



# Congestion Charges

Volume 1

## THE PROBLEM OF URBAN CONGESTION IN CANADA

The recent CAA study *Grinding to a Halt: Evaluating Canada's Worst Bottlenecks* took a new perspective on a problem that Canadians know all too well: urban congestion is a growing strain on our economy and well-being. Canada's worst traffic bottlenecks are almost as bad as bottlenecks in Chicago, Los Angeles and New York. Bottlenecks affect Canadians in every major urban area, increasing commute times by as much as 50%.

This CAA briefing on investments in active transportation is one in a series that explore potential solutions to the problem of urban congestion in Canada. These briefings delve into solutions not only to highway congestion, but also to congestion on urban streets. Taken together the solutions explored in these briefings represent a toolkit to address this problem. The objective is to inform policy makers and the public about options to reduce congestion and key considerations for when and where a particular solution might be the right fit.

Most congestion cost estimates account only for recurrent congestion--congestion which occurs due to normal day-to-day traffic volumes. Recurrent congestion excludes non-recurrent congestion that is caused by collisions, major weather events and other irregular occurrences. In many Canadian cities, however, non-recurrent congestion is not all that uncommon. As such, in the event of collisions, break-downs and other disruptions, clearing the incident quickly and efficiently can significantly improve traffic flow.

There are no estimates of the overall cost of congestion associated with incidents in Canada. In the United Kingdom, congestion on the highway system has been estimated to cost \$4.8 billion per year,<sup>1</sup> of which one-quarter, \$1.2 billion is caused by incidents.<sup>2</sup> Within the City of Toronto, half of all congestion on the City's expressways (Gardiner and Don Valley Parkway) is caused by collisions and breakdowns.<sup>3</sup> As an example, if one-third of the congestion at Canada's worst bottlenecks alone were attributable to incidents, and this congestion could be cut in half, savings of close to \$50 million per year could be achieved, including savings of 3.7 million litres of fuel.

Traffic incident management (TIM) is a planned and coordinated program to detect and remove incidents as quickly and safely as possible, restoring traffic flow.<sup>4</sup> Canada's severe winter conditions can cause and exacerbate incidents, making cost-effective TIM potentially even more important here than in most other countries.

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**is the estimated cost of congestion on the highway system in the United Kingdom.**

<sup>1</sup> All dollar amounts in this briefing are in Canadian Dollars. US-Dollar amounts have been converted to Canadian Dollars at a rate of \$1.25 Canadian Dollars per US Dollar. Estimates should be considered approximate

<sup>2</sup> Department for Transport (2012)      <sup>3</sup> City of Toronto (2016)

<sup>4</sup> TIM does not include incident prevention, other than the prevention of "secondary" incidents that result from the disruption of the initial, primary incident. For instance, a variety of training, regulatory, infrastructure and vehicle improvements in recent years have made contributions to reducing incidents, and associated congestion. However, such preventative measures are not the subject of this briefing.

## PROBLEM: CONGESTION OF URBAN FREEWAYS

### POTENTIAL SOLUTION: FREEWAY SERVICE PATROLS

**How does it work & what are the benefits?** Systematic patrolling of freeways by highly trained personnel with specially equipped vehicles. Typical functions include performing minor repairs, assisting motorists, removing debris, providing fuel, providing first aid, pushing vehicles out of travel lanes and assisting emergency services. **Examples:** Road Rangers Program (Florida), Highway 407 ETR Highway Safety Patrol (Ontario). Coordinated Highways Action Response Team (CHART) (Maryland)

Freeway service patrols offer benefits ranging from \$6 to \$28 for every dollar spent. Costs of roughly \$25 million annually for a large program like that of Florida, covering the state's freeway system.

#### CONSIDERATIONS:

- **Affordability can be an issue if freeway service patrols must compete with other priorities for funding within public budgets.**
- **Limited public information is available in Canada on the costs, benefits and good practices associated with freeway service patrols.**
- **In some cases arrangements may already exist for some level of freeway service patrol, and adjusting arrangements can present an obstacle, for example if long term contracts are in place.**

## PROBLEM: CONGESTION ON URBAN FREEWAYS

### POTENTIAL SOLUTION: NEW APPROACHES TO INCIDENT INVESTIGATIONS AND CLEARANCE

**How does it work & what are the benefits?** A variety of underexplored technologies and approaches are available to speed up incident clearance. **Examples:** Incident screens (United Kingdom), drones to photograph incident sites (already in use with the RCMP and some other police in Canada), guaranteed payment for towing services.

Incident screens (physical barriers to prevent rubbernecking and resulting secondary collisions) can offer a benefit of \$300,000 per incident. Using drones to map and video incident scenes can speed up highway closures by 30-40 minutes. Drones typically costs \$20,000-\$60,000 including training.

#### CONSIDERATIONS:

- **Some technologies that can speed up incident clearance tend to be low in cost and offer tangible benefits, but whether the potential benefits outweigh the costs would depend on specific circumstances such as time taken to deploy incident screens or drones and annual operating costs.**
- **Another policy change that can speed up incident clearance is how towing services are paid for. Guaranteed payment for towing services can encourage tow truck operators to quickly clear incidents as they do not need to negotiate payment at the incident site. However, such programs have a cost for the public entity guaranteeing the payment.**

## PROBLEM: CONGESTION ON URBAN FREEWAYS

### POTENTIAL SOLUTION: IMPROVED INCIDENT RESPONSE COORDINATION

**How does it work & what are the benefits?** Improved coordinated among the numerous entities that might be involved in incidents including police, highway service patrols, highway maintenance personnel, tow trucks, emergency medical services, fire services, utilities and public security agencies. **Examples:** Autoroute 13 incident (Quebec), Rapid Scene Incident Clearance (Florida).

Costs and benefits are highly dependent on the program adopted.

#### CONSIDERATIONS:

- **Limited public information is available in Canada on the costs, benefits and good practices associated with incident response coordination.**
- **Given the large number of entities that can potentially be involved in responding to an incident, and in some cases, the absence of a clear lead agency (although this is often the police), getting started on improving coordination can be a real challenge, particularly without significant leadership from a Ministry of Transportation or equivalent entity.**
- **Given limited information and coordination challenges, obtaining funding for coordination, including for joint training and even to assure communication among responders, can be an even greater challenge.**

# THE TRAFFIC INCIDENT MANAGEMENT PROCESS

In general, the TIM process involves a number of steps (Figure 1). The benefits of TIM come from executing each step as quickly and effectively as possible.

**Figure 1: General Steps in the Traffic Incident Management Process**

STEP	DESCRIPTION
<b>Detection</b>	The incident is brought to the attention of the agencies responsible for maintaining the traffic flow and safe operations of the road. <sup>5</sup> Incidents are typically detected through reports by persons with mobile phones (including via 9-1-1 calls). Dispatch operators handle 9-1-1 calls by performing preliminary incident investigations to determine appropriate initial response. Through investigation, operators are generally able to determine location, severity of the incident as well as possible injuries and property damage. In areas covered by cameras and other sensors, these technologies can play an important part in incident detection.
<b>Verification</b>	Confirming that an incident has taken place and gathering information such as the exact location, nature, extent, severity, and other relevant details that enable an effective response. The first on-site police officer or other emergency service personnel conduct the initial verification of traffic incidents. Where available, cameras can aid in verification.
<b>Response</b>	<p>The first on-site personnel, usually the police officer or service patrol, complete the incident assessment and activate a response. Incident response involves dispatching the “appropriate personnel, equipment, and materials as soon as sufficient information is available about an incident.”<sup>6</sup></p> <p>An effective and timely response depends on the coordination and the preparedness of the emergency response team for all types of incidents. Communication is also essential for an effective response not only between various service providers, but also to keep motorists well informed of an incident including through variable message signs, media and mobile device alerts.</p> <p>As the severity of the incident and associated damage increases, the response can include additional officers and many agencies (fire, emergency medical services, utility vehicles, tow trucks, environmental control, collision investigators, coroner, emergency management, etc.), which can affect the length of the incident.</p>
<b>Site/Traffic Management</b>	<p>Site management is the “management of resources to remove the incident and reduce the impact on traffic flow.”<sup>7</sup> Securing the scene for the safety of the emergency personnel on-site, incident victims, and other motorists is the primary objective for the incident site management process.</p> <p>Traffic management entails establishing traffic control measures to minimize congestion and to reduce the risk of secondary incidents. This can involve providing clear delineation of the detour path and safely directing traffic around the incident.</p>

<sup>5</sup> Farradyne, P. B. (2000)

<sup>6</sup> Austroads Inc. (2007)

<sup>7</sup> Austroads Inc. (2007)

STEP	DESCRIPTION
Investigations	Collision investigations can sometimes become very complex when serious injuries, fatalities and criminal involvement occurs. Collision reconstruction and forensic investigators may require the scene to be closed off to allow for evidence collection and collision reconstruction activities.
Clearance	Incident clearance is the “process of removing wreckage, debris, or any other element that disrupts the normal flow of traffic, or forces lane closures, and restoring the roadway capacity to its pre-incident condition.” <sup>8</sup> Clearance is typically the most time-consuming step in the TIM process, <sup>9</sup> and so is a key focus for TIM improvement efforts.
Recovery (Returning to Normal Traffic)	Once the scene has been cleared and the roadway is fully opened, the time taken to return to normal traffic flow is defined as recovery. This time can be a significant proportion of the incident management timeline due to the ripple effect from an incident.

## TRAFFIC INCIDENT MANAGEMENT IN CANADA

Major urban areas in Canada generally have in place TIM processes including regional coordination centres such as the BC’s Regional Transportation Management Centre, Ontario’s COMPASS Transportation Management Centre and Quebec’s regional Integrated Traffic Management Centres. These centres typically monitor networks of cameras and other sensors which allow them to quickly detect and verify incidents. The centres can then be involved, to varying degrees, in coordinating response.

TIM is not a new idea in Canada, but it has not necessarily been adopted to its full potential. While the focus of TIM has typically been on freeway incidents, some TIM approaches are also applicable to local roads. This briefing focuses some specific aspects of TIM that are perhaps underexplored in Canada and could offer significant benefits at a modest cost. These aspects usually cut across more than one of the steps in the TIM process set out in Figure 1.

### The Canadian Automobile Association (CAA) and Incident Management

As Canada’s largest provider of towing services, the CAA itself plays a significant role in incident management across Canada. CAA Roadside Assistance services to Members in support of incident management include collision tows (see more below), emergency gas delivery, flat tire service, vehicle extrication, minor roadside adjustment and emergency repairs.

<sup>8</sup> Farradyne (2000)

<sup>9</sup> Austroads Inc., 2007

## FREEWAY SERVICE PATROLS

A freeway service patrol (FSP) is a program that involves highly trained personnel with specially equipped vehicles who systematically patrol congested highways. Typical FSP functions include performing minor repairs, assisting motorists, removing debris, providing fuel, providing first aid, pushing vehicles out of travel lanes and assisting emergency services.

### EXAMPLES

#### Florida Road Ranger Program

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Started in 1999, the Florida Road Ranger Program is an FSP operating on Florida's Interstate Highways, particularly on congested urban freeways. Road Rangers is a free service provided by the Florida Department of Transportation. Road Rangers typically respond within 15-30 minutes.<sup>10</sup> The objectives of the program are "reduction of accidents, reduction of incident duration by assisting the Florida Highway Patrol (law enforcement), assistance to disabled or stranded motorists, removal of road debris, reduction of congestion produced air pollutants and increased safety at incident scenes."

In 2012 the Florida Department of Transportation commissioned an independent benefit-cost analysis of the Road Ranger Program.<sup>11</sup> This analysis valued the benefits of the program in dollar terms including improved safety, reduced cost of obtaining assistance for the motorists being helped, reduced traffic delays, reduced emissions and reduced fuel consumption. The study found that the \$25-million annual program cost was greatly exceeded by \$167 million in benefits, almost all (96%) resulting from reduced delay. Put another way, the Road Ranger program is estimated to generate \$6.70 in benefits for every dollar spent.

#### Highway 407 ETR Highway Safety Patrol

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Highway 407 ETR Highway Patrollers patrol Ontario's Highway 407 at all times. They are tasked with control of highway operations, dealing with hazards in lanes, and emergency response. They also provide assistance to motorists whenever possible including with tire changes, up to five litres of free gasoline, calling a tow truck, and parking behind disabled vehicles with flashing amber lights and directional arrows.

#### Maryland Coordinated Highways Action Response Team (CHART)

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CHART operates 43 emergency patrol vehicles that cover 3,200 km of Maryland highways. Patrols take place 24/7 in the Baltimore/Washington Metropolitan Area and 5 am to 9 pm in less busy areas, but patrols can assist with incidents anywhere in the state. CHART estimates that 225-250 secondary crashes are prevented every year, delay and fuel costs are reduced by \$1 billion per year and that CHART has reduced major incident duration by 40-50% in the past decade.<sup>12</sup>

CHART has involved \$20 million in capital annually to fund infrastructure and devices, \$12 million in operating costs and \$2-4 million per year for information technology.<sup>13</sup> As such, roughly speaking, the program appears to offer a ratio of benefit to cost ratio of roughly 28:1, if benefits and costs are compared on an annual basis.

<sup>10</sup> Florida Department of Transportation (n.d.)

<sup>11</sup> As described in US Department of Transportation (2015)

<sup>12</sup> Maryland Department of Highways (N.D.)

<sup>13</sup> US Department of Transportation (2016)

# NEW APPROACHES TO INCIDENT INVESTIGATIONS AND CLEARANCE

Having the right equipment to quickly and safely respond to, manage, investigate and clear incidents can have major impacts on the duration and congestion consequences of incidents.

## EXAMPLES

### Incident Screens

Incident screens (Figure 2) are a simple TIM tool being deployed in the United Kingdom. An incident screen physically blocks motorists from seeing what is happening behind the screen, reducing “rubbernecking,” the tendency of motorists to slow down and look at the scene of an incident, slowing traffic and potentially causing secondary incidents through inattention. Each incident screen is loaded on a trailer and can screen up to 75 m and is 2.1 m high.<sup>14</sup>

The UK Highways Agency estimated the average economic benefit per incident from using incident screens is \$300,000.<sup>15</sup> However, the Agency has recently been criticized for rarely using the 3,000 screens it acquired in 2009 at a cost of \$3.7 million. As of August 2015, the screens had only been used 77 times.<sup>16</sup> Even so, this would suggest benefits of \$23.1 million have been obtained, well in excess of the cost of acquiring the screens, but not taking into account the costs of deploying them to each incident. Such costs would vary depending on the number of screens and personnel relative to the area to be covered, among other factors.

**Figure 2: Incident Screens**



Source: UK Government Web Archive

Using driving simulators and eye-tracking goggles, US researchers estimated that with a screen fully obscuring an incident, drivers spent on average four seconds looking at an incident. In contrast, without incident screens or if the incident was only partially obscured by screens, then drivers spent on average 12 seconds “rubbernecking.”<sup>17</sup>

Incident screens are more applicable for major incidents that result in a highway closure of many hours, given the time required to deploy.

<sup>14</sup> Department for Transport (2012)

<sup>15</sup> Department for Transport (2013)

<sup>16</sup> Gallagher (2015)

<sup>17</sup> Colon, et al. (2013)

## Investigation Technology: Drones

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The police now routinely use flying drones to photograph incident locations. The result is a reduction in the time required to take photos from two hours to about 15 minutes, and reducing a highway closure by 30-45 minutes. The drones, including training, cost \$20,000-\$60,000.<sup>18</sup> The photos taken can be converted into a three-dimensional video.<sup>19</sup> Drones, however, face some limitations. For instance, they currently cannot be used at night, in bad weather or in high winds.<sup>20</sup>

Since not all police officers carry drones, the costs of deployment also need to be weighed against the benefits. While in general drones have raised privacy concerns, in this instance concerns may be largely mitigated as incident locations tend to be secured from the public.

**Figure 3: Incident Investigation Drone**



Source: Pexels

## Paying for Towing Services

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In Canada road users have a variety of options for obtaining towing services. These range from subscription-based services, such as those operated under the CAA brand, to unaffiliated operators who can be called without a prior relationship having been established.

Differences in how towing services are paid for can have an impact on how quickly incidents are cleared. In Quebec, for example, tow truck operators collect payment directly from motorists for whom they are providing service. While the Quebec Ministry of Transportation has in place maximum prices by vehicle type, this system often results in road-side negotiation or even refusal of towing, which significantly lengthens clearance times. Ontario, on the other hand, has in some cases a system of deferred and guaranteed payment for tow truck operators. Motorists are only invoiced in the days following a tow, and the Ontario Ministry of Transportation makes the payment if the motorist does not.<sup>21</sup> The Ontario system has made a significant difference. Before guaranteed payment was put in place, 30% of all tow calls went unpaid, causing tow operators to have to raise prices for everyone, further exacerbating the problem.<sup>22</sup>

While the Ontario system offers advantages there remain opportunities to better coordinate towing operations, as discussed below.

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<sup>18</sup> Van Dongen (2014)

<sup>19</sup> Gaffney (2015)

<sup>20</sup> Lu (2014)

<sup>21</sup> Gagné (2017)

<sup>22</sup> Menzies (2008)

# INCIDENT RESPONSE COORDINATION

A critical component of effective TIM is coordination among all of the relevant entities. Specific entities involved may vary to some degree from incident to incident, but would typically involve the police, highway service patrol (where available) or highway maintenance personnel and tow trucks. Other entities that may be involved depending on the nature and severity of the incident include emergency medical services, fire services, utilities and public security agencies.<sup>23</sup>

## EXAMPLES

### The Autoroute 13 Incident

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The tragic events of March 14-15, 2017 on Autoroute 13 in Montreal, and the resulting inquiries, offer a rare glimpse into the operations and failings of major incident management in Canada. A major snow storm coupled with a series of coordination failures led to motorists being stranded overnight on Autoroute 13. Coordination failures of general relevance included:

- A lack of access to Quebec Provincial Police radio communications by the Ministry of Transportation's regional Integrated Traffic Management Centre for Montreal. The Integrated Traffic Management Centre had previously relied on police radio communications to detect and verify incidents, but lost this ability when police upgraded radios.
- Lack of sufficient training of Traffic Management Centre staff.
- Lack of appropriate scaling up of resources available during a time of significant traffic incidents resulting from the snow storm (albeit the storm was worse than forecast).
- Ministry of Transportation highway patrollers and provincial police officers lacking cell phones or all-wheel drive vehicles.
- The Integrated Traffic Management Centre is largely an information centre and did not have the capability to manage the response to the incident itself, beyond passing on information.
- There was a lack of communication between provincial police operations centre and the Integrated Traffic Management Centre.

### Florida Rapid Scene Incident Clearance (RISC)

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Florida has an Open Roads Policy that sets a goal of safely clearing major highway incidents and truck crashes in 90 minutes or less. First implemented on Florida's Turnpike Enterprise roads, the system is now being implemented across the state.

At the core of RISC is providing financial incentives to qualified and participating heavy-duty towing service providers. To qualify for the program tow operators must maintain contractual equipment and training standards.

<sup>23</sup> Gagné (2017)

Tow providers are required to respond to major incidents with two heavy-duty tow trucks as well as support vehicles for clean-up and debris removal within 60 minutes of receiving a notification. Once given the notice to proceed from the lead official on scene, the contractor has to clear the roadway within 90 minutes. If the contractor meets both the response and clearance deadlines, it receives a bonus of \$600 to \$3,500. If the contractor fails to open the roadway within three hours, they are penalized \$10 for each minute over. Contractors averaged a 41-minute response time and 55 minutes to clear the roadway.<sup>24</sup>

This is in contrast to systems in use elsewhere, such as British Columbia, for example, where first responders such as the police simply call heavy-duty tow operators based on a list, without necessarily having information about the sufficiency of the capabilities of the operator they are contacting. The heavy-duty tow operators do not participate in a RISC-type program and so are not contractually obligated to meet training and equipment standards.<sup>25</sup>

**Figure 4: An All-Too-Common Scene on a Freeway:  
Traffic Incident Management Can Help**



Source: Pixabay

<sup>24</sup> Texas A&M Transportation Institute (N.D.)

<sup>25</sup> Clouthier (2016) and Florida's Turnpike Enterprise (2017)

# IMPLEMENTATION CONSIDERATIONS

As has been illustrated above, TIM practices tend to offer significant congestion relief benefits at modest cost. There are probably two key reasons why TIM practices have not received as much attention in Canada as they deserve.

## Affordability – the competition for budget dollars

TIM programs have to compete against other priorities in the budgets of authorities responsible for roads and highways. For example, in spite of recognizing a very high ratio of benefits to cost of 10:1 for freeway service patrols due to reduced delay,<sup>26</sup> the City of Toronto decided to defer implementation because of the insufficiency of resources.<sup>27</sup> Ultimately, however, following a two-month pilot project in the fall of 2017, the City did launch “quick clear squads” on the City’s expressways and major arterial roads after having found funding through re-allocation.

## Little public information in Canada

A compounding factor is likely a lack of information. Remarkably little public information is available in Canada on TIM practices, either in place or contemplated. This is in contrast to the United States, where TIM programs are much better known and a community exists to promote and improve these practices. For example, the US National Traffic Incident Management Coalition is a multi-disciplinary partnership of the public safety and transportation communities.

# TRENDS AFFECTING COSTS AND BENEFITS

Technological development is the overriding trend affecting the costs and benefits of TIM.

TREND	WHAT IS IT	POTENTIAL IMPACT ON TIM
<b>Falling cost of technology and increased availability</b>	The increased availability and falling cost of new technology is making TIM more cost effective. Most notably, incident detection and verification is becoming much more rapid and accurate thanks to the falling costs of sensors, including cameras and in-vehicle technologies. For investigations, the use of drones is helping to reduce time required.	Faster detection, verification and investigations will speed the TIM process, reducing congestion.

<sup>26</sup> City of Toronto (2016)

<sup>27</sup> City of Toronto (2016)

# CONCLUSION

Incidents are a key contributor to urban congestion in Canada. So what would a large and coordinated effort to promote a package of these solutions look like in terms of their total benefits? Benefits would be greatest in areas of greatest congestion, such as the bottlenecks identified in the CAA study *Grinding to a Halt: Evaluating Canada's Worst Bottlenecks*,<sup>28</sup> and where limited TIM practices are currently in use. As an example, if one-third the congestion at Canada's worst bottlenecks was attributable to incidents, and this congestion could be cut in half, savings of close to \$50 million per year could be achieved, including savings of 3.7 million litres of fuel.

The starting point for any coordinated effort to improve TIM practices should certainly involve a significantly expanded effort at communicating the costs, benefits and best practices of TIM. TIM is among the most cost-effective solutions to the problem of urban congestion in Canada, and should receive far more attention than it does at present.

<sup>28</sup> CAA (2017)

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