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A New Voice for Addressing Transportation Operations in Small Urban and Rural Areas

Small urban and rural areas account for approximately 44 percent of the U.S. population. These areas lack the resources to adequately support transportation system operations. They often lack the benefits of traffic engineers, sophisticated models, or the latest technologies.

Many small urban and rural areas continue to experience significant growth which strains their limited transportation resources and increases traffic congestion and delays. At the same time, these areas play an important role in supporting the connectivity of the national transportation system to promote trade and effectively manage emergencies. Recent natural disasters in the southern United States have revealed significant problems in evacuating a large population from major metropolitan areas. These problems were clearly evident in the non-urban segments of evacuation routes.

Recognizing these unique needs and building upon years of working with small urban and rural areas, ATAC launched an initiative to focus on these areas' transportation operations needs.

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Traffic Operations Field Study

The last few years have witnessed a tremendous emphasis on transportation system operations. This is very evident in the recently enacted SAFETEA-LU, which calls for including operations in metropolitan and statewide planning and developing standards for real-time system management information.

Traffic signal control systems play a significant role in transportation system operations. Recent national assessment efforts resulted in unsatisfactory scores for traffic signal operations, especially in the areas of management and responsiveness to changing traffic conditions. Transportation agencies implement timing plans and detection technology based on funding levels, technical training, and work experience. Basic concepts for traffic signal operations and detection strategies have been well documented. However, there is a real need to examine innovative control strategies and develop practical best practices.

(Field Test continued on page 2)

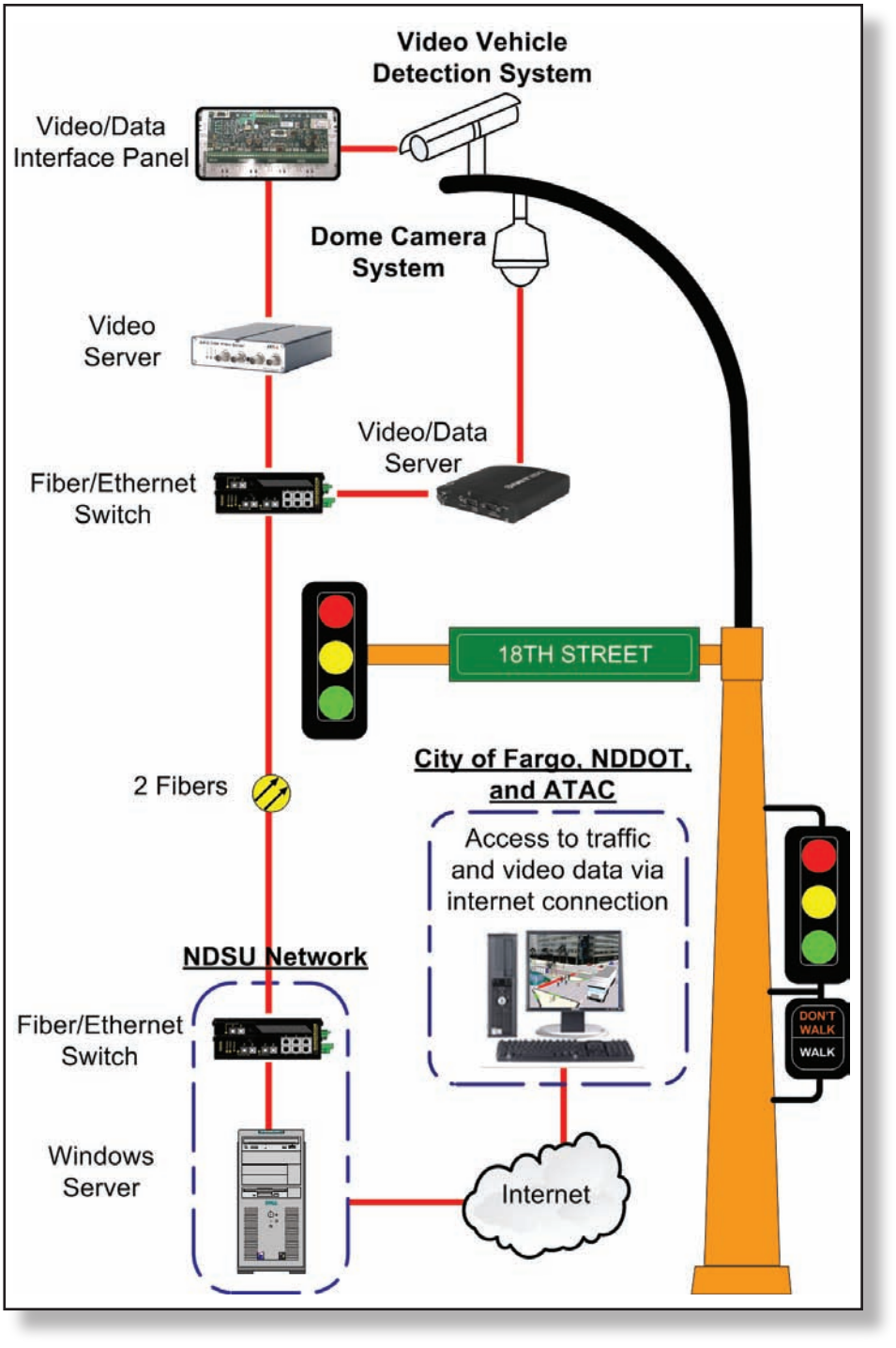
(Field Test cont.)

ATAC is partnering with the City of Fargo on a traffic signal control field study to research, evaluate, and develop methods to improve traffic signal operations. Various detection strategies (placement and function) and traffic controller operations will be evaluated to determine their effects on intersection operation in terms of traffic delay. In addition, traffic data will be collected continuously to determine temporal changes during typical and non-typical (special events) traffic conditions.

This partnership allows ATAC to collect data using four Autoscope image processing cameras at the intersection of 12th Ave. N. and 18th St. near the NDSU campus. The data will be transferred via the City of Fargo's fiber optic network to NDSU. In return, the city will have access to the data collected, research findings, and use of a video surveillance camera with a powerful zoom that can support traffic management during special events.

The City of Fargo provided most of the necessary infrastructure for camera installation as well as use of its fiber optics communications to facilitate camera installations and data transfer. Because the cameras needed to be elevated at least 30 feet above the roadway, luminaire arms were installed on the signal standards.

The communications design for this project involved close coordination and cooperation among ATAC, City of Fargo, NDSU, and Traffic Control Corp., which supplied the necessary equipment for the project. NDSU Network Services provided guidance on possible communications alternatives and assisted ATAC throughout the design and installation process. In addition, Network Services facilitated ATAC's access to the NDSU fiber network.



Schematic of hardware and communications for 12th Avenue North and 18th Street field study

Video and traffic data are transported via Fargo's fiber optics to the intersection of 12th Ave. N. and Bolley Dr. (one block from 18th St.). A new fiber connection was added to connect Fargo's fiber optics system with NDSU's network at that intersection. NDSU's fiber terminates at the Information Technology Service's network core, where ATAC and the City of Fargo will be able to access the data and control the camera via an IP connection.

With the mild winter Fargo has enjoyed this season, fiber optics installation and necessary connections were successfully completed in December of 2005. The Autoscope and surveillance cameras installation and connections was completed in January of 2006. The system is expected to be fully operational by the end of March 2006.

Installation of field equipment at 12th Avenue North and 18th Street intersection

North Dakota Work Zone Mobility and Safety Program

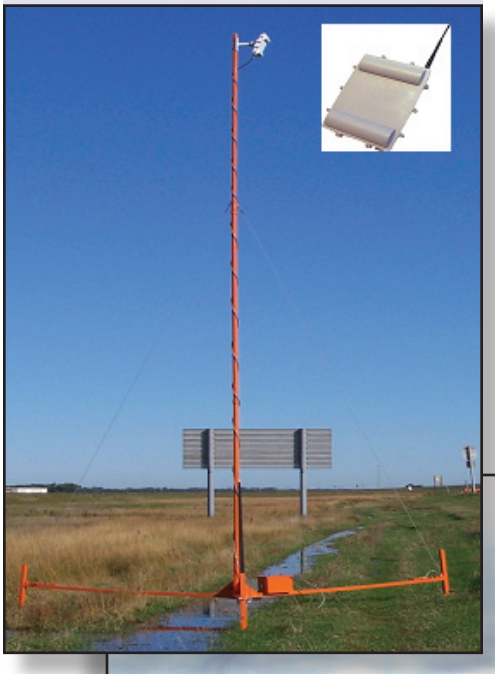
ATAC is facilitating a new program developed in partnership with the North Dakota Department of Transportation (NDDOT), North Dakota Highway Patrol (NDHP), and Associated General Contractors (AGC) of North Dakota. Other private companies initially involved in the program include Border States Paving and United Rentals Highway Technologies.

The main goal of the program is to enhance safety and traffic operations in highway work zones through: 1) effective management and control strategies; 2) applications of advanced technologies (ITS); 3) accumulating work zone performance data to support decision making; and 4) successful public awareness and outreach. Realizing the diversity and complexity of factors affecting these goals, this program is envisioned to provide a long-term platform for studying major work zone mobility and safety as well as evaluating potential strategies.

The first phase of this program aims at developing a better understanding of traffic patterns and driver behavior in North Dakota work zones. Field data will be collected on traffic volumes and time-of-day distribution, traffic speeds, traffic delays, and incidents. A case study is being developed in order to use I-29 work zones planned for the summer 2006 construction season in Fargo.

ATAC will collect data using several traffic detection technologies, including microwave radar and image processing. It is anticipated that the data will be collected simultaneously at key locations, including the approach to the work zone, merging areas, mid-stream, and exit from the work zone. Incident reports, including crashes in the work zone area will also be documented and analyzed by the project team to identify problem areas and develop solution strategies. ATAC will also work with NDDOT and contractor staff to keep a record of work zone activities and changes to work zone traffic control as the project proceeds. This information is critical to understanding any possible correlation between work zone activities and traffic operations and safety.

Depending on the success of the data collection process and availability of resources, selected enforcement and driver information strategies will also be evaluated. The evaluation will measure traffic (and driver) response to the selected strategies compared to the base-line conditions.



ATAC radar and video traffic data collection systems deployed in the field

Traffic Operations Roundtable Meeting in Minot

North Dakota's Traffic Operations Roundtable is now in its second year. The roundtable was established by ATAC to boost support to traffic engineers across North Dakota and the region. The roundtable allows peers to share ideas, identify critical issues, provide experiences, and guide ATAC's traffic operations activities. The roundtable has been meeting twice each year to discuss issues of interest, share experiences, and learn about new policies and practices.

The City of Minot hosted the summer roundtable meeting, which was held in late August 2005. The main agenda items for the meeting included an update on members' current activities, new transportation legislation, traffic signal control technologies, and future roundtable activities. The meeting also included two technical tours: a "traffic engineer on a train" site visit organized by the FHWA North Dakota Division and the BNSF Railroad and an elaborate tour of Minot's key transportation facilities and projects.

The BNSF site visit familiarized traffic engineers with a train's major systems, operational characteristics, as well as interaction with rail and roadway control devices around grade crossings. Participants learned about some of the major safety issues related to vehicle-train crashes and observed train crews operating a train and navigating from a rail yard through an urban rail corridor in Minot.

Traffic Signal Control Cabinet (City of Minot)

Also during the meeting, Steve Busek from the FHWA North Dakota Division, provided an overview of some of the relevant provisions contained in SAFETEA-LU, the new federal transportation bill that became law in August of 2005. Busek shared some of the major highlights that have an impact on traffic operations and safety in North Dakota, including: increased funding for rural road safety issues; flexibility in using transportation enhancement funds for pedestrian and bicyclist safety; and new funding for school traffic safety. He also discussed some specific projects that were approved for North Dakota.

Allan Covlin from the NDDOT commented on some of the provisions in the new transportation bill as well as legislative transportation changes approved at the state level. The North Dakota Legislature approved a variable speed limit sign for use in work zones and increased the maximum amount speed limits could be reduced in work zones from 20 mph to 30 mph. Covlin also mentioned that several major retail chains are planning to open in several North Dakota cities, creating a need to look at the traffic impacts of these mega stores. Several local transportation agency representatives echoed Covlin's comments, citing a need for possible trip generation rates, site impact assessment, and arrangements for funding and implementing required transportation improvements.

Matt Allwood of Traffic Control Corporation (TCC) provided the group with information related

Jeff Rodacker, City of Minot Traffic Engineer

to the major differences between NEMA TS-1 and TS-2, as well as 2070 traffic signal controllers. In addition, he illustrated some of the main features of selected systems, including the Econolite ASC/3 Series traffic controller, and the Autoscope video detection system.

Jeff Rodacker and Darrell Francis from the City of Minot provided an informative tour of their facilities as well as selected projects within the city. The group toured Minot's Sign Shop, a couple of advanced traffic signal cabinets with wireless communications, and the City of Minot engineering offices. Rodacker demonstrated Minot's traffic signal control software, which allows him to manage traffic signal controllers from the convenience of his office.

Meeting participants concluded by discussing activities to be undertaken by the roundtable, including traffic operations training, traffic signal analysis software training, and joint training with South Dakota. Additionally, the roundtable will be looking at operational policies and laws related to traffic operations at dark signals (i.e., due to power failure).

Controller Interface Device exhibited at annual TRB meeting

ATAC's Controller Interface Device (CID) was highlighted in January at the annual meeting of the Transportation Research Board, the nation's largest meeting of transportation professionals. The Transportation Research Board (TRB) is a division of the National Research Council and its annual meeting draws more than 9,500 transportation professionals from around the world.

ATAC research fellow Shawn Birst, presented information on the CID at the Traffic Signal Systems Simulation Subcommittee. Members of that subcommittee had been discussing ways to improve how traffic signal operations are modeled in traffic simulation, including using "hardware-in-the-loop" approaches.

Birst presented information on ATAC's CID and illustrated how the CID may be used to accurately model complex traffic signal operations in conjunction with the VISSIM traffic simulation model.

In addition, Birst and associate research fellow Jason Baker also demonstrated the CID at the TRB's exhibit hall. The device was featured by the Federal Highway Administration in an exhibit also featuring its Adaptive Control Software (ASC) Lite initiative.

"This meeting represents the best of transportation research from around the world. Presenting and demonstrating the CID at TRB indicates how innovative and useful this approach is to traffic modelers," Birst says. The presentation and demonstrations were very well received by advanced simulation users and controller vendors who see value in the device for testing traffic controllers.

ATAC's CID was initially developed by students and is built using off-the-shelf technology. ATAC developed several software components to perfect the CID interface between the simulation program and signal controller. The device is easy to set up and use, is relatively small, easy to upgrade and has Ethernet connectivity allowing users to run analysis using CID/controller combinations from virtually any location in the world. With this capability, ATAC is promoting a concept of a virtual traffic lab to allow collaboration among researchers and traffic engineers across the U.S.

Shawn Birst presents ATAC CID at the 2006 Transportation Research Board (TRB) meeting

ATAC Newsletter Profile

Ed Ryen, Assistant Maintenance Engineer for NDDOT in Bismarck

Road construction is always a menacing part of summer driving in North Dakota, but for Ed Ryen, Assistant Maintenance Engineer for the North Dakota DOT (NDDOT), keeping construction work as safe and efficient as possible is paramount.

Ryen oversees the Intelligent Transportation Systems (ITS) program for the NDDOT and works with the Advanced Traffic Analysis Center (ATAC) on how best to use these technologies for improving transportation in North Dakota. ITS refers to the use of advanced sensor, computer, electronics and communication technologies and management strategies to provide traveler information and increase the safety and efficiency of the surface transportation system.

"We work with them (ATAC) for planning ITS technologies, supporting their deployment, and evaluating their performance," Ryen said. Some of the major technologies used in North Dakota include weather stations on the road, dynamic message signs and weigh-in-motion stations. The NDDOT is also increasingly deploying automated roadway and bridge treatment (anti-icing) systems.

First and foremost, the NDDOT seeks to use ITS to increase the safety of highway travel as well as to provide travelers with up-to-date weather and travel information. Several media are available for travelers to access this information, including a Web site with current weather and road conditions, and the "511" number that travelers can call. In fact, today's 511 system is largely based on the late 1990's NDDOT efforts for delivering road and weather information to travelers using cell phones.

Despite the promising future of ITS, its implementation in North Dakota faces several hurdles. "The biggest challenge is funding," Ryen said. Consequently, the NDDOT has set priorities for ITS use and developed an implementation plan based on those priorities. The department's limited ITS budget will be spent based on that plan.

Ed Ryen, PE
Assistant Maintenance Engineer

North Dakota's wide open spaces also make ITS implementation difficult. "All ITS devices must be in communication with each other, and in North Dakota there is limited fiber availability," Ryen said. In addition to a fiber-optic cable, ITS devices must be near a power source. Costs for the devices go up substantially if they are placed too far away from these necessities.

This is why partnerships are so important for expediting the use of ITS and making the best of limited resources. North Dakota is a founding member of the North/West Passage Coalition which promotes seamless traveler information along the I-90 and I-94 corridors between Wisconsin and Washington State. As part of this effort, the NDDOT and the Minnesota DOT jointly deployed an automated treatment system for the I-94 Red River Bridge between Fargo and Moorhead. ATAC was an integral part of this project by supporting the development of a concept of operations and communication alternatives to support the system.

In the future, Ryen will be working with ATAC to study work zones on streets and highways to evaluate the safety and efficiency of construction sites. ATAC will conduct a case study in Fargo this summer.

Ryen has been with the NDDOT for more than 25 years. He graduated from NDSU in 1980 with a B.S. degree in civil engineering. He worked in construction for 10 years before moving to bridge inspection. He then spent a year and a half in the planning division involved with the GIS program. He became assistant maintenance engineer, his current position, in 2002.

In the maintenance and engineering services division of the DOT, he monitors the budgets within the division, and coordinates the department on behalf of the Department of Emergency Services for state emergencies and homeland security concerns, Ryen said. In managing ITS activities for the department, he makes sure North Dakota's ITS programs are in compliance with federal requirements, and ensures that activities, studies and plans across the state are coordinated.

(SURTOC cont.)

ATAC originally promoted the initiative to the Institute of Transportation Engineers (ITE) and the Federal Highway Administration (FHWA) in early spring 2005. In June 2005, the initiative was presented at the National Transportation Operations Coalition (NTOC), where it was embraced as one of several key activities NTOC would focus on in the following 18 months. A steering committee consisting of key transportation agencies and organizations was formed which later made up the Small Urban and Rural Transportation Operations Coalition (SURTOC).

The primary goals of SURTOC include:

1. Identify high-priority transportation operations needs in small urban and rural areas
2. Learn from and apply successful and tested practices
3. Develop a resource (help desk) of technical information and training opportunities that targets transportation operations professionals in small urban and rural areas
4. Provide a forum to network and share information

One of the first activities being undertaken by SURTOC is to conduct a broad assessment of transportation operations in small urban and rural areas. The assessment will identify needs and issues that will drive initiative activities. It will also identify high-priority information and training topics and the best ways to deliver them to the small urban and rural areas. ATAC developed a dedicated website (www.surtoc.org) that will facilitate the assessment effort and potentially provide a forum for future activities.

There are currently nine transportation organizations and several private consulting firms that make up SURTOC's steering committee. They include:

1. American Public Works Association (APWA)
2. American Association of State Highway and Transportation Officials (AASHTO)
3. Federal Highway Administration (FHWA)
4. Institute of Transportation Engineers (ITE)
5. Intelligent Transportation Society of America (ITSA)
6. National Association of County Engineers (NACE)
7. National Association of Counties (NACO)
8. National Association of Development Organizations (NADO)
9. National Association of Regional Councils (NARC)

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