Development of ITS Service Books

MTO

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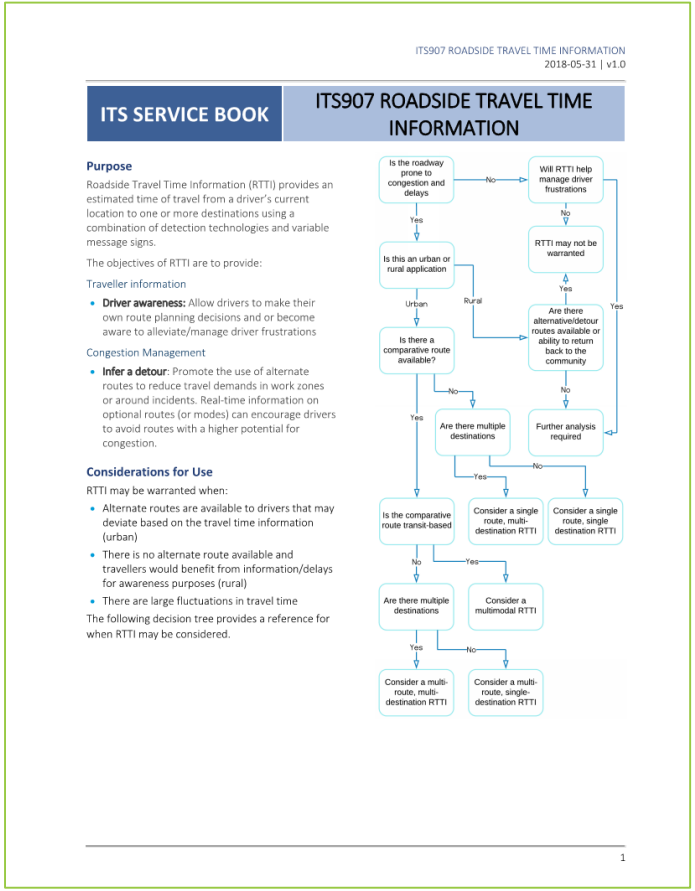
The Need

- A document-based tool to help understand, plan, design, and implement ITS services for MTO
- Allow personnel to:
  - Understand basic characteristics of ITS and the ITS services offered
  - Provide a means to assess and justify the need for a potential ITS service/application
  - Understand the architecture and concept
  - Estimate costs, benefits, and performance measures

Solution = Service Books

- What are the ITS Services available?
- When should we deploy it?
- Where can we deploy it?
- Why are we deploying it?
- How much will it cost?
- What are the measurable benefits?

- Easy to read, concise
- 5-8 pages



ITS907 ROADSIDE TRAVEL TIME INFORMATION
2018-05-31 | v1.0

ITS SERVICE BOOK | **ITS907 ROADSIDE TRAVEL TIME INFORMATION**

Purpose

Roadside Travel Time Information (RTTI) provides an estimated time of travel from a driver's current location to one or more destinations using a combination of detection technologies and variable message signs.

The objectives of RTTI are to provide:

Traveller information

- **Driver awareness:** Allow drivers to make their own route planning decisions and or become aware to alleviate/manage driver frustrations

Congestion Management

- **Infer a detour**: Promote the use of alternate routes to reduce travel demands in work zones or around incidents. Real-time information on optional routes (or modes) can encourage drivers to avoid routes with a higher potential for congestion.

Considerations for Use

RTTI may be warranted when:

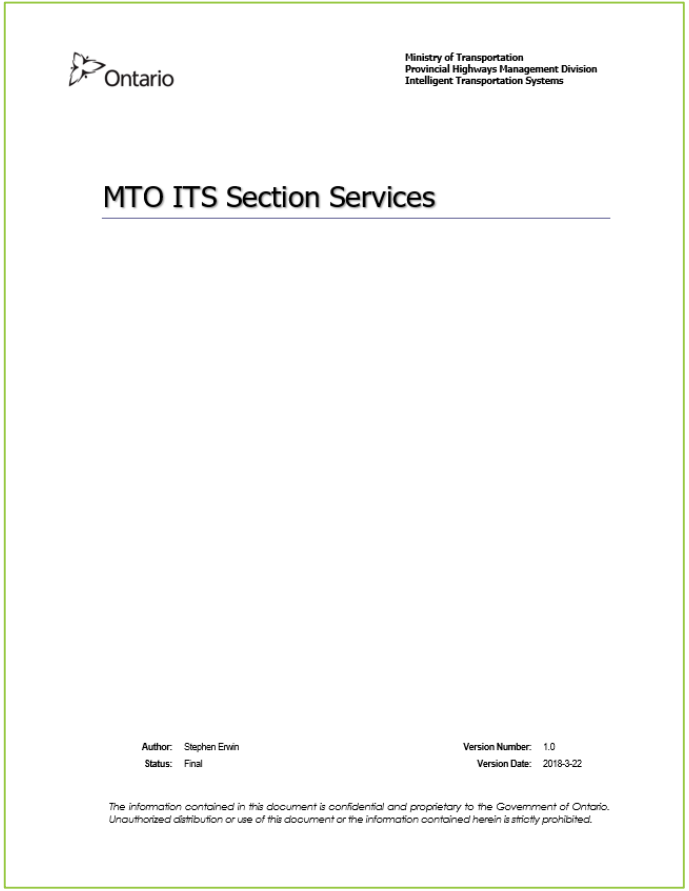
- Alternate routes are available to drivers that may deviate based on the travel time information (urban)
- There is no alternate route available and travellers would benefit from information/delays for awareness purposes (rural)
- There are large fluctuations in travel time

The following decision tree provides a reference for when RTTI may be considered.

1

ITS Schema

- Represents a wide range of ITS Services
- Each ITS Service was reviewed and prioritized
- Sets priorities for Service Book development
- Connected vehicle services also included


Ontario

Ministry of Transportation
Provincial Highways Management Division
Intelligent Transportation Systems

MTO ITS Section Services

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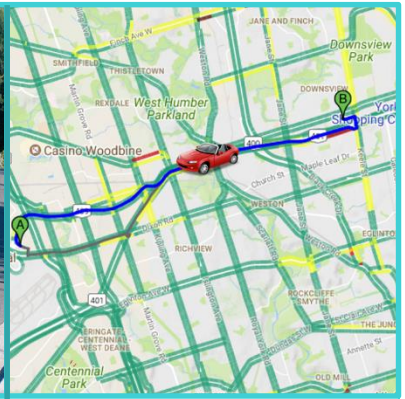
Service Books To-Date (Completed/In Progress)

			
Traffic Management •Roadside Travel Time Information •Temporary Queue Warning •Smart Work Zones •Incident Management – Detection and Incident Management •Permanent Queue Warning •Ramp Metering	**Weather** •Weather Warning	**Public Safety** •Wildlife Detection and Warning	**Traveller Information** •Enroute Traveller Information Services

Content of a Service Book

1. Purpose
2. Considerations for Use
3. Applicability and Limitations
4. Service Components
5. Architecture
6. Traffic Management
7. System Concept
8. Deployment Considerations
9. Costs and Procurement Strategy
10. Case Studies / Deployments
11. Performance Measures
12. Emerging Technologies

Incident Detection – Service Book Walkthrough

Purpose

- Describes the objectives, and key benefits of this service
- Identifies the problems this service helps to address

Purpose

Incident Detection relies on technology to identify and respond to unplanned events affecting safety and mobility along a roadway.

The objectives of Incident Detection are to:

- Improve incident response and clearing times through technology-based detection approach
- Improve safety
- Reduce secondary collisions
- Reduce congestion build-up

The Federal Highway Administration (FHWA) has identified five (5) functional areas associated with Traffic Incident Management:

1. Detection and Verification
2. Traveller Information
3. Response
4. Scene Management and Traffic Control
5. Quick Clearance and Recovery

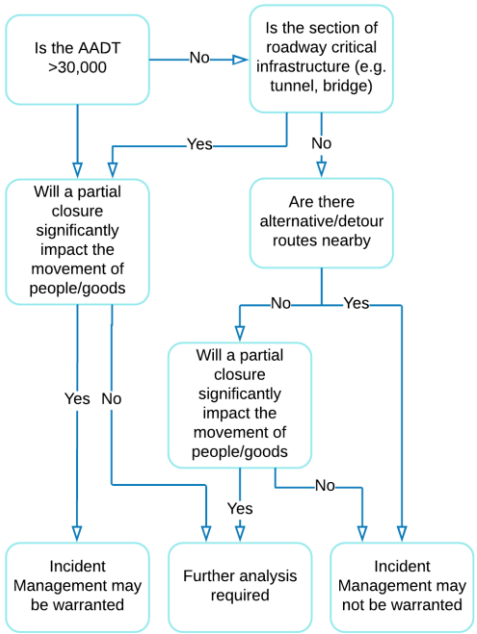
The ITS functionalities of Traffic Incident Management will be primarily focused on areas 1 and 2 related to incident detection, verification and traveller information.

Incident Detection – Service Book Walkthrough

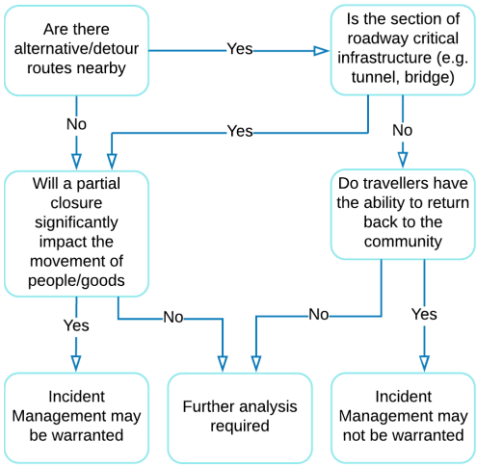
Considerations for Use

- Text and flowchart-based justification and guidelines to help determine if the ITS service is warranted
- Not a catch all, further analysis may be required depending on the application
- Level of subjectivity

Urban



Rural



Incident Detection – Service Book Walkthrough

Service Book Applicability

- References complementary ITS Services
- Acknowledges any limitations and where the Service Book should be used

ITS Service Applicability and Limitations of this Service Book

This Service Book is applicable to the following services based on the US ITS Architecture (ARC-IT v8.1)

Data Management

- ITS202 – Performance Monitoring

Maintenance and Construction

- ITS304 – Work Zone Management

Public Safety

- ITS505 – Incident Scene Safety – Incident Ahead Warnings
- ITS506 – Incident Scene Safety – Motorists Guidance

Traffic Management

- ITS909 – Traffic Incident Management – Detection and Incident Management

Limitations

This Service Book may be used in conjunction with other Service Books that have been developed.

This Service Book will aid in determining the need, components, purpose and general placement for Incident Detection. Further analysis to identify the specific needs of Incident Detection is encouraged.

While technologies and data sources continually to evolve, this Service Book references technologies already approved by MTO.

Incident Detection – Service Book Walkthrough

Service Components

- Provides information on the different technologies available (e.g. radar detectors, cameras, communications)

Architecture

- Provides an overview of the system and its connections with other systems and stakeholders

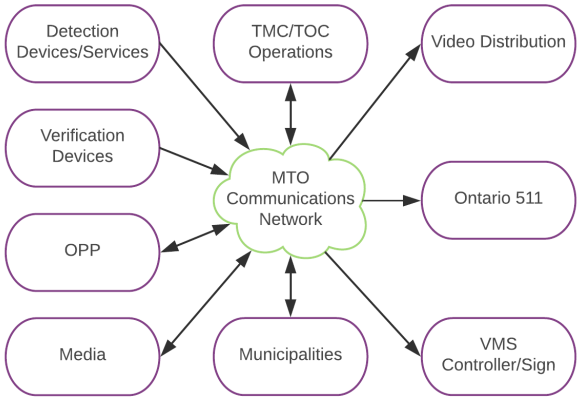
Traffic Management

- Details how the Service will operate from a Traffic Management Centre point-of-view

ITS Components

The key ITS components for Incident Detection are based on:

- **Detection** – a means to detect an incident has occurred
- **Verification** – a means to verify a detected incident actually occurred and the potential response needed to address it
- **Traveller Information** – a means to notify travelers of the location and/or conditions resulting from the incident.



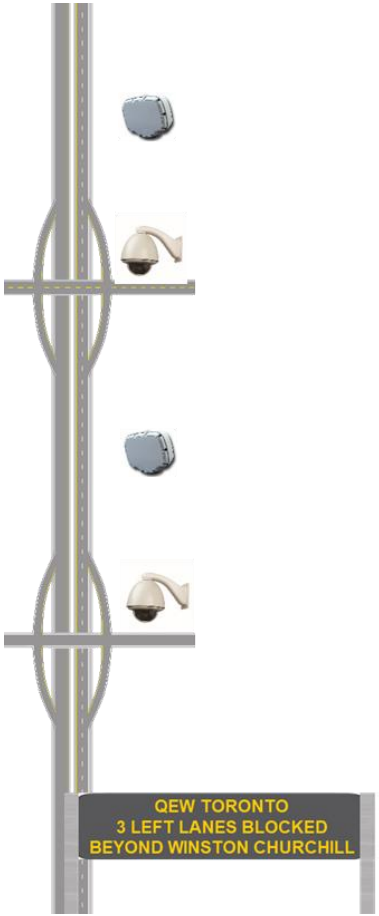
Incident Detection – Service Book Walkthrough

System Concept

- Graphical concept of a typical, potential layout

Deployment Considerations

- Technical, institutional, and other considerations to take into account



Deployment Considerations

The following are some considerations as part of the deployment of Incident Detection:

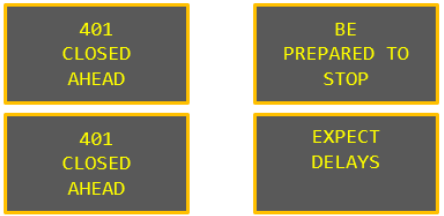
- In the event of an incident, it is anticipated the TMC/TOC operator will take all necessary steps to maximize safety first and foremost prior to initiating ITS-related work tasks
- CCTV cameras shall be spaced approximately 1,000 metres apart, while taking into consideration sightlines
- Detectors shall be spaced at 500 - 1200 meters apart to provide a reasonable level of granularity in urban areas
- Consider local terrain and clear zone requirements to assess the placement of VMS
- Consider geometric constraints, sightlines, and decision points when placing detection and verification devices
- Consider maintenance roles, responsibilities, and processes for each component
- Incident detection can be based on a combination of detection devices (e.g. CCTV, radar, and loops)
- Maintain communications with OPP Communications Centre and any other key parties to monitor incident and traffic management activities along with incident clearance
- Ensure Traveller Information is reset to pre-incident conditions once the incident has cleared

Incident Detection – Service Book Walkthrough

Messaging Examples

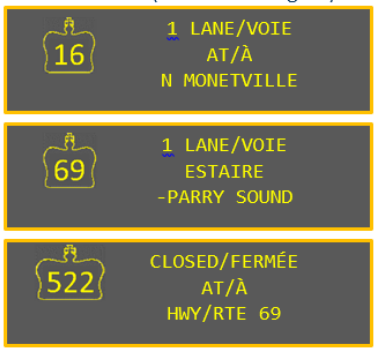
- Sample messages for scenarios all sign types
  - Temporary PVMS/FVMS
  - Pole-Mounted/Cantilever VMS
  - Overhead VMS
- Regional Variances
- Bilingual Considerations

Emergency Full Closure (West/Northwest Region)



Partial Closure (East Region)

Partial Closure (Northeast Region)



Incident Detection – Service Book Walkthrough

Costs

- Shopping list style of high-level costs for relevant components to that service

Procurement Strategy

- Procurement approaches related to temporary/permanent deployments, type of system (e.g. COTS vs. custom), tendering considerations

Element	Cost
Purchase: Supply and Install	
Permanent	
Inductive Loop Detectors	$20,000 per station
Non-Intrusive Radar Detectors	$10,000
Bluetooth Detector	$7,000
Dome Camera	$5,000
Camera Lowering Device System with Pole	$25,000
Digital Video Recorder	$1,500
Pole-Mounted VMS	$100,000
Overhead VMS Sign	$400,000 - $500,000
ATMS Controller Cabinet Site	$20,000
Civil Provisions (Ducts, F/O, Power)	$150,000 per km
9.0 m Concrete Pole	$2,800
Traffic Control (lane closure)	$4,000
Semi-Permanent/Temporary	
Pole-Mounted Sensor on Trailer	$10,000

Sample Cost Deployment

An example of Incident Detection may consist of:

- Four (4) non-intrusive radar detectors mounted on a concrete pole at an existing ATMS site
  - 4 x $10,000 = $40,000
  - 4 x $2,800 = $11,200
- Four (4) CCTV cameras on camera lowering device systems with local recording at an existing ATMS site
  - 4 x $5,000 = $20,000
  - 4 x 25,000 = $100,000
  - 4 x $5,000 = $20,000
- Total Deployment = $140,000

Incident Detection – Service Book Walkthrough

Case Studies / Previous Deployments

- Example deployments within and outside of Ontario

Performance Measures

- Metrics to help measure the success of the system

Case Studies / Previous Deployments

Description	Components
Highway 400-Series Corridors Ministry of Transportation Ontario	• Various corridors deploying a Freeway Traffic Management System (FTMS) • Includes various devices including cameras, traffic detectors, signage and associated communications, power, and cabinet infrastructure
KC Scout System Missouri DOT	• Began deploying a video analytics based incident detection system in 2012 for their 300+ cameras • Noticed more efficient results in automated detection immediately
Incident Detection/Verification System Minnestota DOT	• Utiizes video to manually detect and verify incidents. VMS signs are updated accordingly • All key corridors have full coverage

Performance Measures

- Roadway Clearance Time – time when incident is first detected to all pre-incident lanes becoming available
- Secondary Incidents – number of incidents occurring between while the primary incident is still active. This may include incidents within the incident scene, queue, and opposite direction of the incident scene.
- Number of incidents detected through the Incident Detection system

Incident Detection – Service Book Walkthrough

Emerging Technologies

- Opportunity to acknowledge technologies (existing or emerging) not currently utilized by the MTO in its deployments

Emerging Technologies

CCTV Video Detection

- Operator monitoring of video feeds
- Options for video analytics/image processing used to identify vehicle speeds (analytics not currently used by MTO)
- Detection systems should have an automated incident detection algorithm to automatically prompt TMC operators of potential incidents (not currently used by MTO)
- Maintenance program to ensure clean camera lens/housing

Probe Data

- Portability, scalability, infrastructure-free, comparable/better granularity to other detection technologies
- Probe data platform utilized with potential to expand to existing ATMS platforms through customized API integrations

Waze Connected Citizens

- Crowd-sourced data from Waze users to obtain notifications of detected incidents
- Reported incidents need to be vetted through a verification process

Aerial CCTV Video Monitoring (not currently used by MTO)

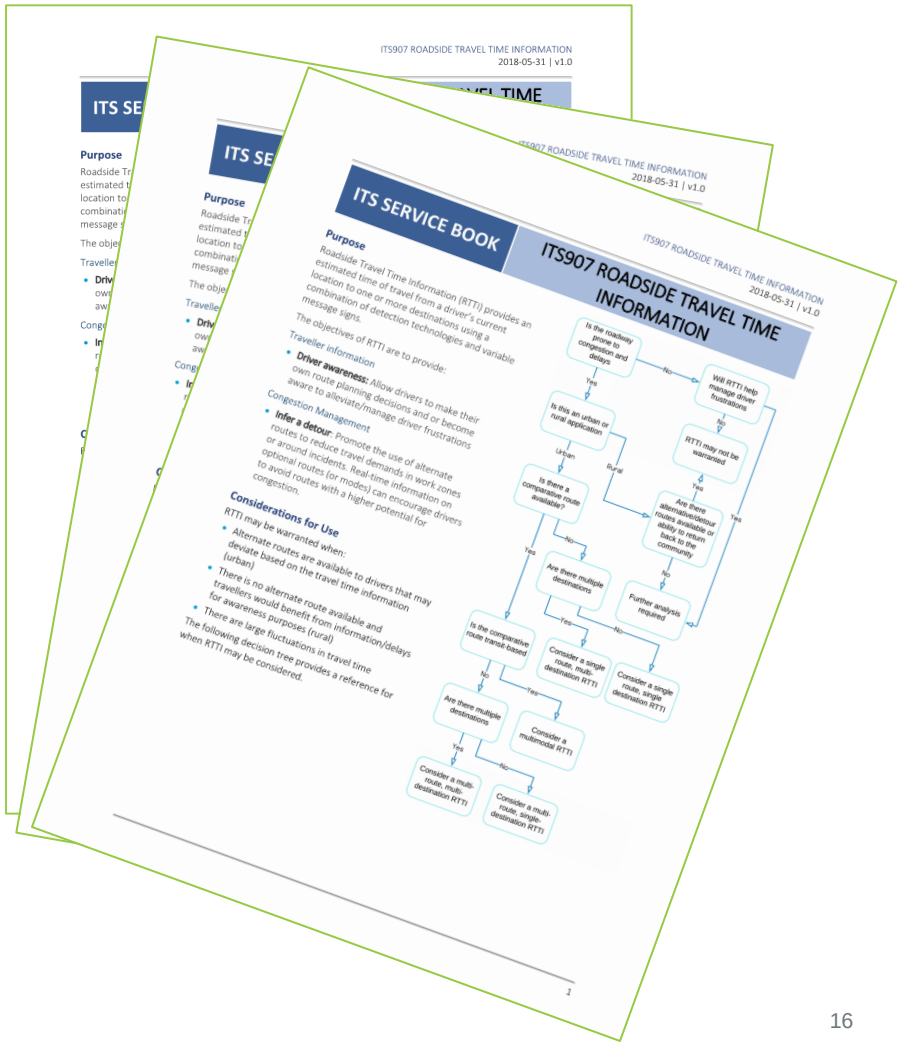
- Visual verification of an incident using a deployment of aerial vehicles such as drones

Automated Incident Detection

- Detection systems should have an automated incident detection algorithm to automatically prompt TMC operators of potential incidents (not currently used by MTO)

Next Steps

- Continue developing additional Service Books
- Introduce the Service Book Library within MTO and promote its use across the Regions
- Periodically re-visit Service Books to adapt to changes within Ontario and the industry



Thank You!

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