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IMPLEMENTATION UPDATE INTEGRATED INTELLIGENT TRANSPORTATION SYSTEMS TECHNOLOGY

The Transportation Services Committee recommends:

- 1. Receipt of the presentation by Steve Kemp, Manager, Traffic Engineering and ITS, and Rajeev Roy, Manager, Transit Management Systems, Transportation Services Department; and**
- 2. Adoption of the recommendation contained in the following report dated November 19, 2009, from the Commissioner of Transportation Services.**

1. RECOMMENDATION

It is recommended that this report be received for information.

2. PURPOSE

This report updates Regional Council on the implementation of Intelligent Transportation Systems (ITS) initiatives in the Transportation Services Department.

3. BACKGROUND

Integrated Intelligent Transportation Systems are an essential component to deliver Transportation Master Plan objectives

The Regional Municipality of York Transportation Master Plan identifies four objectives as follows:

- Reduce the need for travel
- Encourage alternative travel modes
- Improve public transit
- Optimize roads

Intelligent Transportation Systems (ITS) are being deployed in the Region to help us achieve these objectives. ITS on our road system is used to maximize existing roadway capacity. ITS is used extensively on the VIVA/YRT system to improve customer service to attract additional ridership.

Integrated Intelligent Transportation Systems will improve Customer Service

Intelligent Transportation Systems (ITS) is the application of technology (computers, sensors, control, communications, and electronic devices) in transportation to save lives, time, money, energy and the environment.

In a roads environment, ITS technologies provide tools to monitor traffic conditions, manage traffic flow, manage congestion, and provide alternate route information to travellers. ITS technologies help staff collect, analyze, and archive data about the performance of the road system. With this data, information can be relayed to road users through different ITS technologies, enhancing a road users ability to avoid incidents, construction activities, adverse weather conditions and other congestion causing events.

In a transit environment, ITS technologies provide real-time dispatch-related functions, allow staff to monitor schedule adherence and provide real-time schedule information to customers. ITS technologies help staff enhance customer service, improve passenger and driver safety and optimize operational performance. Data collected from ITS technologies help staff perform analysis about the performance of the transit system and provide input to efficient service planning for the future.

The integration of ITS technologies between transit and other road users will improve our operation by:

- Allowing road users to make informed multi-modal trip decisions.
- Using transit performance data to improve traffic management capabilities for other road users (e.g. road construction and incident information from transit drivers, real time travel time information from transit vehicles).
- Saving operational costs through the use of common central systems and communications network.

Regional Council approved the Intelligent Transportation Systems Strategic Plan in December 2007

ITS strategic plans identify opportunities and associated deployment plans that take into consideration the input from relevant stakeholders. York's ITS strategic plan prioritized the technology projects and developed an implementation schedule and budget for the next 10 years.

Implementation of Intelligent Transportation Systems Technologies in transit started with the launch of Viva in 2005

Implementation of transit ITS technology started with the launch of Viva in September 2005. The intelligent transportation systems deployed with the implementation of Viva are considered industry gold standards and set Viva ahead of almost all North American

jurisdictions. In June 2006, Regional Council endorsed similar technology implementations for the conventional York Region Transit and Mobility Plus fleet.

4. ANALYSIS AND OPTIONS

COMPLETED PROJECTS

The following section provides a brief description of the ITS projects already implemented.

Critical intersection monitoring using Closed Circuit Television (CCTV) cameras provide better incident management tools

This system provides real-time monitoring of critical intersections within our road network from a central control centre. The installation of cameras for traffic management purposes allows Transportation Services staff to:

- Identify collision locations, initiate emergency response and remotely implement traffic signal timing adjustments when necessary.
- Identify unauthorized road occupancy activities that cause traffic congestion and respond accordingly.
- Monitor and manage traffic congestion at critical locations within our road network.

Intersections equipped with traffic cameras include:

- Highway 7 at Woodbine Avenue
- Highway 7 at McCowan Road
- Highway 7 at Keele Street
- Highway 7 at Jane Street
- Highway 7 at Weston Road
- Highway 7 at Pine Valley Drive
- Yonge Street at London Road (north of Davis Drive)
- Davis Drive at Southlake Hospital
- Davis Drive West at Highway 400

Closed circuit television monitoring enables transportation system managers to monitor operations, measure performance, assist with emergency response and quickly respond to roadway incidents.

Automatic Vehicle Location Systems for Winter Maintenance Vehicles will allow monitoring on snow clearing operations and respond to customer complaints in a timely manner

All contracted and Region-owned winter maintenance vehicles have been equipped with Automatic Vehicle Location Systems. These systems give road operations staff the ability to monitor winter maintenance activities in real time ensuring an appropriate level of response to storm events.

On-board monitoring equipment also allows staff to measure contractor and staff performance on salt management targets, winter maintenance response times and driver behaviour.

Viva and York Region Transit operations and dispatch-related functions have been improved by the Computer-Aided Dispatch and Automatic Vehicle Location System

The system provides real-time monitoring and tracking of Viva and York Region Transit buses from a control centre, as well as schedule adherence and dispatch-related functions. The system includes the following:

- Automatic Vehicle Location – Tracks the real-time position of each bus using global positioning technology and relays the bus location to the control centre.
- Computer-Aided Dispatch – Provides a comprehensive centralized tracking and dispatching functions to operations staff. Data transmitted from the buses are processed by the software enabling bus status, schedule adherence, and incident information to be displayed in the control centre.
- Voice and Data Communications – Allows the control centre staff to send or receive text messages to and from buses. The system also allows voice communications between the control centre and drivers.
- Automated Stop Announcement – As per the directive from the Human Rights Commission, the next stop information is automatically announced 200 metres in advance of every stop.
- In-vehicle Variable Message Sign – Displays next stop information on a continuous basis.
- Destination Signs – Automatically controls the front, side and rear destination signs by the on-board computer and are refreshed depending upon the route/trip operated by the bus.
- Automatic Passenger Counters – Counts the number of customers entering and exiting a bus. This data is used to analyze service utilization and patterns and make necessary adjustments to ensure efficiency and thereby cost savings.
- Emergency Alarm and Covert Microphone – All buses are equipped with an emergency alarm and covert microphone systems. When activated by the driver, control centre staff can listen to the incident in progress on the bus.
- Supervisor Laptops – All field supervisors are provided with a laptop through which they have access to the important components of the system.

The Viva and York Region Transit Computer-Aided Dispatch/Automated Vehicle Location (CAD/AVL) system is an essential tool for transit staff to monitor operations, measure performance and improve safety and security for passengers and drivers.

Mobility Plus Computer-Aided Dispatch and Automatic Vehicle Location System provides an enhanced tool for managing operations and dispatch related functions

The system provides real-time monitoring and tracking of Mobility Plus buses from a control centre, as well as schedule adherence and dispatch-related functions. The system includes the following:

- Automatic Vehicle Location – Tracks the real-time position of each bus using global positioning technology and relays the bus location to the control centre.
- Computer-Aided Dispatch – Provides a comprehensive centralized tracking and dispatching functions to operations staff. Data transmitted from the buses are processed by the software enabling bus status, schedule adherence and incident information to be displayed in the control centre.
- Data Communications – The system allows the control centre staff to send or receive text messages to and from buses.

The Mobility Plus CAD/AVL system has allowed transit staff to optimize operations by adding same day trips and providing better information to the customers.

Viva and York Region Traveller Information Systems provide better, quicker and real-time information to Transit customers

- Variable Message Signs - Installed at all Viva stations and some terminals to advise customers of real-time “Next Bus” arrival information.
- Web-based Trip Planning – The YRT website allows customers to plan their trip by simply entering their trip start and end locations. The program returns travel options using the various services operating in York Region.
- Google Trip Planning – In addition to the YRT trip planning feature, customers can use the Google Maps website to plan a trip using the various services operating in York. This option has become very popular with customers as it can be used on most handheld mobile devices with an internet connection.
- Next Bus Email – An email service through which customers can send their bus stop number to nextbus@york.ca. Schedule information for the next few buses servicing the stop is returned almost instantly.
- Interactive Voice Response – The interactive voice response system front-ends the call centre and allows the customer to obtain schedule information for the bus stop of their choice. The interactive voice response system in Mobility Plus call centre allows the Para transit customers to book trips and confirm/cancel their booked trips without

having any interaction with the call centre staff. This information is available 24-7 through the telephone.

The Traveller Information Systems provide up-to-date travel information through easily accessible mediums available to the public, thereby enhancing customer service, mobility and productivity throughout the YRT/Viva system.

Viva Automated Fare Collection System allows customers to pay fares prior to boarding the bus thereby reducing dwell times

The Viva fare payment is based on Proof of Payment (POP), which requires the customer retain a ticket, pass, or other form of proof that a fare has been paid. The customers can pay fares using the ticket vending machines/ticket validators installed at all stops and terminals. When using the Viva service, the traveller is required to show this proof, typically on a random basis to a roving enforcement officer.

This reduces the dwell time at Viva stations and all cash transaction or money is handled at the station thereby avoiding fare-related disputes between the driver and customers.

Viva Transit Signal Priority System allows buses running behind schedule to get priority at signalized intersections

Transit Signal Priority has been installed on the routes operated by Viva, York Region's bus rapid transit service, and facilitates the movement of Viva buses through busy signalized intersections. It reduces the delay and travel time and improves Viva service reliability, thereby improving quality of service. Priority is provided only to the buses which are behind schedule. An advantage of this type of priority is that only a small percentage of buses will request priority thereby minimizing the effects on side streets and intersection operation in general.

On-board and Terminal Security Camera System assists transit operations and enforcement staff in accident and passenger complaints investigation

The on-board and terminal security camera system has been installed to improve driver and passenger safety and security. All buses are equipped with security cameras and a digital video recorder. The video is downloaded only in response to an event or accident, otherwise is overwritten in sequence. YRT is working on an upgrade which will allow a few pictures to be sent to the control centre in response to the driver activating the emergency alarm.

Richmond Hill Centre, Bernard and Promenade terminals are installed with a security camera system which is monitored at YRT dispatch offices.

The security camera system assists in investigation by police, accident investigation, resolving fare-related disputes and helps investigate fraud and passenger complaints.

Advertising/Marketing Screens on Viva buses allow news and weather information to be displayed on-board in addition to the advertisement

All Viva buses are installed with a LCD monitor mounted behind the driver. The monitor provides news, weather, sports, celebrity news, and other text-based data to the customers. Update is done through a wireless network.

An LCD monitor system will be operated and maintained through a Marketing agency and revenue generated through advertisement will be shared with the Region.

FUTURE PROJECTS

The following section provides a brief description of the ITS projects which are planned for future.

Traveller Information Systems will allow road users make informed decisions about route and mode choices

Transportation Services staff are developing internet-based traveller information tools that can be used by road users pre-trip in order to make informed route and mode choices. Road users will be able to access information on-line from a single source such as:

- Real-time snapshot images from available traffic cameras.
- Real-time travel speed information on selected routes.
- Road closure information (construction and event related).
- Transit and active transportation alternatives.

Advanced Traffic Signal Control techniques will allow traffic signal timings to be adjusted based on traffic conditions and reduce overall delay

Inefficient traffic signal timing can cause unnecessary delay to transit and other road users. Advanced traffic signal control systems and techniques are available to respond in real-time to changing traffic conditions on the road network. Transportation Services staff are employing new techniques to ensure that existing control systems are being used to their fullest functionality. A review of current capabilities versus state of the practice is underway in order to document need and identify gaps.

Data Warehouse and Business Intelligence System will provide a tool to manage the huge volume of data being generated by the various ITS technologies

The data warehouse and business intelligence solution for York Region Transit will provide a tool to manage the huge volume of data being generated by the various ITS

technologies and convert the data into useful information which could be used by functional groups to manage their businesses in an efficient and cost-effective manner. A data warehouse and business intelligence system will provide YRT with the necessary tools to provide the right information, to the right decision makers, at the right time by managing the data in an efficient manner. This system will provide a central repository for all data currently being generated by the systems installed on Viva, YRT and Mobility Plus buses, stations and terminals.

PRESTO - Greater Toronto Area Smart Card System will provide a common fare card allowing customers to ride on any participating GTA transit system without pre-purchasing tickets or passes

The proposed GTA fare system, known as “Presto”, will provide a common fare card allowing customers to ride on any participating GTA transit system without pre-purchasing tickets or passes. Customers will not have to worry about the fare policies for each transit system nor have the exact cash fare. The Presto card will allow fare payment and accommodate the fare policies of all transit systems, including intersystem transfers, discounts and customer loyalty schemes in a way that will be transparent to the customer. Customers will, however, still be able to pay in cash if they choose.

Presto is scheduled to be implemented in January 2011 in York Region.

Fleet Management System will allow Transportation Services staff to ensure timely maintenance on the vehicles thereby improving performance and utilization

A fleet management system will allow access to better information about the fleet condition and will allow the Transportation Services Department to make better business decisions as it relates to both fleet and inventory, and operate in a more efficient and cost-effective manner. The system will provide a central repository for all fleet-related data to deliver timely information to decision makers, enable better monitoring of service levels (delays, schedule adherence, warranty coverage, etc.), better allocation of resources, and improve performance and utilization of the fleet assets. Implementation of fleet management system is a corporate initiative and also includes Police and EMS.

BENEFITS OF INTELLIGENT TRANSPORTATION SYSTEMS

The implementation of Intelligent Transportation Systems technologies within the Transportation Services Department has several direct and/or indirect benefits such as:

- Reduced traffic congestion and improved reliability of the transportation network for all road users.
- Automatic vehicle location systems on winter maintenance vehicles have improved our ability to manage storm events and respond to customer enquiries.

- Annual transit ridership has increased 24.3% from 15.2 million riders in 2005 to 18.9 million riders in 2008.
- Overall customer satisfaction with Transit services has increased from 66% in 2004 to 73% in 2008.
- Satisfaction with York Region Transit website (www.yrt.ca) allowing customers to plan their trip and obtain schedule information has increased from 72% in 2006 to 82% in 2008.
- Interactive voice response system allowing customers to obtain automated schedule information has resulted in 10-15% less calls being handled by the call centre staff, and an annual savings of \$75,000.
- Computer aided dispatch and automatic vehicle location system on Mobility Plus buses has reduced processing time for same day bookings, leading to a 24% increase in the utilization of service hours or an annual efficiency of \$120,000.
- Next Bus email system (nextbus@york.ca) allows customers to obtain schedule information using internet enabled mobile devices. In a recent customer satisfaction survey 77% of the customers responded that they use this feature on a regular basis.
- Security cameras on buses have assisted in solving many assault and criminal cases, false claims against drivers, and fare disputes. Since the installation in late 2007, approximately 100 requests have been received from police and other agencies to get access to the video from buses. In three cases on Mobility Plus services the video assisted in proving false assault allegations against the drivers.
- Automated fare collection machines installed at stops allow customers to purchase their tickets in advance, significantly reducing bus dwell times at stops.

Relationship to Vision 2026

Regional Council has always maintained that a strong transportation system is vital to "smart growth" strategies helping reduce the cost and undesirable impacts of urban growth by making the Region cleaner, quieter, safer and more convenient for getting around. Council's community plan Vision 2026, commits the Region to "effective, efficient and environmentally sensitive transportation".

5. FINANCIAL IMPLICATIONS

The Intelligent Transportation Systems strategic plan was approved by Council in December 2007. The 10-year strategy includes approximately \$27M capital investment for the Roads/Traffic initiatives. An additional \$14M capital investment is planned for Transit related ITS (including \$8M for the Presto project).

6. LOCAL MUNICIPAL IMPACT

There is no direct municipal impact associated with this report.

7. CONCLUSION

Significant progress has been made in making the Regional transportation system as intelligent as possible. Using the latest technology, we have a unique opportunity in a young and growing Region to implement ITS at the design stages and not retrofit as in older municipalities.

For more information on this report, please contact Rajeev Roy, Manager, Transit Management Systems, at Ext. 5682 and Steve Kemp, Manager, Traffic Engineering and Integrated Intelligent Transportation Systems, Ext. 5226.

The Senior Management Group has reviewed this report.