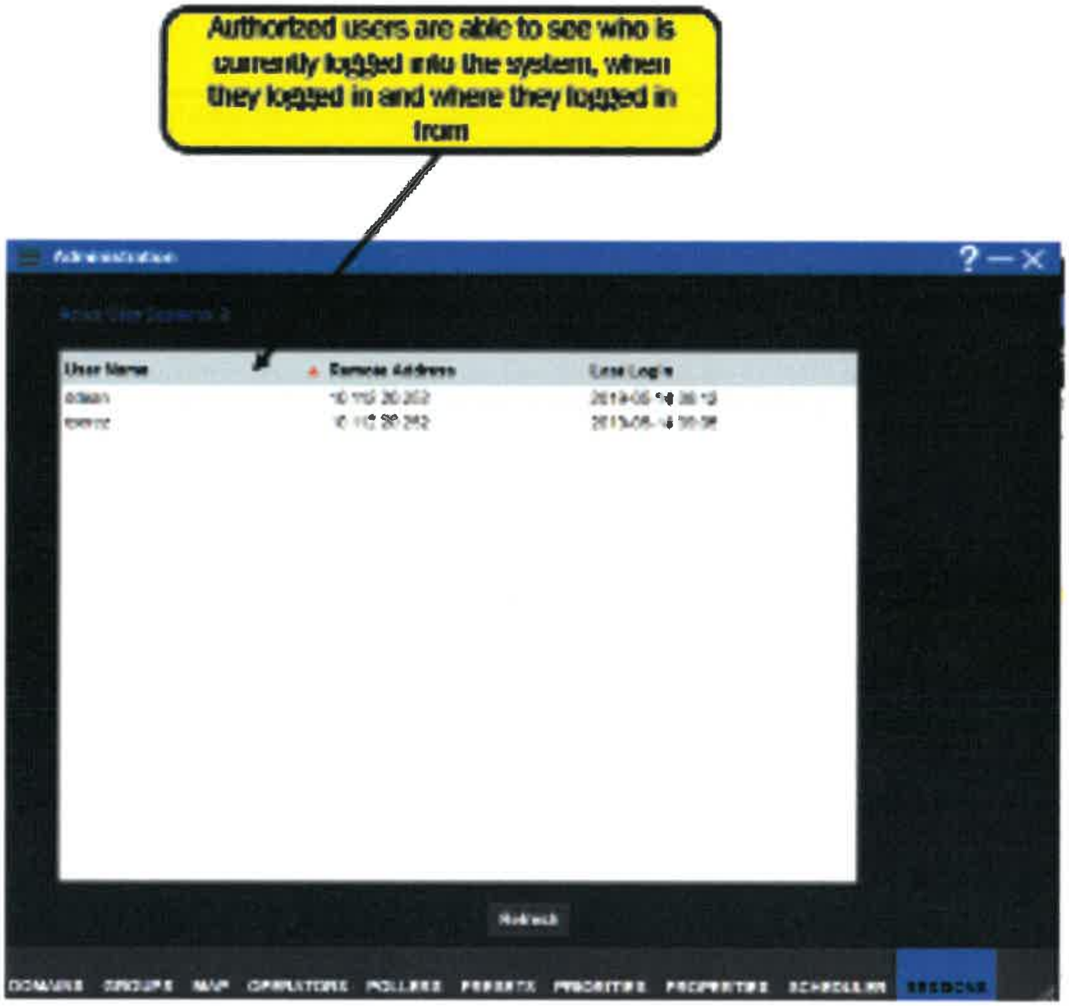



Figure 184 – Active User Sessions

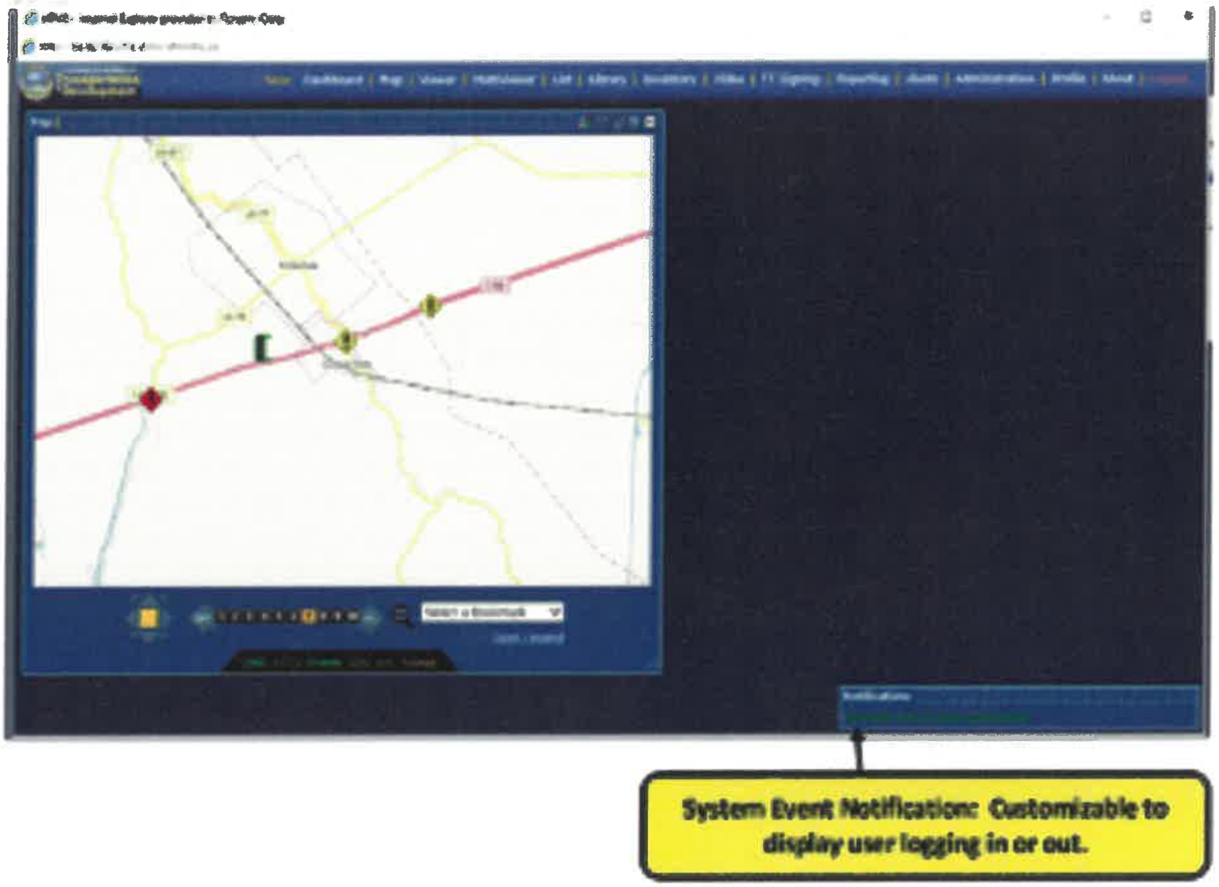



Figure 185 –System Notification

*REQUIREMENT 4.13.1.7: The ATMS user interface shall include map display for both local and remote workstations.*

*REQUIREMENT 4.13.1.8: User interface maps shall be GIS based to enable smooth and continuous scrolling and zooming.*

*REQUIREMENT 4.13.1.9: User interface maps shall include functionality to hide layers or attributes at wide zoom levels to avoid map clutter.*

*REQUIREMENT 4.13.1.11: The ATMS user interface maps shall display active incidents (construction, incidents, etc.).*

*REQUIREMENT 4.13.1.13: The ATMS user interface maps shall display icons representing both fixed and portable device locations.*

*REQUIREMENT 4.13.1.14: The user interface map display of DMS shall distinguish DMS that are not currently connected or operational from those that are operational and connected to the ATMS and ready to receive a message from the ATMS.*

*REQUIREMENT 4.13.1.18: The user interface map display shall display icons representing locations of all CCTV connected to the ATMS*

*REQUIREMENT 4.13.1.22: The user interface shall allow operators to turn map layers on and off.*

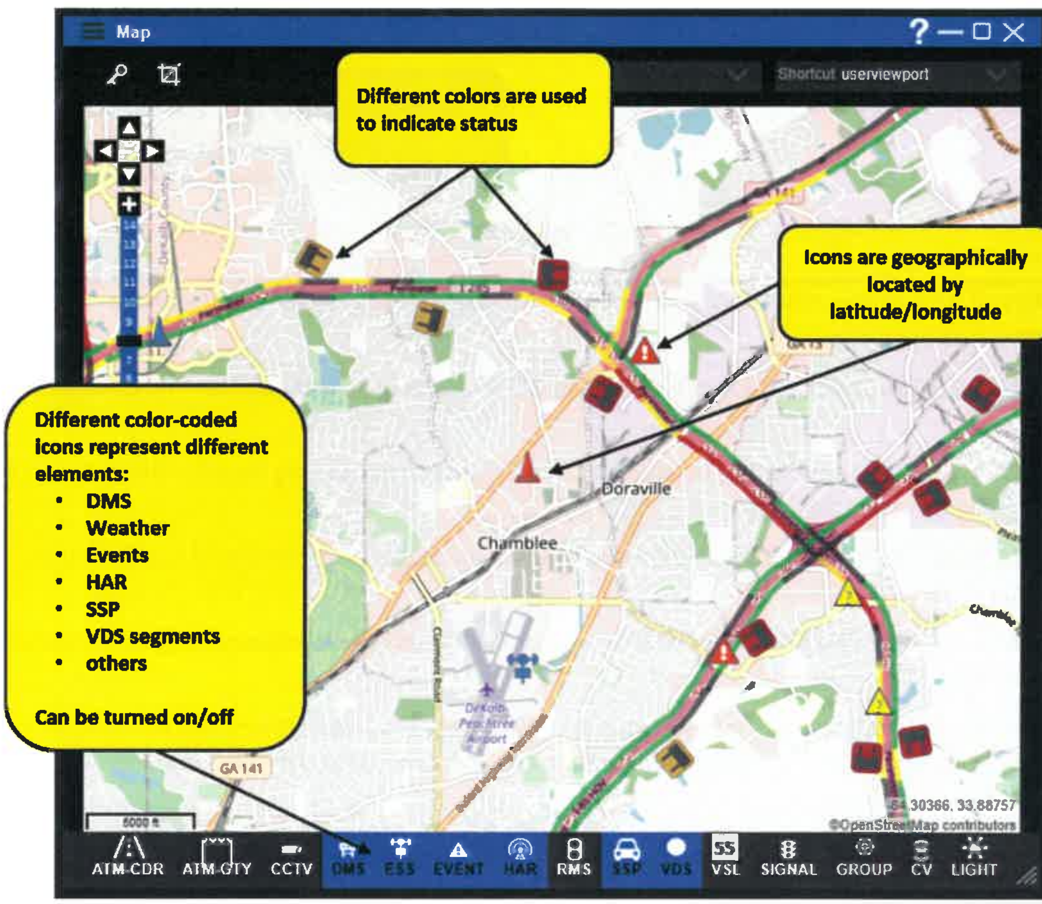
*REQUIREMENT 4.13.1.23: The user interface map display shall display icons representing locations of weather stations supplying information to the ATMS.*

*REQUIREMENT 4.13.1.25: The user interface shall enable operators to view the locations and status portable ITS devices.*

*REQUIREMENT 4.13.1.26: The ATMS shall display device status data on the map display.*

*REQUIREMENT 4.13.1.27: The ATMS shall have the capability of displaying real-time data that is collected by field devices and made available to the ATMS.*

The User Interface Map within iNET™ displays GIS based data within the browser and is available to all local and remote users. If network connectivity exists between TMC's, users from areas can view the same Map. As changes are made in the user interfaces, the updates are seen by all users immediately allowing them to view changes in a real time manner. The full featured map displays icons for DMS (portable and fixed), Cameras, weather stations, events and speed detector data. The map has a legend that summarizes all icons in the system and the different states. For field devices that receive real time updates, the icon color changes based on the current status. Users have the ability to pan, zoom, and move the map to different locations within the region. Users also have the ability to toggle on and off icons by type or status. The color of the icon represents the operational state of the device. If the device is gray, the device is offline. A red icon indicates the device is on-line but has a failure. A yellow icon means the device is reporting status, but the status is suspect or the communication is not stable. Devices in green indicate the device is online, healthy and reporting status. Based on this functionality, the iNET™ Map satisfies the above requirements.



We will meet the following 22 requirements for viewing real time information for field devices and events.

*REQUIREMENT 4.13.1.10: The ATMS shall provide a mechanism for operators and users to select what is displayed on the map ( e.g. make DMS visible or not visible on the map, make CCTV visible or not visible on the map).*

*REQUIREMENT 4.13.1.12: The ATMS user interface maps shall enable operators to select an incident icon to open and view information describing the incident.*

*REQUIREMENT 4.13.1.15: The on-screen map shall distinguish between fixed and portable DMS.*

*REQUIREMENT 4.13.1.16: The user interface maps shall enable operators to select DMS to view current messages displayed on the signs.*

*REQUIREMENT 4.13.1.17: The user interface maps shall enable authorized users to select DMS to control the current messages displayed on the signs.*

*REQUIREMENT 4.13.1.19: The user interface shall enable authorized users to select CCTV to pan, tilt, and zoom the CCTV cameras.*

*REQUIREMENT 4.13.1.20: The user interface shall enable operators to select CCTV cameras to view real-time video from the cameras.*

*REQUIREMENT 4.13.1.21: The user interface shall enable operators to open multiple cameras simultaneously, viewing real-time video from each camera*

*REQUIREMENT 4.13.1.24: The user interface shall enable operators to select weather stations to view the current status of the weather station.*

*REQUIREMENT 4.13.1.25: The user interface shall enable operators to view the locations and status of portable ITS devices.*

*REQUIREMENT 4.13.1.28: The ATMS user interface shall provide a mechanism for operators to manage multiple events simultaneously ( e.g. toggling back and forth between).*

*REQUIREMENT 4.13.1.29: The ATMS user interface shall enable operators to request and view diagnostics of the System.*

*REQUIREMENT 4.13.1.30: The ATMS user interface shall enable users to view the operational status of field devices and other systems connected to the ATMS.*

*REQUIREMENT 4.13.1.31: Operators shall have a mechanism to initiate the ATMS to ping field devices to detect if communications and field devices are responding properly.*

*REQUIREMENT 4.13.1.32: The ATMS administrators shall be able to set minimum thresholds, such that operators cannot set their thresholds below the value.*

*REQUIREMENT 4.13.1.33: The ATMS user interface shall enable administrators to assign permissions to users.*

*REQUIREMENT 4.13.1.34: The thresholds controlling the ATMS event management plans shall be adjustable by operators or administrators.*

*REQUIREMENT 4.13.1.35: The user interface shall enable operators to view parking information made available to the ATMS.*

*REQUIREMENT 4.13.1.36: The ATMS user interface shall provide a mechanism for operators to view standard operational procedures to be used while responding to events or incidents.*

*REQUIREMENT 4.13.1.37: The ATMS shall provide prescribed response scenarios or automation tools to assist users in controlling multiple devices quickly, consistently, and with limited manual input*

*REQUIREMENT 4.13.1.39: The ATMS shall provide spell check, text wrapping, and copy/cut/paste capabilities for all operator typed entry.*

*REQUIREMENT 4.13.1.40: The ATMS user interface shall enable users to view the status of communication with field devices and other system connected to the ATMS.*

When a user clicks on an icon from the map a viewing window appears that contains all relevant information for that device. iNET™ has viewing windows for Weather, Event, DMS and CCTV. Each viewer has the location, description, and status information and allows operators with the correct privileges to control the device or event.

There are a few ways in which the operator can view multiple cameras in iNET™. They can use the Multi-Viewer module to view up to 12 CCTV feeds at the same time or they can open 8 CCTV viewer windows. The number of viewer windows is a system configurable number that can be adjusted based on the hardware platform that iNET™ is operating from and the system network that allows access to the CCTV devices and or video feeds.


Figure 186 – Multiviewer CCTV Feed

When the iNET™ user clicks on the weather icon from the map, the weather viewer appears with all real time information for that weather station. If the weather station has a camera, the snapshots will appear in the viewer and the user can click the up and down arrow to traverse through all camera snapshots for the station. For more detail regarding Device Control for RWIS, please see the above Section 2.2.5 Device Controls – RWIS.


Figure 187 – Weather Stations

The iNET™ ATMS system allows operators to view multiple events at once as well as manage them. There are several ways for operators to view the event, the Event Layer on the Map, placing multiple events in a Multi-Viewer window to track and manage or just by having multiple event viewer windows open at once and cycling between them. The number of viewer windows available to be open is a system configurable property by anyone with the correct permission set and is usually defaulted to 8 viewer window at one time.

When a user clicks on the DMS icon from the map, the DMS viewer appears, which allows the user to view, and control messages to the sign. To control the sign, messages can be selected from a Message Library, or manually entered. If the user manually places a message on the sign, a spell check will appear to ensure correct spelling prior to placing the message on the sign. The user has the ability to manually poll the sign for status and can also run a full diagnostic test on the sign provided the user has the correct privileges. For a detailed explanation of controlling a sign, please refer to Section 2.2.3 Device Controls – DMS.


Figure 188 DMS Viewer Control

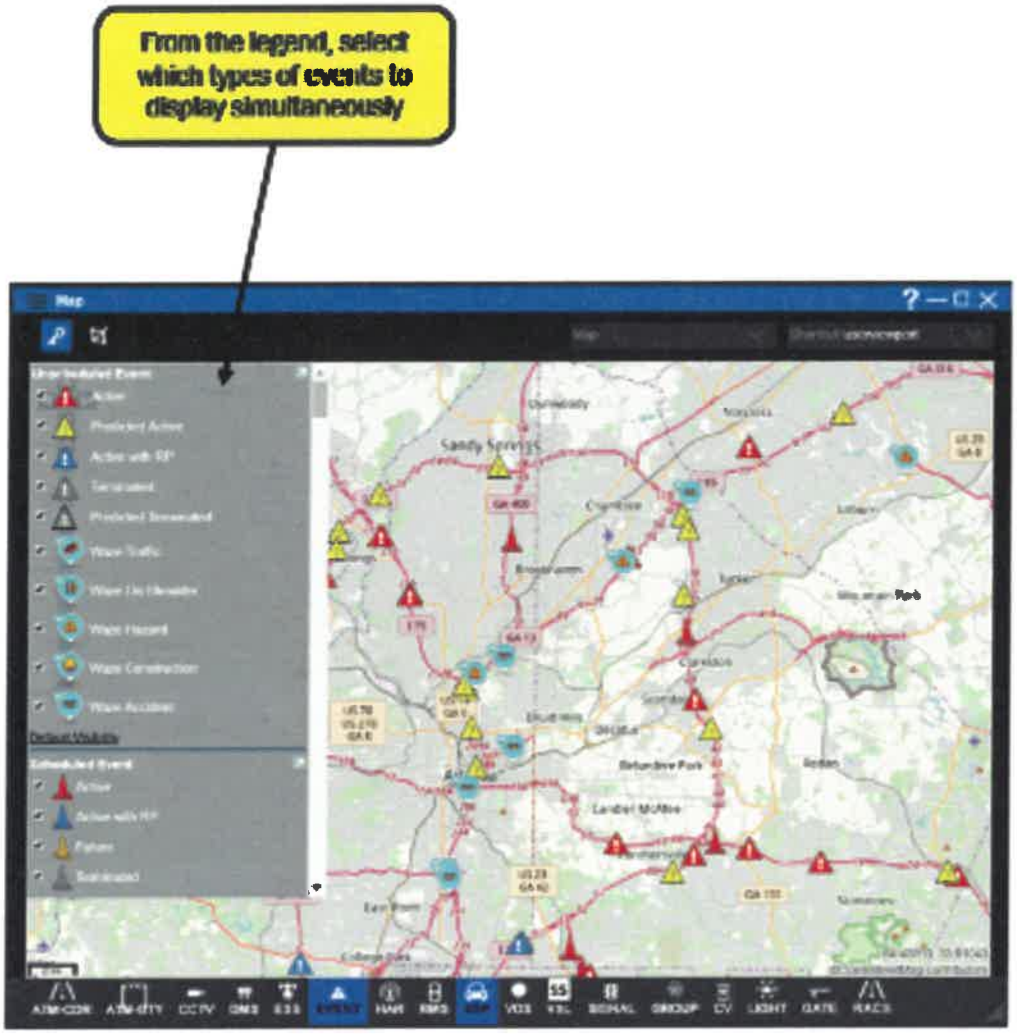



Figure 189 – Map with Event Layer

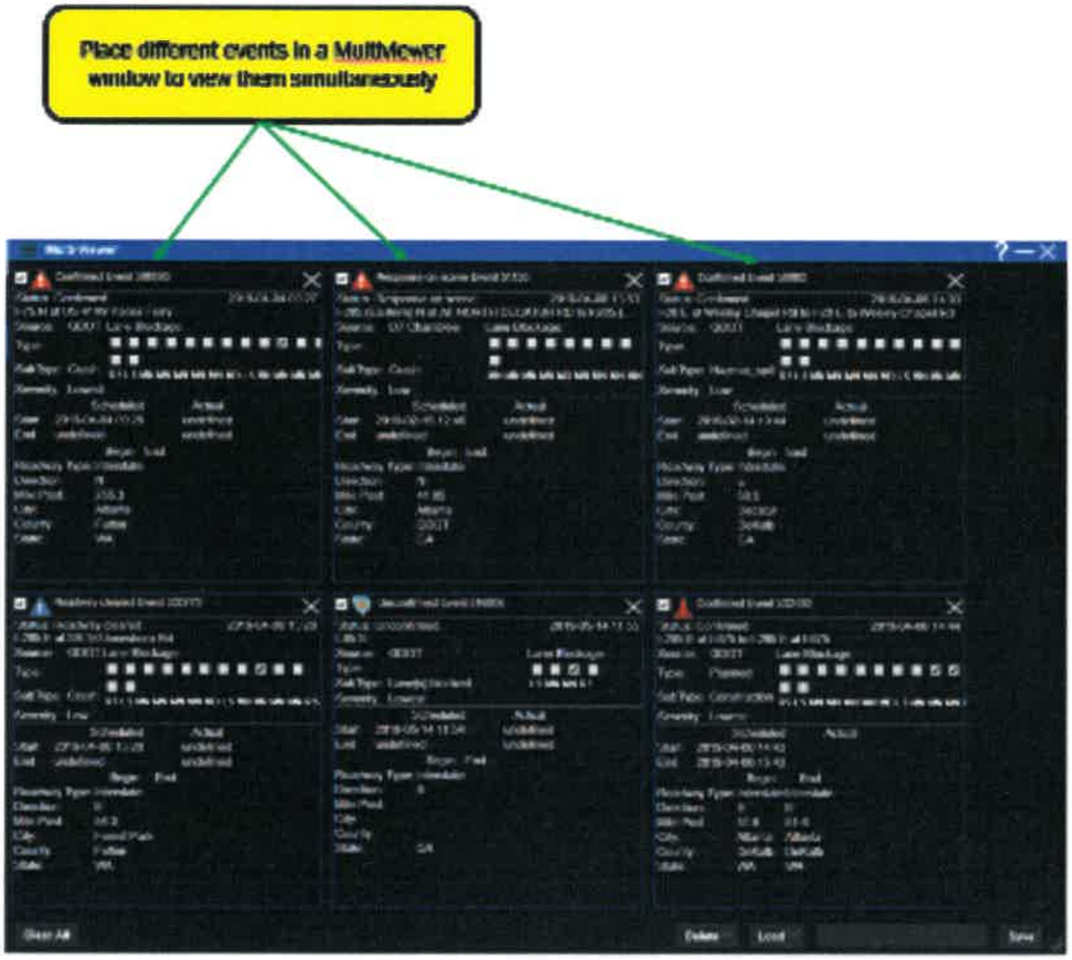



Figure 190 – Multi-Viewer with Events

iNET™ has the capability to display system health and diagnostics. The two most common ways are through a report request or the system dashboard that display device status for all devices connected to the system.

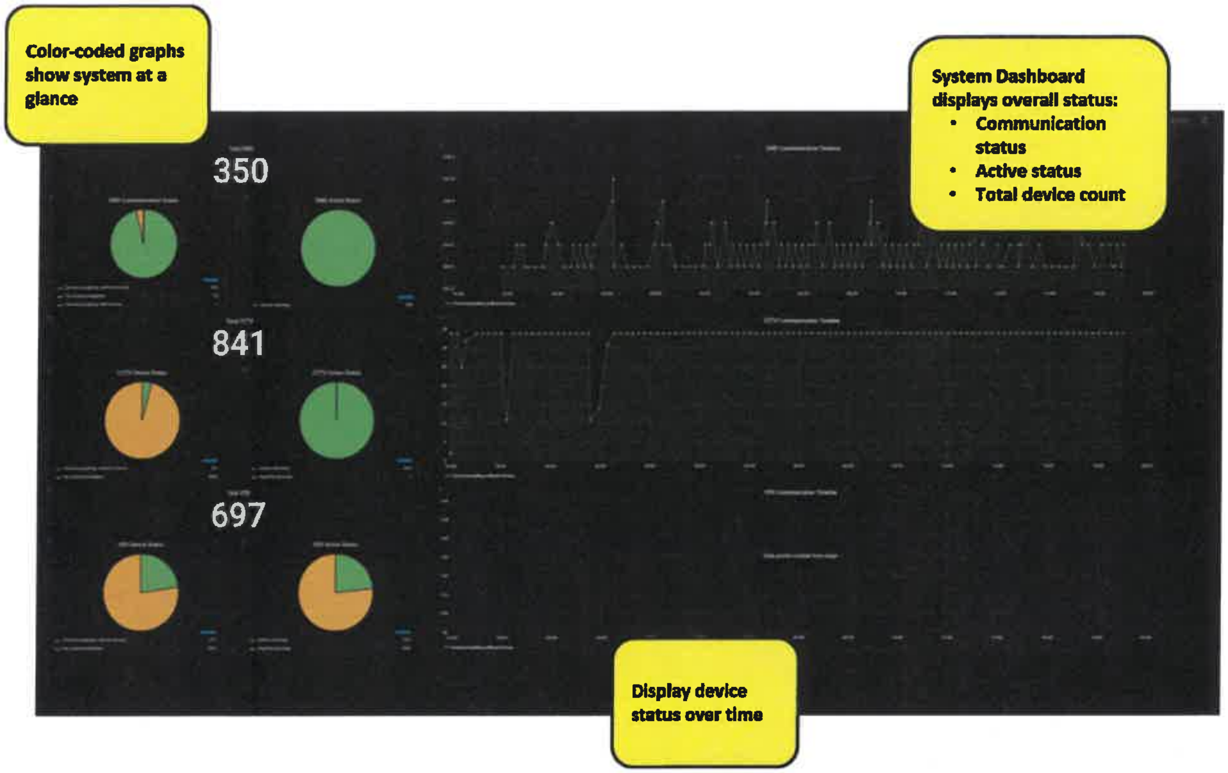



Figure 191 – Device Status Dashboard

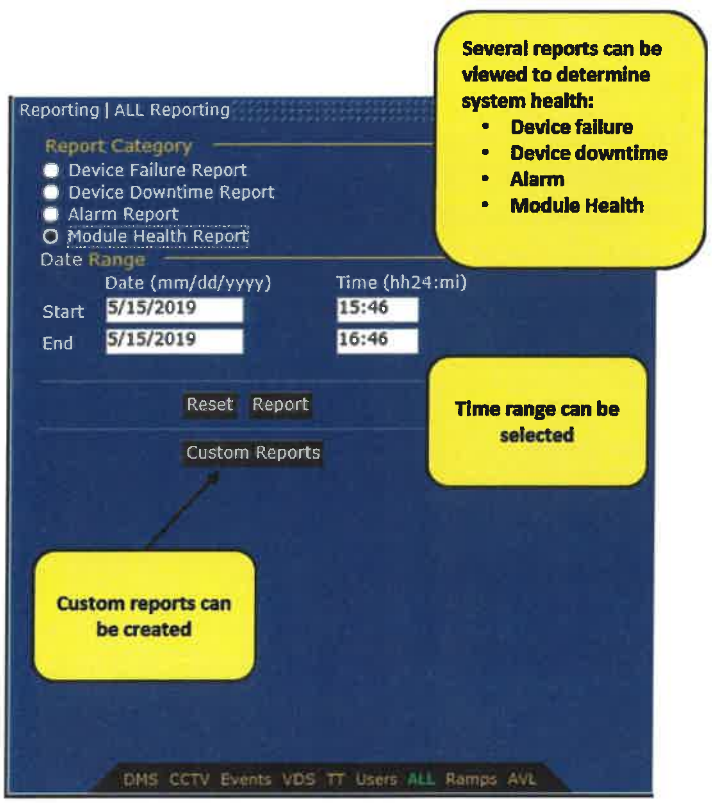



Figure 192 – Module Health Report

iNET™ continuously communicates with field device to check status and receive or send data. This is accomplished using software configuration to poll the devices. The system device pollers are found in the administration window and can be accessed or edited by operators with the correct permission set. iNET™ also contains a mechanism to poll individual devices from the specific device viewer itself.

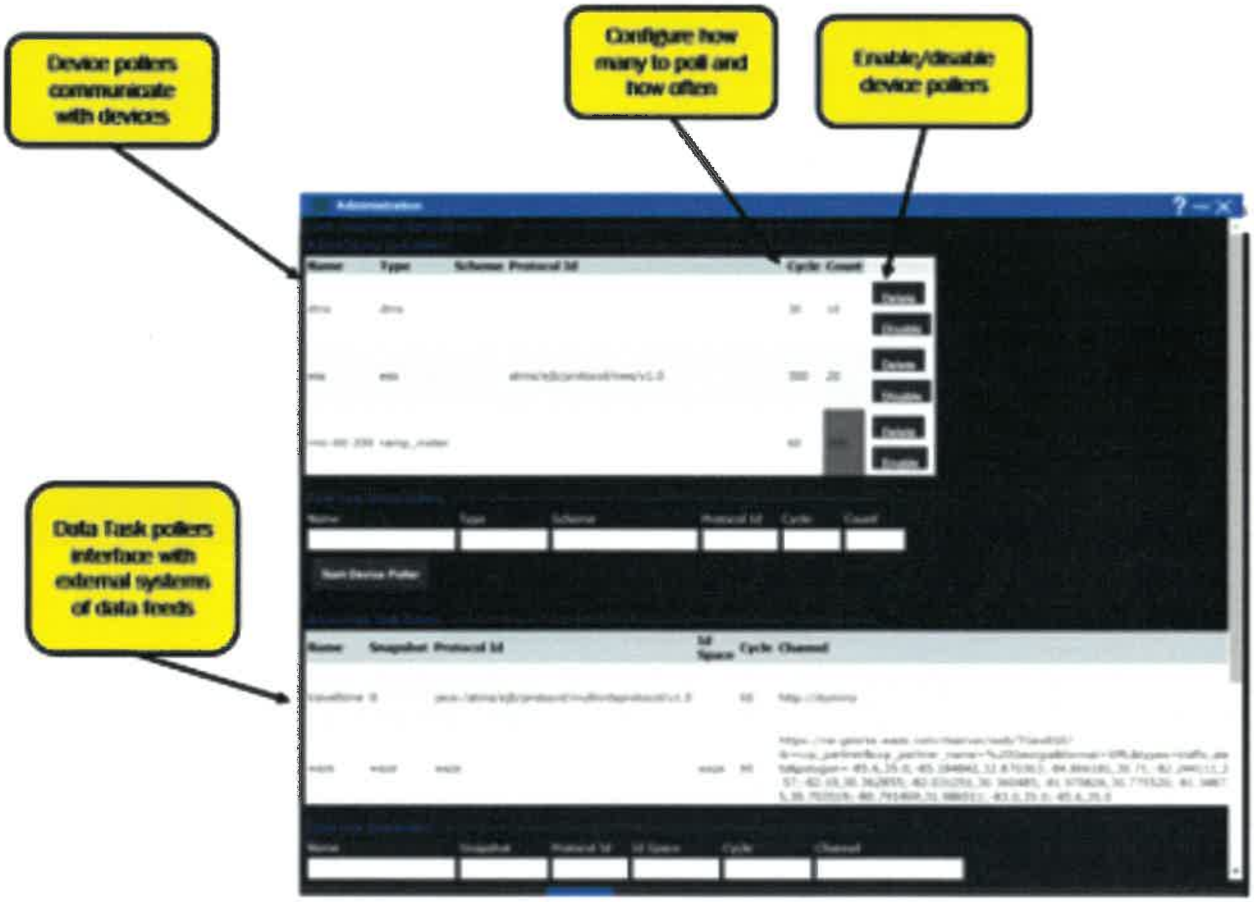



Figure 193 – System Pollers


Figure 194 – Individual Device Poll

iNET™ ATMS administrators can regulate minimum and maximum thresholds set by operators for a variety of user interface functions. The thresholds set by administrators prevents operators from going below or above values for a specific user interface function.

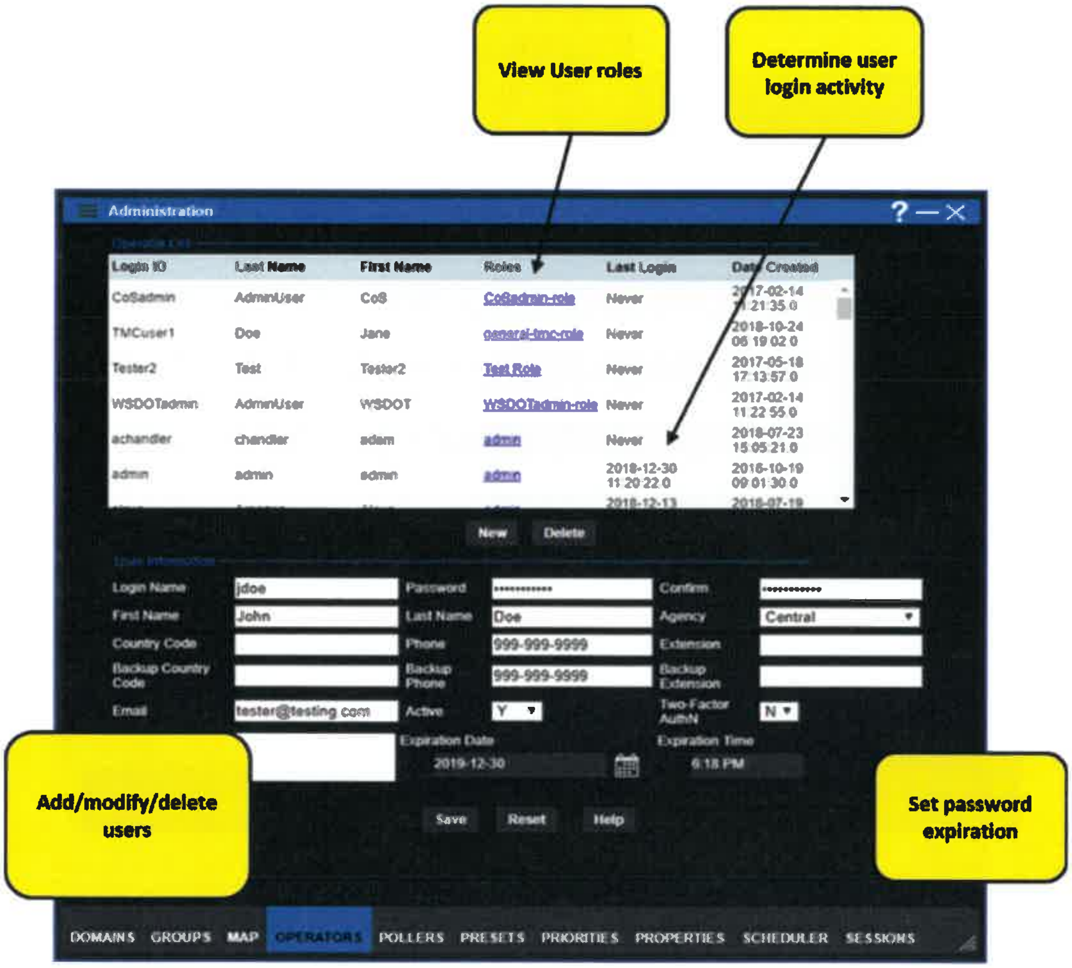



Figure 195 – User Administration

iNET™ enables administrators the ability to manage user access to system functionality. iNET™ security provides a flexible design that allows for managing individual users, or groups of users with access to individual devices, groups of devices, all devices, or no devices. The granularity of the permissions available allows the user/security management system to be highly configurable. Only users with administrative permissions will be granted access to manage user accounts and permissions (functional privileges). These administrative users have the following permissions:

- Create, modify, suspend, or remove individual user accounts
- Create, modify, or remove predefined user types or templates
- Add, modify, or remove specific permissions from individual users
- Add, modify, or remove permissions from predefined user templates

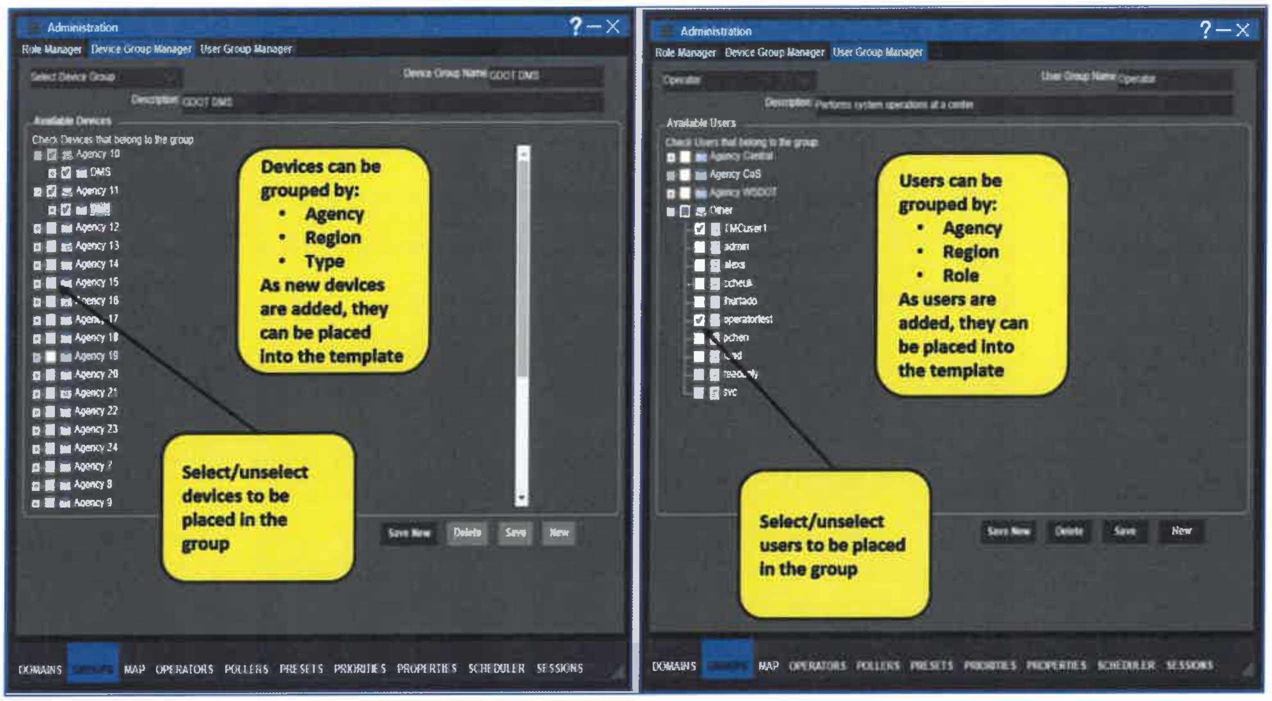



Figure 196 – User/Device Group Management

The Parsons ATMS user interface provides a mechanism for operators to view context-sensitive help on all user interface screens. The context-sensitive help that is made available to users will be enhanced to include standard operational procedures to be used by operators while responding to events or incidents.

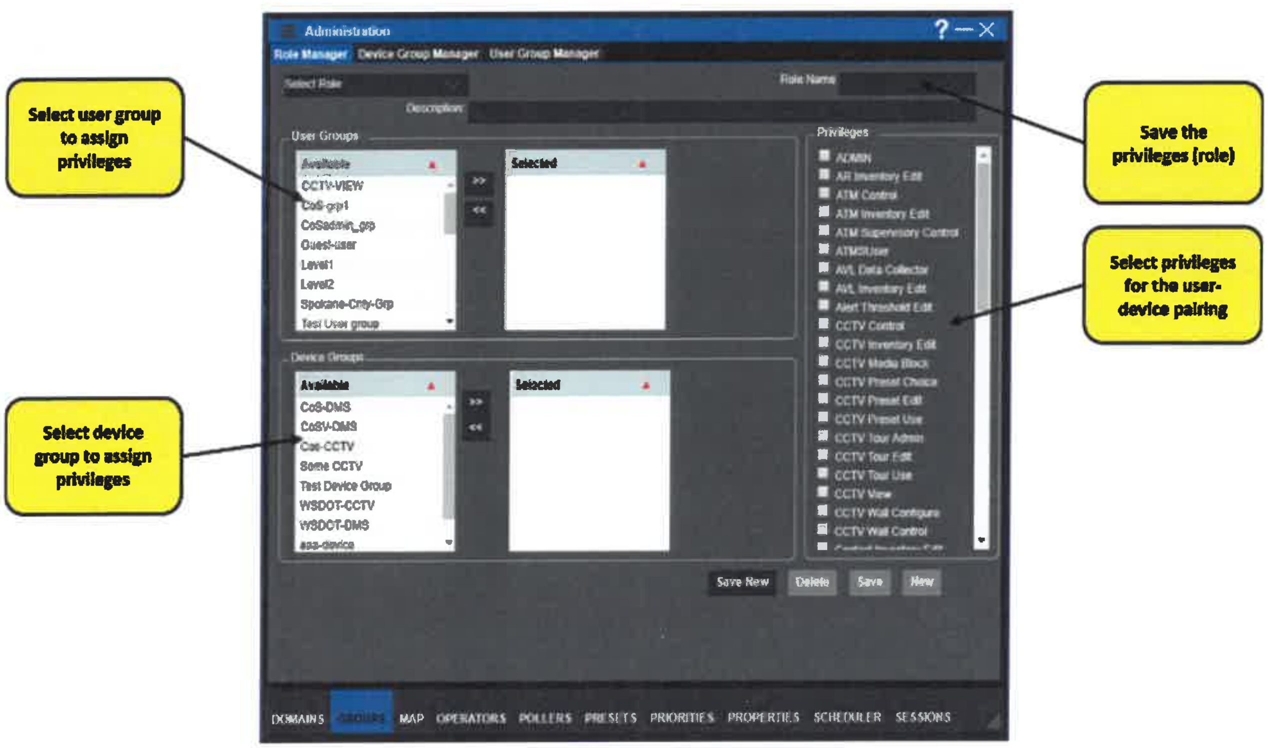



Figure 197 – Role/Permission Administration

The multi-viewer window in iNET™ allows users to configure and display different devices within 1 window grouping as a named set. By opening a multi-viewer window and dragging and dropping a device icon into the window and saving the group as a named set, the set then can be retrieved later for viewing. Each multi-viewer window is resizable and can hold numerous devices and types simultaneously. These saved multi-viewer windows are system-wide so that they may be viewed by others.

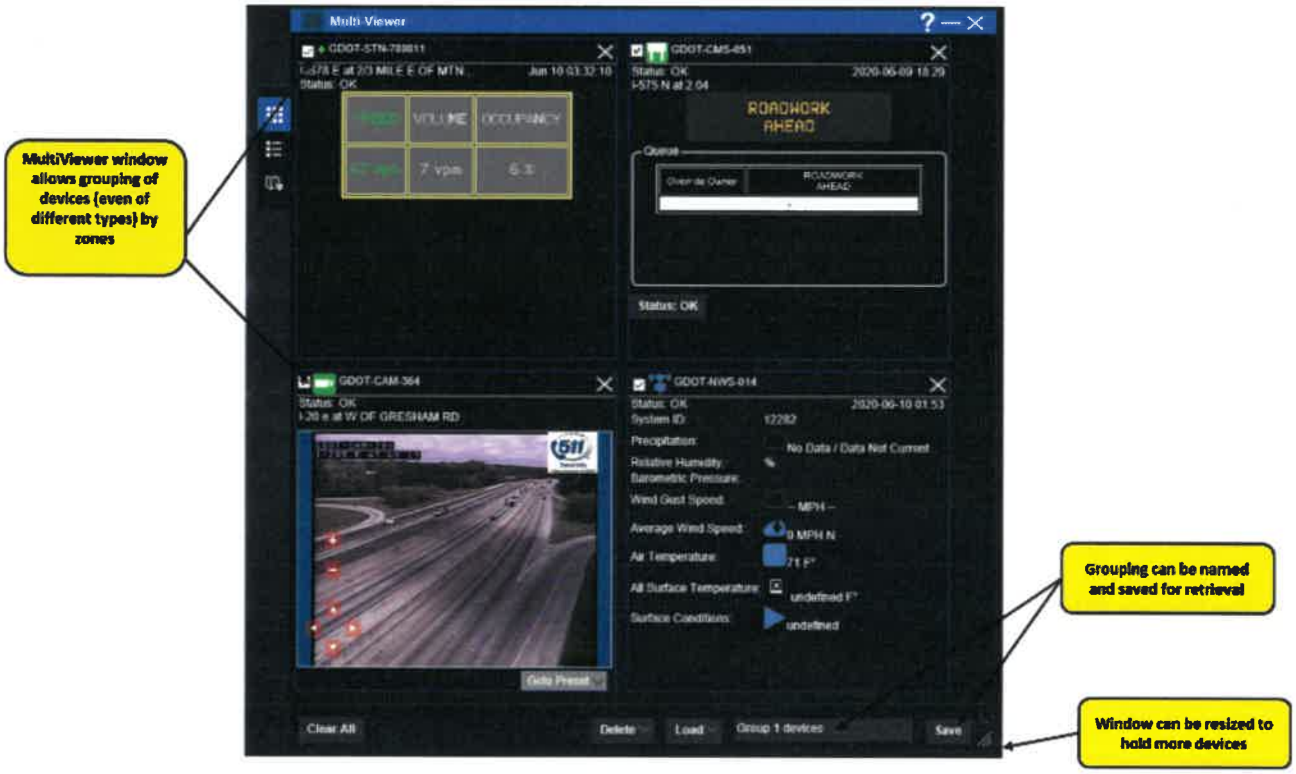



Figure 198 –Configurable Multi-Viewer Window

The iNET™ ATMS solution proposed for West Virginia provides standard editing features for all operator typed entry, to include spell check and text wrapping. Features such as copy/cut/paste are natively inherent for all edit fields due to the iNET™ web-based user interface.

## 2.2.10.b. Desirables

We will meet and exceed the 24 desirable requirements noted below through the implementation of our iNET™ Map Module. See detailed explanation on how our map module meets or exceeds these requirements below.

*REQUIREMENT 4.13.2.1: The ATMS user interface should include tailored windows for each user, based on login*

*REQUIREMENT 4.13.2.2: The user preferences to determine the interface presented should be set by users.*

*REQUIREMENT 4.13.2.3: Alerts and notifications should be tailored to each user based on preferences established by each user.*

*REQUIREMENT 4.13.2.4: The ATMS should provide a mechanism for authorized users to send and receive instant messages with other users while logged into the system. These messages should be capable of allowing attachments.*

*REQUIREMENT 4.13.2.5: The ATMS user interface maps should display traffic flow maps.*

*REQUIREMENT 4.13.2.6: Flow maps displayed on the ATMS user interface should integrate freeway and arterial conditions on one common map display.*

*REQUIREMENT 4.13.2.7: Flow maps should have the capability to display speed data.*

*REQUIREMENT 4.13.2.8: Flow maps should have the capability to display freeway occupancy data.*

*REQUIREMENT 4.13.2.9: The ATMS should integrate information between incident reports and construction maintenance reports.*

*REQUIREMENT 4.13.2.10: The ATMS user interface map display should provide a mechanism for operators to view the location of systems and field devices monitored but not controlled by the ATMS.*

*REQUIREMENT 4.13.2.11: Real-time display should include volume data.*

*REQUIREMENT 4.13.2.12: Real-time volume data display should be able to be displayed by individual lane.*

*REQUIREMENT 4.13.2.13: The ATMS should display aggregated real-time volume data by direction at a station's location.*

*REQUIREMENT 4.13.2.14: Real-time display should include occupancy data.*

*REQUIREMENT 4.13.2.15: Real-time occupancy data display should be able to be displayed by individual lane.*

*REQUIREMENT 4.13.2.16: The ATMS should be able to display average real-time occupancy data for all lanes by direction at a station's location*

*REQUIREMENT 4.13.2.17: The ATMS should be able to display average real-time speed data for all lanes by direction at a detector's location.*

*REQUIREMENT 4.13.2.18: Operators should be able to adjust threshold values for when to receive notices and alerts.*

*REQUIREMENT 4.13.2.19: Operators/users should use thresholds to control what types of alerts they receive. For example, operators may decide not to receive alerts of technical failures while technical support may opt to receive technical failure alerts.*

*REQUIREMENT 4.13.2.20: The ATMS user interface maps should display pre-planned detour routes.*

*REQUIREMENT 4.13.2.21: The user interface map display should display icons representing locations of all variable speed displays connected to the ATMS.*

*REQUIREMENT 4.13.2.22: The user interface should enable operators to select variable speed displays and view the current status of the sign.*

*REQUIREMENT 4.13.2.23: The user interface should enable authorized users to select variable speed display sign icons and change the status of the variable speed display.*

*REQUIREMENT 4.13.2.24: The ATMS should provide the ability for the operator to display snap shot images from RWIS camera or other digital still image sources on any combination of workstation or video display monitors within the TMC.*

iNET™ allows the individual user to customize their desktop to display default windows, or none at all on each login. The operator just needs to set their desktop up in their own desired configuration and then open the profile menu and select Save Current Desktop for Next Login. Also every time an operator logs out of the system they will be asked it if they wish to save their current desktop which accomplishes the same result. This will save their desktop preferences to the individual profile ID and it will appear each time that user logs in until they reset it or change it following the same process.

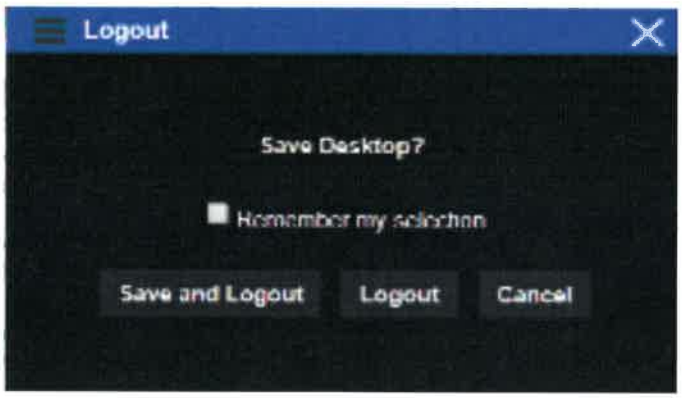



Figure 199 -Logout Screen

Each individual user has the ability choose their own desktop theme that will change the overall appearance of iNET™ from the profile window.

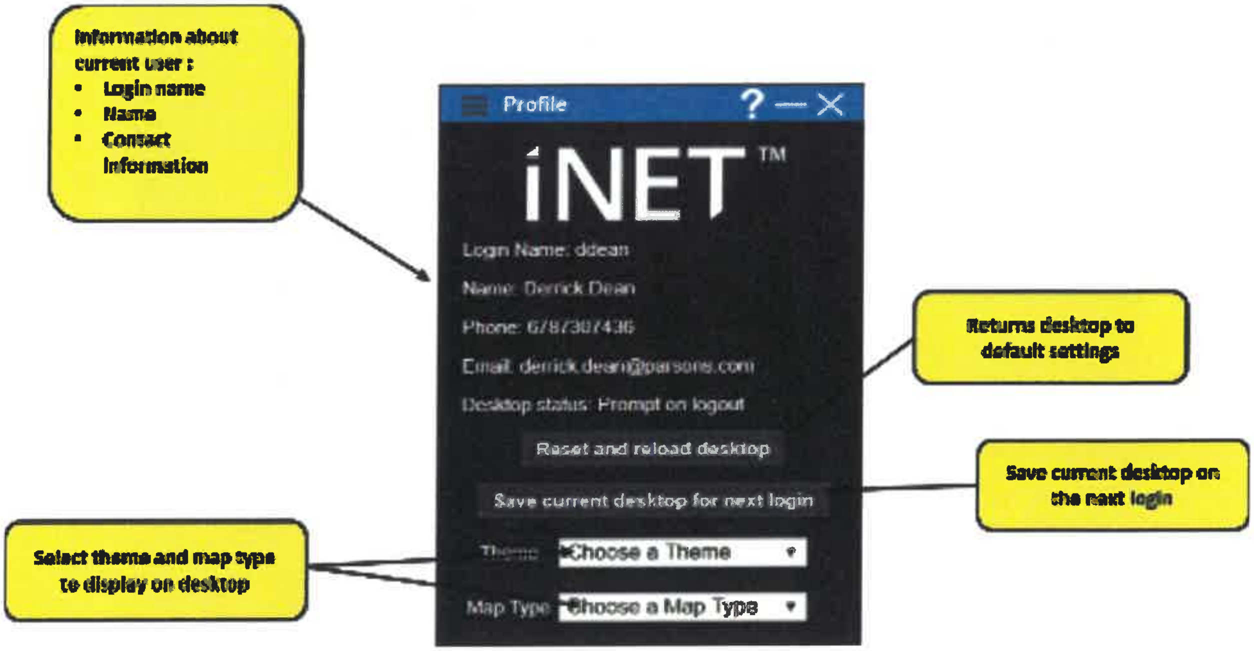



Figure 200 – Profile Menu

iNET™ alerts are configurable per operator. The iNET™ Alert window shows a running log of any alerts that are triggered in the system. These range from device communications failures to high VDS volumes or speeds, or excessive weather conditions.


Figure 201 – Alert Window Threshold Settings

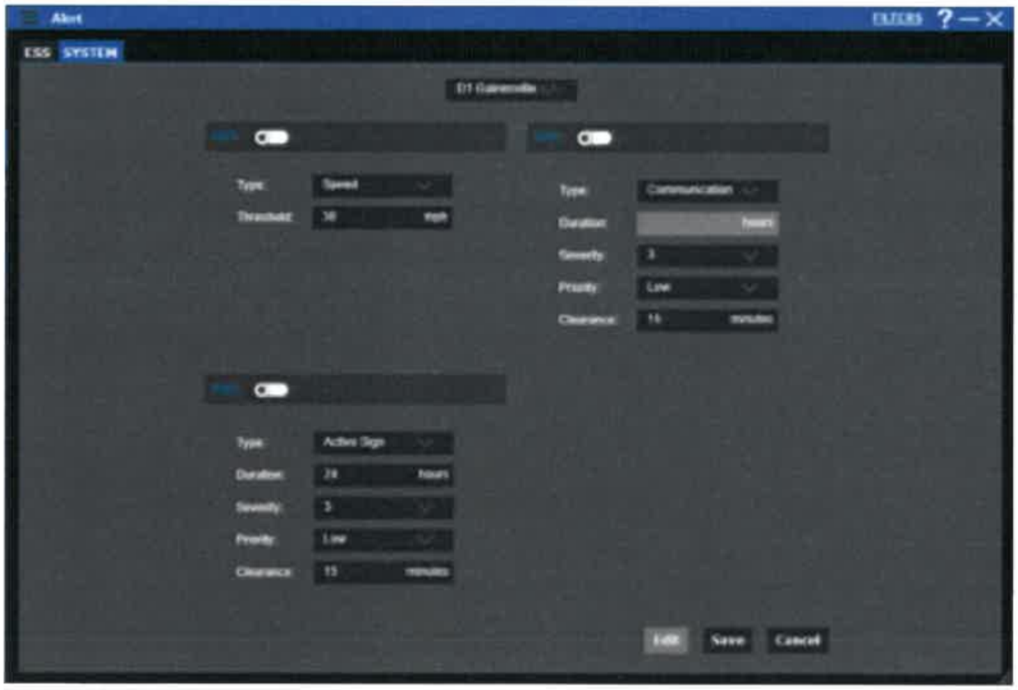



Figure 202 - System Alert Thresholds

iNET™ has an instant messenger feature that it usable by all operators who are logged in have the required permissions assigned to them. The operator opens the Instant Messenger by selecting from the sidebar which will open a list of all users who are logged into iNET™ and then they select the user(s) they want to send messages to and type the message and hit send.

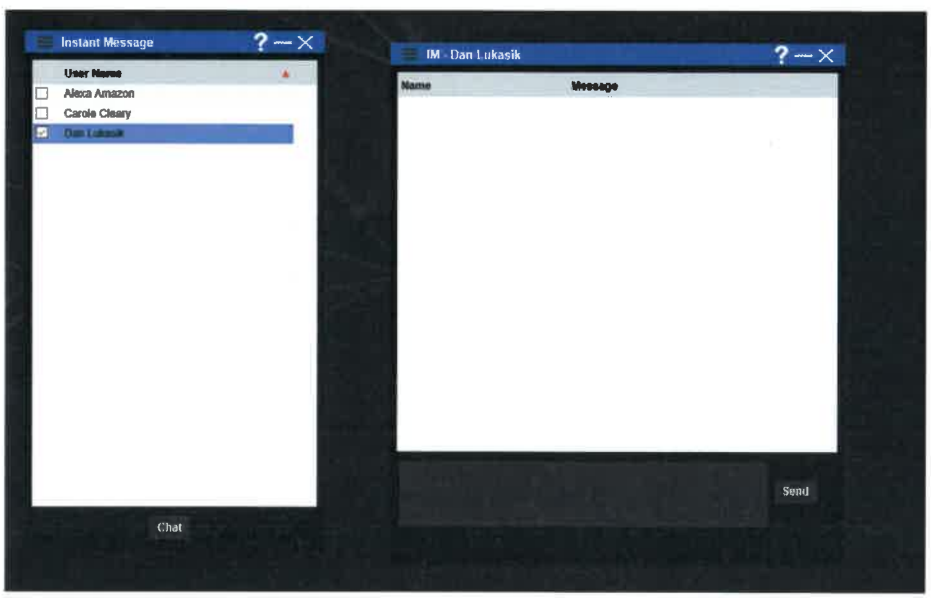



Figure 203 - Instant Messenger

iNET™ has the ability to display the real time speed for each individual lane of roadway along with the average of the whole section of roadway.

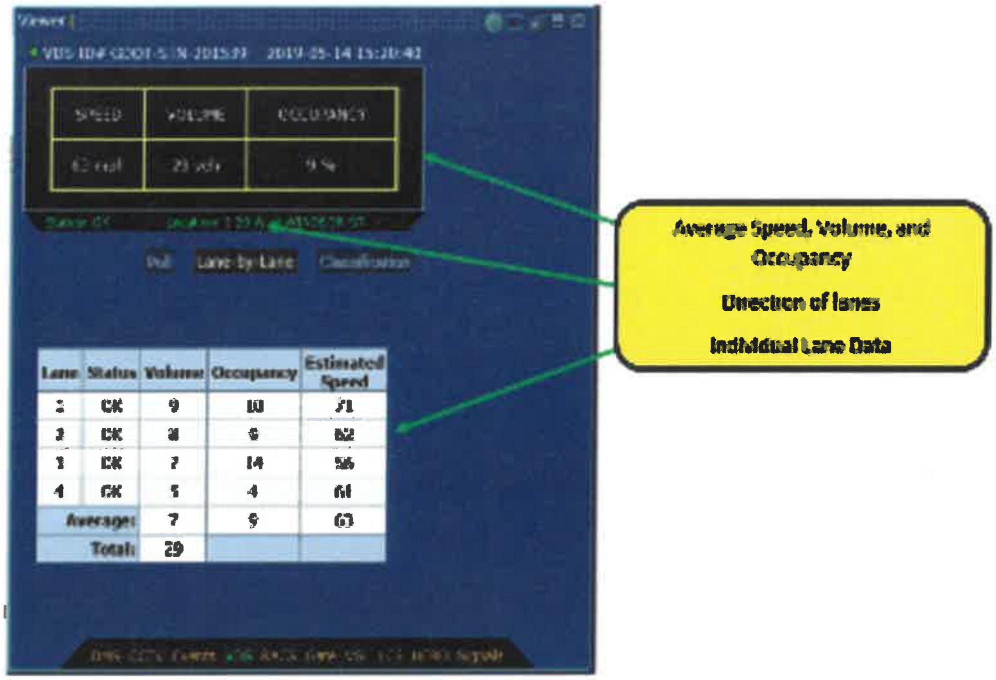



Figure 204 – VDS data by lane

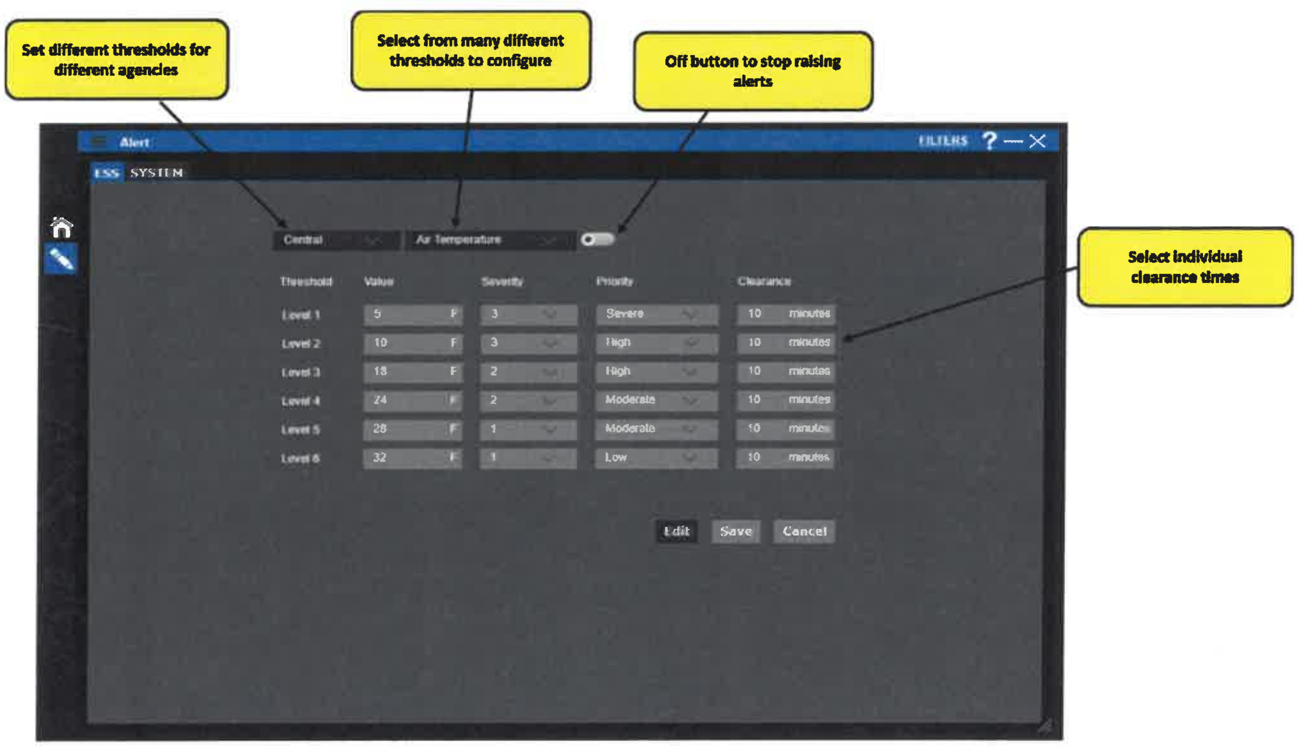



Figure 205 – Alert Window Showing Weather Triggers


Figure 206 – Alert Window Showing Device Triggers

The iNET™ Alert window shows a running log of any alerts that are triggered in the system. These range from device communications failures to high VDS volumes or speeds, or excessive weather conditions. Once an event is triggered, it is managed through the Event Management windows where actions can be taken through the response plan tab.

Other thresholds can also trigger an event. Device communications failures, detector speeds reaching a certain threshold, and messages being posted on signs too long, are all configurable through the Edit tab of the Alert window.

Weather alerts, such as high wind speeds, or extreme temperatures can trigger an event. The thresholds for these events, such as high winds or low temperatures, are configurable through the Edit tab.

The iNET™ ATMS Map module is designed to support the addition of custom map layers that may be used for a variety of traffic management functions. Parsons will include a map layer that displays pre-planned detour routes based on shapefile information provided by WVDOT.

As an example, the following figure represents a custom map layer based on a polyline shapefile showing safety service patrol routes.

Figure 207 – Custom Map Layer Based on a Polyline Shapefile

The ATMS software has the ability to display icons for all devices connected to it. We have an icon for the Variable Speed Limit signs that are deployed in several states. By selecting the VSL layer on the map the icons are displayed.

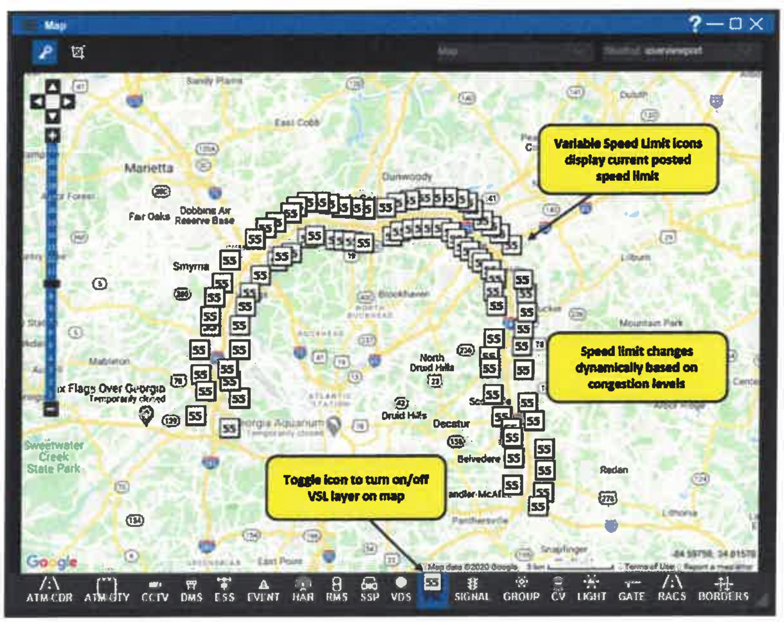



Figure 208 – VSL Map Layer

By clicking on the icon the operator can open the variable speed limit sign to see its' current status and options for control and configuration.


Figure 209 – VSL Current Status

iNET™ supports interfaces to several weather data sources including, Vaisala, WeatherBug, and National Weather Service. Once the data is brought into ATMS, it is integrated within the Map, and User Interface and List Viewers allowing operators with approved access to view and manage weather data. If the device or service has the capabilities iNET™ can access the camera or video image for that station as well.


Figure 210 –Weather Data Displays

## 2.2.11 Data Collection and Archiving

### 2.2.11.a. Mandatory Requirements

Data generated by the ATMS will, be saved to a SQL Server database managed by the WVDOT IT department. This database configuration will use SQL Server Reporting Services for accessing the datasets. For visualization, Parsons will deploy Grafana and Tableau. The iNET™ ATMS capabilities to collect, archive and present data are described in the subsequent paragraphs and will meet and exceed the following requirements:

*REQUIREMENT 4.14.1.1: The ATMS shall have a data archiving capability that stores and provides access to historical data. Data is to be collected from ITS field devices and from system users both in normal operation and during the management of planned and unplanned events. WVDOT has a 5 year data retention requirement.*

*REQUIREMENT 4.14.1.2: The ATMS shall provide operational data to calculate performance measures for both system utilization (including such items as number of events managed, amount of public access, and amount of staff access) and system performance (including such items as server up time, field device up time, communication reliability, and field device command responsiveness).*

*REQUIREMENT 4.15.2.2: The ATMS should be able to archive all data from the activity log to the data archive subsystem*

*REQUIREMENT 4.15.2.3: The ATMS should be able to archive log data in the data archiving system at predefined times to generate a continuous archival record.*

The data archival process, as part of the standard ATMS processes, will save data from ITS devices, operator actions, error logs, events and third-party data all of which are logged to the archival database. The operator actions log includes any activity performed on the System for each user. In addition, system log files can be configured to log to the database for additional parsing. Logging is enabled on a continuous basis. Archived data will include collection and archival time stamps. Data processed by the analytical system will also be saved to the archival database(s). As a specific example, VDS data generated by the ATMS adheres to the following process:

1. **Data retrieval** – The ATMS retrieves data from VDS stations, as in the current system.
2. **Raw data archival** – Raw VDS data is archived to the SQL Server archive database.
3. **Raw data producer** – The ATMS produces raw VDS data onto the Kafka message bus.
4. **VDS analytics** – Consume raw VDS data from the message bus, roll up data on a preconfigured basis, and place the rolled-up data back on the Kafka message bus.
5. **Processed data save** – Consume the analyzed data produced by the VDS analytics and save it back to the archive database.


The benefits of this approach are as follows:

6. **Timeliness** – Data is analyzed in real-time. For example, if the WVDOT is looking for 15-minute VDS data, the data will be analyzed every 15 minutes using the prior 15 minutes of data.
7. **Data destination** – Since the destination for the data is the message bus, which can then be consumed and saved to alternate data records, the WVDOT is provided with significant flexibility in where and how the processed data can be saved. This allows the WVDOT to incorporate agile methodologies more easily

into the data analysis frameworks, as consumers of data can be added or removed as necessary to meet operational goals.

8. **Analytics and visualization separation** – Since the analysis of the data is separated from the visualization of the data, the WVDOT can adopt or adapt to different visualization platforms as part of its continuous improvement process if desired.

The purging of data is done carefully and with consideration. Scripts will be established to look at user-configurable parameters for the purging of datasets, which will be run as scheduled jobs using the SQL Server scheduling and execution engine. The user parameters that define the purge range and frequency will be configured as properties within the ATMS.

*REQUIREMENT 4.14.1.3: The ATMS shall have the ability to import data from third-party providers.*

*REQUIREMENT 4.14.1.4: The ATMS shall have the ability to display and use real-time third-party data similar to data collected from field devices.*

*REQUIREMENT 4.14.1.10: The ATMS shall enable manual loading of collected data through an operator entry mechanism.*

There are several options to integrate Third-Party Data into ATMS and to have this data archived and available for reporting and analytics. The first mechanism is to have a real-time interface to collect this data at a periodic rate, archive the data, which would make the data available for reporting and analytics. The other option is to perform a bulk load of the data directly into the archive database. If a bulk load is needed, the data will be usually be presented in either a database export, or a CSV file. Either format can be loaded into ATMS. If a Database export is provided, Database Views can be created to make this data available for Reporting. If a CSV file is provided, the data can either be mapped into iNET™ DB table format or can be loaded as a database table with an associated view created for Reporting. Although the manual loading of data is typically done by System Administrators, this privilege can be given to operators as well. iNET™ fully supports third-party archiving and satisfies the requirements.

*REQUIREMENT 4.14.1.5: The ATMS data archive shall have an analytics package.*

*REQUIREMENT 4.14.1.6: The Analytic Package shall enable users to access and view the archived data.*

*REQUIREMENT 4.14.1.7: The Analytics Package shall enable users to request and view data analyses and specify a time-slice over an operator defined time period.*

*REQUIREMENT 4.14.1.8: Data analytics shall include functionality to compute and display 24 hours traffic volumes.*

iNET™ Data Archival and Reporting module provides a robust data archiving capability that stores and provides access to historical data. Data collected from ITS devices, external systems, third-party data providers, event information, and calculated operational data are all archived to the historical database. User actions and configuration parameters changes are also archived.

The Parsons iNET™ ATMS provides an enhanced archival and reporting solution that provides leading edge solutions for historical and real-time data analytics and reporting. The solution allows flexibility in data sources and data storage in the pursuit of using data to drive performance. As part of this deployment, and to meet and exceed the mandatory requirements, Parsons will deploy the following technologies:

- **Tableau** – Analytics package that provides advanced visualization and ad hoc reporting capabilities, as well as attractive canned reports.
- **Grafana** – Provides real-time dashboarding capabilities.
- **Kafka** – Acts as a message bus and in-memory storage solution for the application of analytics.

- **Flink** – Used for data analysis.
- **SQL Server Database** – ATMS real time and historical database.

**Parsons data analytics approach will provide both real-time and historical analytics, for immediate operational response and long-term planning purposes.**

The analytics package enables users to request, view and perform analysis over a user-defined time period, such as computing and displaying 24 hours of traffic volumes.

Parsons has already developed a rich set of dashboards and reports using this new approach. This approach allows for flexibility throughout the project life cycle, loosely coupling the producers and consumers of the significant amount of data generated within the WVDOT ATMS environment. This leaves the ATMS as the real-time operational environment and separates out the analysis of the data into a data streaming and visualization environment, separate from the ATMS software itself. Portions of the data can be excluded from public access with network security.

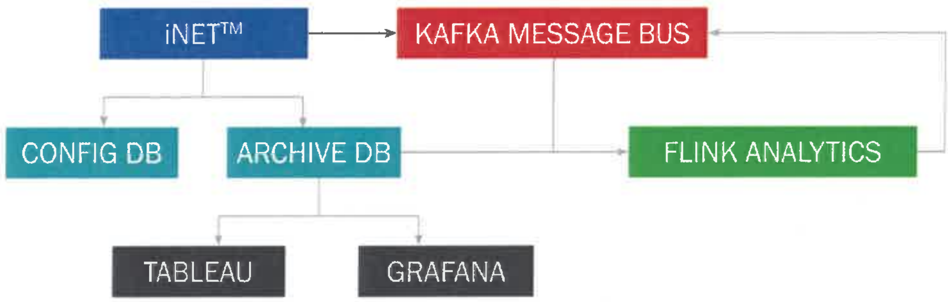



**Figure 211 ATMS Reports & Visualization Architecture**

The analytics package for iNET™ will fully satisfy and exceed the above Requirements, as demonstrated in the examples that follow.

*REQUIREMENT 4.14.1.9: The ATMS shall enable portions of data to be excluded from public access.*

The iNET™ system provides operational reports for each module, as well as system level reports, all of which can be filtered. These reports include communication status reports for devices, device configuration reports, user activity reports, signal preemption, intersection timing, coordination status, detector data reports, event reports, reports of errors, and performance measure reports.


**Figure 212 – Example Report Options**

The report windows allow the user to filter on specific date ranges or devices with default parameters set to reduce data entry time. Users can export the data into other formats such as Microsoft Excel, PDF, and CSV.

iNET™ logs all data entry and changes made to the system. The Parsons iNET™ ATMS maintains an audit trail, whereby a record of change of all activity in the system is captured at multiple levels. iNET™ is designed to version database record changes, log user/administrator actions, and capture system/device activity, which includes a log of center to center and center to field transactions/status.

The log contains the user ID, date and time, and the change made. Log information is available for viewing in the User Activity report and/or can be exported from the database for further analysis. The audit trails captured by iNET™ provide a chronological record of all system activity that can be used to establish a timeline of all actions, which can be used to investigate a specific operation and/or troubleshoot a given anomaly.

There are two options in iNET™ ATMS to exclude data from public access. The first mechanism is within the ATMS where an Administrator can select what data is viewable to the public. The second option is at the Operator level, where specific information (such as individual events) can be excluded from public data feeds. Enabling either of these options, will prevent this information from being disseminated to all public sources including the 511 system. The third mechanism is to set these privileges within the archived database. Setting certain tables as private will prevent reporting and analytic tools from accessing or using this data in Reports or Analytic Visualizations. These three mechanisms to control public access to data satisfies the following requirement.

## 2.2.11.b. Desirables

The iNET™ ATMS archives all traffic volume, occupancy, and speed (VOS) data whether from field devices or third-party data sources, with VOS data recorded for each individual lane. This includes data from TMC partner agencies, including portable devices. Figure 213 – Sample VDS Data Report is an example of a VDS Data report, with lane-by-lane data and timestamps. A parameter can be set for inclusion of third-party data into the archive. Similarly, the ATMS will archive all weather sensor data and provides a report which can be run by selecting an individual weather station, a group of stations or selecting a date and time range for all stations and sensors. iNET™ Data Archival and Reporting meets and exceeds the following requirements:

*REQUIREMENT 4.14.2.1: The historical data in the archive should include traffic volume data, whether from sensors or third-party data sources.*

*REQUIREMENT 4.14.2.2: The Traffic volume data should be stored by individual lane.*

*REQUIREMENT 4.14.2.3: The historical data in the archive should include traffic occupancy data.*

*REQUIREMENT 4.14.2.4: Traffic occupancy data should be stored by individual lane.*

*REQUIREMENT 4.14.2.5: The historical data in the archive should include traffic speed data.*

*REQUIREMENT 4.14.2.6: Traffic speed data should be stored by individual lane.*

*REQUIREMENT 4.14.2.8: The historical data in the archive should include traffic data that is collected and made available by any roadway within the TMC partner jurisdictions.*

*REQUIREMENT 4.14.2.9: The historical data in the archive should include location and status of portable ITS devices for times when the devices are providing data to or being controlled by the ATMS.*

Once lane-by-lane Volume, Occupancy and Speed data is collected and archived, A VDS Report allows the user to view and download the information. The data can be accessed by station, or by Date and time. All archived data and reporting applications are available to all TMC Partners. Please see Figure 213 – Sample VDS Data Report. A similar report can be run for weather stations to display all sensor data.

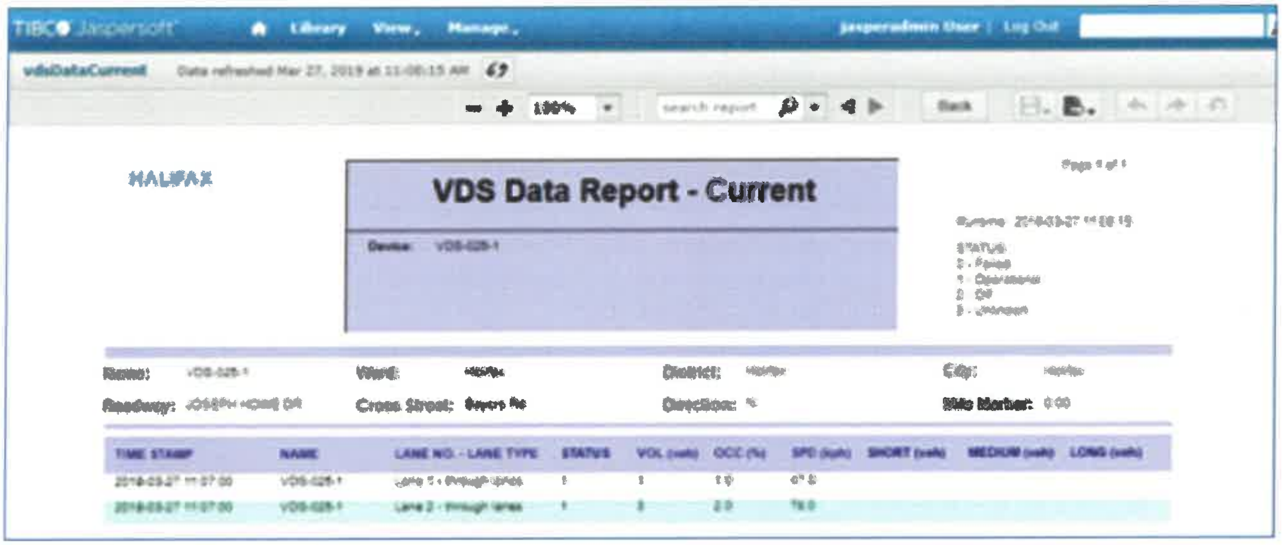



Figure 213 – Sample VDS Data Report

Similar to the VDS Reporting capabilities demonstrated above, all field device inventory and real time information is also captured in the database and available for reporting. For fixed DMS, the location of the sign, the status, and any errors or warnings are available in the DMS Current Status Report. For Historical information on the sign, the user can enter the Sign(s), or a Date/Time period and see the history of the sign including when messages were placed on that sign and the duration of the message. For portable signs with GPS locations being broadcast to ATMS, the same report is automatically available and the location of the DMS is based on the last location reported by the sign. During the times when the portable sign is not reporting location information, the sign will show "offline" with no location information.

*REQUIREMENT 4.14.2.10: Archive ATMS data should be available to partner agencies for download from an on-line access location.*

*REQUIREMENT 4.14.2.16: Data analytics should be automated to the extent possible to support established performance measure reporting needs of the TMC and/or partner agencies. (Note: This should include incident and clearance times, lanes closed, all applicable incident date, monthly and yearly reports)*

*REQUIREMENT 4.14.2.17: The ATMS should include multiple data reporting formats/templates.*

*REQUIREMENT 4.14.2.20: Data analytics should include functionality to compute and display mobile source emissions information if data is collected and provided to the ATMS.*

The iNET™ solution includes the use of third-party reporting tools to provide scheduling and automated delivery of reports to groups of people. The iNET™ ATMS provides reports that, through these tools, users can schedule and run reports automatically. In addition, users can create/save customized reports. These reports can be preset with often used parameters to provide quick access to regularly requested reports. Additional templates and formats are available for reporting preferences.

iNET™ reports generated from the system are displayed to a user and can all be printed without exporting. In addition, the Reports Off the Shelf Software Packages all for users to save or export the data in formats such as XML, PNG, and PDF. Our report formats have been designed to be used across various clients and used in many production environments where structure has been considered, specifically for readability and usability. Standard

The iNET™ ATMS archive database instance is not only available for system reporting, but also third-party reporting and external system/agency access. Archive ATMS data will be available on-line to partner agencies for download directly from the iNET™ Archive database. All third-party data has the option of being archived and available for reporting. For example, if the ATMS was configured to receive mobile source emissions data, this could be archived and available for reporting.

iNET™ Reporting has several options for addressing Performance Metrics. For every event that exists in iNET™, all relevant information is archived from the time the event is created until the event is terminated. A dashboard can be created to analyze performance based on Individual/Operator, Event type, or Date/Time. Once this dashboard is configured it can be available to automatically generate the report or emailed on a scheduled basis. Based on the ATMS features described in these paragraphs, the following requirements are met and in many cases our feature exceeds the requirement.

*REQUIREMENT 4.14.2.7: The historical data in the archive should include traffic travel time data.*

*REQUIREMENT 4.14.2.11: The ATMS should calculate and store travel times based on available speed data.*

iNET™ has two sources of Travel Time data available. One source would be to utilize real time detector speed data and to calculate the travel times. The other source is using third-party data sources that send travel time data to iNET. In both cases, the travel times are defined by segments which have a start and end point. Each segment has an associated speed. The segment data, location information and speed data are all archived into the ATMS Database and available for Reporting. The requirements are satisfied with the current capabilities to archive and retrieve travel time data.

*REQUIREMENT 4.14.2.12: The ATMS should calculate and store Travel Time Index, based on available speed data and free flow data WVDOT has a 5 year data retention requirement.*

Using the Reporting tool that is part of the ATMS software solution, the Travel Time Reporting function allows you to retrieve current and historical travel times from the archive database. Simply select report, Travel Time, Current or Historical and for the Historical select a date and time range. This can be accomplished for all configured travel time segments or just individual segments selected from the drop-down menu.

The ATMS calculates travel times based on segments that are defined by the users and utilizing data from vehicle detection systems or third-party data such as HERE, INRIX, and BlueToad to name a few. The travel times that are generated are stored in the database and archived on a regular basis so the data can be retrieved by those with the correct permission set to run reports in the ATMS.

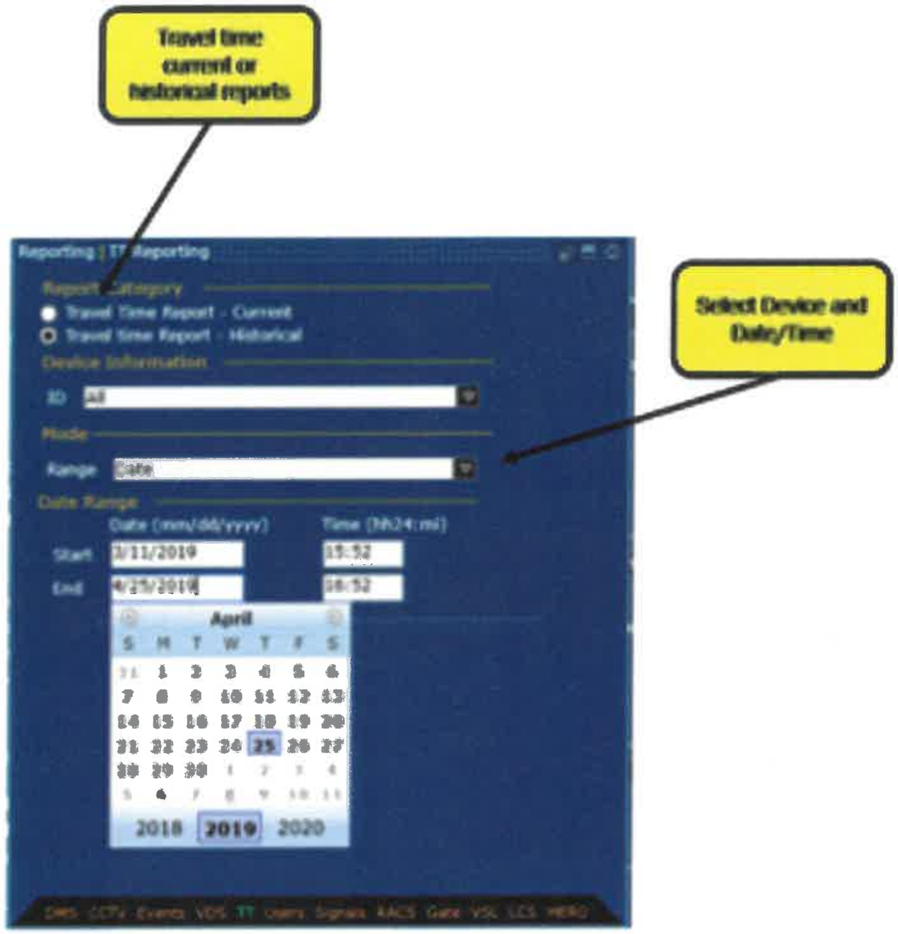



Figure 214 – Travel Time Reports

The iNET™ ATMS calculates Travel Time Index based on available speed data and free flow data. The Travel Time Index calculated in the system is primarily used to manage the display of travel time information on dynamic message signs. The following requirement is met with existing iNET™ ATMS functionality. Please see Figure 215 –Travel Time Index for an example of the Travel Time Report. The Parsons iNET™ ATMS is designed to manage large data sets. We abide by retention requirements that go above the WVDOT 5-year data retention requirement; in fact, we have systems that maintain information for a period of up to 10 years.

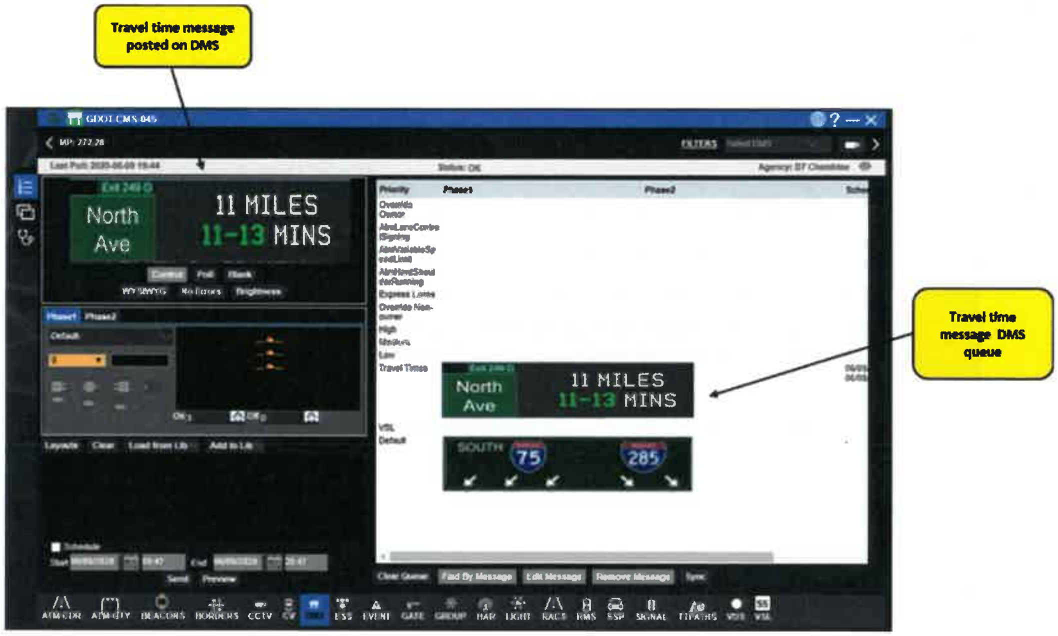



Figure 215 -Travel Time Index

*REQUIREMENT 4.14.2.14: Data analytics should include functionality to compute and display Travel Time Reliability information.*

*REQUIREMENT 4.14.2.15: Travel Time Reliability displays should include reliability by different vehicle classifications, as they are reported to the ATMS.*

iNET™ can calculate and display Travel Time reliability information by processing data collected in the system. Parsons will enhance the iNET™ ATMS solution Data Analytics and Reporting module to store Travel Time reliability information which would then be available to be used for reporting. Once this information is calculated and stored the requirements will be met.

*REQUIREMENT 4.14.2.18: The ATMS should accept data for long term storage on a continuous basis without operation action.*

*REQUIREMENT 4.14.2.19: The ATMS should make archived data available in an online database for a user definable period.*

iNET constantly ingests data and stores it in an archive database behind the scenes with no interaction from operations or administrators. The data archival is an automated process that runs in the background with no interruption of services for the operator using iNET. The only limit to the length of time for the data storage is the amount of hardware needed to archive the data, we have ATMS deployed in several states in which the archival data extends back six plus years and can be retrieved on demand by any user with the correct set of privileges. The configuration of ATMS Archiving and Storage design meets the requirements.

*REQUIREMENT 4.14.2.13: The ATMS should have a parameter for each third-party provider that can be set to use or not use the third-party data is if it was collected from field detectors.*

Third-party traffic data can be enabled or disabled at will in iNET™ by users with the correct permission set. An operator who has permissions to conduct administration function will open the administration window, select pollers from the switcher bar, and then scroll down to the Active Data Task Poller section where each individual item in the list has a Enable/Disable and Delete button that can be utilized without affecting any other data task poller. Please see below for a visual of this feature.


Figure 216 - Active Data Task Poller

## 2.2.12 Notifications and Alarms

### 2.2.12.a. Mandatory Requirements

*REQUIREMENT 4.14.3.1.1: The ATMS shall have and notification built into the system.*

The Alert window allows users to view the health of the system. The Alert window reports any device failures, severe weather conditions, as well as severe traffic conditions. Alerts are also used to notify users about the state of third-party interfaces that may be malfunctioning or inaccessible. For alerts due to weather conditions or alerts due to traffic conditions, an ATMS event can be generated directly from the Alert window. Alerts are categorized by severity: Severe, High, Moderate, and Low. This highly flexible User Interface feature within iNET™ will satisfy the following requirement:

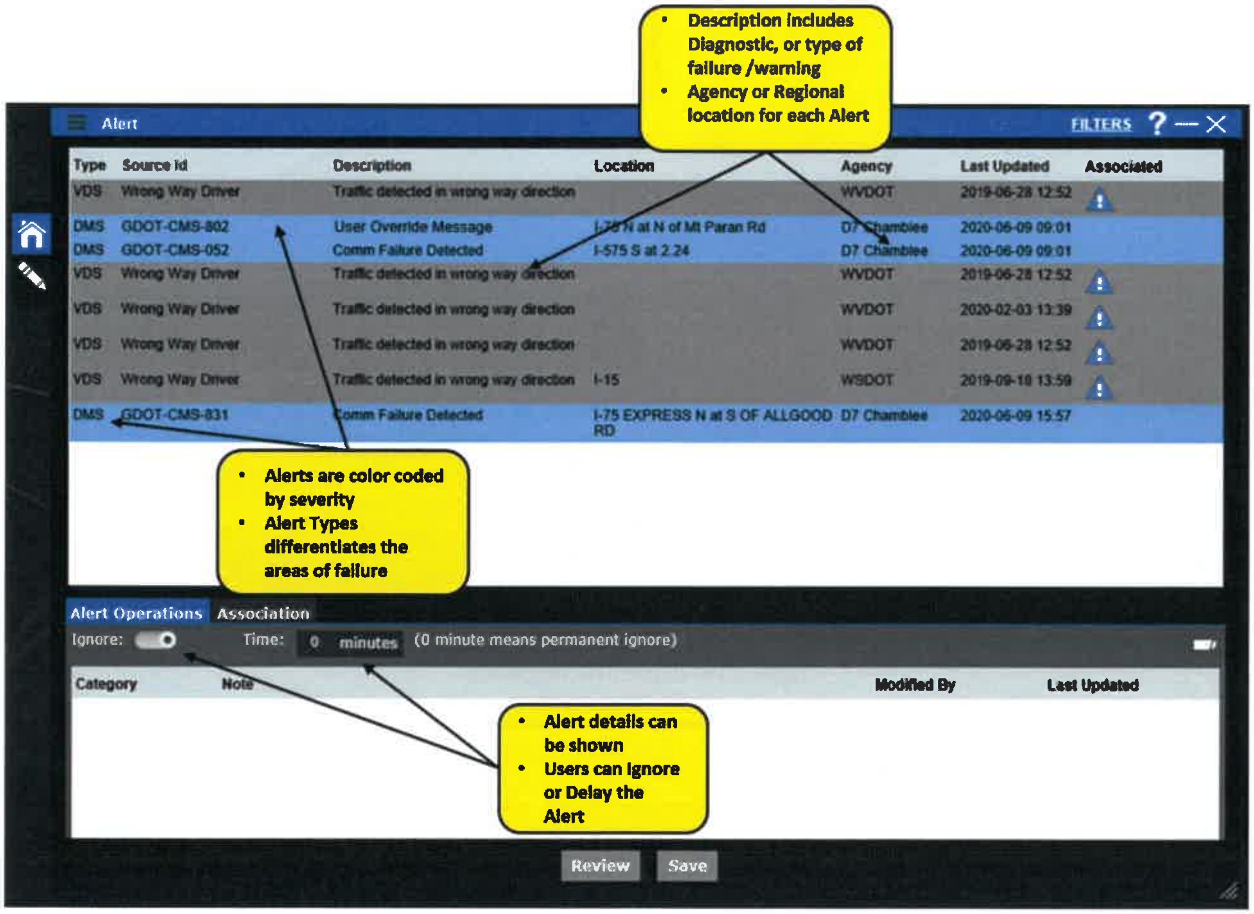



Figure 217 iNET™ Alert Window

Operators have the capability to sort and filter the default Alert Window information to make the data relevant to the region, TMC, or to individual operators. This powerful capability, allows users to view alerts based on:

- The data type (for example CCTV, Events, Weather or DMS)
- The Source of the Data (for example third-party systems such as Bluetoad)
- The Alert Description (for example Filtering on all Lamp Errors or all Congestion Warnings)
- Date/Time (sorting by most recent alerts
- Severity (by lowest severity to highest or highest to lowest)
- Association to Events (sorting by event criticality)

The powerful ability to customize the Alert Window through detailed filtering meets and exceeds the following requirements.

*REQUIREMENT 4.14.3.1.3: The ATMS shall provide the mechanism for users to select filters for alerts and notifications.*

*REQUIREMENT 4.14.3.1.4: The alert and notification filters shall be based on type of filter, device, type of device, time of day, and jurisdiction.*

*REQUIREMENT 4.14.3.1.5: Users shall be able to set alert and notification filters based on geographic area as an option.*

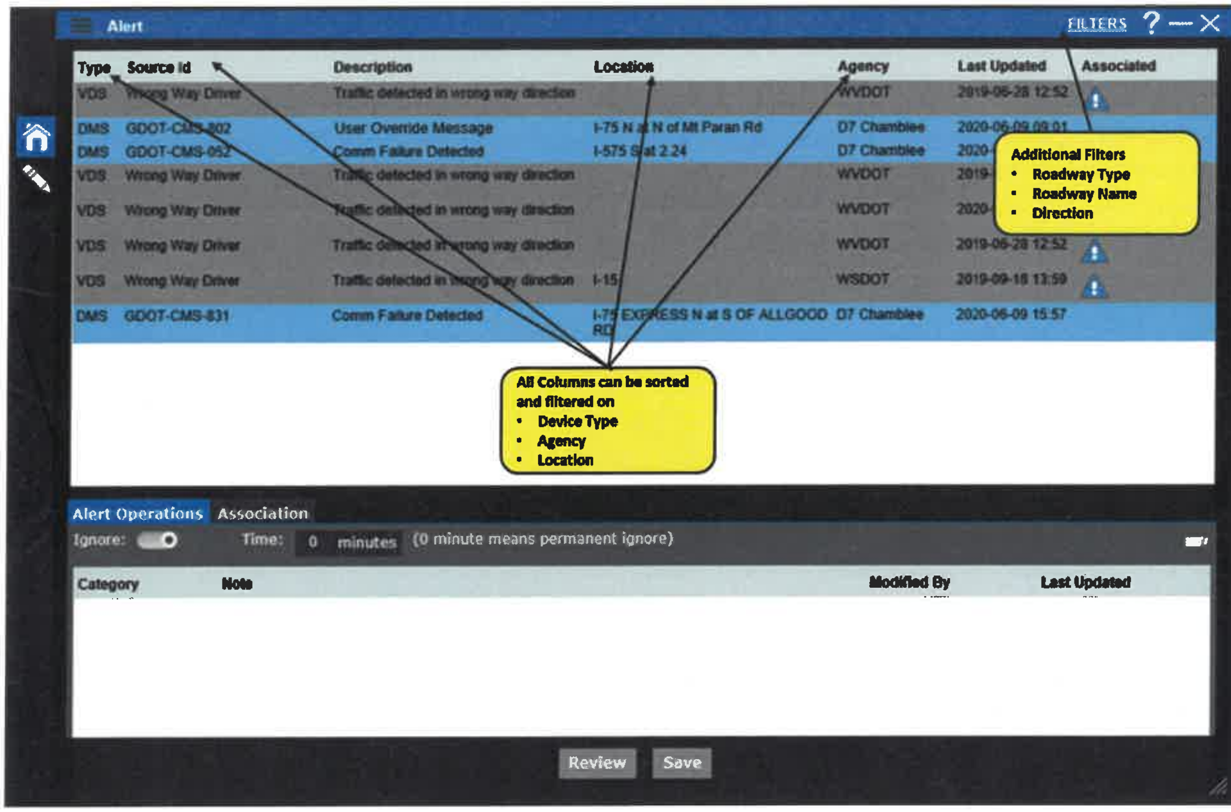



Figure 218 Alarm Window Filtering

In addition to allowing the operator to filter the Alert Views, the system also allows Operators and Administrators with correct privileges, to set thresholds to determine when Alerts are sent. The following are thresholds that can be configured:

- **Speed Thresholds:** sets system to alert when speed, volume or occupancy drops below or exceeds the thresholds set
- **Event Severity:** sets the system to alert at critical events, or events that have exceeded the expected duration, or on specific event types.
- **Device Failure:** sets the system to alert when either a specific device is failed or in general if a device has been in the failed state for longer than the threshold value
- **Weather Conditions:** sets the system to alert when weather thresholds have exceeded or dropped below the threshold. This can include for example Wind, Precipitation or temperature.

The current iNET™ ability to set system or user thresholds will satisfy the following requirements:

*REQUIREMENT 4.14.3.1.2: The ATMS shall provide a single integrated interface, available from any TMC workstation, that allows operators to set threshold conditions for various devices or other user definable conditions such that when threshold conditions are met or exceeded, alarms will be generated notifying the operator of the presence of such condition. At a minimum, data elements available for alarm generation will include traffic measurements, detected incidents, weather measurements, and device status.*

*REQUIREMENT 4.14.3.1.6: The ATMS shall allow authorized users to set alert and notification thresholds by time of day.*

*REQUIREMENT 4.14.3.1.7: The system shall be able to generate alerts and notification based on traffic conditions (traffic speeds, volume levels, congestion levels ) and event triggers (incidents, construction, and maintenance activities, special event activities, etc.).*

*REQUIREMENT 4.14.3.1.8: The ATMS shall be able to send out internal notifications regarding an event up to 100 recipients. Notification to include select information captured in the event log. Notifications shall be completed within 5 minutes of initiation of procedure (process only, not inclusive of conveyance method and receiver's email system delays).*

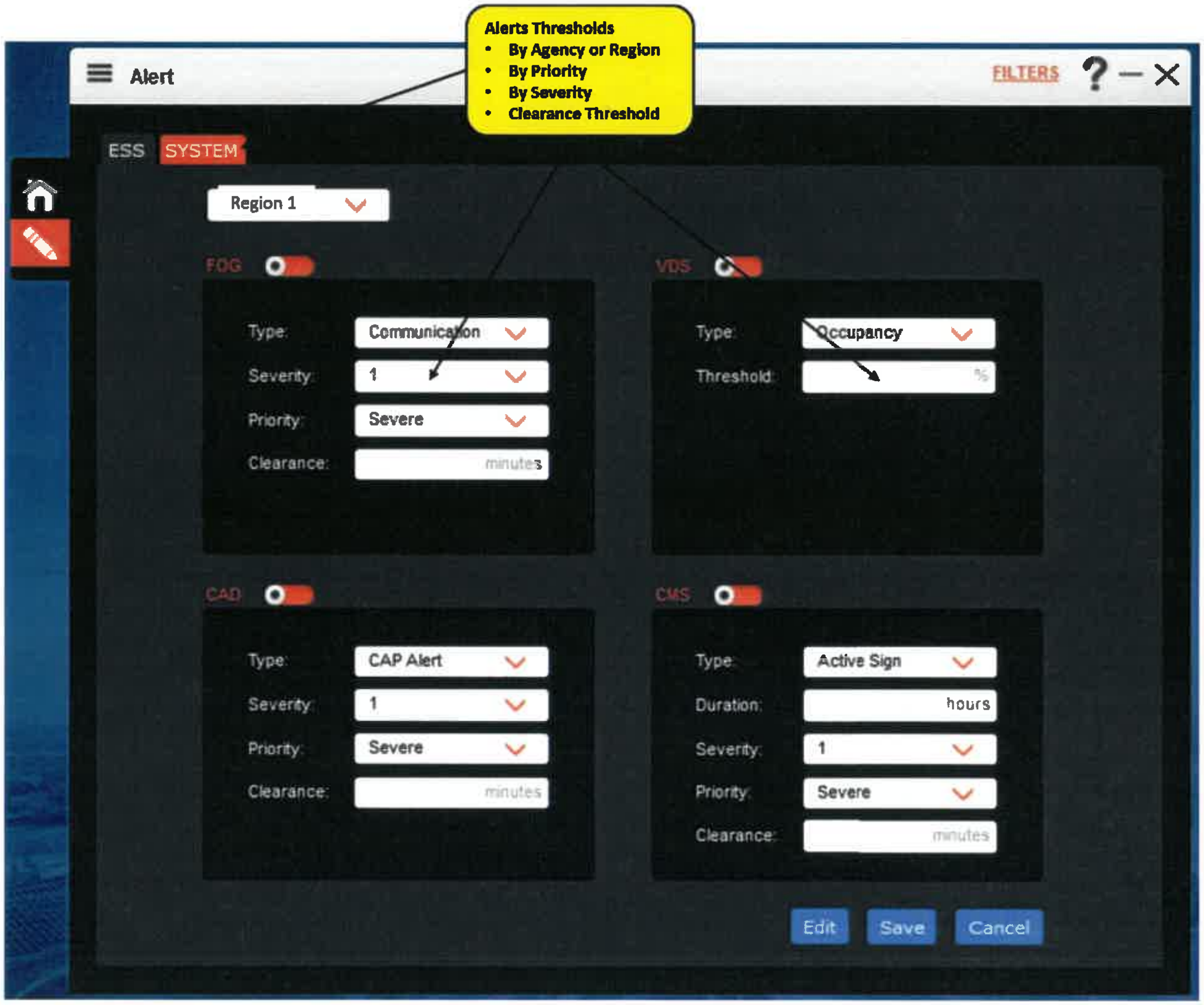



Figure 219 Alert Window Thresholds

As noted in the requirement sections above, iNET™ has the ability for users to set alerts and notifications on a variety of event triggers. The iNET™ Contact Notification subsystem provides one mechanism to distribute event information to user (external and internal). The Contact and Notification Window allows an administrator to set subscriptions to who gets what events and when. The notifications can be sent based on Event, Event type, event severity, event, clearance, or extended event duration. The figure below is an example of how Event subscriptions are configured in the system.

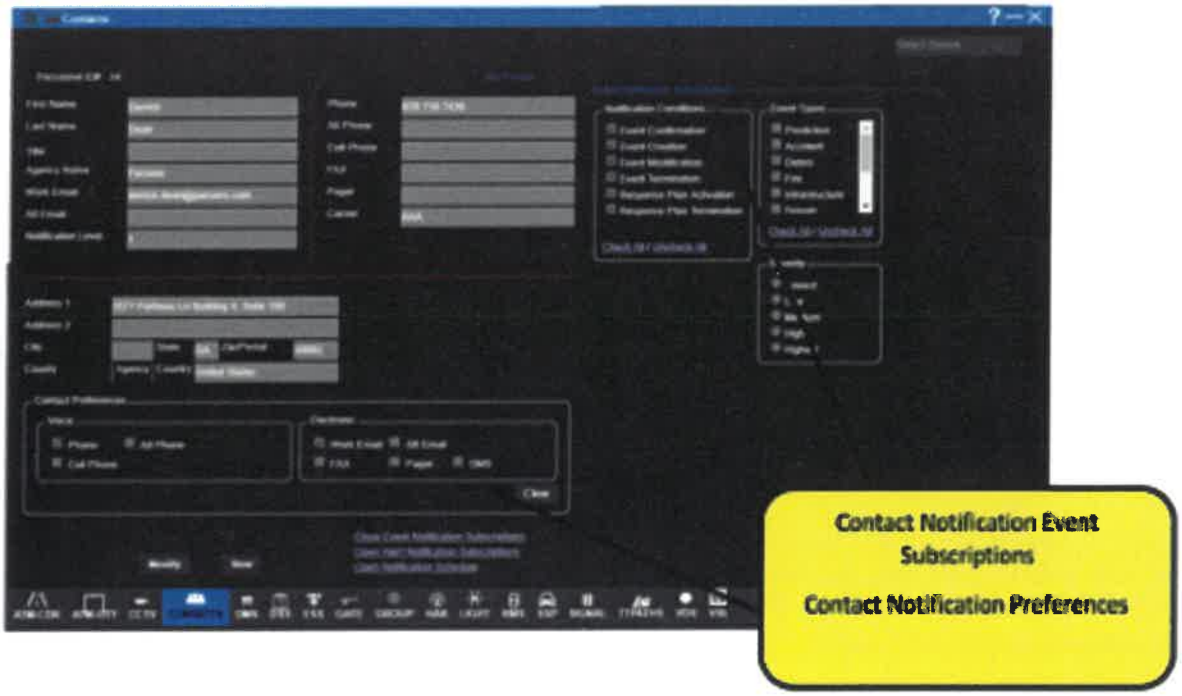



Figure 220 - Contact Notification

## 2.2.13 Log Reports System Reports

We will exceed the eight (8) requirements noted below through the implementation of our iNET™ Data Analytics Platform Module. See detailed explanation on how our Data Analytics Platform module meets or exceeds these requirements below.

*REQUIREMENT 4.15.1.1.1: The ATMS shall be capable of generating reports from ATMS generated data.*

*REQUIREMENT 4.15.1.1.2: Pre-selected, pre-formatted, reports shall be included in the system, e.g. daily/weekly/monthly/annual reports reporting devices in operation, work orders/trouble tickets tracking, incidents, events, etc. These shall be provided in list and graphical formats.*

*Requirement 4.15.1.1.5: The ATMS shall be capable of automatically generating reports via time of day scheduling.*

*REQUIREMENT 4.15.1.1.7: The ATMS shall generate information every 24-hours indicating device/system failures. A maintenance report suitable for staff shall be generated.*

*REQUIREMENT 4.15.1.1.8: The maintenance report shall indicate type of device, device ID, and jurisdictional responsibility for maintenance.*

*Requirement 4.15.1.1.6: The ATMS shall be able to export reports or data base information with comma, space and/or tab between fields to allow import into other programs such as Excel.*

*REQUIREMENT 4.15.1.1.9: The ATMS shall maintain a log of all users' activities relating to field device control, system administration, and user access.*

*Requirement 4.15.1.1.11: The ATMS shall be capable of generating reports of logs covering user-define time periods and including user-selected event types at the direction of the TMC authorized users.*

## 2.2.13.a. Mandatory Requirements

The Data Analytics Platform (DAP) module logs and stores all pertinent traffic and event information, along with device status and user activity 24 hours a day. The data can be retrieved and viewed in a report, or data analytics tools, and can also be exported to other file formats, such as PDF, CSV, or Excel. This module is used for tracking and reporting key performance indicators (KPIs), such as freeway delay and event response KPIs.

Many pre-selected, pre-formatted reports are available to the user through the Reporting feature. These include both tabular and graphical, where applicable. The following table describes the standard reports for the WVDOT ATMS, which can be produced for user-defined periods. Some of the iNET™ reports that are currently available are for those devices configured in the system. These reports contain information about the device status and its use, and in the case of DMS, the report includes the DMS message history. The reports can run for one or all devices and allows for a user-defined date and time ranges.

The status or maintenance reports can be scheduled to run daily, weekly, monthly or annual and sent to designated users, such as maintenance staff, via email. The User Activity report details all users' activities on the system relating to field device control, system administration and user access.

For event reports there are two options, the Event Summary and Event Detail. The Event Summary report gives the requesting party a summary of event by user defined criteria. The default is all events that have occurred in the user defined date and time range. The summary report can be further filtered by category, type, sub-type, priority, roadway type, county, and city.

**Table 28 – iNET™ Pre-formatted Base Reports**

| REPORT NAME | DESCRIPTION |
|---|---|
| **CCTV Activity** | Describes the commands sent to the cameras. Contains the camera ID, location, commands sent and who sent the commands. |
| **CCTV Status** | Describes the status of the cameras. Contains the camera ID, location, date, communications status, image status, PTZ status, and locking status. Two reports are available for status: current and historical. |
| **DMS Message History** | Describes the messages that were posted to the DMSs. Contains the device name, the location, the date and time of the message, what the message said, and who sent the message. |
| **DMS Status** | Describes the communications status of the signs. Contains the device name, owner agency, location, date, the NTCIP status and the communications status. Two reports are available for status: current and historical. |
| **ESS** | Describes the weather information received from a particular station. Two reports are available for status: current and historical. |
| **Event Summary** | Describes the events that have occurred in a given time frame. Contains the event ID, location, start/end dates, type, and who created it. |
| **Event Details** | When viewing the Event Summary report, by selecting the ID of a particular event, a report containing the details for that event will display. |
| **User Activity** | Describes the activities of a given user. Contains the username, date/time, and the user's activity. This report includes user activities that control devices, modifies device configuration, as well as log in and log out activities. |
| **Inventory Audit** | Describes the devices that are in the inventory. Contains the ID, the location, and configuration information for the device. |

| REPORT NAME | DESCRIPTION |
|---|---|
| **VDS Status** | Describes the communications status to the detectors. Contains the agency, device name, location, date, and the communications status. Two reports are available for status: current and historical. |
| **VDS Traffic Data** | Describes the speeds received from a particular VDS. Contains the agency, device ID, location, date, volume, occupancy and speed. This report also includes data from third-party providers. |

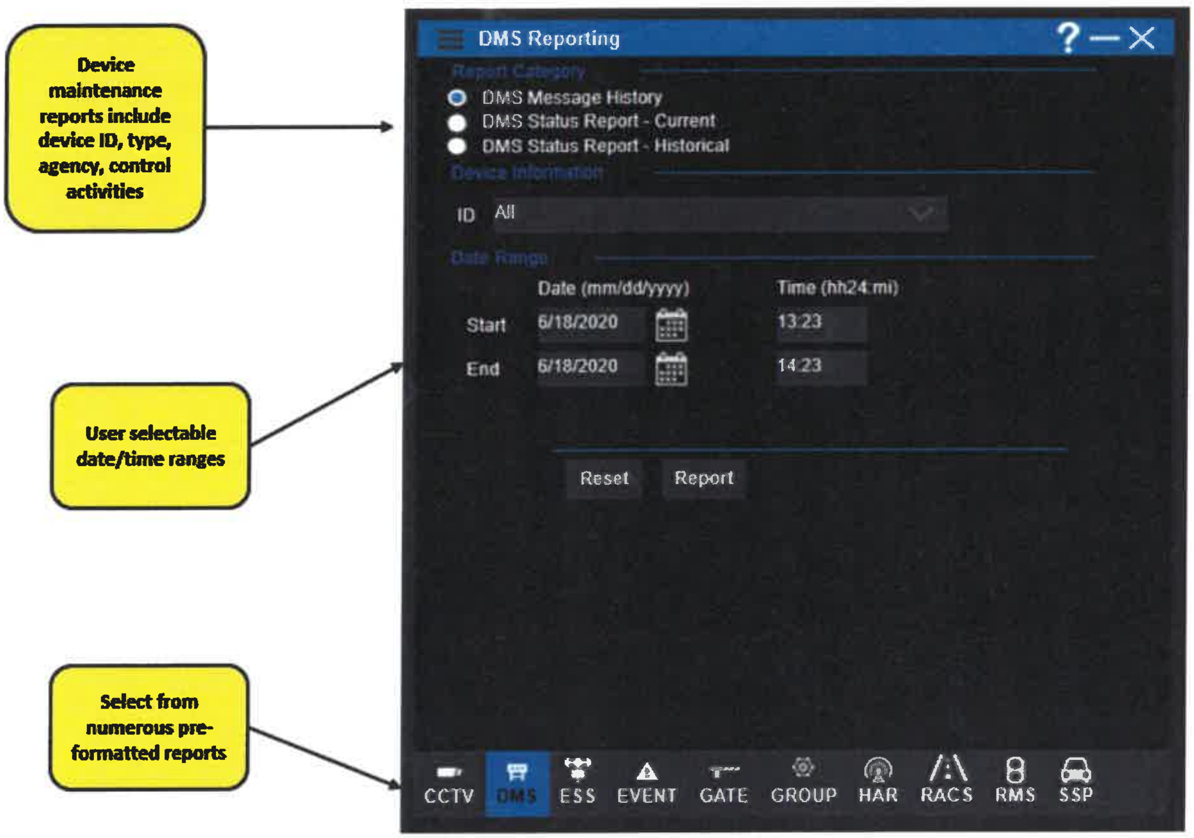



Figure 221 - Device Maintenance and Activity Reports

We will exceed the three (3) requirements noted below through the implementation of our iNET™ Data Analytics Platform Module. See detailed explanation on how our Data Analytics Platform module meets or exceeds these requirements below.

*Requirement 4.15.1.1.3: Users shall be able to generate ad hoc reports, specified by the user, viewable using off the shelf software.*

*Requirement 4.15.1.1.4: Users shall be able to save the ad hoc report to become a permanent report.*

*Requirement 4.15.1.1.10: The ATMS shall provide event logging such that events can be searched on any unique field or combination of fields.*

In addition to standard reports, ad hoc query reports are available through the use of off-the-shelf data analytics packages. Data queries can be generated on any field or combination of fields and saved for future use. Dashboards provide dynamic graphical and tabular data. Parsons proposes using Grafana to display system health, device status and health, and other metrics. Grafana will be deployed separately from the ATMS, and access to Grafana dashboards will not require users to access the ATMS.

Grafana dashboards integrate with Active Directory and can be configured into different organizations and teams with either admin, editor, or viewer privileges for a dashboard or folder being granted to an organization or team. At the WVDOT, Grafana will primarily pull data from SQL Server databases, but it has the capability to pull data from a number of data sources, including Elasticsearch and numerous community-provided data sources that could be used for future expansion of the WVDOT system.

The users of the system will have access, at a minimum, to the following dashboards:

- Uptime Per Type of Field Device
- Travel Time per Travel Time Path
- Speed per Travel Time Path
- AM Peak Speeds
- PM Peak Speeds
- Average Incident Clearance Time
- Travel Time Reliability

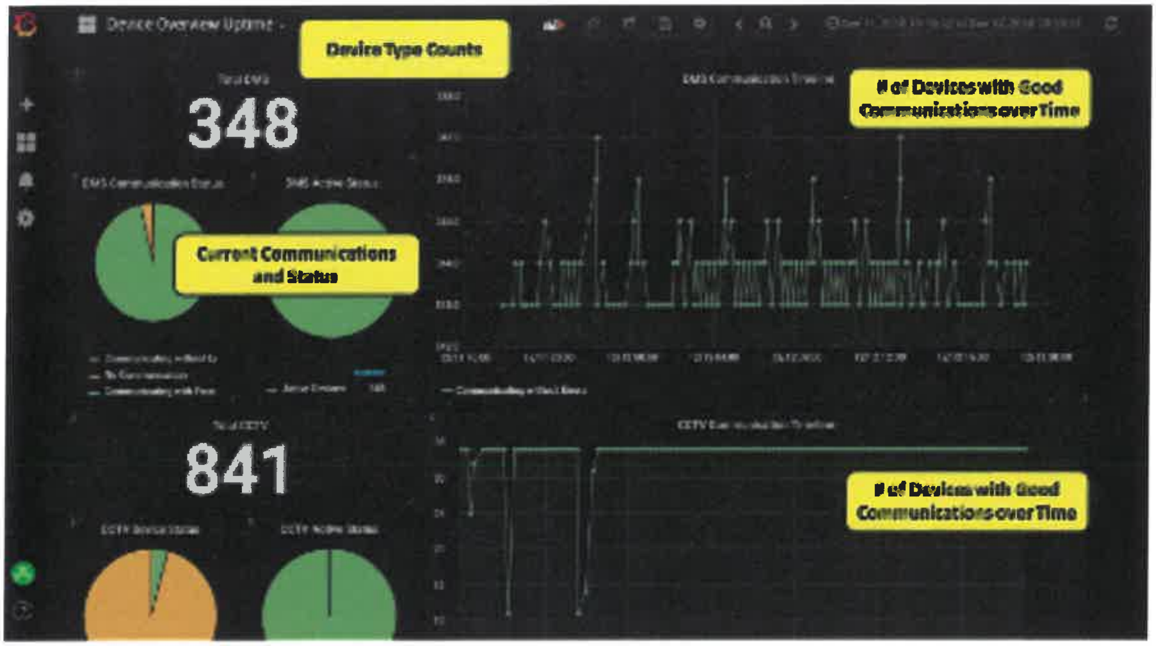



Figure 222 – Device Communications and Uptime

In addition, Parsons plans to provide a single executive dashboard to commissioners and other high-level staff to access that will contain both real-time and recent (24- to 72-hour) overview metrics. It will include the current number of scheduled and unscheduled events, their severity, a measure of current traffic congestion, and overall device status and health metrics.

Also included will be additional dashboards containing summary metrics for DMS, VDS, and event data.


Figure 223 – Current DMS Errors

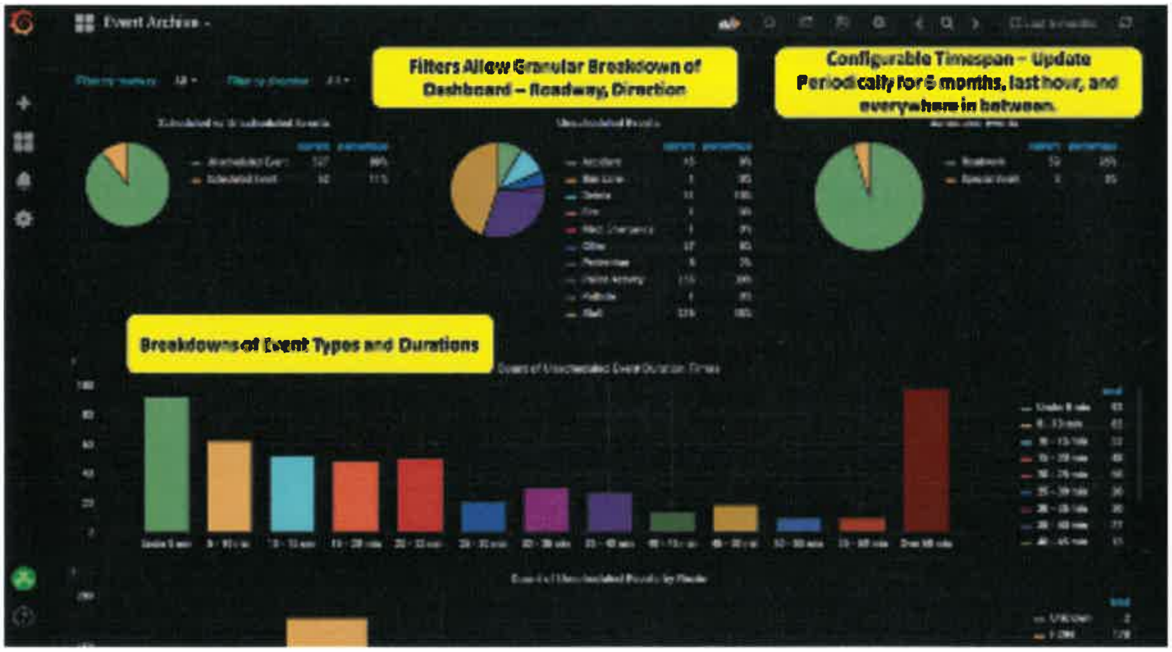



Figure 224 – Events Over Time

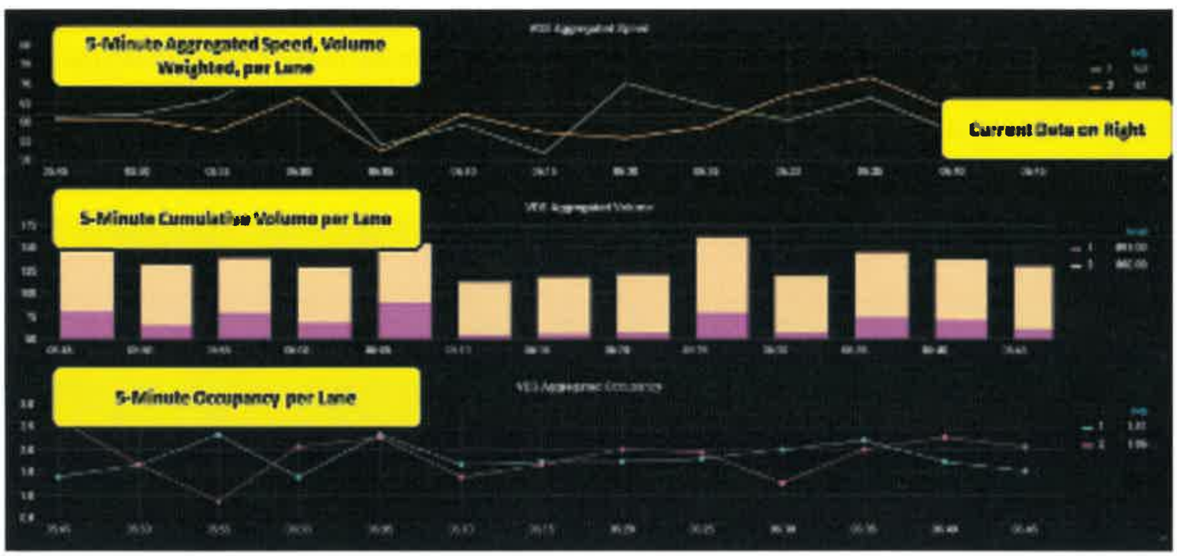



Figure 225 – VDS 5-Minute Data per Lane

Parsons has built ad hoc queries and visualizations using Tableau:

- Can be saved as a permanent report
- Can be scheduled to be automatically generated
- Data can be exported into numerous formats such CSV or Excel
- Can execute searches on specific fields, including event specifics

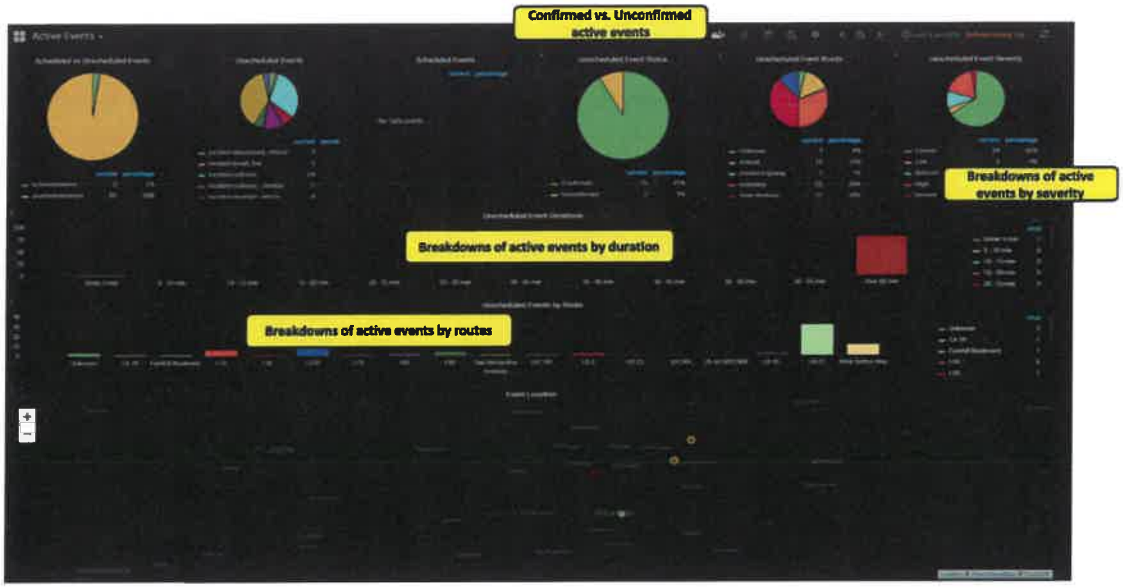



Figure 226 - Currently Active Events

For ad hoc query reports, Parsons will provide Tableau and configure and provide documentation on the underlying datasets available for query, as well as exposing these datasets via sample workbooks and examples for users to follow. Tableau allows for a rich and complex access and permissions configuration, exposing certain data and datasets to specified users, and it allows for the customization of filters and Boolean logic statements. Queries and reports can be configured, scheduled, executed, and saved using standard and built-in functionality. Searches on specific fields or a combination of fields can be conducted. For example, Parsons has built the following ad hoc queries and visualizations using Tableau.

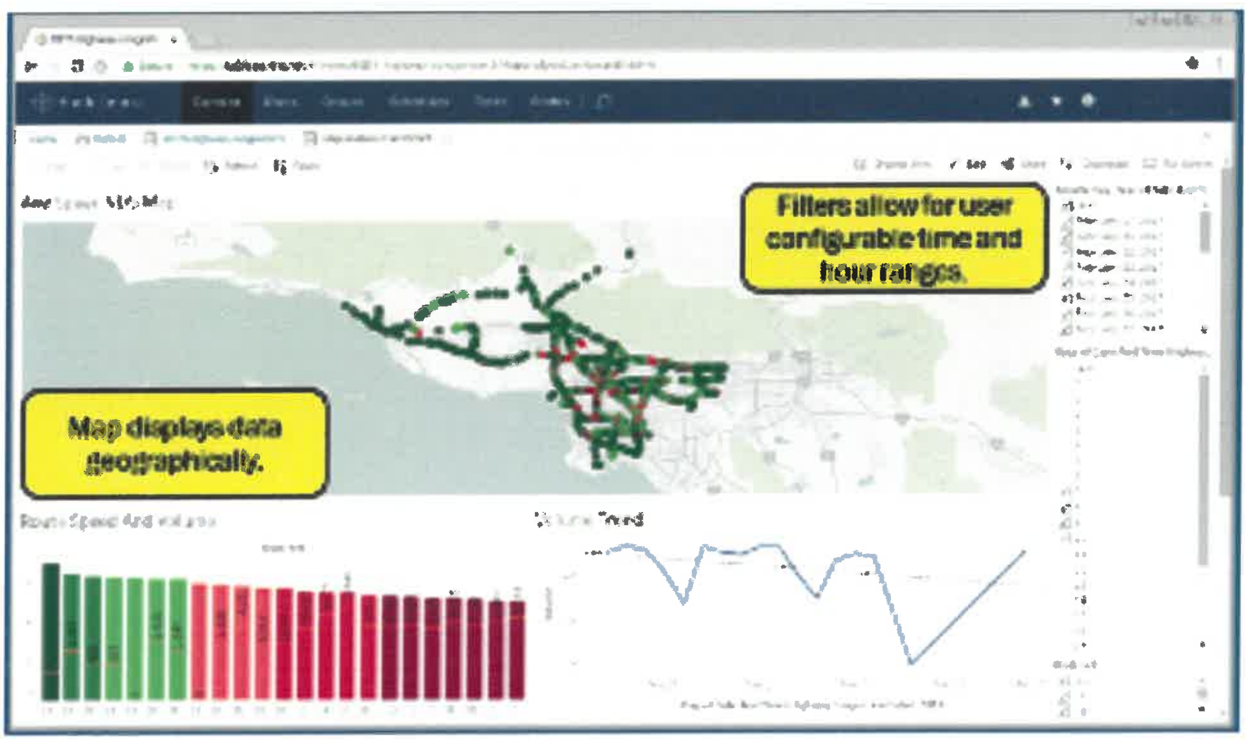



Figure 227 – Speed and Volume Trending (Freeways)


Figure 228 – Traffic Events (Filtered by Route and Event Source)

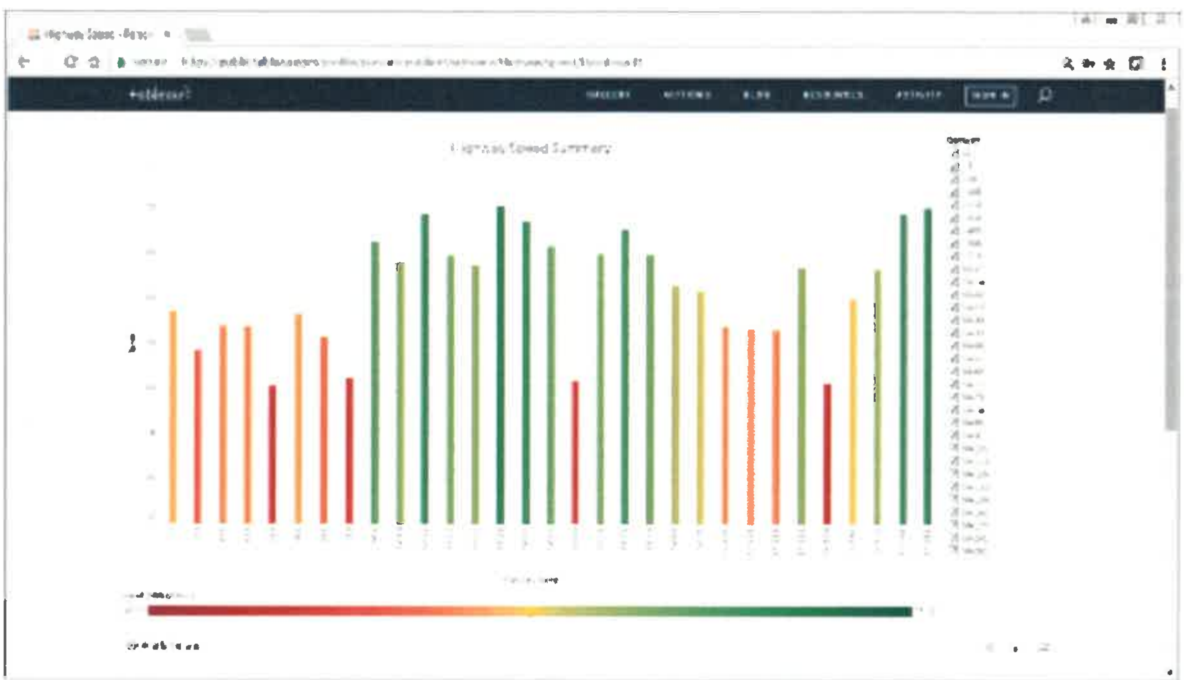


Figure 229 – Highway Speed Bar Chart

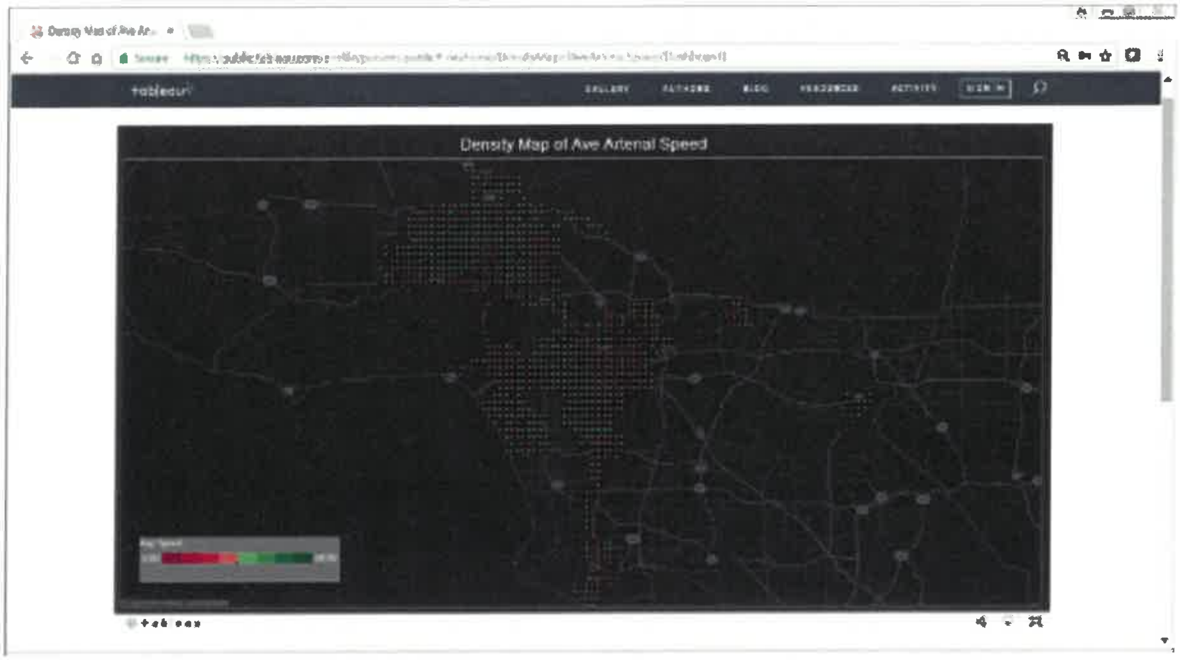



Figure 230 – Density Map of Average Arterial Speed

## 2.2.13.b. Desirables

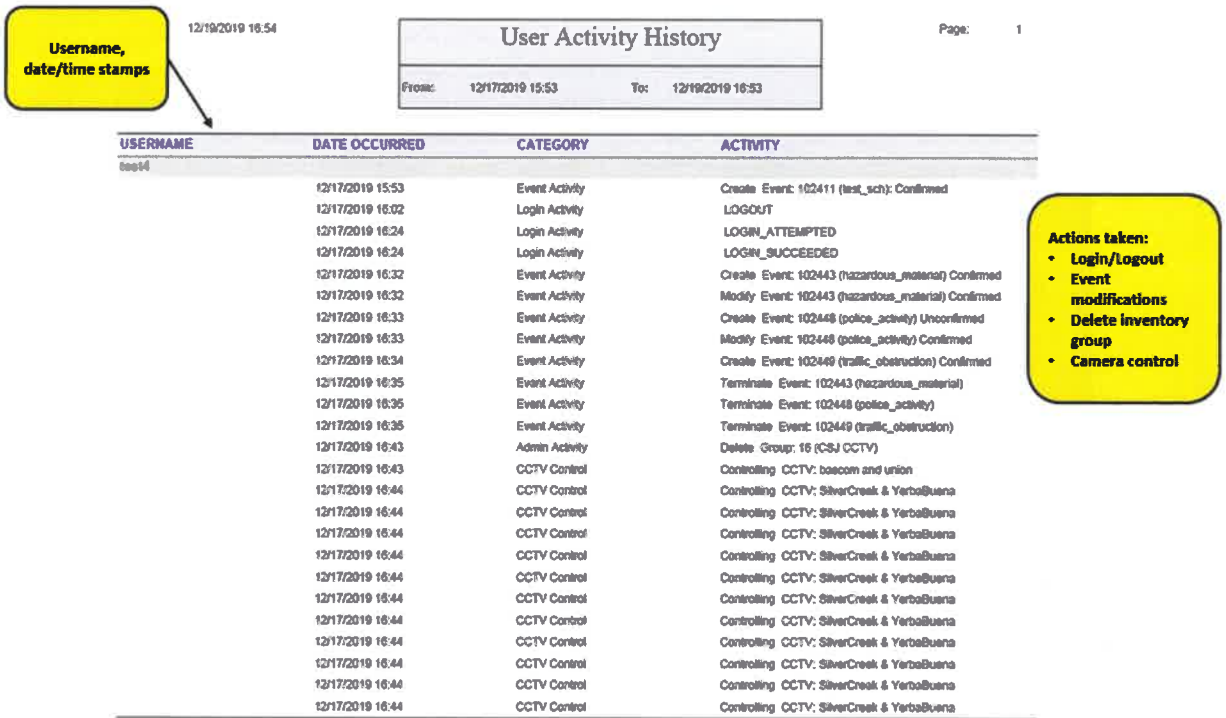
We will exceed the three (3) requirements noted below through the implementation of our iNET™ Data Analytics Platform Module. See detailed explanation on how our Data Analytics Platform module meets or exceeds these requirements below.

*REQUIREMENT 4.15.2.1: The ATMS data should have a GUI to configure collection and storage of user activity log data and to generate and display activity reports.*

*REQUIREMENT 4.15.2.2: The ATMS should be able to archive all data from the activity log to the data archive subsystem.*

*REQUIREMENT 4.5.2.3: The ATMS should be able to archive log data in the data archiving system at predefined times to generate a continuous archival record.*

The iNET™ ATMS solution includes standard user interfaces to configure the collection and storage of user activity log data. Activity log data is archived on a 24-hour continuous basis for actions taken by the user, as well as activity taken on a device. The iNET™ Data Analytics and Reporting module includes standard preformatted reports for users to generate and display activity based on the collection and storage of user activity information. In addition, Tableau and Grafana tools allow the user to configure, generate and display all activities of each user. These activities include logging in/logging out, control actions of devices such as cameras and signs, as well as any device configuration actions. See Section 2.2.11.




12/19/2019 16:54

User Activity History

From: 12/17/2019 15:53 To: 12/19/2019 16:53

Page: 1

| USERNAME | DATE OCCURRED | CATEGORY | ACTIVITY |
|---|---|---|---|
| test4 | | | |
| | 12/17/2019 15:53 | Event Activity | Create Event: 102411 (test_sch): Confirmed |
| | 12/17/2019 16:02 | Login Activity | LOGOUT |
| | 12/17/2019 16:24 | Login Activity | LOGIN_ATTEMPTED |
| | 12/17/2019 16:24 | Login Activity | LOGIN_SUCCEEDED |
| | 12/17/2019 16:32 | Event Activity | Create Event: 102443 (hazardous_material) Confirmed |
| | 12/17/2019 16:32 | Event Activity | Modify Event: 102443 (hazardous_material) Confirmed |
| | 12/17/2019 16:33 | Event Activity | Create Event: 102448 (police_activity) Unconfirmed |
| | 12/17/2019 16:33 | Event Activity | Modify Event: 102448 (police_activity) Confirmed |
| | 12/17/2019 16:34 | Event Activity | Create Event: 102449 (traffic_obstruction) Confirmed |
| | 12/17/2019 16:35 | Event Activity | Terminate Event: 102443 (hazardous_material) |
| | 12/17/2019 16:35 | Event Activity | Terminate Event: 102448 (police_activity) |
| | 12/17/2019 16:35 | Event Activity | Terminate Event: 102449 (traffic_obstruction) |
| | 12/17/2019 16:43 | Admin Activity | Delete Group: 16 (CSJ CCTV) |
| | 12/17/2019 16:43 | CCTV Control | Controlling CCTV: bascom and union |
| | 12/17/2019 16:44 | CCTV Control | Controlling CCTV: SilverCreek & YerbaBuena |
| | 12/17/2019 16:44 | CCTV Control | Controlling CCTV: SilverCreek & YerbaBuena |
| | 12/17/2019 16:44 | CCTV Control | Controlling CCTV: SilverCreek & YerbaBuena |
| | 12/17/2019 16:44 | CCTV Control | Controlling CCTV: SilverCreek & YerbaBuena |
| | 12/17/2019 16:44 | CCTV Control | Controlling CCTV: SilverCreek & YerbaBuena |
| | 12/17/2019 16:44 | CCTV Control | Controlling CCTV: SilverCreek & YerbaBuena |
| | 12/17/2019 16:44 | CCTV Control | Controlling CCTV: SilverCreek & YerbaBuena |
| | 12/17/2019 16:44 | CCTV Control | Controlling CCTV: SilverCreek & YerbaBuena |
| | 12/17/2019 16:44 | CCTV Control | Controlling CCTV: SilverCreek & YerbaBuena |
| | 12/17/2019 16:44 | CCTV Control | Controlling CCTV: SilverCreek & YerbaBuena |
| | 12/17/2019 16:44 | CCTV Control | Controlling CCTV: SilverCreek & YerbaBuena |

Figure 231 – User Activity Report

## 2.2.14 Security and Administration

### 2.2.14.a. Mandatory Requirements

We will exceed the eleven (11) requirements noted below through the implementation of our iNET™ Security and Administration Module. See detailed explanation on how our Security and Administration module meets or exceeds these requirements below.

*REQUIREMENT 4.16.1.1: The ATMS shall provide security and administration functions.*

*REQUIREMENT 4.16.1.2: The ATMS shall provide a log-in, log-out, and exit function.*

*REQUIREMENT 4.16.1.3: The ATMS shall provide a security (ID/password or approved equivalent) function.*

*REQUIREMENT 4.16.1.4: The ATMS shall provide a capability to add or delete users by an administrator.*

*REQUIREMENT 4.16.1.8: The ATMS shall allow a system administrator to change a user's password.*

*REQUIREMENT 4.16.1.9: The ATMS shall allow a system administrator to disable a user.*

*REQUIREMENT 4.16.1.10: The ATMS shall allow a system administrator to change the status of a user to "expired".*

*REQUIREMENT 4.16.1.11: The ATMS shall allow a user to change their own password.*

*REQUIREMENT 4.16.1.12: The ATMS shall allow a user access to the ATMS from any workstation on the system.*

*REQUIREMENT 4.16.1.13: The ATMS workstation I server communications shall be able to function over VPN or firewall traversal.*

*REQUIREMENT 4.16.1.15: The ATMS shall support appropriate security and firewalls necessary to safeguard internal operational information from unauthorized access.*

The iNET™ System Administration and Security module's design allows for an incredible amount of flexibility in managing user accounts. Users can be placed into different types of accounts based on groups with 1,000 or more users or groups with just a single user. These users can act on groups of devices that can contain thousands of units or just one. Most commonly, users are given permissions based on either geographic region or operating agency; however, the permissions can also be based on device type, events, or task functions such as being able to configure a video wall or being able to run reports. The granularity of the security available make for a highly configurable user management system.

Users are able to login from any workstation associated with the system, including those over a VPN or firewall transversal. Users are required to login and logout at each session and the account can be configured to be automatically logged out after a period of inactivity. A username/password is required for logins and the passwords can be set to expire after a configurable amount of time. The system allows users as well as system administrators to change the password for an account. All login/logout activity, as well as any administrative actions done by administrator will be logged with date/time stamps into the archive for reporting purposes. iNET™ comes standard with the User Activity Report which records every user's login, every control action taken, any parameter or configurations changes made by the user, and the user's logout time. This report (Figure 236) includes the user ID, date and time of the transaction, the transaction type, and before and after values for configuration changes. In addition to the required login, the ATMS will support all security and firewalls necessary to safeguard internal operational information from unauthorized access and abide by the State of West Virginia's software standards and security policies.

Only users with administrative permissions will be allowed to manage user accounts. Using the Administration/Operators function in Figure 232, these administrative users can create, delete, modify, suspend, restore, and configure the permissions for each user. Administrators can also set the status of a user to "expire". In addition, user account templates can be easily configured to simplify the day-to-day tasks of user management for system administrators. These templates limit a user's permission based on similar permissions or parameters.

Administrators can be pre-configured with account type templates for ease in creating an account (configurable):

- **External Agency**
- **TMC Operator**
- **Supervisor**
- **Administrator**


Figure 232 – User Account Management

We will exceed the three (3) requirements noted below through the implementation of our iNET™ Security and Administration Module. See detailed explanation on how our Security and Administration module meets or exceeds these requirements immediately below.

*REQUIREMENT 4.16.1.6: The ATMS shall allow for the specification of user's rights by an administrator*

*REQUIREMENT 4.16.1.7: User's rights shall be designated by function and specific equipment.*

*REQUIREMENT 4.16.1.14: The ATMS shall provide a method to manage users and groups of users within the software such that only ATMS authorized users are allowed to access the system. A minimum of four (4) levels of security are required (external agency, TMC operator, supervisor, and administrator).*

The iNET™ System Administration and Security module is responsible for managing user access to system functionality. The module's flexible design allows for managing individual users, small groups of users, or large groups of users with access to individual devices, groups of devices, all devices, or no devices. The granularity of the permissions available allows the user management system to be highly configurable. Only users with administrative permissions will be granted access to manage user accounts and permissions. These administrative users have the following permissions:

- Create, modify, suspend, or remove individual user accounts
- Create, modify, or remove predefined user types or templates
- Add, modify, or remove specific permissions from individual users
- Add, modify, or remove permissions from predefined user templates

**Benefits of iNET™ Permissions:**

- Highly flexible design
- Ease of use with group and device templates
- Allows user groups of just 1 or groups with more than 1000
- Allows device groups of just 1 device or groups of more than 1000
- Only configurable by users with permission (administrators)
- Users can belong to multiple groups

To add a new user, an administrator must first enter the new user in the department's Active Directory account. Once configured, the user will be available in the iNET™ application for the assignment of privileges. To continue, the administrator would log into iNET™ and bring up the Administration-Operators screen. The user information, such as the username and email address, synchronizes with the information from Active Directory and is presented on this screen. After entering and saving any iNET™-specific information, the administrator must assign the user to a template. In iNET™, by selecting the Administration-Groups option (see Figure 233), the administrator is able to select from a list of group templates to place the new user in. Once the user is successfully placed into the group, the privileges assigned to that group template are now in place for the new user. The system can be configured with different types of user accounts:

- **External Agency:** Performs system operations remotely, sometimes with limited control
- **TMC Operator:** Performs system operations at a center
- **Supervisor:** Performs system operations at a center with full control
- **Administrator:** Manages user accounts and monitors system health; Views activity logs, security information, and system performance and diagnostic information


Figure 233 – Defining User Groups


Figure 234 - Device Group Management

Predefined assignments of user types to device groups are named and described in the Role Manager feature. The Role Manager is where the individual permissions are set. Individual privileges are selected to assign this group of individuals access to the selected group of devices.

Once the templates for the various user types are set, the individual user account can be created and simply placed into the predefined user account-type template. A user can be placed in multiple user templates. This is where individual permissions are set for the group of users and group of devices. Figure 235 displays a partial list of permissions available within iNET™.


**Figure 235 – User Permissions Management (Role Manager)**

We will exceed the two (2) requirements noted below through the implementation of our iNET™ Security and Administration Module. See detailed explanation on how our Security and Administration module meets or exceeds these requirements below.

*REQUIREMENT 4.16.1.5: The ATMS shall maintain log and be able to generate reports of administrative actions and all log-in/log-out activity.*

*REQUIREMENT 4.16.1.16: The ATMS shall provide an audit trail capturing the user's ID, date and time stamp, transaction type, and before/after values whenever changes are posted to system database.*

The archiving feature within the ATMS logs all user activity on a continuous 24-hour basis. This includes control actions taken on a device, login/logout activity, system configuration changes, as well as inventory modifications. The figure below displays the options for generating these reports. See Section 2.2.13.b for a sample User Activity report.

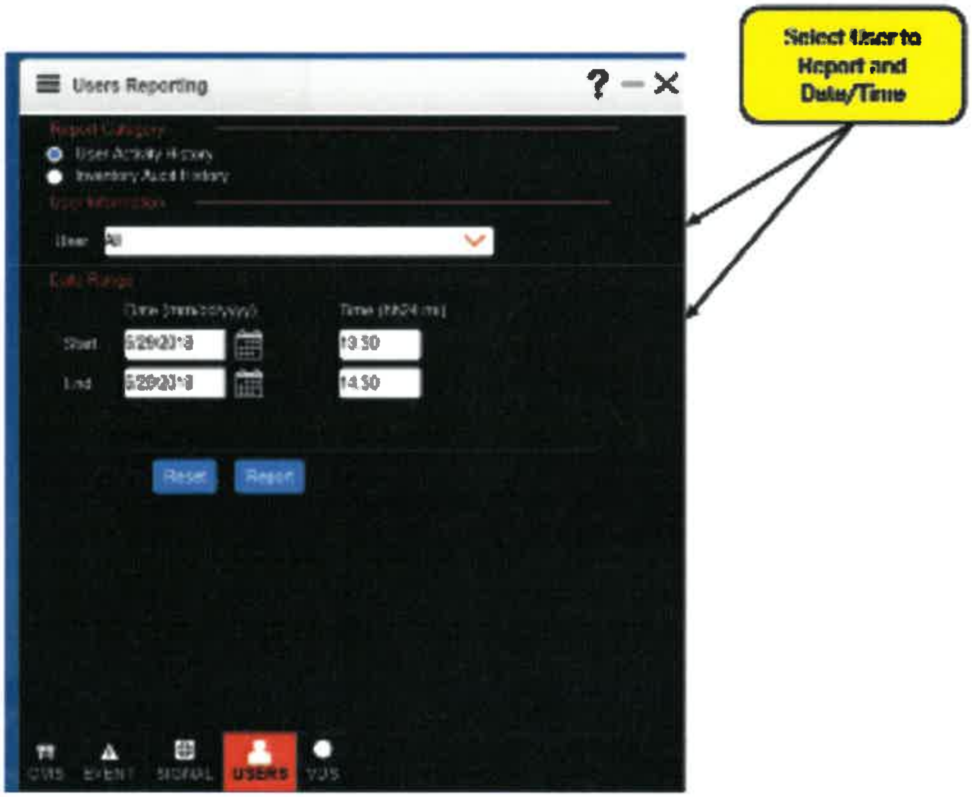



Figure 236 – User Activity History Report

We will exceed the requirement noted below through the implementation of our iNET™ Security and Administration Module. See detailed explanation on how our Security and Administration module meets or exceeds this requirement below.

*REQUIREMENT 4.16.1.17: The ATMS shall support full system backups while maintaining 24/7 operational status.*

The Parsons iNET™ solution includes high-availability, modularity, redundancy, backup and recovery, and failure detection. iNET™ includes advanced clustering, failover, and integration features that allow operations to continue 24 hours a day, 7 days a week, and minimizes interruptions caused by scheduled maintenance. The clustered architecture allows continued operations for all but major system upgrades, allowing simple blue-green deployment and simple roll back of application changes, without requiring any client application updates.

Some of the features provided include the following:

- Unified continuous availability and disaster recovery provides complete protection for critical business services against application, server, and network, storage, or site failures.
- Built-in replication eliminates data loss by delivering near-zero RPOs by working across heterogeneous storage or server hardware; it can replicate application, registry, and filesystem data, significantly reducing overall costs.
- Proactive application health monitoring prevents application failures by proactively monitoring application health in real-time and detecting patterns of degradation before a failure can occur. If such patterns are detected, automated remediation mechanisms are triggered to maintain application continuity.

- Server failure provides application continuity in the event of a hardware failure or an operating-system crash. The passive server actively monitors the active server by sending frequent heartbeat messages to it and expecting an acknowledgement in return over a network connection referred to as the Neverfail channel. If the passive server detects that the active server is no longer responding, either due to a hardware failure or loss of network connectivity on the active server, it can initiate a failover task. During a failover action, the passive server is enabled to immediately take on the role of the active server.

### 2.2.14.b. Desirables

We will exceed the two (2) requirements noted below through the implementation of our iNET™ Security and Administration Module. See detailed explanation on how our Security and Administration module meets or exceeds these requirements below.

*REQUIREMENT 4.16.2.1: The ATMS should provide rules-based administration for access and security at all levels of use.*

*REQUIREMENT 4.16.2.2: The ATMS should provide data locking or buffering routines in a multi-user environment.*

The iNET™ ATMS is designed to support a large-scale enterprise deployment, with thousands of devices and hundreds of users in over 50 deployments. iNET™ employs data locking and buffering best practices to ensure that the integrity of the data is maintained throughout all read/write transactions. See Section 2.2.14.

## 2.2.15 Performance

### 2.2.15.a. Mandatory Requirements

We will exceed the eight (8) requirements noted below with the deployment of our iNET™ solution. See detailed explanation on how our iNET™ solution meets or exceeds these requirements below.

*REQUIREMENT 4.16.2.1: The ATMS shall not require system restarts or reboots except for major system upgrades.*

*REQUIREMENT 4.16.2.2: The ATMS shall be available 24 hours a day, 7 days a week, except during scheduled maintenance.*

*REQUIREMENT 4.16.2.3: The ATMS shall not let its performance and operation be impacted adversely by the malfunction, removal, or addition of interfaces.*

*REQUIREMENT 4.16.2.4: The ATMS system up time goal shall be 99.9%.*

*REQUIREMENT 4.16.2.5: The ATMS refresh rate for the largest map shall be a maximum of 1 second.*

*REQUIREMENT 4.16.2.6: The ATMS refresh rate for all other displays shall be a maximum of 1 second.*

*REQUIREMENT 4.16.2.7: The ATMS vendor response shall define how many devices and type the ATMS is capable of supporting. (Minimum: 500 CCTV, 250 DMS, 1000 Detectors)*

*REQUIREMENT 4.16.2.8: The ATMS vendor shall indicate if all components necessary to make the ATMS functional will be installed on-premise or off-site and the reason/benefit to WVDOT.*

The Parsons' iNET™ solution is a highly robust system, which does not require restarts or reboots except for major system upgrades. It runs continuously 24 hours a day, 7 days a week, except during scheduled maintenance. Because of iNET™ modularity, the performance of the system overall is not adversely affected should one interface become unavailable or malfunction. iNET™ has been stress tested to have an uptime of 99.9%, with refresh rates below the maximum of 1 second, for the map and all other displays.

All proposed components for this deployment will be hosted on-premise. The primary benefit will be lower latency communications between the ATMS, devices, and partner agencies. Some desirable features may be better served through AWS cloud hosted components. The necessity and or benefit of desirable "Big Data" modules can be designed as necessary.

There are no limits to the number or type of devices the iNET™ ATMS can support. iNET™ currently has production deployments with over 2000 CCTV devices, 1500 DMS devices, and 15,000 detectors. iNET™ has also been tested to support status and map display for over 100,000 IOT devices through Connected Vehicle and IOT streetlight data feeds.

iNET™ can be configured with advanced clustering features that allow flexible deployment and maintenance options for WVDOT. iNET™ is optimized to minimize downtime when systems are being maintained or replaced. In fact, downtime is effectively prevented for typical upgrades and issues, with only major system releases possibly requiring any scheduled downtime. When deployed in a high-availability environment, iNET™ can easily satisfy the 99.9 percent availability as stated in Requirement 4.16.2.4. Through integration with virtualization, network, load balancing, and database cluster systems, iNET™ can provide the following environment features:

**Clustering, load-balancing, and failover features are available in the Parsons iNET™ product to provide a high-availability solution.**

- Fully redundant N+1 architecture of systems, communications, and applications
- Fully redundant production equipment at two physically separate data centers
- Load-balanced application and database servers within each data center
- Support for server virtualization (VMware or Hyper-V)
- High-availability clustered database instances (Microsoft SQL AlwaysOn Database Cluster)

### AVAILABILITY FEATURES

iNET™ application servers support two primary features, failover and load balancing, which ensure high availability of critical services included below for reference:

- **Failover:** Clients interacting with an instance of iNET™ will not be interrupted, even when the node on which that instance executes crashes. Behind the scenes, all of the user data that the application makes use of (HTTP session data, EJB SFSB sessions, EJB entities, and SSO credentials) are available at other nodes in the cluster, so that when a failure occurs, and the client is redirected to a new node, the user's data is available, and processing can continue.
- **Client load balancing:** Load balancing enables the application to respond to client requests in a timely fashion, even when subjected to a high volume of requests. Using a load balancer as a front-end, each incoming HTTP request can be directed to one node in the cluster for processing. In this way, the cluster acts as a pool of processing nodes and the load is "balanced" over the pool, achieving scalability and, therefore, availability.
- **Backend load balancing:** iNET™ modules support clustered EJBs and HA singleton features that allow features to run across multiple nodes in a cluster when possible and to run as HA singleton services when necessary. HA or clustered singleton is a service that exists on multiple nodes in a cluster, but it is active on just a single node at any given time. If the node providing the service fails or is shut down, a new singleton provider is chosen and started. Thus, other than a brief interval when one provider has stopped, and another has yet to start, the service is always running on one node. This is an important feature that allows iNET™ to scale supporting a very large number of devices and client connections, and it allows

specific services, like device polling, and data integrations to run on specific servers in the cluster while preserving availability.

- **Failover:** iNET™ uses J2EE features, allowing a client interacting with the application to have uninterrupted access, even in the presence of node failures. iNET™ utilizes the following features to provide seamless failover for clients and backend services when failures occur:
  - Session-oriented servlets to provide user interaction
  - Session-oriented EJBs to perform state-dependent business computation
  - EJB entity beans to store critical data in a persistent store (e.g., database)
  - SSO login to the application
- **Session persistence:** A client interacting with an instance of that application will not be interrupted, even when the node on which that instance executes fails. iNET™ ensures that all the user data that the application makes use of (HTTP session data, EJB SFSB sessions, EJB entities, and SSO credentials) are available at other nodes in the cluster, so that when a failure occurs, and the client is redirected to a new node, the user's data is available, and processing can continue.

## AVAILABILITY SCENARIOS

The ability to distribute and fail over connections and services across multiple application servers in a cluster is a critical feature to support high-availability operation. iNET™ provides continuous operation through hardware, application, or communications failures. The figure below provides a high-level illustration of normal iNET™ cluster operations, some of the important details are numbered in the diagram and described below.

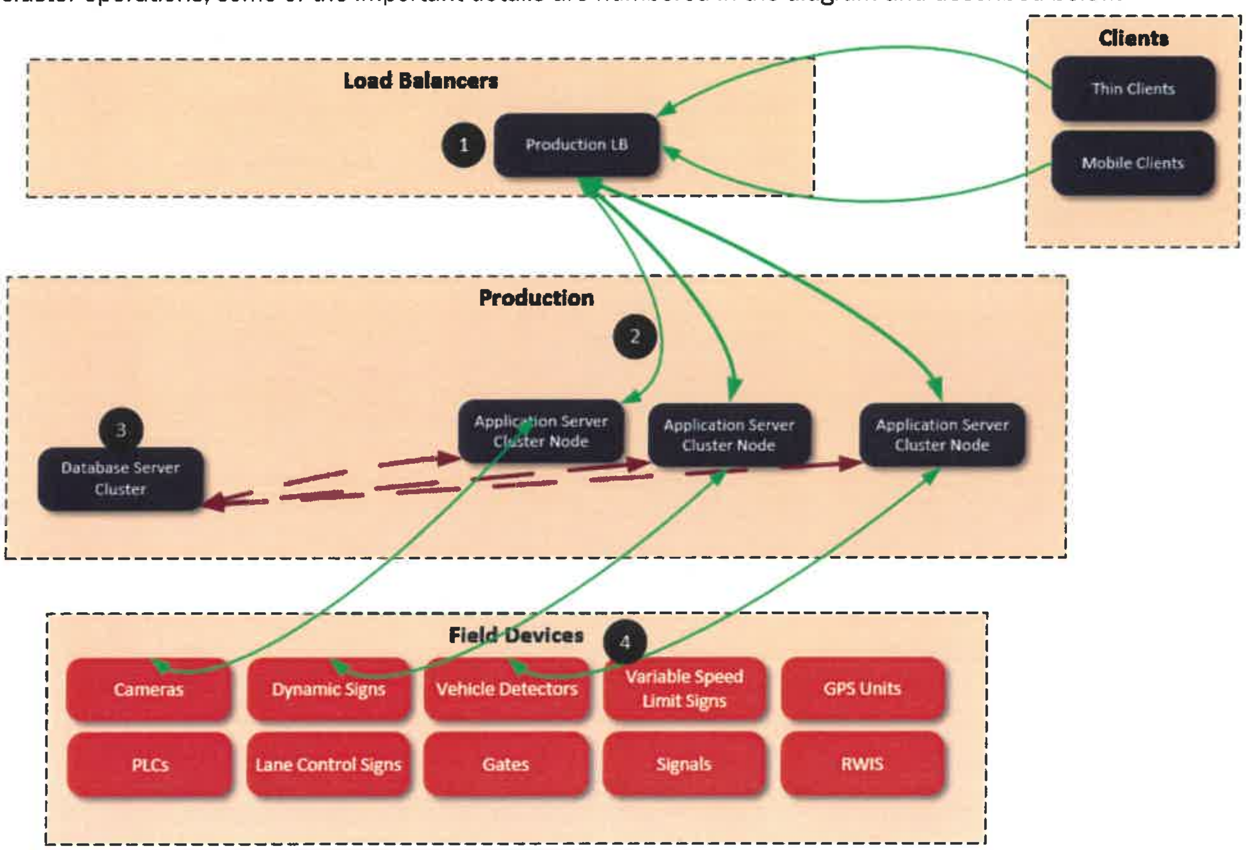



Figure 237 – iNET™ Cluster Operations

1. Under normal operations, iNET™ clients will connect to the application utilizing the load balancer infrastructure. The Load Balancers are monitoring the health of the iNET™ servers in the cluster and directing client connections equally between the servers.
2. Within the iNET™ server cluster, client session and cache data are replicated in real-time between all the cluster servers.
3. The iNET™ cluster utilizes high-availability JDBC features to connect to the database cluster, all in real-time; and archive data is stored and accessed through the high-availability database.
4. iNET™ cluster servers run HA-Singleton services for device control. The work of polling, controlling, and extracting data from field devices is distributed across servers in the application cluster.
5. With the iNET™ cluster configuration, clients and ATMS services remain on-line and accessible when hardware failure, upgrades, replacement, and other issues occur. The figure below illustrates what happens when an issue occurs affecting one of the application servers.

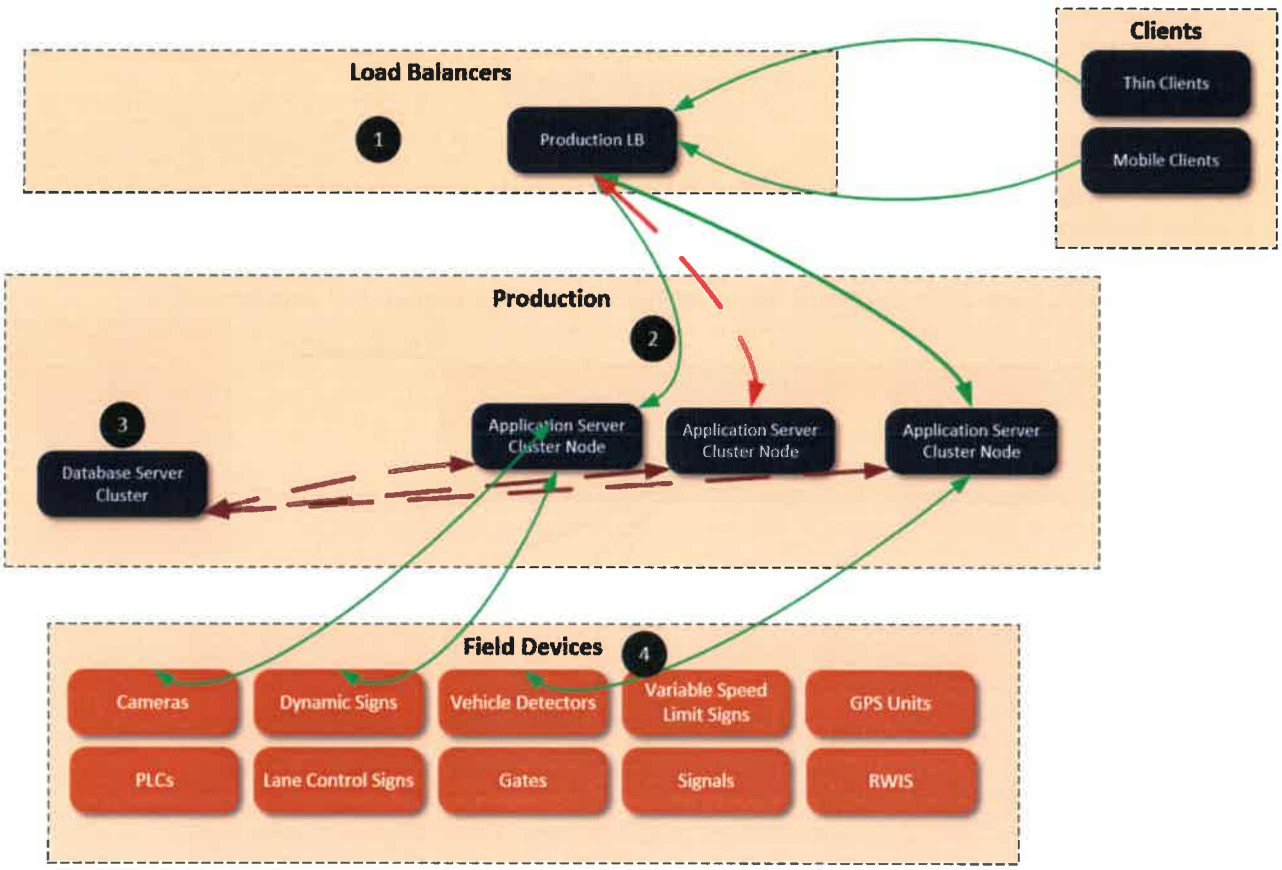



Figure 238 – Sample Application Server Failure

1. When a failure occurs, or an application server is taken offline for maintenance, several things will happen:
    a. The load balancers will detect that one of the application servers is offline
    b. The application server will be removed from the load balancer pools
2. Client connections will be directed to healthy servers remaining in the load balancer pool
    a. The client and cache data have already replicated between the application nodes, so the client is connected to a different server with their session data intact. There is no need for the client to re-login to the system.

   b. The load balancers continue to monitor the health of the offline-server and will add the server back into the pool once health status is reported.
3. All operational data remains available utilizing the High-Availability database cluster and iNET™ enhanced JDBC connections
4. Any HA-Singleton services running on the offline application server have been started on another node. In this example, the Dynamic Sign services have migrated to a different node and all operations remain functional.

The iNET™ cluster configuration provides continuous system availability through a variety of failure scenarios. Several scenarios.

The associated iNET™ features that preserve availability are discussed in further detail below.

### HARDWARE AND APPLICATION FAILURE

Operating iNET™ application servers on multiple physical servers in a redundant configuration allows operations to continue when failure occurs. If a physical server fails, the remaining application servers will start any services on the failed node almost immediately. The iNET™ health monitors and status page will alert load balancers that one or more of the application instances are unhealthy, and thin-client requests will be directed to remaining healthy instances. The iNET™ health monitors and status page can also report when subsystems have failed. For example, if an instance cannot connect to the database cluster, or LDAP endpoints, the failure is again reported to the environment load balancers, and clients are directed to a healthy instance.

### EQUIPMENT UPGRADES

iNET™ clusters allow continuous availability through equipment upgrades and replacement, in a manner like the hardware or application failures described above. However, for equipment upgrades, there is added benefit to migrating user connections and services to designated server instances using the environment load balancers, and then taking specific nodes offline for maintenance.

### APPLICATION DEPLOYMENT

iNET™ upgrades can be deployed with no downtime for all but major system upgrades. The clustered configuration of iNET™ allows specific nodes to be removed from load-balancing pools, and then upgraded offline, with client connections remaining active on other servers.

When major system upgrades are required, the iNET™ cluster configuration and virtualization allow for blue-green deployments, where a secondary iNET™ cluster can be created, allowing for controlled migration between versions. In these deployments, load-balancer configuration can be completed to direct clients between the production clusters as needed to successfully deploy and validate the new release, while still minimizing any operational impacts to the system.

### CAPACITY UPGRADES

iNET™ nodes can easily be added to the cluster configuration with no downtime, allowing additional capacity to support increased users, devices, and operations, as necessary.

## 2.2.15.b. Desirables

We will exceed the requirement noted below with the deployment of our iNET™ solution. See detailed explanation on how our iNET™ solution meets or exceeds these requirements below.

*REQUIREMENT 4.17.2.1: The ATMS should provide for "operator-free" operation so that the system performs all minimally necessary control and monitoring processes unattended.*

The iNET™ ATMS is an "operator-free" system. The system performs all monitoring processes unattended, and with automatic response plan execution and the system scheduler, many control functions can be configured to be "operator-free". The table below describes the "operator-free" features of the system.

Table 29 – iNET™ Operator-Free Features

| FEATURE | DESCRIPTION |
|---|---|
| **Device monitoring** | iNET™ comes with a series of pollers which maintain constant communications with each device. These pollers run unattended. Should there be a problem in communications with a device, an alert will be displayed for that device on the Alert window. If there is an !in the status that is returned from a device, this too will be displayed on the Alert window. |
| **Data Feed monitoring** | Like the device pollers, data feed pollers maintain a constant connection to external systems or data services, such as INRIX. These pollers run unattended. Should there be problem with data connection from an external source, an alert will be displayed on the Alert window. |
| **Event generation** | iNET™ can extract data from external CAD systems and automatically create a confirmed event within the ATMS. |
| **Event termination** | iNET™ can be configured such that events are terminated after the configured time has passed. |
| **Event detection** | The system can be configured to monitor congestion levels and determine if an incident has occurred and create an event within the system. |
| **Archiving** | The archiving feature runs continuously on a 24-hour basis with no operator intervention. |
| **Scheduled Reports** | iNET™ reports can be configured to automatically generate and be emailed to a group of users. |
| **Response Plans** | Response plans can be configured to auto-generate and auto-activate. As an event is confirmed in the system, response plans can be auto-generated and auto-activated. Messages will be automatically posted on signs, signal timing plans activated, messages will be sent to 511 systems or websites, and notifications will be sent. |
| **Notifications** | Each user can configure the system to automatically be notified by text or email messages upon certain alerts. Alerts include event notifications, device error notifications, device activation notifications, or weather notifications. |
| **Scheduled DMS messages** | Using the DMS scheduler, messages such as Public Service Announcements or travel time messages can configured to post automatically for a given date/time/duration. |
| **Travel Times** | The travel times poller runs continuously generating travel times for posting on signs |
| **Scheduled CCTV presets** | iNET™ can be configured to return CCTV presets to a default position/preset at a configurable time. This can be used to set the camera view to an inbound view during |

| FEATURE | DESCRIPTION |
|---|---|
| | morning peak and set the camera view to an outbound view during afternoon peak without operator intervention. |
| **Scheduled CCTV recordings** | The system can be configured to automatically record video from a camera at a designated time, for a designated period without operator intervention. |
| **Session timeouts** | User sessions are monitored for periods of inactivity and automatically logged out after a configurable length of time. |
| **Password expiration** | User passwords can be set to expire after a configurable length of time. |
| **Center-to-Center** | The Center-to-Center module runs operator free to exchange data between systems. |

## 2.2.16 Other ATMS Operations

### 2.2.16.a. Mandatory Requirements

We will exceed the five (5) requirements noted below with the deployment of our iNET™ solution. See detailed explanation on how our iNET™ solution meets or exceeds these requirements below.

*REQUIREMENT 4.17.3.1.1: The ATMS shall include capability to generate real-time travel times for defined roadway segments on Interstate and Expressway routes.*

*REQUIREMENT 4.17.3.1.2: The ATMS shall provide a mechanism for operators to select and implement pre-defined operations response plans for incidents.*

*REQUIREMENT 4.17.3.1.3: The ATMS shall maintain a local emergency response agency contact list*

*REQUIREMENT 4.17.3.1.4: The ATMS shall provide access to the contact lists to authorized users.*

*REQUIREMENT 4.17.3.1.5: Trouble ticket generation capability for system and device service and maintenance needs.*

#### RESPONSE PLANS

iNET™ Decision Support System (DSS) Module contains a response plan library which contains pre-defined response plans for use with incidents, or planned events. The operator has the option of selecting from the response plan library, instead of automatically generating a response plan. The iNET™ response plan library, shown in Figure 239, allows the operator to implement predefined response plans. These response plans include, at a minimum, sign devices and associated messages, ramp meters, signals, notifications to be sent, and cameras to be viewed. These are especially useful for scheduled events, such as construction closures, concerts, or sporting events. The operator can create response plans prior to the actual scheduled event, and then during the event, the operator can implement the library response plans.

> Response plan library allows for predefined response plans to be created and saved.
>
> Response plans can be scheduled for automatic start and termination.

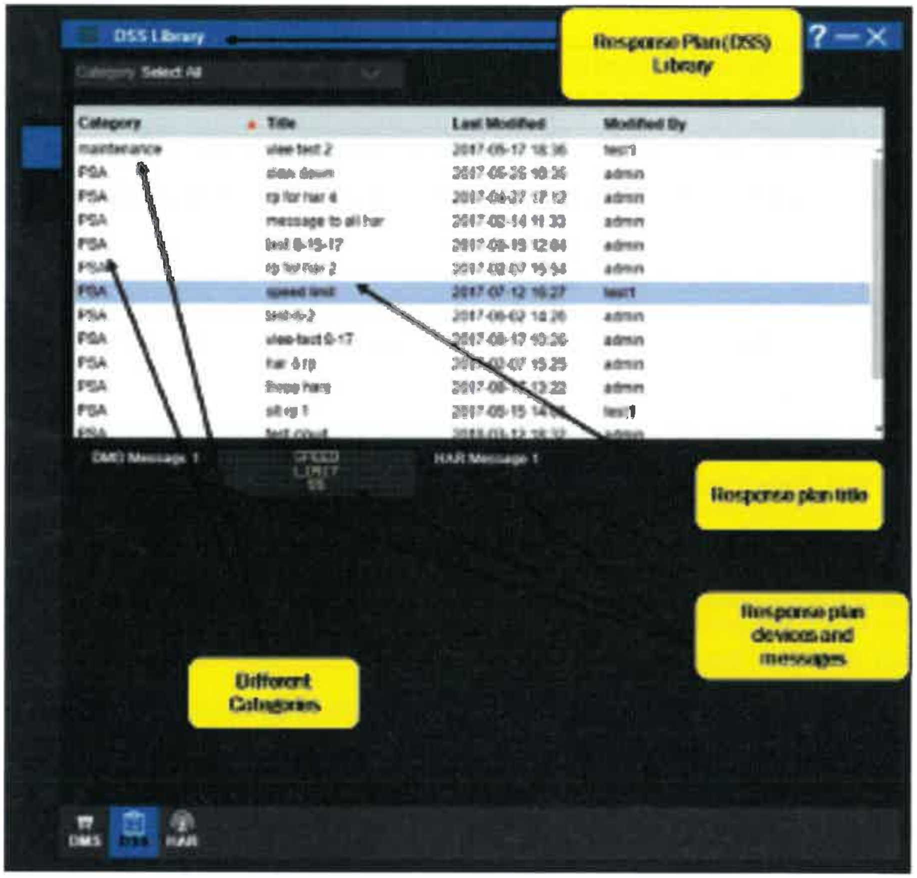



Figure 239 – DSS Library Viewer

In addition, there are times that operations will need to schedule response plans to be implemented "automatically". These cases could be for Public Service Announcements (PSA) that need to be posted on signs or messages to be broadcast over advisory radios for several days. The operator, or any user with privileges, can implement this scheduling functionality using the response plan scheduler, shown in Figure 240, to automatically schedule specific response plans and activate them with minimal user interaction. The operators select the predefined response plan from the response plan library, selects the specific calendar entries, and saves the entry. At the corresponding start date/time, the scheduled response plan will be implemented and at the corresponding end date/time, the response plan will be deactivated.

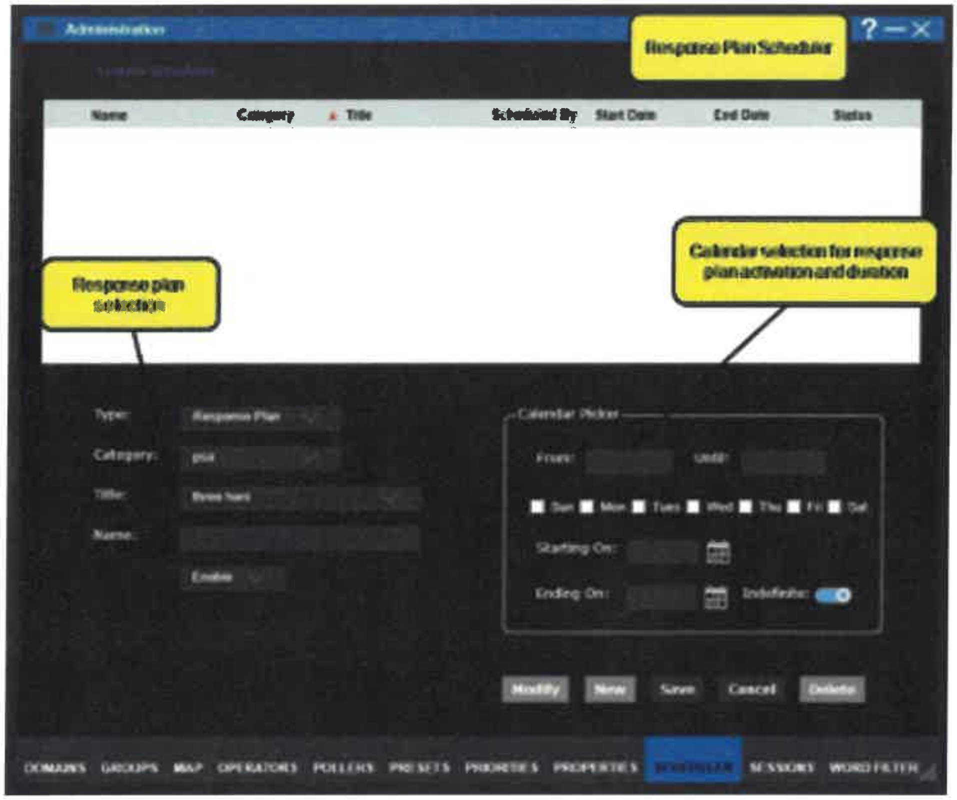



Figure 240 – Response Plan Scheduler Viewer

## CONTACT LIST NOTIFICATIONS

As part of the event lifecycle, the iNET™ Event and DSS modules allow the operator to customize how and when the agencies or other stakeholders are to be contacted about events. The Contact Notification window in Figure 145 – Contact Notification Viewer

allows the operator, with the proper permissions, to configure each user when to receive notifications, the types of notifications to receive, and the severity level of the notification.

Figure 241 – Contact Notification Viewer

### TROUBLE TICKET GENERATION

Parsons supports integration with third-party enterprise asset management systems to automate the tracking and reporting of work orders, alarm messages, equipment inventory, equipment health, and network health. Parsons will streamline and automate the ticket generation capability for system and device service and maintenance needs based on device status information collected in the iNET™ ATMS.

At a minimum, the following information will be exchanged:

- Current operational status
- Failure and/or malfunction location
- Failure and/or malfunction description
- Historical information/report generation.

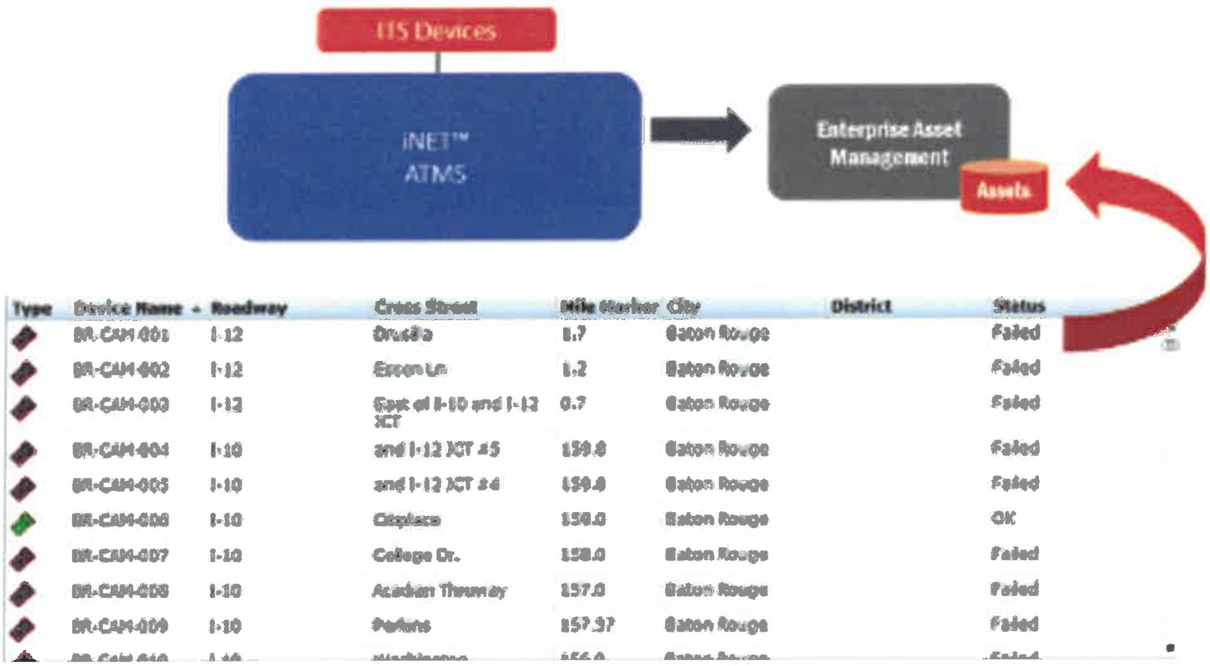



Figure 242 –Third-Party Asset Management Tracking

## 2.2.16.b. Desirables

We will exceed the six (6) requirements noted below with the deployment of our iNET™ solution. See detailed explanation on how our iNET™ solution meets or exceeds these requirements below.

*REQUIREMENT 4.17.3.2.1: The ATMS should include capability to use archived data and real-time data together with predictive algorithms to generate travel forecasts for display to operators.*

*REQUIREMENT 4.17.3.2.2: The ATMS should maintain a call-out list of private industry contractors of equipment resources.*

*REQUIREMENT 4.17.3.2.3: The ATMS should provide a commuter route app so users can enter a frequent route and receive a specific update for their route including incidents, construction, congestion, events, etc.*

*REQUIREMENT 4.17.3.2.4: The ATMS should populate social media mechanisms with event data automatically.*

*REQUIREMENT 4.17.3.2.5: The ATMS should provide for enhanced social media capabilities to allow for easier use of Twitter, Facebook, etc. for events or emergencies.*

*REQUIREMENT 4.17.3.2.6: Operator manuals should be intuitive and key operations should be on flip cards that are easy to access and understand during an emergency.*

### TRAVEL FORECASTS

iNET™ Predictive Module provides integration of online traffic simulation tools to provide 15, 30, 45, and 60-minute prediction data in the forms of level of service, speed, and volume to capacity ratios. Using both real-time and archived data, traffic predictions are used to evaluate the best response plan for managing the congestion. Figure 243 shows an example of travel predictions.

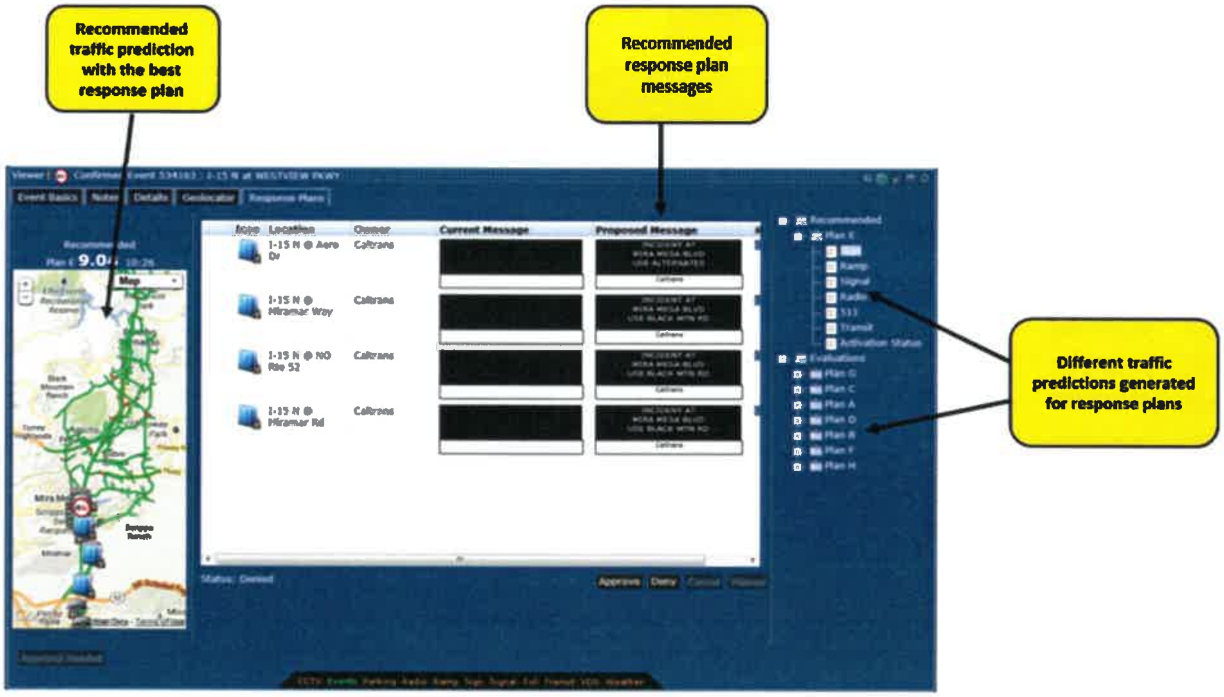



Figure 243 – Traffic Predictions

## CALL OUT LIST OF PRIVATE INDUSTRY CONTRACTORS

The iNET™ ATMS provides multiple ways to manage a list of private industry contractors of equipment resources. The iNET™ Event Management module provides a configurable means to manage resources that may be required during the management of an incident. Operators can select the resource that may be called upon during an incident and enter the arrival and departure times for each resource to capture performance measures associated with the resources. In addition, iNET™ provides the ability to gather a list of private industry contractors of equipment resources as a contact to be notified or alerted about a specific function in the system.

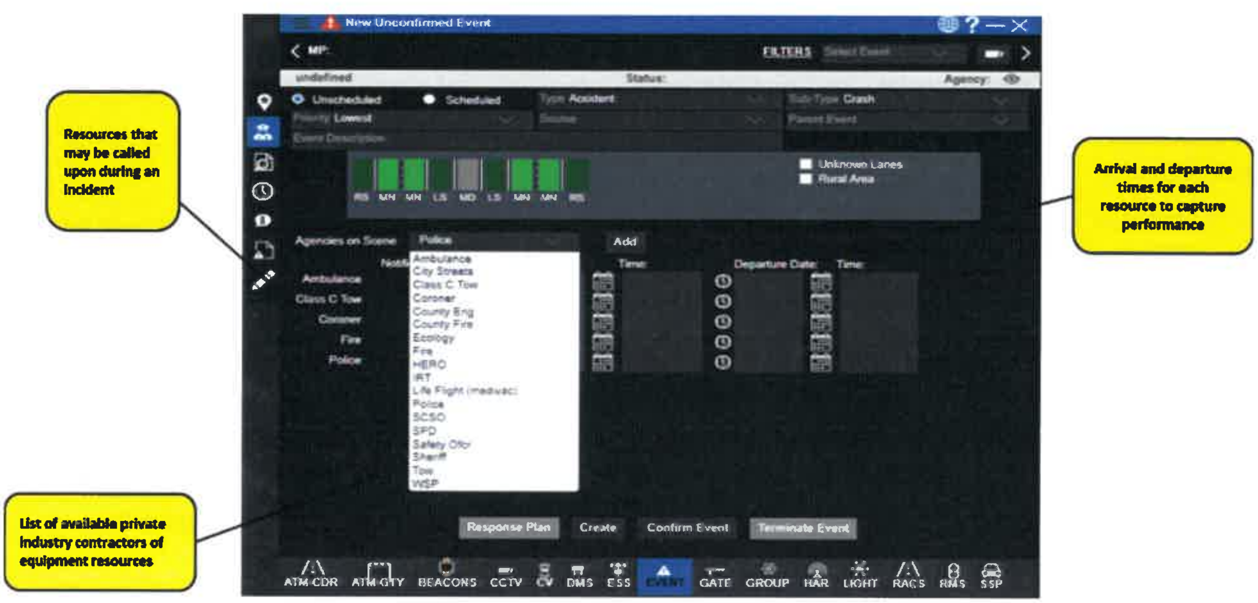



Figure 244 – Event Management – Industry Contractors

### COMMUTER ROUTE APP

Using the Castle Rock public website or the public mobile app, users can create an account and save their favorite routes. Users create a favorite route by entering their start and end address or location, and they have the option of adding waypoints or clicking and dragging to adjust their route. The interface allows users to subscribe to text and/or email alerts for each saved route on the days of the week and during the hours they wish. Users who sign up for this feature can also opt in to be recognized when they dial the 511 phone system from their saved numbers to hear custom, personalized route information on that IVR, as well.

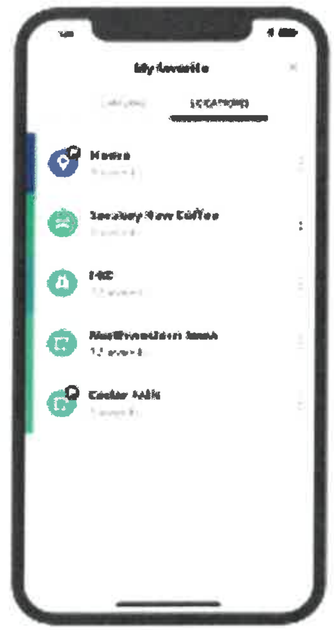


Figure 245 – Favorite Locations

### SOCIAL MEDIA UPDATES

The Castle Rock Alert B module continuously monitors the ATMS event data feed and automatically tweets event updates to one or more social media feeds, depending on the location of the event site.

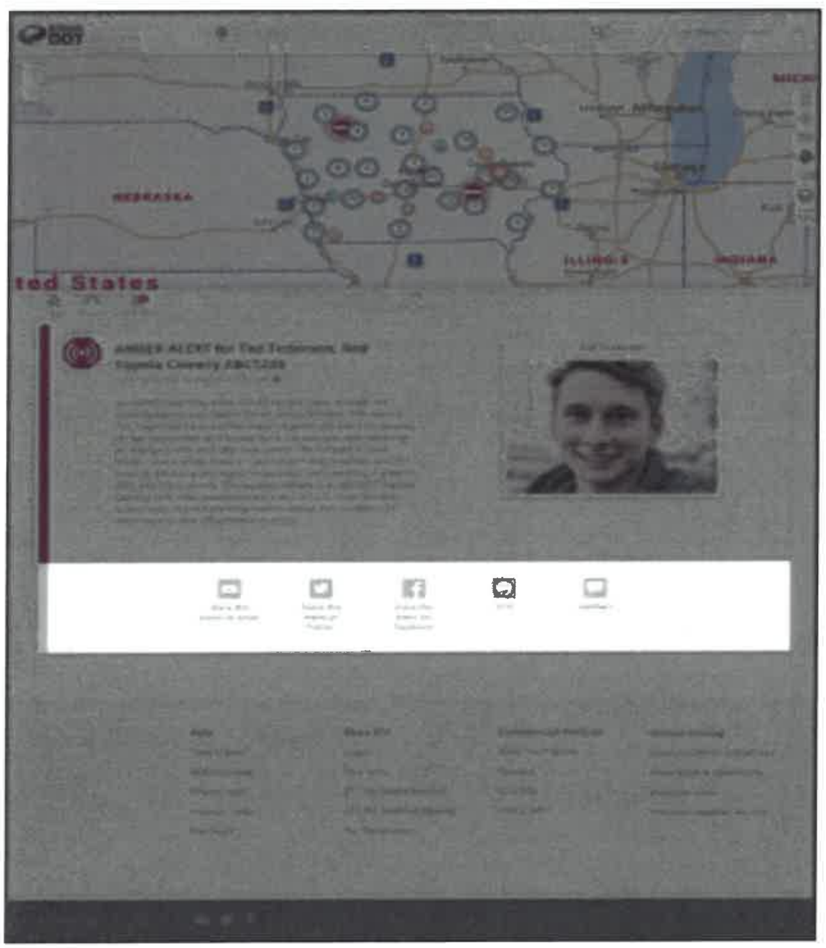



Figure 246 –Social Media

### ENHANCED SOCIAL MEDIA

The iNET™ Decision Support System/Response Plan (DSS) module is directly integration with social media platforms such as Twitter. The iNET™ ATMS provides functionality that will automatically generate “tweets” as a result of a response plan that is generated based on event management characteristics, such as location, severity and lane blockage patterns. Operators of the system can confirm "tweets" generated. INET™ system administrators develop the structured templates that guide the generation of the public traveler information messages that are presented. Upon confirmation by an operator, "tweets" are posted directly to twitter accounts as configured. Additionally, the Castle Rock Alert B posts not only events but also emergency floodgate messages from the ATMS. In addition, agency employees may log directly into the Twitter accounts or use a social media management tool such as HootSuite for easy posting of ad hoc or custom messages.

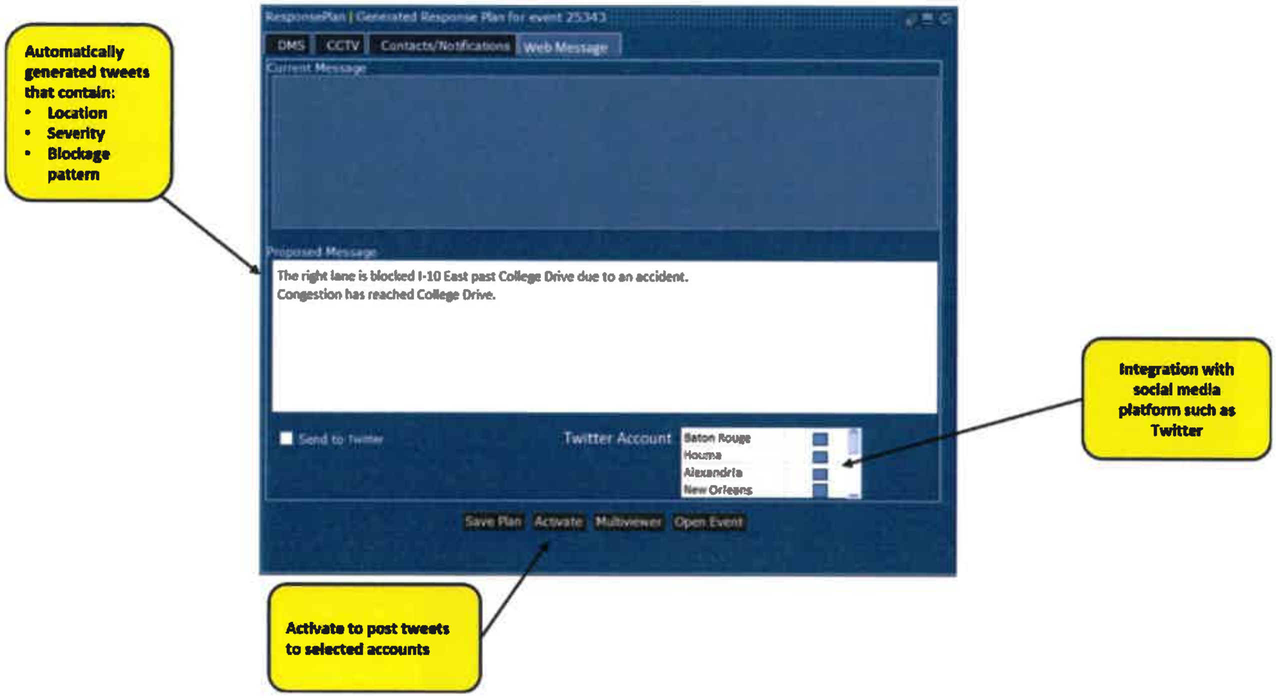



Figure 247 -Web Message

## CONTEXT SENSITIVE ONLINE OPERATOR MANUAL

The ATMS user interface provides a mechanism for operators to view context-sensitive help on all user interface screens. The context-sensitive help that is built into the system points to specific areas in the Operator manuals so that users of the system are immediately aware of how to operate a given area of the ATMS. The context-sensitive help that is made available to users will be enhanced to include flip cards to be used by operators during an emergency.

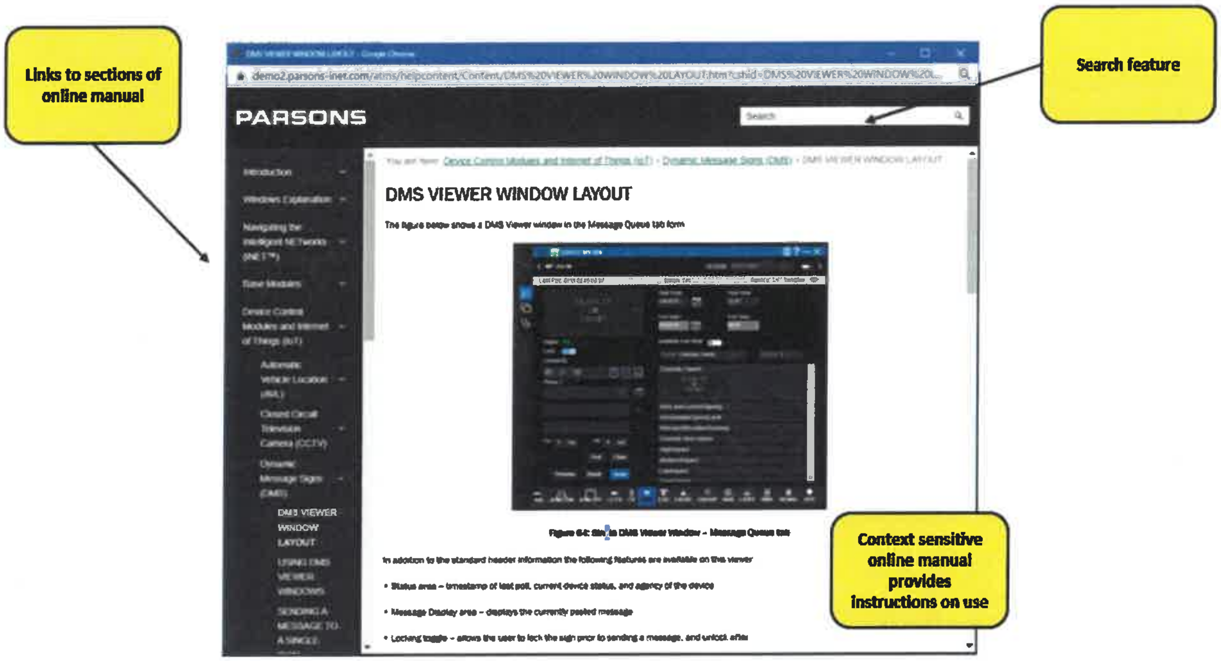



Figure 248 – Online Operator Manual

## 2.2.17 Traffic Signal Control Systems

### 2.2.19.a. Desirables

We will exceed the requirement noted below with the deployment of our iNET™ Traffic Signal Module. See detailed explanation on how our iNET™ Traffic Signal Module exceeds this requirement below.

*REQUIREMENT 4.17.4.1: Although not required at this time, the ATMS should have the capability of adding a traffic signal control module or third-party application for the centralized control of WVDOT traffic signal systems across the state with communication capabilities.*

iNET™ is a flexible, modular based application which allows for the addition or removal of modules with ease. Once the decision is made to move forward with the addition of centralized traffic signal control across the state, iNET™ Traffic Signal Systems (TSS) module can be added to augment the existing system.

The iNET™ Traffic Signal Systems (TSS) module is a full traffic signal monitoring and control system, which includes adaptive, responsive, and TOD traffic signal control functionality. The system includes real-time analytics, arterial traffic signal performance measures, and integration with the other system modules, including the Ramp Metering and Decision Support System modules.

The TSS control feature has the following components (Figure 249):

- **Identification:** this provides static location information for the signal
- **Status:** the current real-time status information is displayed in this section. Two additional features, Visualization and Database Actions, are also available from this section
- **Command:** provides the ability select a pattern to be activated, overriding the local time base schedule until the specified expiry time.

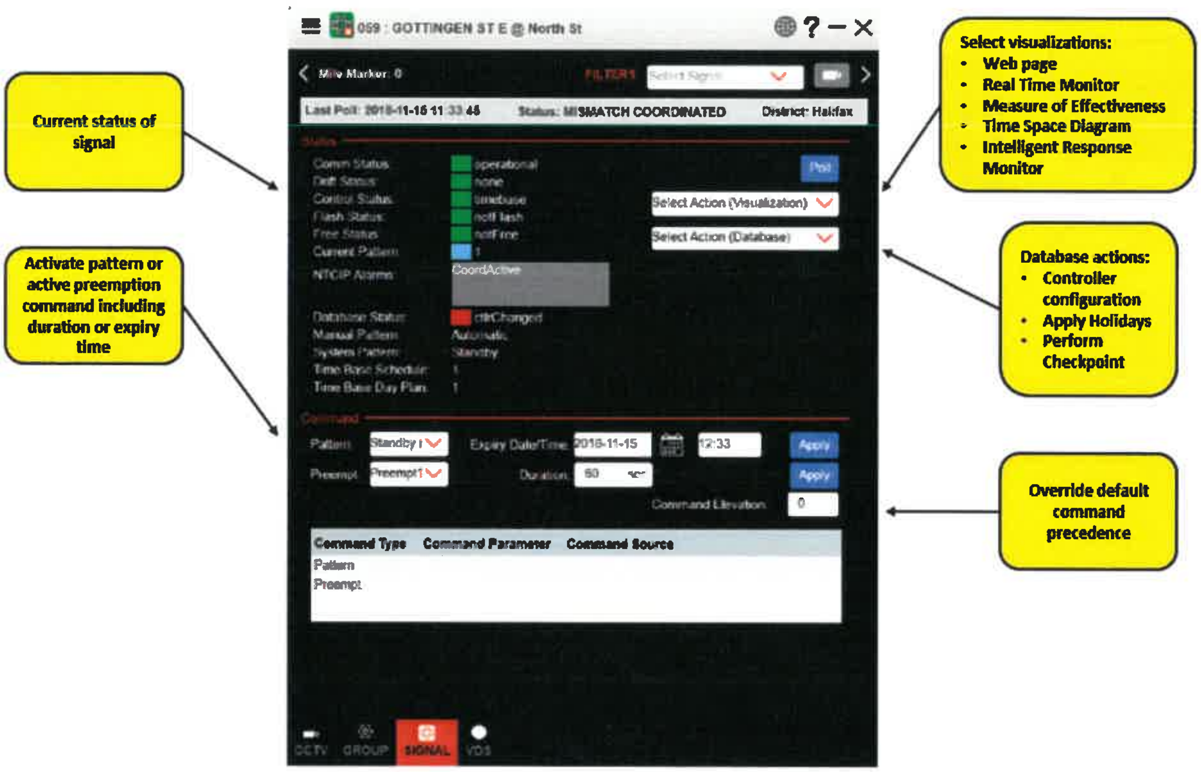



Figure 249 – Signal Module

The Real Time Monitor window displays the second-by-second detailed status of the signal controller, as show in Figure 250. It has a graphical display on the left and a tabular display on the right. The graphical display consists of a background image consisting of a plan view of the intersection overlaid with dynamic symbols indicating the status of the phases and calls. The tabular display area typically contains the following tabs, each presenting the relevant detailed status information using standard NTCIP nomenclature in a spreadsheet-like grid: Phase, Coordination, Detector, Ring, Channel, and Overlap.

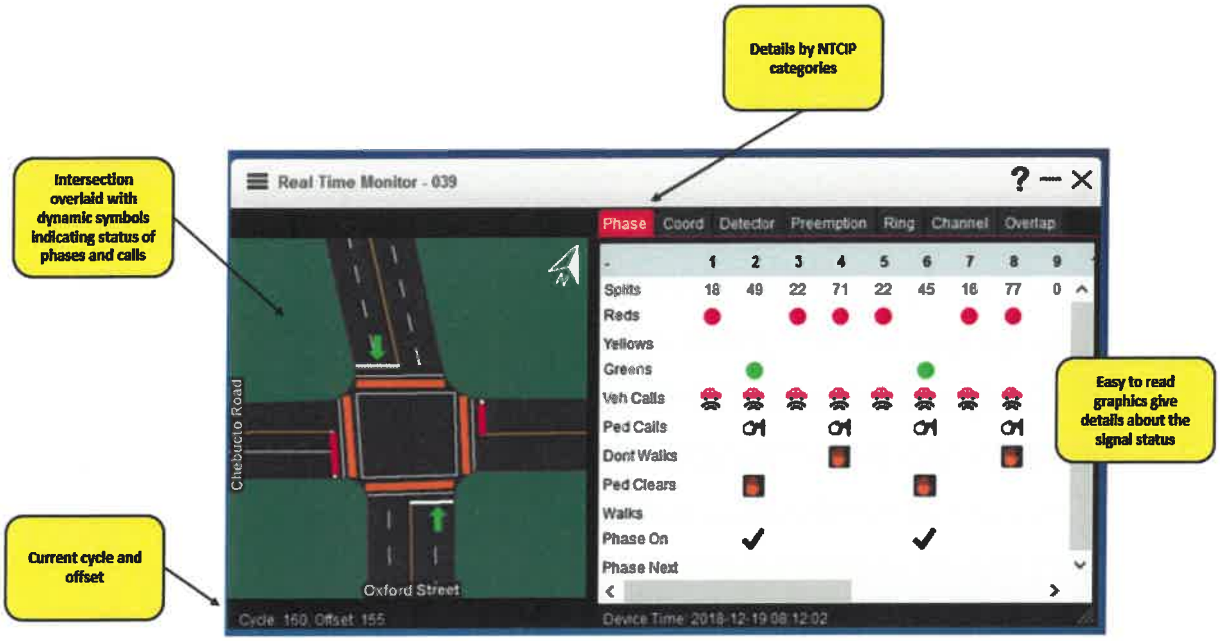



Figure 250 – Real Time Monitor

The Time Space Diagram window (Figure 251) displays the degree of coordination between the Signal and its immediate neighbors on the same roadway in real-time. For the selected roadway, over the past 2-3 cycles, the diagram displays the main-street indications of each Signal along with the resulting green band in the selected direction of flow.

On the diagram, each Signal is represented by two adjoined bars. The two bars represent the main-street indication (red, yellow, or green) of the Signal in both the selected and opposing directions of flow. A black diamond represents the top of the cycle (local cycle zero). A yellow band between the bars represents partial coordination in the selected direction of flow (does not extend through the entire series of Signals). A green band between the bars represents full coordination in the selected direction of flow (extends through the entire series of Signals).

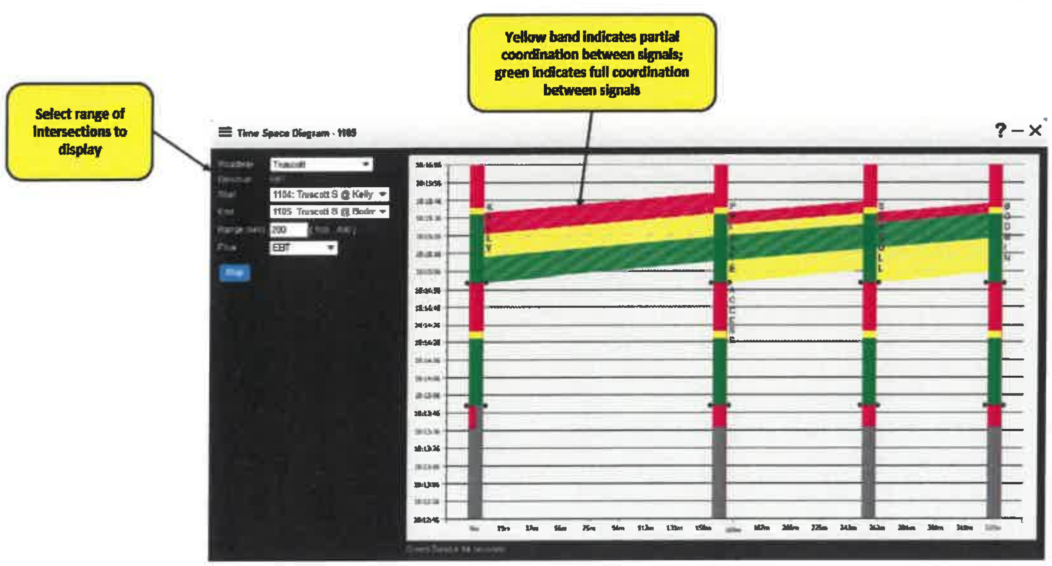



Figure 251 – Time Space Diagram

Table 30 – General System Requirements

| REQUIREMENT ID | REQUIREMENT DESCRIPTION | COMPLY (C/P/N) | COMMENT | EXAMPLE/OTHER DETAILS |
|---|---|---|---|---|
| **MANDATORY REQUIREMENTS** | | | | |
| 4.5.1.1 | The ATMS solution shall be compatible with the State of West Virginia software standards and security policies. The ATMS Solution shall be compatible with Microsoft products and State of West Virginia's acceptable user policy. Here's the link for those policies: West Virginia IT Policies: https://technology.wv.gov/security/Pages/policies-issued-by-the-cto.aspx Security Policy: ttps://technology.wv.gov/SiteCollectionDocuments/Policies%20Issued%20by%2 0the%20CTO/2017/PO1001_Security_Sept2017.pdf | C | Parsons has met this requirement for 74 other ATMS deployments. | The Parsons Cyber and Intelligence (C&I) Division are experts in IT policies especially as it relates to security. Adherence to agency policies is a particular strength of our team. |
| 4.5.1.2 | Functionality of the proposed ATMS and 511 software and systems must be equivalent to or exceed the current functionality as described in the Background and Current Operating Environment Document and in any specific answers to questions submitted to WVDOT through this RFP process. | C | Parsons exceeds most all of the mandatory and optional requirements outlined in the RFP. | See Section 2.2 of our proposal for specifics. |
| 4.5.1.3 | The ATMS Vendor is required to maintain connectivity and key data transfer functionality, during any new or upgraded ATMS software and 511 system installations, between the WVDOT TMC located in Charleston, WV and the remote users and offices that provide information to and/or receive information from the TMC and associated ATMS and 511 software and systems. This includes the current E-911 centers located across the state that provides incident data directly to the ATMS platform and the event/incident window. | C | Parsons are experts at developing and executing transition plans with no system downtime. This includes numerous statewide ATMS and 511 systems. | For the Caltrans ATMS in Los Angeles, Parsons relocated the entire TMC and upgraded the ATMS with only seconds of system interruption during the process. |
| 4.5.1.4 | The Vendor must provide a non-revocable and perpetual license to the WVDOT and its current in-state partner agencies for the use of the ATMS software and its associated systems. | C | Parsons has met this requirement for 60 ATMS solutions already deployed. In addition, we can extend this agency license to include all transportation agencies in the state, at no additional cost. | The States of Georgia and Alabama are example states that have purchased multiagency iNET™ licenses. |

| REQUIREMENT ID | REQUIREMENT DESCRIPTION | COMPLY (C/P/N) | COMMENT | EXAMPLE/OTHER DETAILS |
|---|---|---|---|---|
| 4.5.1.5 | The ATMS Vendor will be required to develop agreements with third-party data providers, software providers, or other system providers required to make the ATMS functional. | C | Parsons has met this requirement for other ATMS solutions | We have worked with Verizon, INRIX and Here to provide third-party data. |
| 4.5.1.6 | A copy of all manuals, diagrams, design documents, requirements documents, testing documentation, training materials, change configuration documentation, upgrades and other material associated with the ATMS software and all associated connections shall be provided to the WVDOT at Final Acceptance and as necessary through the term of the contract. | C | Parsons has met this requirement for 74 other ATMS deployments. | Parsons will make this documentation available on-line within the ATMS as well as within the ATMS context sensitive help feature |

Table 31 – Traffic Display Maps GUI

| REQUIREMENT ID | REQUIREMENT DESCRIPTION | COMPLY (C/P/N) | COMMENT | EXAMPLE/OTHER DETAILS |
|---|---|---|---|---|
| **MANDATORY REQUIREMENTS** | | | | |
| 4.6.1.1 | The ATMS shall display responder information tied to an appropriate highway segment on the TMC operator GUI/traffic conditions map. | C | Parsons has met this requirement for 42 other ATMS solutions | We identify the specific highway segment location and dispatch responders to the scene automatically |
| 4.6.1.2 | The ATMS shall support an interactive base map for displaying the ITS devices statewide. | C | Parsons supports Bing, Google, OpenStreet, ESRI and DM Solutions Maps | We also provide 3D mapping with our solution. |
| 4.6.1.3 | The ATMS map shall support pan and zoom capabilities throughout the State of West Virginia and into adjoining states. | C | Parsons has met this requirement for 74 other ATMS solutions | Users are able to easily switch between various map types and styles. |
| 4.6.1.4 | The ATMS shall display real-time traffic conditions using a standard color coding of green for uncongested conditions through yellow and amber for moderate congestion to red for high congestion on freeways and roadways shown on the map. Real-time latency shall be no more than 5 minutes. | C | Parsons has met this requirement for other 60+ other ATMS solutions | Parsons provides 20-30 second latency for most of our ATMS deployments. |
| 4.6.1.5 | The ATMS shall provide an icon for each type of ITS device identified as part of WVDOT ITS. | C | Parsons has met this requirement for 74 other ATMS solutions | We can create unique icons/icon art specific for WVDOT |
| 4.6.1.6 | The ATMS shall provide a layer for each type of ITS device identified as part of the WVDOT ITS. | C | Parsons has met this requirement for 74 other ATMS solutions | We can create unique icons/icon art specific for WVDOT |
| 4.6.1.7 | The ATMS map shall provide declutter features to provide appropriate number or size of icons as maps are zoomed in or out consistent with layer selection. | C | Parsons has met this requirement for 74 other ATMS solutions | Our solution has various ways to declutter the map and icon displays |
| **DESIRABLES** | | | | |
| 4.6.2.1 | The ATMS should have the ability to integrate and share data with neighboring states including CCTV video. | C | Parsons has met this requirement for other ATMS solutions | Users are able to easily switch between various map types and styles. |

| REQUIREMENT ID | REQUIREMENT DESCRIPTION | COMPLY (C/P/N) | COMMENT | EXAMPLE/OTHER DETAILS |
|---|---|---|---|---|
| 4.6.2.2 | The ATMS map should display all major freeways and streets with graphical representation for each roadway classification. | C | Parsons supports this requirement with Bing, Google, OpenStreet, ESRI and DM Solutions Maps | We also provide 3D mapping with our solution. |
| 4.6.2.3 | The ATMS should allow user selection of type of traffic measurement for near real-time traffic condition display including speeds, volume, occupancy, and (optionally) a combined traffic metric. | C | Parsons has met this requirement for other 60+ other ATMS solutions | Parsons provides 20-30 second latency for most of our ATMS deployments. |
| 4.6.2.4 | The ATMS should allow selection of numerical limits associated with each display color for each type of traffic measurement by a user with sufficient authorization. These parameters should be applied to all traffic condition map/GUI displays. | C | Parsons has met this requirement for other 60+ other ATMS solutions | This is a standard feature for our vehicle detection system module |
| 4.6.2.5 | The ATMS should depict summary device status using coloration of appropriate ITS device icons with the corresponding ITS field device. | C | Parsons has met this requirement for 74 other ATMS solutions | All icons are color coded to represent the current state of icon health and use. |
| 4.6.2.6 | The ATMS should be able to display detailed device information appropriate to the individual type of device upon selection of an icon from the map/GUI. | C | Parsons has met this requirement for 74 other ATMS solutions | All icons are color coded to represent the current state of icon health and use. |
| 4.6.2.7 | The ATMS base map should display neighboring states at a minimum of 25 miles outside of the state's border or have the ability to pan to adjacent states. | C | Parsons has met this requirement for 74 other ATMS solutions | Parsons will provide mapping for WV that covers all neighboring states as well as the entire county. |
| 4.6.2.8 | The user interface map display should display icons representing locations of traffic data sensors connected to the ATMS. | C | Parsons has met this requirement for other 60+ other ATMS solutions | This is a standard feature for our vehicle detection system module |
| 4.6.2.9 | The user interface map should enable operators to select traffic data sensors to view the most recent data recorded from the sensor. | C | Parsons has met this requirement for other 60+ other ATMS solutions | This is a standard feature for our vehicle detection system module |

| REQUIREMENT ID | REQUIREMENT DESCRIPTION | COMPLY (C/P/N) | COMMENT | EXAMPLE/OTHER DETAILS |
|---|---|---|---|---|
| 4.6.2.10 | The user interface map should enable operators to select traffic data sensors to view archived data recorded from the sensor within user defined parameters. | C | Parsons has met this requirement for other 60+ other ATMS solutions | Users are able to run standard reports or ad hoc reports at any time. There is also a real-time historical graph that can be accessed directly from the user interface. |
| 4.6.2.11 | The ATMS base map should show traffic speeds by lane or as an average across all lanes in each direction (station) at user option. | C | Parsons has met this requirement for other 60+ other ATMS solutions | This is a standard feature for our vehicle detection system module |
| 4.6.2.12 | The ATMS base map should show traffic volume by lane or as a total across all lanes in each direction (station) at user option. | C | Parsons has met this requirement for other 60+ other ATMS solutions | This is a standard feature for our vehicle detection system module |
| 4.6.2.13 | The ATMS base map should show traffic occupancy by lane or as an average across all lanes in each direction (station) at user option. | C | Parsons has met this requirement for other 60+ other ATMS solutions | This is a standard feature for our vehicle detection system module |

Table 32 - Device Control DMS

| REQUIREMENT ID | REQUIREMENT DESCRIPTION | COMPLY (C/P/N) | COMMENT | EXAMPLE/OTHER DETAILS |
|---|---|---|---|---|
| **MANDATORY REQUIREMENTS** | | | | |
| 4.7.1.1 | The ATMS shall include and interface for Dynamic Message Sign (DMS) control and management. | C | Parsons has met this requirement for 52 other ATMS solutions | Parsons ATMS Solutions control over 3200 DMS today. |
| 4.7.1.2 | The ATMS shall communicate with each DMS connected to the ATMS to receive all parameters describing the DMS, as contained in NTCIP messages (as defined by NTCIP Object Definitions). | C | Parsons has met this requirement for 52 other ATMS solutions | Parsons are experts and pioneers in the implementation of NTCIP-based field device control. |
| 4.7.1.3 | The ATMS shall display the parameters for each DMS as received from the standardized NTCIP message. The ATMS will adapt entered text and message library text to fit the specific DMS configuration, unless restricted by size. | C | Parsons has met this requirement for 52 other ATMS solutions | This is a standard feature of our DMS module. |
| 4.7.1.4 | The ATMS shall include the capability for operators to control the messages that are displayed on fixed and portable DMS connected to the ATMS. | C | Parsons has met this requirement for 52 other ATMS solutions | This is a standard feature of our DMS module. |
| 4.7.1.5 | The ATMS shall include logic to manage multiple agencies and users who might simultaneously attempt to control a common DMS. | C | Parsons has met this requirement for 52 other ATMS solutions | The system has a full priority queueing administrative feature that allows priorities of users/agencies to be assigned |
| 4.7.1.6 | DMS control shall be dependent on appropriate user permissions. | C | Parsons has met this requirement for 52 other ATMS solutions | This is a standard feature of our System Administration and Security (SAS) module. |
| 4.7.1.7 | If a conflict between requested messages arise, the owning agency will have priority. | C | Parsons has met this requirement for 52 other ATMS solutions | The system has a full priority queueing administrative feature that allows priorities of users/agencies to be assigned |
| 4.7.1.8 | If a conflict between requested messages arise and all conflicting requests are from the same agency, the system will grant the request of the user with the highest priority. | C | Parsons has met this requirement for 52 other ATMS solutions | The system has a full priority queueing administrative feature that allows priorities of users/agencies to be assigned |

| REQUIREMENT ID | REQUIREMENT DESCRIPTION | COMPLY (C/P/N) | COMMENT | EXAMPLE/OTHER DETAILS |
|---|---|---|---|---|
| 4.7.1.9 | The ATMS shall have the capability to alert an operator with an agency that owns a DMS if another agency posts a message to the DMS. | C | Parsons has met this requirement for 52 other ATMS solutions | The system has a full priority queuing administrative feature that allows priorities of users/agencies to be assigned |
| 4.7.1.10 | The ATMS shall have the capability to alert an operator who has posted a DMS message if another operator has overridden the message by posting another message. | C | Parsons has met this requirement for 52 other ATMS solutions | The system has a full priority queuing administrative feature that allows priorities of users/agencies to be assigned |
| 4.7.1.11 | The ATMS shall provide a mechanism for authorized users to control the messages displayed on DMS from remote locations. | C | Parsons has met this requirement for 52 other ATMS solutions | This can be done remotely by any computer with a web browser or by using the iNET™ mobile module on a tablet or smartphone. |
| 4.7.1.12 | The ATMS shall include the capability for automated message creation. | C | Parsons has met this requirement for 52 other ATMS solutions | This is done using the iNET™ Decision Support System (DSS) module. |
| 4.7.1.13 | The ATMS shall include logic to manage conflicts between automatically generated messages (e.g. travel time displays etc.) and manually generated messages. | C | Parsons has met this requirement for 52 other ATMS solutions | The iNET™ DMS queuing feature is used to resolve these conflicts. The message concatenation feature can also be used. |
| 4.7.1.14 | The ATMS shall include the capability to automatically generate messages for DMS to display Travel Times, as collected/calculated by the ATMS. | C | Parsons has met this requirement for 52 other ATMS solutions | This is done using the iNET™ Decision Support System (DSS) module. |
| 4.7.1.15 | The ATMS shall include DMS message libraries. | C | Parsons has met this requirement for 52 other ATMS solutions | This is a standard feature of our DMS module. |
| 4.7.1.16 | The ATMS shall allow authorized users to select a message from any of the DMS message libraries. | C | Parsons has met this requirement for 52 other ATMS solutions | This is a standard feature of our DMS module. |

| REQUIREMENT ID | REQUIREMENT DESCRIPTION | COMPLY (C/P/N) | COMMENT | EXAMPLE/OTHER DETAILS |
|---|---|---|---|---|
| 4.7.1.17 | The ATMS shall allow authorized users to generate a message from free text. | C | Parsons has met this requirement for 52 other ATMS solutions | This is a standard feature of our DMS module. All free text messages will be checked using the embedded spell checker. |
| 4.7.1.18 | The ATMS shall allow for additional DMS message libraries to be generated by authorized users or edits to be made to the DMS message libraries. | C | Parsons has met this requirement for 52 other ATMS solutions | This is a standard feature of our DMS module. |
| 4.7.1.19 | All messages from all the DMS message libraries shall be accessible from a master DMS message library. | C | Parsons has met this requirement for 52 other ATMS solutions | This is a standard feature of our DMS module. |
| 4.7.1.20 | The ATMS shall allow authorized users to select that a DMS message be displayed on multiple selected DMS without needing to re-enter the message for each sign selected. | C | Parsons has met this requirement for 52 other ATMS solutions | This is a standard feature of our DMS module. |
| 4.7.1.21 | The ATMS shall allow authorized users to select a DMS message, either standard or custom, for display on all signs controlled by the ATMS. | C | Parsons has met this requirement for 52 other ATMS solutions | This is a standard feature of our DMS module. |
| 4.7.1.22 | The ATMS shall communicate with all legacy field devices currently used by WVDOT and future DMS procurements. | C | Parsons has met this requirement for 52 other ATMS solutions | Our solution has a large library of standards-based and proprietary protocols. |
| 4.7.1.23 | The ATMS shall be able to display a predefined travel time message to a selected set of DMS and update the travel time estimate dynamically without user interaction. | C | Parsons has met this requirement for 52 other ATMS solutions | This is a standard feature of our Travel Time (TT) module. We have recently improved our TT estimation using machine learning intelligence. |
| 4.7.1.24 | The ATMS user shall be able to save a new message in a message library. | C | Parsons has met this requirement for 52 other ATMS solutions | This is a standard feature of our DMS module. |
| 4.7.1.25 | The ATMS user shall be able to choose a predefined message from message library, edit and resave the message. | C | Parsons has met this requirement for 52 other ATMS solutions | This is a standard feature of our DMS module. |

| REQUIREMENT ID | REQUIREMENT DESCRIPTION | COMPLY (C/P/N) | COMMENT | EXAMPLE/OTHER DETAILS |
|---|---|---|---|---|
| 4.7.1.26 | The ATMS shall provide assistance in selecting standard DMS messages from the message library. | C | Parsons has met this requirement for 52 other ATMS solutions | This is a standard feature of our DMS module. |
| 4.7.1.27 | The ATMS shall be able to send a message to one or more signs simultaneously. | C | Parsons has met this requirement for 52 other ATMS solutions | This is a standard feature of our DMS module. |
| 4.7.1.28 | ATMS users shall be able to delete a message from the message library. | C | Parsons has met this requirement for 52 other ATMS solutions | This is a standard feature of our DMS module. |
| 4.7.1.29 | The ATMS shall be able to terminate messages. | C | Parsons has met this requirement for 52 other ATMS solutions | This is a standard feature of our DMS module. |
| 4.7.1.30 | The ATMS shall support daily automated diagnostic of DMS, including alarm generation based on diagnostic results, results logging, and results archival. | C | Parsons has met this requirement for 52 other ATMS solutions | All device alarms appear in the alarm window. Alerts can occur both visually and audibly. |
| 4.7.1.31 | The ATMS shall provide the ability to control and retrieve information from a DMS via NTCIP 1203vl. | C | Parsons has met this requirement for 40+ other ATMS solutions | Parsons are experts and pioneers in the implementation of NTCIP-based field device control. |
| 4.7.1.32 | The ATMS shall provide the ability to control and retrieve information from a DMS using permanent DMS protocol(s). | C | Parsons has met this requirement for 52 other ATMS solutions | Our solution has a large library of standards-based and proprietary protocols. |
| 4.7.1.33 | The ATMS shall provide the ability to control and retrieve information from a DMS using portable DMS protocol(s). | C | Parsons has met this requirement for 52 other ATMS solutions | Our solution has a large library of standards-based and proprietary protocols. |
| 4.7.1.34 | The ATMS shall support storage and display of messages including uppercase alphanumeric characters and at minimum the following special characters: #@&8+< >!?./- and arrows. | C | Parsons has met this requirement for 52 other ATMS solutions | This is a standard feature of our DMS module. |

| REQUIREMENT ID | REQUIREMENT DESCRIPTION | COMPLY (C/P/N) | COMMENT | EXAMPLE/OTHER DETAILS |
|---|---|---|---|---|
| 4.7.1.35 | The DMS Interface shall provide an interface for sequencing up to three line message panels as well as full matrix DMS, including graphics. | C | Parsons has met this requirement for 52 other ATMS solutions | This is a standard feature of our DMS module. |
| 4.7.1.36 | The ATMS shall support the use of full color DMS and graphics. | C | Parsons has met this requirement for several other ATMS solutions | This is a standard feature of our DMS module. |
| **DESIRABLES** | | | | |
| 4.7.2.1 | The ATMS may have a master library of DMS messages that may be sorted by the capability of DMS that an operator is placing a message on. When the operator selects a certain DMS, the message library available to that DMS may be restricted by the size and capability of that DMS. | C | Parsons has met this requirement for 52 other ATMS solutions | The library capabilities of our solution are extensive. There are also fully automated response plans where the system recommends the messages based upon DSS templates. |
| 4.7.2.2 | The ATMS should support retrieval and display DMS status reports including at a minimum sign display content, illumination, pixel failures, power status communication status, and temperature. Fan error and humidity are highly desired, if available from field hardware. | C | Parsons has met this requirement for 52 other ATMS solutions | There are full DMS diagnostic and reporting capabilities. |

Table 33 – Device Control CCTV

| REQUIREMENT ID | REQUIREMENT DESCRIPTION | COMPLY (C/P/N) | COMMENT | EXAMPLE/OTHER DETAILS |
|---|---|---|---|---|
| **MANDATORY REQUIREMENTS** | | | | |
| 4.8.1.1 | The ATMS shall provide a mechanism for operators to view real-time video from CCTV cameras. | C | Parsons has met this requirement for 55 other ATMS solutions | Parsons supports a large library of CCTV camera control protocols as well as all standard video compression algorithms. |
| 4.8.1.2 | The ATMS shall provide a mechanism for operators to control CCTV cameras (pan, tilt, zoom). | C | Parsons has met this requirement for 55 other ATMS solutions | Parsons supports a large library of CCTV camera control protocols, including NTCIP standards, ONVIF Standards and proprietary protocols. |
| 4.8.1.3 | The ATMS shall include capability to set camera pre-sets. | C | Parsons has met this requirement for 55 other ATMS solutions | This a standard feature of our CCTV module. |
| 4.8.1.4 | The ATMS will allow an operator to develop camera tours made up of views and presets from operator configurable cameras. | C | Parsons has met this requirement for 55 other ATMS solutions | This a standard feature of our CCTV module. |
| 4.8.1.5 | The ATM shall include fine control of pan, tilt and zoom for CCTV cameras. | C | Parsons has met this requirement for 55 other ATMS solutions | This a standard feature of our CCTV module. |
| 4.8.1.6 | The ATMS shall enable all users and TMC partner agencies with an ATMS client or workstation to view and control CCTV, according to their assigned user permissions. | C | Parsons has met this requirement for 55 other ATMS solutions | The System Administration and Security (SAS) module allows camera permissions to be assigned to all users and user groups. |
| 4.8.1.7 | The ATMS shall determine rights and privileges of camera control based on permission and priority assigned to users by an administrator. | C | Parsons has met this requirement for 55 other ATMS solutions | The System Administration and Security (SAS) module allows camera permissions to be assigned to all users and user groups. |
| 4.8.1.8 | The ATMS shall provide video recording capabilities. | C | Parsons has met this requirement for 55 other ATMS solutions | This standard feature is available using network NVRs or DVRs. |

| REQUIREMENT ID | REQUIREMENT DESCRIPTION | COMPLY (C/P/N) | COMMENT | EXAMPLE/OTHER DETAILS |
|---|---|---|---|---|
| 4.8.1.9 | The ATMS shall control and allow viewing from both digital and analog cameras. | C | Parsons has met this requirement for 20 other ATMS solutions | We support all standard digital and analog video formats. |
| 4.8.1.10 | The ATMS shall interface with the workstation and video wall controller for the TMC video wall for viewing capability by operators. (Note: The current manufacture protocol in the existing ATMS system is VICADS version 4.1) | C | Parsons has met this requirement for 20+ other ATMS solutions | Our ATMS supports interfaces with all major video wall controller manufacturers. |
| 4.8.1.11 | The ATMS shall enable operators to select the configuration of the video wall. | C | Parsons has met this requirement for 20+ other ATMS solutions | Our ATMS supports interfaces with all major video wall controller manufacturers. |
| 4.8.1.12 | The ATMS shall enable operators to select what camera feeds are displayed on specific portions of the video wall. | C | Parsons has met this requirement for 20+ other ATMS solutions | Our ATMS supports interfaces with all major video wall controller manufacturers. |
| 4.8.1.13 | The ATMS shall include capability to block selected cameras from selected viewers, while enabling other viewers to continue to view the camera video. | C | Parsons has met this requirement for other ATMS solutions | We will fully implement this requirement |
| 4.8.1.14 | The ATMS shall communicate with all legacy field devices currently used WVDOT. (Note: All field devices are 2008 or newer and are on the WVDOH APL.) | C | Parsons has met this requirement for 55 other ATMS solutions | Parsons supports a large library of CCTV camera control protocols as well as all standard video compression algorithms. |
| 4.8.1.15 | The ATMS solution shall control the distribution of all traffic images for internal and external use on the public website and 511 app. | C | Parsons has met this requirement for 10 other ATMS solutions | Parsons has implemented video distribution solutions using open-source (e.g. VLC) and other proprietary products. |
| 4.8.1.16 | The ATMS solution shall collect and report current camera status, e.g. communication, image status, and PTZ status. | C | Parsons has met this requirement for 55 other ATMS solutions | This is a standard feature of our CCTV module. |

| REQUIREMENT ID | REQUIREMENT DESCRIPTION | COMPLY (C/P/N) | COMMENT | EXAMPLE/OTHER DETAILS |
|---|---|---|---|---|
| 4.8.1.17 | The operator shall be able to select a camera from the CCTV menu or GUI map. | C | Parsons has met this requirement for 55 other ATMS solutions | This is a standard feature of our CCTV module. |
| 4.8.1.18 | The ATMS shall provide a demand indicator on the user's screen that will display when another authorized use requires control of the camera PTZ | C | Parsons has met this requirement for 55 other ATMS solutions | This feature is enabled via our camera locking feature. |
| 4.8.1.19 | The ATMS shall provide preset positions and the capability of programming a minimum of four (4) PTZ preset positions. The presets shall not be deleted/lost if the ATMS or camera software loses connection to the device. | C | Parsons has met this requirement for 55 other ATMS solutions | This is a standard feature of our CCTV module. |
| 4.8.1.20 | The ATMS shall display camera ID within the video image consisting of the name of the camera location at the administrator option. | C | Parsons has met this requirement for 55 other ATMS solutions | This is displayed within the CCTV viewer dialog. |
| 4.8.1.21 | The ATMS shall provide for the display of a camera control ID of the party controlling the camera control ID of the party controlling the camera when not in a preset position at administrator option | C | Some customization is needed for this requirement. | The iNET™ camera module will display the user that is currently controlling the camera. |
| 4.8.1.22 | The ATMS shall provide a selectable time-out feature which is a programmable interval (range of 2 to 30 minutes) or event identification in which the camera must automatically return to a preset default position after the last camera control commands is received or the event is terminated. | C | Parsons has met this requirement for 55 other ATMS solutions | This is a standard feature of our CCTV module. |
| 4.8.1.23 | The ATMS shall be capable of at least four independent camera tours consisting of display to a user-selected video monitor consisting of a user-selected camera and (optional) preset for display of a user-selected duration. (Note: The current ATMS system utilizes additional screens connects to the operator's workstation) | C | Parsons has met this requirement for 55 other ATMS solutions | This is a standard feature of our CCTV module. |
| 4.8.1.24 | The ATMS shall allow a pan-tilt-zoom (PTZ) and focus and iris control by any authorized user. | C | Parsons has met this requirement for 55 other ATMS solutions | This is a standard feature of our CCTV module. |

| REQUIREMENT ID | REQUIREMENT DESCRIPTION | COMPLY (C/P/N) | COMMENT | EXAMPLE/OTHER DETAILS |
|---|---|---|---|---|
| 4.8.1.25 | The ATMS shall validate that users have authorized access and priority for full camera control. | C | Parsons has met this requirement for 55 other ATMS solutions | This is a standard feature of our CCTV module. |
| 4.8.1.26 | The ATMS interface shall provide a mechanism for capturing still and moving video images from CCTV video streams in standard format such as JPEG and publishing them to the traffic web page. | C | Parsons has met this requirement for other ATMS solutions | These images can be saved as jog files to the local or network directories. |
| 4.8.1.27 | The ATMS shall allow for camera view access by television media with appropriate rights and restrictions | C | Parsons has met this requirement for 55 other ATMS solutions | This is a standard feature of our CCTV module. |
| **DESIRABLES** | | | | |
| 4.8.2.1 | The ATMS should include capability to set camera pre-sets by time of day/day of week, season of the year, and by independent user | C | Parsons has met this requirement for 55 other ATMS solutions | The System Administration and Security (SAS) module allows camera permissions to be assigned to all users and user groups as well as to set priority privileges. |
| 4.8.2.2 | The ATMS should manage conflicts between pre-sets selected by multiple users. | C | Parsons has met this requirement for 55 other ATMS solutions | The System Administration and Security (SAS) module allows camera permissions to be assigned to all users and user groups as well as to set priority privileges. |
| 4.8.2.3 | CCTV control from users accessing the ATMS from within the TMC should have a latency of no more than 0.5 second (current ATMS is configured to meet this requirement) as defined by the time an operator executes a control command and when an operator is able to visually verify the command was completed on a workstation or video wall. | C | Parsons has met this requirement for many other ATMS solutions | We support this latency capability, but this is often a function of the network performance as well. |
| 4.8.2.4 | CCTV control from users accessing the ATMS from remote access should have a latency of no more than 0.5 seconds as defined by the time an operator executes a control command and when an operator is able to visually verify the command was completed on a workstation or video wall. | C | Parsons has met this requirement for many other ATMS solutions | We support this latency capability, but this is often a function of the network performance as well. |

| REQUIREMENT ID | REQUIREMENT DESCRIPTION | COMPLY (C/P/N) | COMMENT | EXAMPLE/OTHER DETAILS |
|---|---|---|---|---|
| 4.8.2.5 | The ATMS should interface to cameras operated by TMC partners on arterial roadways. | C | Parsons has met this requirement for 55 other ATMS solutions | This is a standard feature of our CCTV module. |
| 4.8.2.6 | The ATMS should provide an interface that allows operators to manage, control, and display multiple closed circuit television cameras including pan-tilt-zoom functions and manual camera functions available from the camera vendors where applicable. camera image display must include simultaneous display of all cameras up to the number of monitors in the TMC. | C | Parsons has met this requirement for other ATMS solutions | This feature can be accommodated, depending on the camera manufacturer interface. |
| 4.8.2.7 | The ATMS should allow reclamation of control of a camera being demanded by other users based on user privilege levels. | C | Parsons has met this requirement for 55 other ATMS solutions | The System Administration and Security (SAS) module allows camera permissions to be assigned to all users and user groups. This includes camera locking and user priority levels. |
| 4.8.2.8 | The ATMS should display the name of camera preset selected within the video image when pointed using the preset capability at administrator option. | C | Parsons has met this requirement for other ATMS solutions | This capability is dependent on the functionality of the camera device. |

Table 34 – Device Control RWIS

| REQUIREMENT ID | REQUIREMENT DESCRIPTION | COMPLY (C/P/N) | COMMENT | EXAMPLE/OTHER DETAILS |
|---|---|---|---|---|
| **MANDATORY REQUIREMENTS** | | | | |
| 4.9.1.1 | The ATMS shall monitor weather data from the field devices and set threshold levels for conditions that must be posted on the GUI and integrated with the notification system. | C | Parsons has met this requirement for 11 other ATMS solutions. | This is a standard feature within our alarm window. |
| 4.9.1.2 | The ATMS shall accept weather sensor data coming from existing and future environmental sensors and systems. (Note: Current system is Vaisala; however, may have different options in the future) | C | Parsons has met this requirement for 11 other ATMS solutions. | We support various proprietary and standard NTCIP ESS/RWIS Interfaces. |
| 4.9.1.3 | The ATMS shall log RWIS data for operational retrieval and reporting purposes. | C | Parsons has met this requirement for 11 other ATMS solutions. | This feature is enabled via our Data Archiving and Reporting (DAR) module. |
| 4.9.1.4 | The ATMS shall support daily automated diagnostics for field RWIS devices, including alarm generation based on diagnostic results and results logging. | C | Parsons has met this requirement for 11 other ATMS solutions. | This is a standard feature of our ESS/RWIS Module. |
| **DESIRABLES** | | | | |
| 4.9.2.1 | The ATMS should enable viewing of RWIS cameras. | C | Parsons has met this requirement for other ATMS solutions | This is a standard feature of our ESS/RWIS Module. |
| 4.9.2.2 | The ATMS should provide an alert to operators when user defined thresholds are met. e.g. The pavement temperature drops below 32 degrees F. | C | Parsons has met this requirement for other ATMS solutions | This is a standard feature within our alarm window. |
| **DATA SENSORS DESIRABLES** | | | | |
| 4.9.3.1 | Although WVDOT does not currently have any data collection sensors in use, they desire this functionality in the future. A detector device control application should be available if and when WVDOT installs detectors. | C | Parsons has met this requirement for 11 other ATMS solutions. | We support various proprietary and standard NTCIP ESS/RWIS Interfaces. |
| 4.9.3.2 | The ATMS should have the ability to integrate with and accept data from third-party data providers such as Waze, HERE, INRIX, etc. or approved equal. | C | Parsons has met this requirement for other ATMS solutions | We support various proprietary and standard NTCIP ESS/RWIS Interfaces. |

| REQUIREMENT ID | REQUIREMENT DESCRIPTION | COMPLY (C/P/N) | COMMENT | EXAMPLE/OTHER DETAILS |
|---|---|---|---|---|
| 4.9.3.3 | The ATMS should provide an interface that allows operators to manage and view a summary of information from roadway sensors to the present status of the entire roadway network including a summary of individual traffic variables (speed, volume, occupancy, or a combined congestion metric) and the status (functional or nonfunctional) of all traffic sensors. | C | Parsons has met this requirement for other ATMS solutions | This is a standard feature of our ESS/RWIS Module. |
| 4.9.3.4 | The ATMS should display an alarm notification when traffic speeds drop, volume rises, or occupancy increases beyond configurable thresholds. | C | Parsons has met this requirement for other ATMS solutions | This is a standard feature within our alarm window. |
| 4.9.3.5 | The ATMS should update the 511 website interface with information including a summary of individual traffic variables (speed, volume, occupancy, or a combined congestion metric). | C | Parsons has met this requirement for other ATMS solutions | This information will be interfaced using our C2C module and 511 system. |
| 4.9.3.6 | The ATMS should update the ATMS traffic conditions map/GUI with measurements from traffic sensors and derived traffic variables on a frequency of once per minute or more frequent with data that have been collected two minutes or less prior. | C | Parsons has met this requirement for other ATMS solutions | This is a standard feature of our Map Module. |
| 4.9.3.7 | The ATMS should automatically measure or calculate volume, traffic speeds, and occupancy. | C | Parsons has met this requirement for other ATMS solutions | This is a standard feature of our Vehicle Detection System Module |
| 4.9.3.8 | The ATMS should calculate and be able to display vehicle classification information. | C | Parsons has met this requirement for other ATMS solutions | This is a standard feature of our Vehicle Detection System Module |

Table 35 – Events and Reporting

| REQUIREMENT ID | REQUIREMENT DESCRIPTION | COMPLY (C/P/N) | COMMENT | EXAMPLE/OTHER DETAILS |
|---|---|---|---|---|
| **MANDATORY REQUIREMENTS** | | | | |
| 4.10.1.1 | The ATMS shall provide a mechanism for operators to manage incidents and events through a dialog box or user interface. | C | Parsons has met this requirement for 45 other ATMS solutions | Parsons ATMS Solutions manage thousands of events on a daily basis. |
| 4.10.1.2 | The ATMS shall store and provide operators with access to event information (incidents, construction/maintenance, parking, etc.) as entered by users. | C | Parsons has met this requirement for 45 other ATMS solutions | The ATMS has a standard UI to generate predefined canned reports. Ad-hoc reporting capabilities will also be provided. |
| 4.10.1.3 | The ATMS shall provide a mechanism for operators to enter/create new incidents or events. Data to be entered may include, but not be limited to: type, location (jurisdiction, route, mile post, direction, lat-long, exit number), source, details, impacts, agencies to notify, response, narrative/comments, activity log, lane configuration, lane impacts, and severity. | C | Parsons has met this requirement for 45 other ATMS solutions | Parsons ATMS Solutions manage thousands of events on a daily basis using all of the details listed in this requirement. |
| 4.10.1.4 | Users shall have the option to select from pre-defined phrase to describe the incident or event. | C | Parsons has met this requirement for 45 other ATMS solutions | Fields can be free text of from pull-down menus. The pull-down selection is editable by system users/administrators. |
| 4.10.1.5 | Users shall have the option to enter free text to describe the incident or event. | C | Parsons has met this requirement for 45 other ATMS solutions | Fields can be free text of from pull-down menus. The pull-down selection is editable by system users/administrators. |
| 4.10.1.6 | Users shall have the option to enter free text to describe the incident or event for descriptions posted to 511. | C | Parsons has met this requirement for 45 other ATMS solutions | Fields can be free text of from pull-down menus. The pull-down selection is editable by system users/administrators. |
| 4.10.1.7 | Users shall be required to specify the location of the incident either through data entry or pin-dropping on a map such that the ATMS can capture the location of the incident relative to the route, direction and location (mile post and/or lat-long). | C | Parsons has met this requirement for 45 other ATMS solutions | Both options are available. |
| 4.10.1.8 | Users shall be required to enter the start and end time of the incident or event. | C | Parsons has met this requirement for 45 other ATMS solutions | This is a standard feature of our Event Management (EM) Module |

| REQUIREMENT ID | REQUIREMENT DESCRIPTION | COMPLY (C/P/N) | COMMENT | EXAMPLE/OTHER DETAILS |
|---|---|---|---|---|
| 4.10.1.9 | The ATMS shall allow incident or event start times in the future to be entered and pre-defined actions to take place ( e.g. construction events are often entered before the start time). | C | Parsons has met this requirement for 45 other ATMS solutions | This is a standard feature of our Event Management (EM) Module |
| 4.10.1.10 | Authorized users shall be able to edit incident reports. | C | Parsons has met this requirement for 45 other ATMS solutions | This is a standard feature of our Event Management (EM) Module |
| 4.10.1.11 | Authorized users shall be able to edit incident reports created by any user in the system. | C | Parsons has met this requirement for 45 other ATMS solutions | This is a standard feature of our Event Management (EM) Module |
| 4.10.1.12 | Authorized users shall be able to edit incident reports received by the ATMS from external systems. | C | Parsons has met this requirement for 45 other ATMS solutions | This is a standard feature of our Event Management (EM) Module |
| 4.10.1.13 | The ATMS shall provide a mechanism for entry and edit of construction information as a specific type of incident/event. | C | Parsons has met this requirement for 45 other ATMS solutions | This is a standard feature of our Event Management (EM) Module |
| 4.10.1.14 | Authorized users shall be able to create construction/maintenance event reports in the ATMS. | C | Parsons has met this requirement for 45 other ATMS solutions | This is a standard feature of our Event Management (EM) Module |
| 4.10.1.15 | Authorized users shall be able to edit construction/maintenance event reports, including changing the status from active to inactive. | C | Parsons has met this requirement for 45 other ATMS solutions | This is a standard feature of our Event Management (EM) Module |
| 4.10.1.16 | The ATMS shall include capability for operators to enter and update construction and maintenance activities for private utilities that will impact travel on public roads. | C | Parsons has met this requirement for 45 other ATMS solutions | This is a standard feature of our Event Management (EM) Module |
| 4.10.1.17 | The ATMS event management system shall include capability to generate and send alerts to WVDOT partner agencies and personnel. | C | Parsons has met this requirement for 45 other ATMS solutions | Alerts are sent using the center-to-center (C2C) module as well as SMS text messages and e-mails. |
| 4.10.1.18 | The ATMS shall provide a mechanism for operators to edit incidents, regardless of the source of the incident. | C | Parsons has met this requirement for 45 other ATMS solutions | This is a standard feature of our Event Management (EM) Module |

| REQUIREMENT ID | REQUIREMENT DESCRIPTION | COMPLY (C/P/N) | COMMENT | EXAMPLE/OTHER DETAILS |
|---|---|---|---|---|
| 4.10.1.19 | The ATMS shall display the location of fixed ITS devices that are integrated into the ATMS. | C | Parsons has met this requirement for 45 other ATMS solutions | This is a standard feature of our Event Management (EM) Module |
| 4.10.1.20 | The ATMS shall display the location of portable devices that are either reporting data to the ATMS (including location) or have been entered/configured in the ATMS by operator | C | Parsons has met this requirement for 45 other ATMS solutions | This is a standard feature of our Event Management (EM) Module |
| 4.10.1.21 | The ATMS shall maintain an incident log that records the date/time stamps of operator's actions and data entry. | C | Parsons has met this requirement for 45 other ATMS solutions | This is a standard feature of our Event Management (EM) Module |
| 4.10.1.22 | The ATMS shall provide a mechanism for entry and edit of truck parking information from existing truck parking systems on I-81 and future systems. (Note: Currently the entry and edit of truck parking information is a function used in the existing ATMS system.) | C | Parsons has met this requirement for 45 other ATMS solutions | This is a standard feature of our Event Management (EM) Module |
| 4.10.1.23 | The ATMS shall include capability of accepting truck parking occupancy data for parking lots. | C | Parsons has met this requirement for 45 other ATMS solutions | This includes integrating with our parking management module. |
| 4.10.1.24 | The ATMS shall accept and handle truck parking occupancy data for multiple lots and distinguish the lots in display to operators. | C | Parsons has met this requirement for 45 other ATMS solutions | This includes integrating with our parking management module. |
| 4.10.1.25 | The ATMS shall include capability to receive incident reports from external systems. | C | Parsons has met this requirement for 45 other ATMS solutions | This is accomplished using our C2C interface or custom APIs |
| 4.10.1.26 | The ATMS shall include functionality to receive incidents from various 911 centers and law enforcement CAD systems and software. | C | Parsons has met this requirement for 45 other ATMS solutions | Our system interfaces with 20 different CAD systems. |
| 4.10.1.27 | The ATMS shall include functionally to detect incidents using incident detection algorithms and available data. | C | Parsons has met this requirement for 45 other ATMS solutions | This functionality is accomplished using our Automatic Incident Detection (AID) module. |

| REQUIREMENT ID | REQUIREMENT DESCRIPTION | COMPLY (C/P/N) | COMMENT | EXAMPLE/OTHER DETAILS |
|---|---|---|---|---|
| 4.10.1.28 | The ATMS shall include capability to process active incidents against internal logic to determine action plans to be performed. | C | Parsons has met this requirement for 45 other ATMS solutions | This is accomplished using our AI-based Decision Support System (DSS) Module. |
| 4.10.1.29 | The ATMS shall provide a mechanism for operators or administrators to create and edit action plans to include recommended activities to be performed for a variety of types of incidents and other events (special events, weather events, construction activities, maintenance activities). | C | Parsons has met this requirement for 45 other ATMS solutions | This is accomplished using our AI-based Decision Support System (DSS) Module. |
| 4.10.1.30 | The ATMS event management plans shall include both automated and manual activities (manual are displayed to operators for them to perform). | C | Parsons has met this requirement for 45 other ATMS solutions | Both features are fully supported. |
| 4.10.1.31 | The event management plans shall evaluate current incident/event reports against thresholds and recommended one or more activities to operators. | C | Parsons has met this requirement for 45 other ATMS solutions | This is a standard feature of our EM and DSS modules. |
| 4.10.1.32 | When activities are recommended to operators, operators shall have a mechanism to accept, decline, or edit and accept the recommendations. | C | Parsons has met this requirement for 45 other ATMS solutions | This is a standard feature of our Decision Support System (DSS) modules. |
| 4.10.1.33 | The ATMS shall perform the activities that are recommended and accepted (with or without editing) by operators. | C | Parsons has met this requirement for 45 other ATMS solutions | This is a standard feature of our Decision Support System (DSS) modules. |
| 4.10.1.34 | The thresholds controlling the ATMS event management plans shall be adjustable by operators or administrators. | C | Parsons has met this requirement for 45 other ATMS solutions | This is a standard feature of our Event Management (EM) Module |
| 4.10.1.35 | The thresholds controlling the ATMS event management plans shall allow for time of day, day of week, time of year settings. | C | Parsons has met this requirement for 45 other ATMS solutions | This is a standard feature of our Event Management (EM) Module |
| 4.10.1.36 | ATMS events can be programmed for future events and associate DMS devices and messages to be used with that future event. | C | Parsons has met this requirement for 45 other ATMS solutions | Storing canned response plans is fully supported. |

| REQUIREMENT ID | REQUIREMENT DESCRIPTION | COMPLY (C/P/N) | COMMENT | EXAMPLE/OTHER DETAILS |
|---|---|---|---|---|
| 4.10.1.37 | The ATMS event management plans shall include control of DMS. | C | Parsons has met this requirement for 45 other ATMS solutions | This is a standard feature of our Decision Support System (DSS) modules. |
| 4.10.1.38 | The DMS event management plans shall automatically recommend messages to be displayed on signs based on incident and event attributes. | C | Parsons has met this requirement for 45 other ATMS solutions | This is accomplished using our AI-based Decision Support System (DSS) Module. |
| 4.10.1.39 | The ATMS event management plans shall allow authorized users to program messages for DMS and 511 to be presented by time of day. | C | Parsons has met this requirement for 45 other ATMS solutions | This is done using our DMS scheduler feature. |
| 4.10.1.40 | The time of day messages in event management plans shall be able to be overridden by authorized users. | C | Parsons has met this requirement for 45 other ATMS solutions | This is done using our standard DMS queue/priority functionality. |
| 4.10.1.41 | The ATMS event management plans shall include standard operating procedures for operators to follow, based on the type and location of the event. | C | Parsons has met this requirement for 45 other ATMS solutions | This is accomplished using our AI-based Decision Support System (DSS) Module. |
| 4.10.1.42 | The ATMS shall have the ability to automatically send an event alert message to selected recipients upon incident confirmation via automated event notification. | C | Parsons has met this requirement for 45 other ATMS solutions | Using the DSS system, external contacts are identified, and they are notified via SMS text, email or phone messages. |
| 4.10.1.43 | The ATMS shall display active events as symbols (icons) located next to the associated link on the traffic Conditions map/GUI. | C | Parsons has met this requirement for 45 other ATMS solutions | This is a standard feature of our Map module. |
| 4.10.1.44 | The ATMS shall provide users the ability to initiate the editing, confirmation, and termination of events by selecting the graphic object from the traffic conditions map/GUI. | C | Parsons has met this requirement for 45 other ATMS solutions | This is a standard feature of our Event Management (EM) Module. |
| 4.10.1.45 | The ATMS shall provide the ability to view an active event report containing a listing of all events active at the time of the report request including summary information about each event. | C | Parsons has met this requirement for 45 other ATMS solutions | This is a standard feature of our Data Archiving and Reporting (DAR) Module. |
| 4.10.1.46 | The ATMS shall provide users the ability to assign (add/remove) field devices to an event. The field device shall remain assigned to that event until the event is terminated, the device is removed, or the device is added to another event. | C | Parsons has met this requirement for 45 other ATMS solutions | This is a standard feature of our Decision Support System (DSS) module. |

| REQUIREMENT ID | REQUIREMENT DESCRIPTION | COMPLY (C/P/N) | COMMENT | EXAMPLE/OTHER DETAILS |
|---|---|---|---|---|
| 4.10.1.47 | The ATMS shall provide users the ability to reactivate a terminated event. | C | Parsons has met this requirement for 45 other ATMS solutions | This is a standard feature of our Decision Support System (DSS) module. |
| 4.10.1.48 | The ATMS shall distribute all event data to WVDOT authorized users. | C | Parsons has met this requirement for 45 other ATMS solutions | This is a standard feature of our Event Management (EM) Module. |
| 4.10.1.49 | The ATMS shall provide the user with a request to confirm before an event is terminated. | C | Parsons has met this requirement for 45 other ATMS solutions | This is a standard feature of our Event Management (EM) Module. |
| 4.10.1.50 | The ATMS shall record date and time of device access, system user, action taken, messages posted to device and error logs by event or by operator. | C | Parsons has met this requirement for 45 other ATMS solutions | This is a standard feature of our Data Archiving and Reporting (DAR) Module. |
| 4.10.1.51 | The ATMS shall identify DMS devices for use in display of specific message set(s) in response to an event. | C | Parsons has met this requirement for 45 other ATMS solutions | This is accomplished using our AI-based Decision Support System (DSS) Module. |
| 4.10.1.52 | The ATMS shall provide a user interface to accept, modify or decline the identified ITS devices suggested by the system in response to an event. | C | Parsons has met this requirement for 45 other ATMS solutions | This is accomplished using our AI-based Decision Support System (DSS) Module. |
| 4.10.1.53 | The ATMS shall provide a user interface to initiate or inhibit display of DMS messages with and allow user modification of DMS messages in response to an event. | C | Parsons has met this requirement for 45 other ATMS solutions | This is a standard feature of our DMS Module. |
| 4.10.1.54 | The ATMS shall provide the ability to create test events that are not transmitted outside of the TMC or to devices for the purpose of training of operators. | C | Parsons has met this requirement for 45 other ATMS solutions | This capability will be done using the training ATMS instance. |
| **DESIRABLES** | | | | |
| 4.10.2.1 | The ATMS should provide a mechanism for automated interface with RWIS and entry and edit of weather reports as a specific type of incident/event. | C | Parsons has met this requirement for 45 other ATMS solutions | Weather events are a standard event type within our system. |

| REQUIREMENT ID | REQUIREMENT DESCRIPTION | COMPLY (C/P/N) | COMMENT | EXAMPLE/OTHER DETAILS |
|---|---|---|---|---|
| 4.10.2.2 | The ATMS should provide a mechanism for entry and edit of holiday based restrictions as a specific type of incident/event. | C | Parsons has met this requirement for 45 other ATMS solutions | This is a standard feature of our Event Management (EM) Module |
| 4.10.2.3 | The ATMS should allow multiple authorized users to edit event data at the same time and save dynamically. A conflict resolution scheme is to be proposed. | C | Parsons has met this requirement for 45 other ATMS solutions | This is a standard feature of our Event Management (EM) Module |
| 4.10.2.4 | The ATMS should provide a mechanism for entry and edit of permanent freight specific information related to height, width, and load rating as it pertains to specified routes, locations and/or direction of travel. | C | Some Customization is needed for the commercial vehicle fields. | Some Customization is needed for the commercial vehicle fields. |
| 4.10.2.5 | The ATMS should include capability for operators to enter temporary weight, width, and height restrictions for commercial vehicles. | C | Some Customization is needed for the commercial vehicle fields. | Some Customization is needed for the commercial vehicle fields. |
| 4.10.2.6 | The ATMS event management plans should include user creation of detour routes. | C | Parsons has met this requirement for 45 other ATMS solutions | Users are able to create messages will alternate routes at any time. |
| 4.10.2.7 | The ATMS should allow users to drag and drop event icons within the traffic conditions map/GUI and associate the event with the nearest roadway and/or cross street. | C | Parsons has met this requirement for 45 other ATMS solutions | This is a standard feature of our Event Management (EM) Module |

Table 36 – Traveler Information

| REQUIREMENT ID | REQUIREMENT DESCRIPTION | COMPLY (C/P/N) | COMMENT | EXAMPLE/OTHER DETAILS |
|---|---|---|---|---|
| **MANDATORY REQUIREMENTS** | | | | |
| 4.11.1.1 | The ATMS shall provide a data stream to be accessed by the 511 website to share data for display on the 511 website and 511 app. | C | Parsons has met this requirement for other ATMS solutions | These are standard features of our 511 system solution. |
| 4.11.1.2 | The data sharable with the 511 website and 511 app shall include all traveler information reports (incidents, construction, events, freight, parking) entered, received, or edited in the ATMS. | C | Parsons has met this requirement for other ATMS solutions | Our team has provided these capabilities for several statewide 511 solutions. |
| 4.11.1.3 | The data sharable with the 511 website and 511 app shall include CCTV video images captured by cameras connected to the ATMS. | C | Parsons has met this requirement for other ATMS solutions | Our team has provided these capabilities for several statewide 511 solutions. |
| 4.11.1.4 | The data sharable with the 511 website and 511 app shall include DMS messages posted to DMS connected to the ATMS. | C | Parsons has met this requirement for other ATMS solutions | Our team has provided these capabilities for several statewide 511 solutions. |
| 4.11.1.5 | The ATMS shall provide a data stream to be accessed by third-party traveler information dissemination entities. | C | Parsons has met this requirement for other ATMS solutions | Our team has provided these capabilities for several statewide 511 solutions. |
| 4.11.1.6 | The data sharable with the third-party Information Dissemination entities shall include all traveler information reports (incidents, construction, events, freight, parking) entered, received, or edited in the ATMS. | C | Parsons has met this requirement for other ATMS solutions | Our team has provided these capabilities for several statewide 511 solutions. |
| 4.11.1.7 | The data sharable with the third-party Information Dissemination entities shall include CCTV camera images captured by cameras connected to the ATMS. | C | Parsons has met this requirement for other ATMS solutions | Our team has provided these capabilities for several statewide 511 solutions. |
| 4.11.1.8 | The data shareable with the third-party Information Dissemination entities shall include DMS messages posted to DMS connected to the ATMS. | C | Parsons has met this requirement for other ATMS solutions | Our team has provided these capabilities for several statewide 511 solutions. |

| REQUIREMENT ID | REQUIREMENT DESCRIPTION | COMPLY (C/P/N) | COMMENT | EXAMPLE/OTHER DETAILS |
|---|---|---|---|---|
| 4.11.1.9 | The ATMS shall be upward expandable to cover increased coverage areas. | C | Parsons has met this requirement for other ATMS solutions | Our team has provided these capabilities for several statewide 511 solutions. |
| 4.11.1.10 | The ATMS shall provide for a highway conditions, including trend data, reporting system that can be accessed by authorized users with ATMS software or application access. | C | Parsons has met this requirement for other ATMS solutions | Our team has provided these capabilities for several statewide 511 solutions. |
| 4.11.1.11 | The ATMS highway conditions reporting system shall have the ability to enter road conditions for multiple locations or the entire state or an entire district all at once versus having to enter conditions for each segment of road one by one. | C | Parsons has met this requirement for other ATMS solutions | Our team has provided these capabilities for several statewide 511 solutions. |
| 4.11.1.12 | The ATMS shall have the ability to create warnings of commercial vehicle and oversize/overweight restrictions due to closures, width restrictions/height restrictions, construction and maintenance. | C | Parsons has met this requirement for other ATMS solutions | Our team has provided these capabilities for several statewide 511 solutions. |
| 4.11.1.13 | The ATMS Vendor shall provide a telephony and web-based 511 system to meet or exceed the capabilities of the current 511 system used by WVDOT. | C | Parsons has met this requirement for other ATMS solutions | Our team has provided these capabilities for several statewide 511 solutions. |
| 4.11.1.14 | The 511 system shall the ability to provide public safety alerts and announcements at the beginning of a call based on the location entered or statewide on all calls. | C | Parsons has met this requirement for other ATMS solutions | Our team has provided these capabilities for several statewide 511 solutions. |
| 4.11.1.15 | The ATMS shall transfer data useful for traveler information into WVDOT's 511 system for access by the general public. Data shall include at a minimum event-related data provided by the highway condition reporting system, relevant data obtained from ITS field devices, NWS weather alerts, weather forecast, and estimated travel times. | C | Parsons has met this requirement for other ATMS solutions | Our team has provided these capabilities for several statewide 511 solutions. |

| REQUIREMENT ID | REQUIREMENT DESCRIPTION | COMPLY (C/P/N) | COMMENT | EXAMPLE/OTHER DETAILS |
|---|---|---|---|---|
| 4.11.1.16 | The ATMS shall provide a mobile application with a hands-free option for the 511 system in order to maintain adherence to restrictions on use of phones while driving in West Virginia. | C | Parsons has met this requirement for other ATMS solutions | Our team has provided these capabilities for several statewide 511 solutions. |
| 4.11.1.17 | The ATMS shall provide a mechanism for automatically publishing data and video images from multiple sources to the WVDOT 511 as well as various traveler information websites at specific intervals. | C | Parsons has met this requirement for other ATMS solutions | Our team has provided these capabilities for several statewide 511 solutions. |
| 4.11.1.18 | The ATMS shall transmit highway conditions reporting data to the 511 system. | C | Parsons has met this requirement for other ATMS solutions | Our team has provided these capabilities for several statewide 511 solutions. |
| 4.11.1.19 | The ATMS shall display condition and device data for 511 website distribution with maximum of 5 minutes of data latency. | C | Parsons has met this requirement for other ATMS solutions | Our team has provided these capabilities for several statewide 511 solutions. |
| 4.11.1.20 | The ATMS shall provide a graphical map of the state or selected region for displaying the WVDOT's ITS devices and select summary and status information suitable for 511 website display compatible with common web browsers. | C | Parsons has met this requirement for other ATMS solutions | Our team has provided these capabilities for several statewide 511 solutions. |
| 4.11.1.21 | The 511 map shall display for internet distribution all major freeways and streets within the state's boundaries with distinct graphical representation for each roadway classification. | C | Parsons has met this requirement for other ATMS solutions | Our team has provided these capabilities for several statewide 511 solutions. |
| 4.11.1.22 | The 511 map shall display near real-time traffic speeds using a standard color coding of green for uncongested conditions through yellow and amber for moderate congestion to orange and reds for high congestion on freeways located within the state. This data can come from third-party providers. | C | Parsons has met this requirement for other ATMS solutions | Our team has provided these capabilities for several statewide 511 solutions. |

| REQUIREMENT ID | REQUIREMENT DESCRIPTION | COMPLY (C/P/N) | COMMENT | EXAMPLE/OTHER DETAILS |
|---|---|---|---|---|
| 4.11.1.23 | The 511 map display shall provide map navigation tools (zoom in/out icons, window box, layer control toggles, status of equipment). | C | Parsons has met this requirement for other ATMS solutions | Our team has provided these capabilities for several statewide 511 solutions. |
| 4.11.1.24 | The 511 map shall display for internet distribution the appropriate information being supplied by corresponding ITS devices including at minimum full motion video images from cameras, sign display for DMS, and data from RWIS. | C | Parsons has met this requirement for other ATMS solutions | Our team has provided these capabilities for several statewide 511 solutions. |
| 4.11.1.25 | The 511 website shall provide a menu to select which ITS devices to display (layer controls). | C | Parsons has met this requirement for other ATMS solutions | Our team has provided these capabilities for several statewide 511 solutions. |
| 4.11.1.26 | The 511 website shall provide a legend to explain which ITS devices are being displayed. | C | Parsons has met this requirement for other ATMS solutions | Our team has provided these capabilities for several statewide 511 solutions. |
| 4.11.1.27 | The 511 map shall provide a legend to explain the near real-time traffic speed colors being displayed. | C | Parsons has met this requirement for other ATMS solutions | Our team has provided these capabilities for several statewide 511 solutions. |
| 4.11.1.28 | The ATMS shall automatically refresh the real-time traffic speed display on 511 at a minimum frequency of 30 seconds. | C | Parsons has met this requirement for other ATMS solutions | Our team has provided these capabilities for several statewide 511 solutions. |
| 4.11.1.29 | The ATMS shall be capable of distributing color and black and white video images to WVDOT's 511 website. | C | Parsons has met this requirement for other ATMS solutions | Our team has provided these capabilities for several statewide 511 solutions. |
| 4.11.1.30 | The 511-telephony system, including the 511 system as well as the communication capability, shall have the ability to handle an average of 200 to 300 calls per day and allow for a peak usage of 5,000 to 6,000 calls per day. Vendor is to propose how they would meet this requirement or provide an alternate solution. | C | Parsons has met this requirement for other ATMS solutions | Our team has provided these capabilities for several statewide 511 solutions. |

| REQUIREMENT ID | REQUIREMENT DESCRIPTION | COMPLY (C/P/N) | COMMENT | EXAMPLE/OTHER DETAILS |
|---|---|---|---|---|
| 4.11.1.31 | The 511 shall graphically provide the location of each camera and a representation to show the user what direction the camera is facing. | C | Parsons has met this requirement for other ATMS solutions | Our team has provided these capabilities for several statewide 511 solutions. |
| 4.11.1.32 | The 511 system shall have the ability to add additional routes in the future beyond what is covered by current 511 system now. | C | Parsons has met this requirement for other ATMS solutions | Our team has provided these capabilities for several statewide 511 solutions. |
| 4.11.1.33 | The 511 website shall provide a linked text-based list of primary website content for selection by users. | C | Parsons has met this requirement for other ATMS solutions | Our team has provided these capabilities for several statewide 511 solutions. |
| 4.11.1.34 | The 511 website shall allow users to select cameras and DMS for a specified region of the state or by major roadway and accident or construction/work zone information for a specified region of the state or by major roadway. | C | Parsons has met this requirement for other ATMS solutions | Our team has provided these capabilities for several statewide 511 solutions. |
| 4.11.1.35 | No Adobe flash content is to be used on the 511 website, 511 mobile website or 511 application. | C | Parsons has met this requirement for other ATMS solutions | Our team has provided these capabilities for several statewide 511 solutions. |
| 4.11.1.36 | The 511 website shall provide a link to specific WVDOT construction projects/special projects/studies information sites. | C | Parsons has met this requirement for other ATMS solutions | Our team has provided these capabilities for several statewide 511 solutions. |
| 4.11.1.37 | The 511 website shall be smart-phone/mobile phone accessible and shall be adapted to work in both a desktop and mobile format with all content that is available on desktop version available on mobile version. | C | Parsons has met this requirement for other ATMS solutions | Our team has provided these capabilities for several statewide 511 solutions. |
| 4.11.1.38 | The 511 mobile website and the 511 app shall have a warning banner regarding use while driving and disclaimer similar to one used on the current WV511 app. | C | Parsons has met this requirement for other ATMS solutions | Our team has provided these capabilities for several statewide 511 solutions. |

| REQUIREMENT ID | REQUIREMENT DESCRIPTION | COMPLY (C/P/N) | COMMENT | EXAMPLE/OTHER DETAILS |
|---|---|---|---|---|
| 4.11.1.39 | The 511 website and 511 app shall be updated as necessary as operating systems used by mobile phone providers are updated. Vendor is to verify impacts to functionality if new OS releases are anticipated and maintain functionality through updates to software as required with new OS updates or versions. | C | Parsons has met this requirement for other ATMS solutions | Our team has provided these capabilities for several statewide 511 solutions. |
| 4.11.1.40 | The 511 website shall be capable of being imbedded into other HTML documents, or mirrored by other websites, with 511 logos intact as an Inline Frame (Iframe) or similar. | C | Parsons has met this requirement for other ATMS solutions | Our team has provided these capabilities for several statewide 511 solutions. |
| 4.11.1.41 | The camera image displayed on the 511 website and exported to external users shall have a customizable graphic overlay that will identify the source of the images. | C | Parsons has met this requirement for other ATMS solutions | Our team has provided these capabilities for several statewide 511 solutions. |
| **DESIRABLES** | | | | |
| 4.11.1.42 | The data sharable with the 511 website and 511 app should include freeway traffic speed indicators. | C | Parsons has met this requirement for other ATMS solutions | Our team has provided these capabilities for several statewide 511 solutions. |
| 4.11.1.43 | The data sharable with the 511 website and 511 app should include arterial traffic speed information gathered by the ATMS or third-party provider. | C | Parsons has met this requirement for other ATMS solutions | Our team has provided these capabilities for several statewide 511 solutions. |
| 4.11.1.44 | The data sharable with the third-party Information Dissemination entities should include freeway occupancy. (if available) | C | Parsons has met this requirement for other ATMS solutions | Our team has provided these capabilities for several statewide 511 solutions. |
| 4.11.1.45 | The data sharable with the third-party Information Dissemination entities should include arterial traffic speed information gathered by the ATMS. (if available) | C | Parsons has met this requirement for other ATMS solutions | Our team has provided these capabilities for several statewide 511 solutions. |
| 4.11.1.46 | The ATMS should include capability of generating the messages to display travel time estimates for DMS locations in the network. | C | Parsons has met this requirement for other ATMS solutions | Our team has provided these capabilities for several statewide 511 solutions. |

| REQUIREMENT ID | REQUIREMENT DESCRIPTION | COMPLY (C/P/N) | COMMENT | EXAMPLE/OTHER DETAILS |
|---|---|---|---|---|
| 4.11.1.47 | The ATMS should provide a mechanism to automatically post travel time estimates to DMS. | C | Parsons has met this requirement for other ATMS solutions | Our team has provided these capabilities for several statewide 511 solutions. |
| 4.11.1.48 | The ATMS should have the ability to push commercial vehicle and OS/OW restrictions to subscribers. | C | Parsons has met this requirement for other ATMS solutions | Our team has provided these capabilities for several statewide 511 solutions. |
| 4.11.1.49 | The ATMS highway conditions reporting system should be able to provide roadway condition reporting to local roads in addition to major US and state routes. | C | Parsons has met this requirement for other ATMS solutions | Our team has provided these capabilities for several statewide 511 solutions. |
| 4.11.1.50 | The 511 website should provide for individual public users to create user accounts and customize travel route alerts to notify them of incident, events or unusual congestion along their designated travel route(s) and display specified camera images related to that route. | C | Parsons has met this requirement for other ATMS solutions | Our team has provided these capabilities for several statewide 511 solutions. |
| 4.11.1.51 | The ATMS should allow selection of numerical limits associated with each display color for each type of traffic measurement by an ATMS user with sufficient authorization. These parameters should be applied to display generation for the 511 website. | C | Parsons has met this requirement for other ATMS solutions | Our team has provided these capabilities for several statewide 511 solutions. |
| 4.11.1.52 | The 511 website should incorporate a banner scrolling along the bottom of the WV511.org page that will allow ATMS operators to enter text for unique events and emergency notifications. | C | Parsons has met this requirement for other ATMS solutions | Our team has provided these capabilities for several statewide 511 solutions. |
| 4.11.1.53 | The 511-phone system to have a comprehensive vocabulary for text to voice system or more intuitive interpretation of what the operator types in to the system. (e.g. if the operator types "SB", 511 system should know that means southbound versus having to type the words out.) | C | Parsons has met this requirement for other ATMS solutions | Our team has provided these capabilities for several statewide 511 solutions. |

| REQUIREMENT ID | REQUIREMENT DESCRIPTION | COMPLY (C/P/N) | COMMENT | EXAMPLE/OTHER DETAILS |
|---|---|---|---|---|
| 4.11.1.54 | The ATMS should require varying levels of administration rights on the 511 website from view only to super user. | C | Parsons has met this requirement for other ATMS solutions | Our team has provided these capabilities for several statewide 511 solutions. |
| 4.11.1.55 | The data sharable with the third-party Information Dissemination entities should include freeway traffic speed. (if available) | C | Parsons has met this requirement for other ATMS solutions | Our team has provided these capabilities for several statewide 511 solutions. |

Table 37 – Integration External

| REQUIREMENT ID | REQUIREMENT DESCRIPTION | COMPLY (C/P/N) | COMMENT | EXAMPLE |
|---|---|---|---|---|
| **MANDATORY REQUIREMENTS** | | | | |
| 4.12.1.1 | The ATMS shall establish and maintain connections with existing external systems. | C | Parsons has met this requirement for 74 other ATMS solutions | Parsons has recently built data hubs for connection with external systems for Chicago, Milwaukee, Gary, San Diego and Los Angeles. |
| 4.12.1.2 | The ATMS shall operate and report system diagnostics to enable operators to confirm that communications to external systems are functioning properly. | C | Parsons has met this requirement for 74 other ATMS solutions | Our GDOT ATMS system performs diagnostics for over 5600 devices. |
| 4.12.1.3 | The ATMS shall operate and report system diagnostics to enable operators to confirm that communications to external field devices are functioning properly. | C | Parsons has met this requirement for 74 other ATMS solutions | Our GDOT ATMS system performs diagnostics for over 5600 devices. |
| 4.12.1.4 | The ATMS shall incorporate center to center standards enabling standardized data exchange with other systems and agencies. | C | Parsons has met this requirement for other 40+ ATMS solutions | The Parsons iNET™ ATMS has numerous C2C deployments following TMDD 2.X and 3.X standards. |
| 4.12.1.5 | The ATMS shall provide traffic data to West Virginia 511 system, website and 511 app. | C | Parsons has met this requirement for 15 different ATMS solutions | Parsons has 10 Statewide ATMS deployments where data is fed to regional 511 systems. |
| 4.12.1.6 | The ATMS shall have the ability to establish, maintain, and exchange data with CAD systems operated by 911 centers and law enforcement agencies within the State of West Virginia. | C | Parsons has completed CAD system interfaces for 20 different projects. | In the San Francisco Bay Area, Los Angeles and San Diego deployments, the Parsons ATMS received CAD information from the California Highway Patrol (CHP). |
| 4.12.1.7 | The ATMS shall receive CAD incident reports and make them available to authorized users through the ATMS user interface. | C | Parsons has completed CAD system interfaces for 20 different projects. | In the San Francisco Bay Area, Los Angeles and San Diego deployments, the Parsons ATMS received CAD information from the California Highway Patrol (CHP). |

| REQUIREMENT ID | REQUIREMENT DESCRIPTION | COMPLY (C/P/N) | COMMENT | EXAMPLE |
|---|---|---|---|---|
| 4.12.1.8 | The ATMS shall be able to share ATMS functionality with the WVPA (West Virginia Parkway Authority) offices. | C | We will meet this requirement using our C2C interface. Parsons has met this requirement for other 40+ ATMS solutions | The Parsons iNET™ ATMS has numerous C2C deployments following TMDD 2.X and 3.X standards. |
| 4.12.1.9 | The ATMS shall integrate with the current Citilog video analytics system in order to provide data related to wrong-way driver, incident and stopped vehicle detection. | C | Parsons has integrated with the Citilog solution from other ATMS deployments. | All of these video analytics functions are already incorporated into our ATMS solution. |
| **DESIRABLES** | | | | |
| 4.12.2.1 | The ATMS should integrate with external agencies' systems using standardized Center to Center communication protocols. | C | Parsons has met this requirement for other 40+ ATMS solutions | The Parsons iNET™ ATMS has numerous C2C deployments following TMDD 2.X and 3.X standards. |
| 4.12.2.2 | The ATMS should have the ability to integrate the fog warning/conditions system to activate a DMS. | C | Parsons has met this requirement for other ATMS solutions | We most recently deployed this capability in Virginia. |
| 4.12.2.3 | The ATMS should have the ability to access to OES flood gauge monitoring system. (IFLOWS) (Note: This desirable is for monitoring only) | C | Parsons has met this requirement for other ATMS solutions | We most recently deployed this capability in Virginia. |
| 4.12.2.4 | For optional interfaces not incorporated into the ATMS, the ATMS should provide a means to initiate the external software from within the ATMS and must log the initiation and termination of the external software. | C | Via the Parsons ATMS, certain polling and system interface processes can be initiated and stopped. For other third-party interfaces, some may be required. | All device polling processes can be setup, initiated and/or stopped from the Parsons ATMS user interface. |
| 4.12.2.5 | The ATMS should be able to share ATMS functionality with the West Virginia State Police Troop locations and dispatch centers. | C | Parsons has provided this capability with 56 different deployed ATMS solutions. | With any standard web browser, the WVSP can view and control any devices (if the appropriate permissions are setup by WVDOT. |
| 4.12.2.6 | The ATMS should have the ability to integrate West Virginia weigh station offices through on-site video monitoring and providing access to the ATMS software application. | C | The Parsons ATMS solution interfaces with over 13000 CCTV cameras today. | Parsons can interface with any type of fixed or full motion CCTV cameras using all standard video compression protocols. Analog video is also supported. |

Table 38 – Operator and User Features

| REQUIREMENT ID | REQUIREMENT DESCRIPTION | COMPLY (C/P/N) | COMMENT | EXAMPLE/OTHER DETAILS |
|---|---|---|---|---|
| **MANDATORY REQUIREMENTS** | | | | |
| 4.13.1.1 | The ATMS shall enable multiple users to be logged in simultaneously. | C | Parsons has met this requirement for other ATMS solutions | Our system currently supports over 750 concurrent users. |
| 4.13.1.2 | The ATMS shall enable users to access the system from locations remote from the TMC. | C | Parsons has met this requirement for other ATMS solutions | Our system is a true web-based thin client ATMS, making accessible from anywhere using a standard laptop. |
| 4.13.1.3 | The ATMS user interface shall display alerts and notifications to users. | C | Parsons has met this requirement for other ATMS solutions | The system has full alarms, alerting and notification functions. |
| 4.13.1.4 | The ATMS user interface shall enable users to view the identification of other users that are logged in to the system. | C | Parsons has met this requirement for other ATMS solutions | This is a standard capability of our System Administration and Security (SAS) module. |
| 4.13.1.5 | The ATMS shall alert operators when users log in or log off the system. | C | Parsons has met this requirement for other ATMS solutions | This is a standard capability of our System Administration and Security (SAS) module. |
| 4.13.1.6 | The activities performed in the ATMS by other users shall be visible to all other users with the appropriate authority. | C | Parsons has met this requirement for other ATMS solutions | This is a standard capability of our System Administration and Security (SAS) module. |
| 4.13.1.7 | The ATMS user interface shall include map display for both local and remote work stations. | C | Parsons has met this requirement for other ATMS solutions | This is a standard capability of our System Administration and Security (SAS) module. |
| 4.13.1.8 | User interface maps shall be GIS based to enable smooth and continuous scrolling and zooming. | C | Parsons has met this requirement for other ATMS solutions | This is a standard feature of our Map module. |
| 4.13.1.9 | User interface maps shall include functionality to hide layers or attributes at wide zoom levels to avoid map clutter. | C | Parsons has met this requirement for other ATMS solutions | This is a standard feature of our Map module. |
| 4.13.1.10 | The ATMS shall provide a mechanism for operators and users to select what is displayed on the map ( e.g. make DMS visible or not visible on the map, make CCTV visible or not visible on the map). | C | Parsons has met this requirement for other ATMS solutions | This is a standard feature of our Map module. |
| 4.13.1.11 | The ATMS user interface maps shall display active incidents (construction, incidents, etc.). | C | Parsons has met this requirement for other ATMS solutions | This is a standard feature of our Event Management (EM) module. |

| REQUIREMENT ID | REQUIREMENT DESCRIPTION | COMPLY (C/P/N) | COMMENT | EXAMPLE/OTHER DETAILS |
|---|---|---|---|---|
| 4.13.1.12 | The ATMS user interface maps shall enable operators to select an incident icon to open and view information describing the incident. | C | Parsons has met this requirement for other ATMS solutions | This is a standard feature of our Event Management (EM) module. |
| 4.13.1.13 | The ATMS user interface maps shall display icons representing both fixed and portable device locations. | C | Parsons has met this requirement for other ATMS solutions | Our systems display both fixed and mobile assets. The position of mobile assets are tracked using our AVL module. |
| 4.13.1.14 | The user interface map display of DMS shall distinguish DMS that are not currently connected or operational from those that are operational and connected to the ATMS and ready to receive a message from the ATMS. | C | Parsons has met this requirement for other ATMS solutions | Parsons ATMS solutions control over 3200 different DMS in live solutions today. |
| 4.13.1.15 | The on-screen map shall distinguish between fixed and portable DMS. | C | Parsons has met this requirement for other ATMS solutions | Parsons ATMS solutions control over 3200 different DMS in live solutions today. |
| 4.13.1.16 | The user interface maps shall enable operators to select DMS to view current messages displayed on the signs. | C | Parsons has met this requirement for other ATMS solutions | Parsons ATMS solutions control over 3200 different DMS in live solutions today. |
| 4.13.1.17 | The user interface maps shall enable authorized users to select DMS to control the current messages displayed on the signs. | C | Parsons has met this requirement for other ATMS solutions | Parsons ATMS solutions control over 3200 different DMS in live solutions today. |
| 4.13.1.18 | The user interface map display shall display icons representing locations of all CCTV connected to the ATMS | C | Parsons has met this requirement for other ATMS solutions | We currently have ATMS installations that are able to view and control 2000+ cameras within one ATMS UI. |
| 4.13.1.19 | The user interface shall enable authorized users to select CCTV to pan, tilt, and zoom the CCTV cameras. | C | Parsons has met this requirement for other ATMS solutions | We currently have ATMS installations that are able to view and control 2000+ cameras within one ATMS UI. |
| 4.13.1.20 | The user interface shall enable operators to select CCTV cameras to view real-time video from the cameras. | C | Parsons has met this requirement for other ATMS solutions | We currently have ATMS installations that are able to view and control 2000+ cameras within one ATMS UI. |

| REQUIREMENT ID | REQUIREMENT DESCRIPTION | COMPLY (C/P/N) | COMMENT | EXAMPLE/OTHER DETAILS |
|---|---|---|---|---|
| 4.13.1.21 | The user interface shall enable operators to open multiple cameras · simultaneously, viewing real-time video from each camera. | C | Parsons has met this requirement for other ATMS solutions | We currently have ATMS installations that are able to view and control 2000+ cameras within one ATMS UI. |
| 4.13.1.22 | The user interface shall allow operators to turn map layers on and off. | C | Parsons has met this requirement for other ATMS solutions | This is a standard feature of our Map module. |
| 4.13.1.23 | The user interface map display shall display icons representing locations of weather stations supplying information to the ATMS. | C | Parsons has met this requirement for other ATMS solutions | This is a standard feature of our ESS/RWIS Module. |
| 4.13.1.24 | The user interface shall enable operators to select weather stations to view the current status of the weather station. | C | Parsons has met this requirement for other ATMS solutions | This is a standard feature of our ESS/RWIS Module. |
| 4.13.1.25 | The user interface shall enable operators to view the locations and status of portable ITS devices. | C | Parsons has met this requirement for other ATMS solutions | Using our AVL module, the positions of all mobile assets are tracked and displayed on our map. |
| 4.13.1.26 | The ATMS shall display device status data on the map display | C | Parsons has met this requirement for other ATMS solutions | This is a standard feature of our Map module. |
| 4.13.1.27 | The ATMS shall have the capability of displaying real-time data that is collected by field devices and made available to the ATMS. | C | Parsons has met this requirement for other ATMS solutions | This is a standard feature of our Map module. |
| 4.13.1.28 | The ATMS user interface shall provide a mechanism for operators to manage multiple events simultaneously ( e.g. toggling back and forth between). | C | Parsons has met this requirement for other ATMS solutions | Dozens of different events and event types can be managed simultaneously. |
| 4.13.1.29 | The ATMS user interface shall enable operators to request and view diagnostics of the System. (Note: The user should receive the following diagnostic information: status display IE, temp, power, pixels, out, door open, fan on, etc.) | C | Parsons has met this requirement for other ATMS solutions | Our system has a series on analytics dashboards related to tracking and displaying system diagnostics. |
| 4.13.1.30 | The ATMS user interface shall enable users to view the operational status of field devices and other systems connected to the ATMS. | C | Parsons has met this requirement for other ATMS solutions | The operation status of all ITS assets are displayed in real time within our user interface. |

| REQUIREMENT ID | REQUIREMENT DESCRIPTION | COMPLY (C/P/N) | COMMENT | EXAMPLE/OTHER DETAILS |
|---|---|---|---|---|
| 4.13.1.31 | Operators shall have a mechanism to initiate the ATMS to ping field devices to detect if communications and field devices are responding properly. | C | Parsons has met this requirement for other ATMS solutions | Parsons ATMS solutions currently track 63000 different field devices today, which includes their communication health. |
| 4.13.1.32 | The ATMS administrators shall be able to set minimum thresholds, such that operators cannot set their thresholds below the value. | C | Parsons has met this requirement for other ATMS solutions | This is a standard capability of our System Administration and Security (SAS) module. |
| 4.13.1.33 | The ATMS user interface shall enable administrators to assign permissions to users. | C | Parsons has met this requirement for other ATMS solutions | This is a standard capability of our System Administration and Security (SAS) module. |
| 4.13.1.34 | The ATMS shall import specific traffic operations related CAD data so that it can be made available to the ATMS user and used to create events within the ATMS. | C | Parsons has met this requirement for other ATMS solutions | Our system currently interfaces with 20 different CAD systems |
| 4.13.1.35 | The user interface shall enable operators to view parking information made available to the ATMS. | C | Parsons has met this requirement for other ATMS solutions | This feature is enabled via our parking module |
| 4.13.1.36 | The ATMS user interface shall provide a mechanism for operators to view standard operational procedures to be used while responding to events or incidents. | C | Customization needed to support this requirement | This is a standard feature of our Event Management (EM) module. |
| 4.13.1.37 | The ATMS shall provide prescribed response scenarios or automation tools to assist users in controlling multiple devices quickly, consistently, and with limited manual input. | C | Parsons has met this requirement for other ATMS solutions | This is a standard feature of our Decision Support System (DSS) Module. |
| 4.13.1.38 | The ATMS shall provide a means of organizing devices into logical groupings or zones. | C | Parsons has met this requirement for other ATMS solutions | This is a standard feature of our Decision Support System (DSS) Module. |
| 4.13.1.39 | The ATMS shall provide spell check, text wrapping, and copy/cut/paste capabilities for all operator typed entry. | C | Parsons has met this requirement for other ATMS solutions | These are standard features within our solution, include spell check. |

| REQUIREMENT ID | REQUIREMENT DESCRIPTION | COMPLY (C/P/N) | COMMENT | EXAMPLE/OTHER DETAILS |
|---|---|---|---|---|
| 4.13.1.40 | The ATMS user interface shall enable users to view the status of communication with field devices and other system connected to the ATMS. | C | Parsons has met this requirement for other ATMS solutions | Parsons ATMS solutions currently track 63000 different field devices today, which includes their communication health. |
| **DESIRABLES** | | | | |
| 4.13.2.1 | The ATMS user interface should include tailored windows for each user, based on login. | C | Parsons has met this requirement for other ATMS solutions | Setting UI layouts and display colors/motifs is a standard feature. |
| 4.13.2.2 | The user preferences to determine the interface presented should be set by users. | C | Parsons has met this requirement for other ATMS solutions | This is a standard capability of our System Administration and Security (SAS) module. |
| 4.13.2.3 | Alerts and notifications should be tailored to each user based on preferences established by each user. | C | Parsons has met this requirement for other ATMS solutions | The system has a full contacts and notification system that allows hundreds of users to be notified of events and other alerts or alarms. The notifications include SMS text, emails and phone messaging. |
| 4.13.2.4 | The ATMS should provide a mechanism for authorized users to send and receive instant messages with other users while logged into the system. These messages should be capable of allowing attachments. | C | Parsons has met this requirement for other ATMS solutions | The system has a full contacts and notification system that allows hundreds of users to be notified of events and other alerts or alarms. The notifications include SMS text, emails and phone messaging. |
| 4.13.2.5 | The ATMS user interface maps should display traffic flow maps. | C | Parsons has met this requirement for other ATMS solutions | This is a standard feature of our Vehicle Detection System (VDS) module. |
| 4.13.2.6 | Flow maps displayed on the ATMS user interface should integrate freeway and arterial conditions on one common map display. | C | Parsons has met this requirement for other ATMS solutions | This is a standard feature of our Vehicle Detection System (VDS) module. |
| 4.13.2.7 | Flow maps should have the capability to display speed data. | C | Parsons has met this requirement for other ATMS solutions | This is a standard feature of our Vehicle Detection System (VDS) module. |
| 4.13.2.8 | Flow maps should have the capability to display freeway occupancy data. | C | Parsons has met this requirement for other ATMS solutions | This is a standard feature of our Vehicle Detection System (VDS) Module. |
| 4.13.2.9 | The ATMS should integrate information between incident reports and construction maintenance reports. | C | Parsons has met this requirement for other ATMS solutions | This is a standard feature of our Data Analytics and Reporting (DAR) module. |

| REQUIREMENT ID | REQUIREMENT DESCRIPTION | COMPLY (C/P/N) | COMMENT | EXAMPLE/OTHER DETAILS |
|---|---|---|---|---|
| 4.13.2.10 | The ATMS user interface map display should provide a mechanism for operators to view the location of systems and field devices monitored but not controlled by the ATMS. | C | Parsons has met this requirement for other ATMS solutions | This is a standard feature of our Map module. |
| 4.13.2.11 | Real-time display should include volume data. | C | Parsons has met this requirement for other ATMS solutions | This is a standard feature of our Vehicle Detection System (VDS) module. |
| 4.13.2.12 | Real-time volume data display should be able to be displayed by individual lane. | C | Parsons has met this requirement for other ATMS solutions | This is a standard feature of our Vehicle Detection System (VDS) module. |
| 4.13.2.13 | The ATMS should display aggregated real-time volume data by direction at a station's location. | C | Parsons has met this requirement for other ATMS solutions | This is a standard feature of our Vehicle Detection System (VDS) module. |
| 4.13.2.14 | Real-time display should include occupancy data. | C | Parsons has met this requirement for other ATMS solutions | This is a standard feature of our Vehicle Detection System (VDS) module. |
| 4.13.2.15 | Real-time occupancy data display should be able to be displayed by individual lane. | C | Parsons has met this requirement for other ATMS solutions | This is a standard feature of our Vehicle Detection System (VDS) module. |
| 4.13.2.16 | The ATMS should be able to display average real-time occupancy data for all lanes by direction at a station's location. | C | Parsons has met this requirement for other ATMS solutions | This is a standard feature of our Vehicle Detection System (VDS) module. |
| 4.13.2.17 | The ATMS should be able to display average real-time speed data for all lanes by direction at a detector's location. | C | Parsons has met this requirement for other ATMS solutions | This is a standard feature of our Vehicle Detection System (VDS) module. |
| 4.13.2.18 | Operators should be able to adjust threshold values for when to receive notices and alerts. | C | Parsons has met this requirement for other ATMS solutions | The system has a full contacts and notification system that allows hundreds of users to be notified of events and other alerts or alarms. The notifications include SMS text, emails and phone messaging. |
| 4.13.2.19 | Operators/users should use thresholds to control what types of alerts they receive. For example, operators may decide not to receive alerts of technical failures while technical support may opt to receive technical failure alerts. | C | Parsons has met this requirement for other ATMS solutions | The system has a full contacts and notification system that allows hundreds of users to be notified of events and other alerts or alarms. The notifications include SMS text, emails and phone messaging. |

| REQUIREMENT ID | REQUIREMENT DESCRIPTION | COMPLY (C/P/N) | COMMENT | EXAMPLE/OTHER DETAILS |
|---|---|---|---|---|
| 4.13.2.20 | The ATMS user interface maps should display pre-planned detour routes. | C | Customization needed to support this requirement | We have enabled this feature within various Integrated Corridor Management (ICM) deployments including our San Diego ICMS Installation |
| 4.13.2.21 | The user interface map display should display icons representing locations of all variable speed displays connected to the ATMS. | C | Parsons has met this requirement for other ATMS solutions | Parsons has 15 different deployments of ATMS solutions that display Variable Speed Limit (VSL) Signing, This includes Michigan DOT and GDOT. |
| 4.13.2.22 | The user interface should enable operators to select variable speed displays and view the current status of the sign. | C | Parsons has met this requirement for other ATMS solutions | Parsons has 15 different deployments of ATMS solutions that display Variable Speed Limit (VSL) Signing, This includes Michigan DOT and GDOT. |
| 4.13.2.23 | The user interface should enable authorized users to select variable speed display sign icons and change the status of the variable speed display. | C | Parsons has met this requirement for other ATMS solutions | Parsons has 15 different deployments of ATMS solutions that display Variable Speed Limit (VSL) Signing, This includes Michigan DOT and GDOT. |
| 4.13.2.24 | The ATMS should provide the ability for the operator to display snap shot images from RWIS camera or other digital still image sources on any combination of workstation or video display monitors within the TMC. | C | Parsons has met this requirement for other ATMS solutions | This is a standard feature of our ESS/RWIS Module. |

Table 39 – Data Collecting Archiving

| REQUIREMENT ID | REQUIREMENT DESCRIPTION | COMPLY (C/P/N) | COMMENT | EXAMPLE/OTHER DETAILS |
|---|---|---|---|---|
| **MANDATORY REQUIREMENTS** | | | | |
| 4.14.1.1 | The ATMS shall have a data archiving capability that stores and provides access to historical data. Data is to be collected from ITS field devices and from system users both in normal operation and during the management of planned and unplanned events. WVDOT has a 5-year data retention requirement. | C | Parsons has met this requirement for 56 other ATMS solutions | Parsons ATMS installations store more than 250TB of information today. For WVDOT, we will store over 10 years of historical and configuration data. |
| 4.14.1.2 | The ATMS shall provide operational data to calculate performance measures for both system utilization (including such items as number of events managed, amount of public access, and amount of staff access) and system performance (including such items as server up time, field device up time, communication reliability, and field device command responsiveness). | C | Parsons has met this requirement for 56 other ATMS solutions | The Parsons ATMS has extensive performance measurement dashboards and on-line data analytics. |
| 4.14.1.3 | The ATMS shall have the ability to import data from third-party providers. | C | Parsons has met this requirement for 56 other ATMS solutions | Ore system imports data from many third-party data providers including Waze, INRIX, Here and Verizon. |
| 4.14.1.4 | The ATMS shall have the ability to display and use real-time third-party data similar to data collected from field devices. | C | Parsons has met this requirement for 56 other ATMS solutions | Ore system imports data from many third-party data providers including Waze, INRIX, Here and Verizon. |
| 4.14.1.5 | The ATMS data archive shall have an analytics package. | C | Parsons has met this requirement for 56 other ATMS solutions | Our solution supports Tableau, Grafana and other third-party analytical packages. |
| 4.14.1.6 | The Analytic Package shall enable users to access and view the archived data. | C | Parsons has met this requirement for 56 other ATMS solutions | The ATMS has standard canned reports by user selectable time slices and report types. The system also has full ad hoc reporting capabilities. |
| 4.14.1.7 | The Analytics Package shall enable users to request and view data analyses and specify a time-slice over an operator defined time period. | C | Parsons has met this requirement for 56 other ATMS solutions | The ATMS has standard canned reports by user selectable time slices and report types. |

| REQUIREMENT ID | REQUIREMENT DESCRIPTION | COMPLY (C/P/N) | COMMENT | EXAMPLE/OTHER DETAILS |
|---|---|---|---|---|
| 4.14.1.8 | Data analytics shall include functionality to compute and display 24 hours traffic volumes. | C | Parsons has met this requirement for 56 other ATMS solutions | This is a standard reporting feature within our Data Analytics and Reporting (DAR) Module. |
| 4.14.1.9 | The ATMS shall enable portions of data to be excluded from public access. | C | Parsons has met this requirement for 56 other ATMS solutions | Data can be filtered from access by other 3rd parties. |
| 4.14.1.10 | The ATMS shall enable manual loading of collected data through an operator entry mechanism. | C | Parsons has met this requirement for 56 other ATMS solutions | This is a standard feature of our system. |
| **DESIRABLES** | | | | |
| 4.14.2.1 | The historical data in the archive should include traffic volume data, whether from sensors or third-party data sources. | C | Parsons has met this requirement for 56 other ATMS solutions | This is a standard historical data storage feature within our Data Analytics and Reporting (DAR) Module. |
| 4.14.2.2 | Traffic volume data should be stored by individual lane. | C | Parsons has met this requirement for 56 other ATMS solutions | This is a standard historical data storage feature within our Data Analytics and Reporting (DAR) Module. |
| 4.14.2.3 | The historical data in the archive should include traffic occupancy data. | C | Parsons has met this requirement for 56 other ATMS solutions | This is a standard historical data storage feature within our Data Analytics and Reporting (DAR) Module. |
| 4.14.2.4 | Traffic occupancy data should be stored by individual lane. | C | Parsons has met this requirement for 56 other ATMS solutions | This is a standard historical data storage feature within our Data Analytics and Reporting (DAR) Module. |
| 4.14.2.5 | The historical data in the archive should include traffic speed data | C | Parsons has met this requirement for 56 other ATMS solutions | This is a standard historical data storage feature within our Data Analytics and Reporting (DAR) Module. |
| 4.14.2.6 | Traffic speed data should be stored by individual lane. | C | Parsons has met this requirement for 56 other ATMS solutions | This is a standard historical data storage feature within our Data Analytics and Reporting (DAR) Module. |

| REQUIREMENT ID | REQUIREMENT DESCRIPTION | COMPLY (C/P/N) | COMMENT | EXAMPLE/OTHER DETAILS |
|---|---|---|---|---|
| 4.14.2.7 | The historical data in the archive should include traffic travel time data. | C | Parsons has met this requirement for 56 other ATMS solutions | This is a standard historical data storage feature within our Data Analytics and Reporting (DAR) Module. |
| 4.14.2.8 | The historical data in the archive should include traffic data that is collected and made available by any roadway within the TMC partner jurisdictions. | C | Parsons has met this requirement for 56 other ATMS solutions | This is a standard historical data storage feature within our Data Analytics and Reporting (DAR) Module. |
| 4.14.2.9 | The historical data in the archive should include location and status of portable ITS devices for times when the devices are providing data to or being controlled by the ATMS. | C | Parsons has met this requirement for 56 other ATMS solutions | This is a standard historical data storage feature within our Data Analytics and Reporting (DAR) Module. |
| 4.14.2.10 | Archive ATMS data should be available to partner agencies for download from an on-line access location. | C | Parsons has met this requirement for 56 other ATMS solutions | This is a standard historical data storage feature within our Data Analytics and Reporting (DAR) Module. |
| 4.14.2.11 | The ATMS should calculate and store travel times based on available speed data. | C | Parsons has met this requirement for 56 other ATMS solutions | This is a standard historical data storage feature within our Data Analytics and Reporting (DAR) Module. |
| 4.14.2.12 | The ATMS should calculate and store Travel Time Index, based on available speed data and free flow data. WVDOT has a 5-year data retention requirement. | C | Parsons has met this requirement for 56 other ATMS solutions | Parsons ATMS installations store more than 250TB of information today. For WVDOT, we will store over 10 years of historical and configuration data. |
| 4.14.2.13 | The ATMS should have a parameter for each third-party provider that can be set to use or not use the third-party data as if it was collected from field detectors. | C | Parsons has met this requirement for 56 other ATMS solutions | This is a standard historical data storage feature within our Data Analytics and Reporting (DAR) Module. |
| 4.14.2.14 | Data analytics should include functionality to compute and display Travel Time Reliability information. | C | Some customization will be provided to store TT reliability information. | Parsons will enhance the iNET™ ATMS solution Data Analytics and Reporting module to store Travel Time reliability information which would then be available to be used for reporting. |
| 4.14.2.15 | Travel Time Reliability displays should include reliability by different vehicle classifications, as they are reported to the ATMS. | C | Some customization will be provided to store TT reliability information. | This is a standard historical data storage feature within our Data Analytics and Reporting (DAR) Module. |

| REQUIREMENT ID | REQUIREMENT DESCRIPTION | COMPLY (C/P/N) | COMMENT | EXAMPLE/OTHER DETAILS |
|---|---|---|---|---|
| 4.14.2.16 | Data analytics should be automated to the extent possible to support established performance measure reporting needs of the TMC and/or partner agencies. (Note: This should include incident and clearance times, lanes closed, all applicable incident date, monthly and yearly reports) | C | Parsons has met this requirement for 56 other ATMS solutions | The ATMS has standard canned reports by user selectable time slices and report types. The system also has full ad hoc reporting capabilities. |
| 4.14.2.17 | The ATMS should include multiple data reporting formats/templates. | C | Parsons has met this requirement for 56 other ATMS solutions | This is a standard feature of our Data Analytics and Reporting (DAR) module |
| 4.14.2.18 | The ATMS should accept data for long term storage on a continuous basis without operation action. | C | Parsons has met this requirement for 56 other ATMS solutions | This is a standard feature of our Data Analytics and Reporting (DAR) module |
| 4.14.2.19 | The ATMS should make achieved data available in an online database for a user definable period. | C | Parsons has met this requirement for 56 other ATMS solutions | This is a standard historical data storage feature within our Data Analytics and Reporting (DAR) Module. |
| 4.14.2.20 | Data analytics should include functionality to compute and display mobile source emissions information if data is collected and provided to the ATMS. | C | Parsons has met this requirement for 56 other ATMS solutions | This capability existing within our ATMS for solutions such as Waze. |
| **NOTIFICATIONS AND ALARMS MANDATORY REQUIREMENTS** | | | | |
| 4.14.3.1.1 | The ATMS shall have and notification built into the system. | C | Parsons has met this requirement for 56 other ATMS solutions | The system has a full contacts and notification system that allows hundreds of users to be notified of events and other alerts or alarms. The notifications include SMS text, emails and phone messaging. |

| REQUIREMENT ID | REQUIREMENT DESCRIPTION | COMPLY (C/P/N) | COMMENT | EXAMPLE/OTHER DETAILS |
|---|---|---|---|---|
| 4.14.3.1.2 | The ATMS shall provide a single integrated interface, available from any TMC workstation, that allows operators to set threshold conditions for various devices or other user definable conditions such that when threshold conditions are met or exceeded, alarms will be generated notifying the operator of the presence of such condition. At a minimum, data elements available for alarm generation will include traffic measurements, detected incidents, weather measurements, and device status. | C | Parsons has met this requirement for 56 other ATMS solutions | The system has a full alarms and alerting feature that allows these thresholds to be set. |
| 4.14.3.1.3 | The ATMS shall provide the mechanism for users to select filters for alerts and notifications. | C | Parsons has met this requirement for 56 other ATMS solutions | The system has a full contacts and notification system that allows hundreds of users to be notified of events and other alerts or alarms. The notifications include SMS text, emails and phone messaging. |
| 4.14.3.1.4 | The alert and notification filters shall be based on type of filter, device, type of device, time of day, and jurisdiction. | C | Parsons has met this requirement for 56 other ATMS solutions | The system has a full contacts and notification system that allows hundreds of users to be notified of events and other alerts or alarms. The notifications include SMS text, emails and phone messaging. |
| 4.14.3.1.5 | Users shall be able to set alert and notification filters based on geographic area as an option. | C | Parsons has met this requirement for 56 other ATMS solutions | The system has a full contacts and notification system that allows hundreds of users to be notified of events and other alerts or alarms. The notifications include SMS text, emails and phone messaging. |
| 4.14.3.1.6 | The ATMS shall allow authorized users to set alert and notification thresholds by time of day. | C | Parsons has met this requirement for 56 other ATMS solutions | The system has a full contacts and notification system that allows hundreds of users to be notified of events and other alerts or alarms. The notifications include SMS text, emails and phone messaging. |

| REQUIREMENT ID | REQUIREMENT DESCRIPTION | COMPLY (C/P/N) | COMMENT | EXAMPLE/OTHER DETAILS |
|---|---|---|---|---|
| 4.14.3.1.7 | The system shall be able to generate alerts and notification based on traffic conditions (traffic speeds, volume levels, congestion levels) and event triggers (incidents, construction and maintenance activities, special event activities, etc.) | C | Parsons has met this requirement for 56 other ATMS solutions | The system has a full contacts and notification system that allows hundreds of users to be notified of events and other alerts or alarms. The notifications include SMS text, emails and phone messaging. |
| 4.14.3.1.8 | The ATMS shall be able to send out internal notifications regarding an event to up to 100 recipients. Notification to include select information captured in the event log. Notifications shall be completed within 5 minutes of initiation of procedure (process only, not inclusive of conveyance method and receiver's email system delays). | C | Parsons has met this requirement for 56 other ATMS solutions | The system has a full contacts and notification system that allows hundreds of users to be notified of events and other alerts or alarms. The notifications include SMS text, emails and phone messaging. |

Table 40 – Reports

| REQUIREMENT ID | REQUIREMENT DESCRIPTION | COMPLY (C/P/N) | COMMENT | EXAMPLE/OTHER DETAILS |
|---|---|---|---|---|
| **MANDATORY REQUIREMENTS** | | | | |
| 4.15.1.1.1 | The ATMS shall be capable of generating reports from ATMS generated data. | C | Parsons has met this requirement for 56 other ATMS solutions | All historical and configuration data is stored using the Data Archiving and Reporting (DAR) Module. Greater than 10 years of data will be available for canned and ad hoc reporting. |
| 4.15.1.1.2 | Pre-selected, pre-formatted, reports shall be included in the system, e.g. daily/weekly/monthly/annual reports reporting devices in operation, work orders/trouble tickets tracking, incidents, events, etc. These shall be provided in list and graphical formats. | C | Parsons has met this requirement for 56 other ATMS solutions | All historical and configuration data is stored using the Data Archiving and Reporting (DAR) Module. Greater than 10 years of data will be available for canned and ad hoc reporting. |

| REQUIREMENT ID | REQUIREMENT DESCRIPTION | COMPLY (C/P/N) | COMMENT | EXAMPLE/OTHER DETAILS |
|---|---|---|---|---|
| 4.15.1.1.3 | Users shall be able to generate ad hoc reports, specified by the user, viewable using off the shelf software. | C | Parsons has met this requirement for 56 other ATMS solutions | Ad Hoc reporting will be made available via Tableau and/or Grafana ad-hoc reporting tools. |
| 4.15.1.1.4 | Users shall be able to save the ad hoc report to become a permanent report. | C | Parsons has met this requirement for 56 other ATMS solutions | Ad Hoc reporting will be made available via Tableau and/or Grafana ad-hoc reporting tools. |
| 4.15.1.1.5 | The ATMS shall be capable of automatically generating repots via time of day scheduling. | C | Parsons has met this requirement for 56 other ATMS solutions | The ATMS has a standard UI to generate predefined canned reports. Ad-hoc reporting capabilities will also be provided. |
| 4.15.1.1.6 | The ATMS shall be able to export reports or data base information with comma, space and/or tab between fields to allow import into other programs such as Excel. | C | Parsons has met this requirement for 56 other ATMS solutions | This is a standard feature of or Data Archiving and Reporting (DAR) Module. |
| 4.15.1.1.7 | The ATMS shall generate information every 24-hours indicating device/system failures. A maintenance report suitable for staff shall be generated. | C | Parsons has met this requirement for 56 other ATMS solutions | This is a standard feature of or Data Archiving and Reporting (DAR) Module. |
| 4.15.1.1.8 | The maintenance report shall indicate type of device, device ID, and jurisdictional responsibility for maintenance. | C | Parsons has met this requirement for 56 other ATMS solutions | This is a standard feature of or Data Archiving and Reporting (DAR) Module. |
| 4.15.1.1.9 | The ATMS shall maintain a log of all users' activities relating to field device control, system administration, and user access. | C | Parsons has met this requirement for 56 other ATMS solutions | This is a standard feature of or Data Archiving and Reporting (DAR) Module. |
| 4.15.1.1.10 | The ATMS shall provide event logging such that events can be searched on any unique field or combination of fields. | C | Parsons has met this requirement for 56 other ATMS solutions | This is a standard feature of or Data Archiving and Reporting (DAR) Module. |
| 4.15.1.1.11 | The ATMS shall be capable of generating reports of logs covering user-define time periods and including user-selected event types at the direction of the TMC authorized users. | C | Parsons has met this requirement for 56 other ATMS solutions | This is a standard feature of or Data Archiving and Reporting (DAR) Module. |

| REQUIREMENT ID | REQUIREMENT DESCRIPTION | COMPLY (C/P/N) | COMMENT | EXAMPLE/OTHER DETAILS |
|---|---|---|---|---|
| **DESIRABLES** | | | | |
| 4.15.2.1 | The ATMS data should have a GUI to configure collection and storage of user activity log data and to generate and display activity reports. | C | Parsons has met this requirement for 56 other ATMS solutions | The ATMS has a standard UI to generate predefined canned reports. Ad-hoc reporting capabilities will also be provided. |
| 4.15.2.2 | The ATMS should be able to archive all data from the activity log to the data archive subsystem. | C | Parsons has met this requirement for 56 other ATMS solutions | This is a standard feature of or Data Archiving and Reporting (DAR) Module. |
| 4.15.2.3 | The ATMS should be able to archive log data in the data archiving system at predefined times to generate a continuous archival record. | C | Parsons has met this requirement for 56 other ATMS solutions | All historical and configuration data is stored using the Data Archiving and Reporting (DAR) Module. |

Table 41 – Security and Admin

| REQUIREMENT ID | REQUIREMENT DESCRIPTION | COMPLY (C/P/N) | COMMENT | EXAMPLE/OTHER DETAILS |
|---|---|---|---|---|
| **MANDATORY REQUIREMENTS** | | | | |
| 4.16.1.1 | The ATMS shall provide security and administration functions. | C | Parsons has met this requirement for 60 other ATMS solutions | All ATMS Installation must be installed with or System Administration and Security (SAS) Module. |
| 4.16.1.2 | The ATMS shall provide a log-in, log-out, and exit function. | C | Parsons has met this requirement for 60 other ATMS solutions | This is a standard feature of our System Administration and Security (SAS) Module. |
| 4.16.1.3 | The ATMS shall provide a security (ID/password or approved equivalent) function. | C | Parsons has met this requirement for 60 other ATMS solutions | This is a standard feature of our System Administration and Security (SAS) Module. |
| 4.16.1.4 | The ATMS shall provide a capability to add or delete users by an administrator. | C | Parsons has met this requirement for 60 other ATMS solutions | This is a standard feature of our System Administration and Security (SAS) Module. |
| 4.16.1.5 | The ATMS shall maintain log and be able to generate reports of administrative actions and all log-in/log-out activity. | C | Parsons has met this requirement for 60 other ATMS solutions | This is a standard feature of our System Administration and Security (SAS) Module. |
| 4.16.1.6 | The ATMS shall allow for the specification of user's rights by an administrator | C | Parsons has met this requirement for 60 other ATMS solutions | This is a standard feature of our System Administration and Security (SAS) Module. |
| 4.16.1.7 | User's rights shall be designated by function and specific equipment. | C | Parsons has met this requirement for 60 other ATMS solutions | This is a standard feature of our System Administration and Security (SAS) Module. |
| 4.16.1.8 | The ATMS shall allow a system administrator to change a user's password. | C | Parsons has met this requirement for 60 other ATMS solutions | This is a standard feature of our System Administration and Security (SAS) Module. |
| 4.16.1.9 | The ATMS shall allow a system administrator to disable a user. | C | Parsons has met this requirement for 60 other ATMS solutions | This is a standard feature of our System Administration and Security (SAS) Module. |

| REQUIREMENT ID | REQUIREMENT DESCRIPTION | COMPLY (C/P/N) | COMMENT | EXAMPLE/OTHER DETAILS |
|---|---|---|---|---|
| 4.16.1.10 | The ATMS shall allow a system administrator to change the status of a user to "expired" | C | Parsons has met this requirement for 60 other ATMS solutions | This is a standard feature of our System Administration and Security (SAS) Module. |
| 4.16.1.11 | The ATMS shall allow a user to change their own password. | C | Parsons has met this requirement for 60 other ATMS solutions | This is a standard feature of our System Administration and Security (SAS) Module. |
| 4.16.1.12 | The ATMS shall allow a user access to the ATMS from any workstation on the system. | C | Parsons has met this requirement for 60 other ATMS solutions | This is a standard feature of our System Administration and Security (SAS) Module. |
| 4.16.1.13 | The ATMS workstation I server communications shall be able to function over VPN or firewall traversal. | C | Parsons has met this requirement for 60 other ATMS solutions | As a web based ATMS, our solution easily operates of internet VPNs. |
| 4.16.1.14 | The ATMS shall provide a method to manage users and groups of users within the software such that only ATMS authorized users are allowed to access the system. A minimum of four (4) levels of security are required (external agency, TMC operator, supervisor, and administrator). | C | Parsons has met this requirement for 60 other ATMS solutions | Users can set rules based upon user, user group, geography or route. |
| 4.16.1.15 | The ATMS shall support appropriate security and firewalls necessary to safeguard internal operational information from unauthorized access. | C | Parsons has met this requirement for 60 other ATMS solutions | We will fully meet this requirement. |
| 4.16.1.16 | The ATMS shall provide an audit trail capturing the user's ID, date and time stamp, transaction type, and before/after values whenever changes are posted to system database. | C | Parsons has met this requirement for 60 other ATMS solutions | This is a standard feature of our Data Analytics Platform (DAP) module. |
| 4.16.1.17 | The ATMS shall support full system backups while maintaining 24/7 operational status. | C | Parsons has met this requirement for 10 other ATMS solutions | Full system backups will be accommodating |

| REQUIREMENT ID | REQUIREMENT DESCRIPTION | COMPLY (C/P/N) | COMMENT | EXAMPLE/OTHER DETAILS |
|---|---|---|---|---|
| **DESIRABLES** | | | | |
| 4.16.2.1 | The ATMS should provide rules-based administration for access and security at all levels of use. | C | Parsons has met this requirement for 60 other ATMS solutions | Users can set rules based upon user, user group, geography or route. |
| 4.16.2.2 | The ATMS should provide data locking or buffering routines in a multi-user environment. | C | Parsons has met this requirement for 60 other ATMS solutions | This is a standard feature within iNET™ |

Table 42 – Performance

| REQUIREMENT ID | REQUIREMENT DESCRIPTION | COMPLY (C/P/N) | COMMENT | EXAMPLE/OTHER DETAILS |
|---|---|---|---|---|
| **MANDATORY REQUIREMENTS** | | | | |
| 4.17.1.1 | The ATMS shall not require system restarts or reboots except for major system upgrades. | C | Parsons has met this requirement for 56 other ATMS solutions | Any database updates or configuration charges do not required restarts for them to take effect. |
| 4.17.1.2 | The ATMS shall be available 24 hours a day, 7 days a week, except during scheduled maintenance. | C | Parsons has met this requirement for 56 other ATMS solutions | The System will be configured using server clustering which enables us to support greater than 99.9 percent system uptime. |
| 4.17.1.3 | The ATMS shall not let its performance and operation be impacted adversely by the malfunction, removal, or addition of interfaces. | C | Parsons has met this requirement for 56 other ATMS solutions | The System will be configured using server clustering which enables us to support greater than 99.9 percent system uptime. |
| 4.17.1.4 | The ATMS system up time goal shall be 99.9%. | C | Parsons has met this requirement for 56 other ATMS solutions | The System will be configured using server clustering which enables us to support greater than 99.9 percent system uptime. |
| 4.17.1.5 | The ATMS refresh rate for the largest map shall be a maximum of 1 second. | C | Parsons has met this requirement for 56 other ATMS solutions | Parsons supports Bing, Google, OpenStreet, ESRI and DM Solutions Maps |
| 4.17.1.6 | The ATMS refresh rate for all other displays shall be a maximum of 1 second. | C | Some displays may take more than 1 second for refresh. | Most user interfaces refresh in <1 second, but some may be slightly longer. |
| 4.17.1.7 | The ATMS vendor response shall define how many devices and type the ATMS is capable of supporting. (Minimum: 500 CCTV, 250 DMS, 1000 Detectors) | C | Our solution can support up to 20,000 or more simultaneous devices. | Parsons ATMS solutions control over 63,000 systems sensors/interfaces. |
| 4.17.1.8 | The ATMS vendor shall indicate if all components necessary to make the ATMS functional will be installed on-premise or off-site and the reason/benefit to WVDOT. | C | The Parsons ATMS can be installed fully on-premise, in the cloud or a hybrid of both | Our iNET™ supports AWS, MS Azure and Google Cloud environments. |
| **DESIRABLES** | | | | |
| 4.17.2.1 | The ATMS should provide for "operator-free" operation so that the system performs all minimally necessary control and monitoring processes unattended. | C | Parsons has met this requirement for 56 other ATMS solutions | Our system is highly automated, and many functions operate with no operator interaction. |

| REQUIREMENT ID | REQUIREMENT DESCRIPTION | COMPLY (C/P/N) | COMMENT | EXAMPLE/OTHER DETAILS |
|---|---|---|---|---|
| **OTHER ATMS OPERATIONS MANDATORY REQUIREMENTS** | | | | |
| 4.17.3.1.1 | The ATMS shall include capability to generate real-time travel times for defined roadway segments on Interstate and Expressway routes. | C | Parsons has met this requirement for 12 other ATMS solutions | This is a standard feature of our Travel Time (TT) module. We have recently improved our TT estimation using machine learning intelligence. |
| 4.17.3.1.2 | The ATMS shall provide a mechanism for operators to select and implement pre-defined operations response plans for incidents. | C | Parsons has met this requirement for 33 other ATMS solutions | This is a core function of our AI-Based Decision Support System (DSS) module. |
| 4.17.3.1.3 | The ATMS shall maintain a local emergency response agency contact list. | | Parsons has met this requirement for 33 other ATMS solutions | Contact list maintenance is a standard iNET™ feature. |
| 4.17.3.1.4 | The ATMS shall provide access to the contact lists to authorized users. | C | Parsons has met this requirement for 33 other ATMS solutions | Contact list maintenance is a standard iNET™ feature. |
| 4.17.3.1.5 | Trouble ticket generation capability for system and device service and maintenance needs. | C | Parsons has met this requirement for other ATMS solutions | The Parsons ATMS Interfaces with other 3rd-part trouble ticket tools. |
| **OTHER ATMS OPERATIONS DESIRABLES** | | | | |
| 4.17.3.2.1 | The ATMS should include capability to use archived data and real-time data together with predictive algorithms to generate travel forecasts for display to operators. | C | Parsons has met this requirement for 12 other ATMS solutions | This is a standard feature of our Travel Time (TT) module. We have recently improved our TT estimation using machine learning intelligence. |
| 4.17.3.2.2 | The ATMS should maintain a call-out list of private industry contractors of equipment resources. | C | Parsons has met this requirement for other ATMS solutions | This includes call outs for tow trucks and safety service patrol vehicles. |
| 4.17.3.2.3 | The ATMS should provide a commuter route app so users can enter a frequent route and receive a specific update for their route including incidents, construction, congestion, events, etc. | C | Parsons has met this requirement for various other ATMS solutions | This is a standard feature. iNET™ Predictive Module provides integration of online traffic simulation tools to provide 15, 30, 45, and 60-minute prediction data in the forms of level of service, speed, and volume to capacity ratios. Using both real-time and archived data, traffic predictions are used to evaluate the best response plan for managing the congestion |

| REQUIREMENT ID | REQUIREMENT DESCRIPTION | COMPLY (C/P/N) | COMMENT | EXAMPLE/OTHER DETAILS |
|---|---|---|---|---|
| 4.17.3.2.4 | The ATMS should populate social media mechanisms with event data automatically. | C | Parsons has met this requirement for various other ATMS solutions | We support social media interfaces today, especially Twitter. We also have implemented the Waze crowd sourcing interface |
| 4.17.3.2.5 | The ATMS should provide for enhanced social media capabilities to allow for easier use of Twitter, Facebook, etc. for events or emergencies. | C | Parsons has met this requirement for various other ATMS solutions | We support social media interfaces today, especially Twitter. We also have implemented the Waze crowd sourcing interface |
| 4.17.3.2.6 | Operator manuals should be intuitive and key operations should be on flip cards that are easy to access and understand during an emergency. | C | Parsons has met this requirement for 56 other ATMS solutions | All manuals are intuitive. The manuals are also directly accessible from the ATMS using context sensitive help. |
| **TRAFFIC SIGNAL CONTROL SYSTEMS DESIRABLES** | | | | |
| 4.17.4.1 | Although not required at this time, the ATMS should have the capability of adding a traffic signal control module or third-party application for the centralized control of WVDOT traffic signal systems across the state with communication capabilities. | C | We have deployed our Traffic Signals Module for 22 different ATMS deployments. | Parsons has a comprehensive traffic signals module that includes adaptive and Intersection as a Service (IaaS) functions |

**DESIGNATED CONTACT:** Vendor appoints the individual identified in this Section as the Contract Administrator and the initial point of contact for matters relating to this Contract.

Joseph Brahm, Vice President

(Name, Title)

Joseph Brahm, Vice President

(Printed Name and Title)

445 Hutchinson Avenue, Columbus, Ohio 43253

(Address)

Mobile: 262.391.8056 / Fax: 614.310.6364

(Phone Number) / (Fax Number)

joseph.brahm@parsons.com

(email address)

**CERTIFICATION AND SIGNATURE:** By signing below, or submitting documentation through wvOASIS, I certify that I have reviewed this Solicitation in its entirety; that I understand the requirements, terms and conditions, and other information contained herein; that this bid, offer or proposal constitutes an offer to the State that cannot be unilaterally withdrawn; that the product or service proposed meets the mandatory requirements contained in the Solicitation for that product or service, unless otherwise stated herein; that the Vendor accepts the terms and conditions contained in the Solicitation, unless otherwise stated herein; that I am submitting this bid, offer or proposal for review and consideration; that I am authorized by the vendor to execute and submit this bid, offer, or proposal, or any documents related thereto on vendor's behalf; that I am authorized to bind the vendor in a contractual relationship; and that to the best of my knowledge, the vendor has properly registered with any State agency that may require registration.

Parsons Transportation Group Inc.

(Company)

Joseph Brahm, Vice President

(Authorized Signature) (Representative Name, Title)

Joseph Brahm, Vice President

(Printed Name and Title of Authorized Representative)

June 24, 2020

(Date)

Mobile: 262.391.8056 / Fax: 614.310.6364

(Phone Number) (Fax Number)

**ADDENDUM ACKNOWLEDGEMENT FORM**
**SOLICITATION NO.: DOT2000000001**

**Instructions:** Please acknowledge receipt of all addenda issued with this solicitation by completing this addendum acknowledgment form. Check the box next to each addendum received and sign below. Failure to acknowledge addenda may result in bid disqualification.

**Acknowledgment:** I hereby acknowledge receipt of the following addenda and have made the necessary revisions to my proposal, plans and/or specification, etc.

**Addendum Numbers Received:**
(Check the box next to each addendum received)

| | |
|---|---|
| [X] Addendum No. 1 | [X] Addendum No. 6 |
| [X] Addendum No. 2 | [ ] Addendum No. 7 |
| [X] Addendum No. 3 | [ ] Addendum No. 8 |
| [X] Addendum No. 4 | [ ] Addendum No. 9 |
| [X] Addendum No. 5 | [ ] Addendum No. 10 |

I understand that failure to confirm the receipt of addenda may be cause for rejection of this bid. I further understand that any verbal representation made or assumed to be made during any oral discussion held between Vendor's representatives and any state personnel is not binding. Only the information issued in writing and added to the specifications by an official addendum is binding.

Parsons Transportation Group Inc.
Company

Joseph Brahm, Vice President
Authorized Signature

June 24, 2020
Date

NOTE: This addendum acknowledgement should be submitted with the bid to expedite document processing.
Revised 6/8/2012

That percentage is then multiplied by the points attributable to the cost proposal to determine the number of points allocated to the cost proposal being evaluated.

**Step 1:** Lowest Cost of All Proposals / Cost of Proposal Being Evaluated = Cost Score Percentage

**Step 2:** Cost Score Percentage X Points Allocated to Cost Proposal = **Total Cost Score**

Example:

Proposal 1 Cost is $1,000,000
Proposal 2 Cost is $1,100,000
Points Allocated to Cost Proposal is 30

Proposal 1: Step 1 – $1,000,000 / $1,000,000 = Cost Score Percentage of 1 (100%)
Step 2 – 1 X 30 = Total Cost Score of 30

Proposal 2: Step 1– $1,000,000 / $1,100,000 = Cost Score Percentage of 0.909091 (90.9091%)
Step 2 – 0.909091 X 30 = Total Cost Score of 27.27273

**6.8. Availability of Information:** Proposal submissions become public and are available for review immediately after opening pursuant to West Virginia Code §5A-3-11(h). All other information associated with the RFP, including but not limited to, technical scores and reasons for disqualification, will not be available until after the contract has been awarded pursuant to West Virginia Code of State Rules §148-1-6.3.d.

**By signing below, I certify that I have reviewed this Request for Proposal in its entirety; understand the requirements, terms and conditions, and other information contained herein; that I am submitting this proposal for review and consideration; that I am authorized by the bidder to execute this bid or any documents related thereto on bidder's behalf; that I am authorized to bind the bidder in a contractual relationship; and that, to the best of my knowledge, the bidder has properly registered with any State agency that may require registration.**

Parsons Transportation Group Inc.
(Company)

Joseph Brahm, Vice President
(Representative Name, Title)

Mobile: 262.391.8056 / Fax: 614.310.6364
(Contact Phone/Fax Number)

June 24, 2020
(Date)

# REQUEST FOR PROPOSAL

West Virginia Department of Transportation– ATMS and 511 Platform

## Certification & Signature Page

VENDOR: (Please submit with your bid)

**Contract Manager:** During its performance of this Contract, Vendor must designate and maintain a primary contract manager responsible for overseeing Vendor's responsibilities under this Contract. The Contract manager must be available during normal business hours to address any customer service or other issues related to this Contract. Vendor should list its Contract manager and his or her contact information below.

**Contract Manager:** Joseph Brahm, Vice President
**Vendor's Address:** 445 Hutchinson Avenue
Columbus, Ohio 43253

**Telephone Number:** Mobile: 262.391.8056
**Fax Number:** 614.310.6364
**Email Address:** joseph.brahm@parsons.com

If applicable, sign and submit the attached **Resident Vendor Preference Certificate** with the proposal.

By signing below, I certify that I have reviewed this Request for Proposal in its entirety; understand the requirements, terms and conditions, and other information contained herein; that I am submitting this proposal for review and consideration; that I am authorized by the bidder to execute this bid or any documents related thereto on bidder's behalf; that I am authorized to bind the bidder in a contractual relationship; and that, to the best of my knowledge, the bidder has properly registered with any State agency that may require registration.

Parsons Transportation Group Inc.
(Company)

Joseph Brahm, Vice President
(Representative Name, Title)

Mobile: 262.391.8056 / Fax: 614.310.6364
(Contact Phone/Fax Number)

June 24, 2020
(Date)

West Virginia Ethics Commission

# Disclosure of Interested Parties to Contracts

(Required by *W. Va. Code* § 6D-1-2)

**Name of Contracting Business Entity:** Parsons Transportation Group Inc. **Address:** 445 Hutchinson Avenue
Columbus, Ohio 43253

**Name of Authorized Agent:** Joseph Brahm, Vice President **Address:** 445 Hutchinson Avenue
Columbus, Ohio 43253

**Contract Number:** CRFP 0803 DOT2000000001 **Contract Description:** ATMS and 511 Platform

**Governmental agency awarding contract:** State of West Virginia, Purchasing Division

☐ **Check here if this is a Supplemental Disclosure**

List the Names of Interested Parties to the contract which are known or reasonably anticipated by the contracting business entity for each category below *(attach additional pages if necessary)*:

1. **Subcontractors or other entities performing work or service under the Contract**

   ☐ Check here if none, otherwise list entity/individual names below.

   Castle Rock Associates

2. **Any person or entity who owns 25% or more of contracting entity (not applicable to publicly traded entities)**

   ☒ Check here if none, otherwise list entity/individual names below.

   Parsons Transportation Group Inc., a wholly-owned subsidiary of Parsons Construction Group Inc., is a wholly-owned subsidiary of Parsons Corporation. Parsons Corporation is a publicly traded company on the New York Stock Exchange under the ticker symbol PSN. The majority of the outstanding shares of Parsons Corporation are help by an Employee Stock Ownership Plan (ESOP) trust for the benefit of eligible participants. No one individual owns more than 0.01% of the ESOP.

3. **Any person or entity that facilitated, or negotiated the terms of, the applicable contract (excluding legal services related to the negotiation or drafting of the applicable contract)**

   ☒ Check here if none, otherwise list entity/individual names below.

Signature: [signature] Date Signed: 6/18/20

## *Notary Verification*

State of Illinois, County of Cook:

I, Teresa K. Strach, the authorized agent of the contracting business entity listed above, being duly sworn, acknowledge that the Disclosure herein is being made under oath and under the penalty of perjury.

Taken, sworn to and subscribed before me this 18th day of June, 2020.

Teresa K. Strach
Notary Public's Signature

TERESA K. STRACH
OFFICIAL SEAL
Notary Public, State of Illinois
My Commission Expires
June 30, 2021

***To be completed by State Agency:***
Date Received by State Agency: ____________
Date submitted to Ethics Commission: ____________
Governmental agency submitting Disclosure: ____________

*Revised June 8, 2018*

STATE OF WEST VIRGINIA
Purchasing Division

# PURCHASING AFFIDAVIT

**CONSTRUCTION CONTRACTS:** Under W. Va. Code § 5-22-1(i), the contracting public entity shall not award a construction contract to any bidder that is known to be in default on any monetary obligation owed to the state or a political subdivision of the state, including, but not limited to, obligations related to payroll taxes, property taxes, sales and use taxes, fire service fees, or other fines or fees.

**ALL CONTRACTS:** Under W. Va. Code §5A-3-10a, no contract or renewal of any contract may be awarded by the state or any of its political subdivisions to any vendor or prospective vendor when the vendor or prospective vendor or a related party to the vendor or prospective vendor is a debtor and: (1) the debt owed is an amount greater than one thousand dollars in the aggregate; or (2) the debtor is in employer default.

**EXCEPTION:** The prohibition listed above does not apply where a vendor has contested any tax administered pursuant to chapter eleven of the W. Va. Code, workers' compensation premium, permit fee or environmental fee or assessment and the matter has not become final or where the vendor has entered into a payment plan or agreement and the vendor is not in default of any of the provisions of such plan or agreement.

**DEFINITIONS:**

**"Debt"** means any assessment, premium, penalty, fine, tax or other amount of money owed to the state or any of its political subdivisions because of a judgment, fine, permit violation, license assessment, defaulted workers' compensation premium, penalty or other assessment presently delinquent or due and required to be paid to the state or any of its political subdivisions, including any interest or additional penalties accrued thereon.

**"Employer default"** means having an outstanding balance or liability to the old fund or to the uninsured employers' fund or being in policy default, as defined in W. Va. Code § 23-2c-2, failure to maintain mandatory workers' compensation coverage, or failure to fully meet its obligations as a workers' compensation self-insured employer. An employer is not in employer default if it has entered into a repayment agreement with the Insurance Commissioner and remains in compliance with the obligations under the repayment agreement.

**"Related party"** means a party, whether an individual, corporation, partnership, association, limited liability company or any other form or business association or other entity whatsoever, related to any vendor by blood, marriage, ownership or contract through which the party has a relationship of ownership or other interest with the vendor so that the party will actually or by effect receive or control a portion of the benefit, profit or other consideration from performance of a vendor contract with the party receiving an amount that meets or exceed five percent of the total contract amount.

**AFFIRMATION: By signing this form, the vendor's authorized signer affirms and acknowledges under penalty of law for false swearing (*W. Va. Code* §61-5-3) that: (1) for construction contracts, the vendor is not in default on any monetary obligation owed to the state or a political subdivision of the state, and (2) for all other contracts, that neither vendor nor any related party owe a debt as defined above and that neither vendor nor any related party are in employer default as defined above, unless the debt or employer default is permitted under the exception above.**

**WITNESS THE FOLLOWING SIGNATURE:**

Vendor's Name: Parsons Transportation Group Inc.

Authorized Signature: [signature] Date: 6/18/20

State of Illinois

County of Cook, to-wit:

Taken, subscribed, and sworn to before me this 18th day of June 2020

My Commission expires June 30, 2021.

TERESA K. STRACH
OFFICIAL SEAL
Notary Public, State of Illinois
My Commission Expires
June 30, 2021

**AFFIX SEAL HERE** **NOTARY PUBLIC** ____________________