Memo

To: Don Kudo, County of Wellington

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Date: April 20th, 2021

Subject: Wellington County RMAP – Data-Driven Safety Strategy

Our File: 20-3297

1.0 Introduction

As part of the Road Master Action Plan for the County of Wellington, a data-driven safety strategy was developed. The strategy is built on best practices both locally and nationally and aligns with the County's vision and policies concerning the management and implementation of transportation infrastructure and services.

The development of a Data-Driven Safety Strategy aligns with the Road Master Action Plan (RMAP) vision to:

"To connect people and goods across the County safely, conveniently, efficiently and sustainably."

It also aligns with specific goals to:

- **Goal #1: Create a Transportation Network with a Focus on Safety; and**
- **Goal #7: Develop Transparent Policy Tools that Guide Investment Decisions in the Transportation Network.**

A data-driven safety strategy is different from a traditional safety review. This type of strategy and safety analysis relies on evidence-based data and/or modelling to provide the ability to not only identify locations where there may be a safety problem, but then also be able to review and quantify primary and/or secondary causes and determine the overall impact to safety.

This document provides an overview and process guidelines for addressing public complaints, identifying problem areas, and evaluating mitigation alternatives. The document is organized as follows:

- **Foundations**: Identification of best practices and local policies;
- **Process:** Provide an overview of the safety review process;
- **Problem Identification:** Identify the need to confirming the problem with a site visit;
- **Evaluation:** Describe how alternative mitigation solutions will be evaluated;
- **Implementation:** Describe the implementation process; and
- **Next Steps:** Define how this safety strategy can be used moving forward to identify and prioritize projects.

2.0 Foundations

The following section provides an outline or overview of the relevant practices and policies that define the significance that safety needs to play in the management and operation of the County's road network. It also identifies the industry standard for identifying problem areas and appropriate mitigation to resolve identified issues.

2.1 Best Practices Review

Standards, practices and policies have already been developed from a road safety strategy perspective both locally and nationally in Canada. These existing standards and policies must fit into the County's strategy.

A best practices review ensures that the County strategy aligns with or follows standard processes used by professionals. It is also helpful to understand how local policies, visions and goals can be incorporated within the context of a larger, more standardized practice. Below are several examples of best practices.

2.1.1 Transportation Association of Canada (TAC)

TAC's 2004 *Canadian Guide to In-Service Road Safety Reviews* provides a high, national standard of road safety procedures and policies. The document serves as a practice guide for conducting in-service road safety reviews. TAC defines an in-service road safety review as an in-depth engineering study of an existing road using road safety principles to identify cost-effective countermeasures that would improve road safety and operations for all road users. In-service road safety reviews can be conducted for any road section, intersection or interchange. They are most effective when conducted at locations where a high collision risk has been identified.

Several key takeaways, specific to the local context of Wellington County, are listed below:

- Improving the physical and operational characteristics of existing roads is a proven method to improve road safety;
- Geometric and operational characteristics of roads must be compatible with the current demand;
- Collisions are caused when a failure occurs in the interaction between the road user, the vehicle, and the road environment;
- 30% of collisions are fully or partially attributed to the road environment:
  - Traffic engineers with an understanding of human behaviour can improve roads to prevent common driver errors from resulting in a collision; and
  - The road environment can be made more forgiving so that a collision is less severe.

Analytical tasks typically undertaken as part of an in-service road safety review include:

- Site visit;
- Collision analysis;
- Geometric analysis;
- Operational analysis;
- Traffic conflict analysis **optional;*
- Human factors analysis **optional; and*
- Identification of issues contributing to collision risk.

TAC's road safety review process is shown in **Figure 1**. This process will be used to guide the development of the proposed Wellington County safety review strategy.

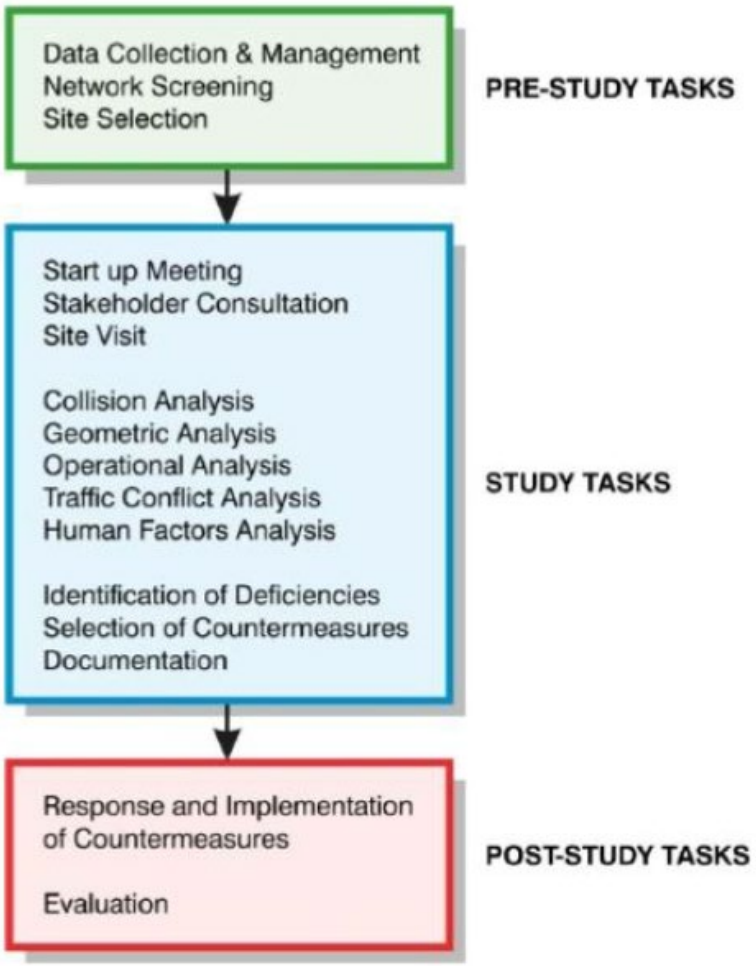

Figure 1: In-Service Road Safety Review Tasks*

**Source: TAC's 2004 Canadian Guide to In-Service Road Safety Reviews, page 65*

2.1.2 Municipal Examples

Five road safety strategies from municipalities with similar physical and administrative environments as the County were also reviewed. These were used as input to developing a Data-driven road safety strategy for Wellington County. Descriptions of these strategies are provided as follows:

City of Guelph Road Safety Strategy (CRSS) – Adopted in July 2020

The City of Guelph is adjacent to the County of Wellington and many trips and road corridors connect and link between the City of Guelph and Wellington County.

The City of Guelph Road Safety Strategy (CRSS) outlines 24 actions to address 10 road safety priorities for Guelph. The five highest-rated road safety priorities identified by the community are pedestrian safety, distracted driving, aggressive driving, cycling safety and speeding. Items that this strategy looked at are radar speed display boards, speed limit changes, traffic signal timing changes as well as educational and awareness campaigns.

A key best practice from this strategy is that it streamlines the collision data collection by obtaining access to the MTO Authorized Requester Information Services (ARIS). The program allows for City staff to obtain detailed collision reports.

Safe Roads Waterloo Region – Web Portal supported by Region of Waterloo and Waterloo Regional Police

The Region of Waterloo is located west of Wellington County. Outside of Cambridge, Kitchener and Waterloo, there are many small communities, rural areas and corridors that are similar to conditions within Wellington County.

The Safe Roads Waterloo Region campaign is dedicated to reducing injuries and deaths caused by traffic collisions on roads. The campaign notes that everyone - drivers, pedestrians, cyclists, government and traffic enforcement - has a part to play in making roads a safer space. The portal provides tips to drivers in terms of driving with care to avoid rear-end collisions and how to travel through roundabouts. It also provides directions to pedestrians and cyclists in terms of how to act at crosswalks and or intersections.

A key best practice from this strategy is that it provides some key information on how long it takes (less than a second) for a vehicle to collide with another vehicle, pedestrian or cyclist if a motorist is distracted and focused on something else.

Peel Region – Vision Zero Road Safety Strategy Plan 2018-2022 – Adopted December 2017

Peel Region is located east of Wellington County. Outside of Mississauga and Brampton, the Town of Caledon has rural areas and rural corridors similar to what is found in Wellington County.

The Strategy aims to not only reduce fatal and injury collisions by 2022, but also to ultimately have zero fatal and injury collisions for all road users. The study consists of a review of traffic

collision information in Peel Region, pinpoints the key problem areas, and then set actions to make improvements to each key problem area. The strategy focuses on six areas of emphasis: intersections, aggressive driving, distracted driving, impaired driving as well as pedestrians and cyclists.

A key best practice from this strategy is the development of over 109 countermeasures focusing on the different emphasis areas, with the countermeasures developed solely based on the location and type of collisions. Peel's approach is based on the characteristics of their network and infrastructure which varies greatly across the region (i.e. Mississauga versus Caledon, City Center versus rural hamlet, urban arterial versus urban collector, auto versus transit, etc.) The more complex the environment the more complex the process for evaluating. This level of detail is not required for the County.

London / Middlesex Road Safety Strategy – Adopted in June 2014

The City of London and the County of Middlesex have some similarities compared to the arrangement between the City of Guelph and Wellington County. Throughout Middlesex County, there are numerous rural corridors with numerous small communities, towns and hamlets located in various locations.

The overall objective of the London Road Safety Strategy is the development of a coordinated road safety strategy plan for the City of London and Middlesex County which provides direction for future road safety projects and programs. The plan defines a system and a process for setting out the targets, countermeasures, and actions that will guide the City of London and the Middlesex County as well as any other partners in creating safer roads by reducing the number and the severity of motor vehicle collisions.

A key best practice from this strategy is that it undertakes a network screening (i.e. a high-level scan of locations to determine which have potential issues) result to determine the top 10 signalized intersections and top 10 pedestrian signals where safety improvements could be introduced, based on the potential for improvement due to historical collision data.

Brant Safe Streets Strategy – Adopted September 2019

The City of Brantford and the County of Brant have some similarities compared to the arrangement between the City of Guelph and Wellington County. Throughout the County of Brant, there are numerous rural corridors with numerous small communities, towns and hamlets located in various locations.

The Brant Safe Streets strategy is designed to achieve four (4) objectives:

- Create roads that are both perceived to be and are safe;
- Change the behaviour of drivers who speed and engage in dangerous driving practices, primarily through positive reinforcement and voluntary compliance;
- Engage members of the community to learn about road safety and become more active in creating and sustaining a safe County road system; and

- Create a mix of easily and rapidly deployed road safety solutions along with longer-term solutions.

A key best practice from this strategy is that it actively impacts how new roads are designed and how existing roads are redesigned to include traffic calming infrastructure such as raised intersections, centre medians, roundabouts/traffic circles are well as cross-section adjustments to introduce infrastructure for cyclists (bike lanes, cycle tracks, etc.) and pedestrians (multi-use pathways, sidewalks, etc.).

Summary

All five of these strategies have been developed to increase safety and reduce/eliminate the number of collisions, with some more focused on education to change driver behaviour rather than looking to upgrade infrastructure. Out of the five strategies reviewed, the Peel Region strategy appears to be the most reliant on reviewing historical collision data to determine where the hotspot areas are present, to come up with specific actions to be identified at the actual problem area.

As a result, the Peel Region Safety Strategy appears to be the most-data-driven safety strategy, where it is taking key outcomes from the collision history data to develop the proper mitigation measures for implementation.

2.1.3 Safe Communities Wellington County

Wellington County is part of the Safe Communities Program. The vision for this program is “to make Wellington County, the safest and healthiest place in which to live, learn, work and thrive in Canada.”

The current Safe Communities Program focuses on seven injury categories. Only two of these categories involve transportation. The first category focuses on motor vehicle (on/off-road) incidents, while the second focuses on safety for pedestrians and cyclists.

The Safe Communities Program focuses on education and outreach and does not provide any engineering recommendations to improve safety. The development of a Data-Driven Road Safety Process for Wellington will help support the vision of Safe Communities, and the existence and use of this document should be communicated as part of the outreach conducted by Safe Communities.

3.0 Process

The recommended Data-Driven Road Safety Process identified for Wellington County aligns well with TAC’s process and Peel Region’s Safety Strategy. The resulting process is a proven, data-driven approach, to be used to deliver a consistent and robust road safety analysis for Wellington County.

The flow chart in **Figure 2** illustrates the Road Safety Process for responding to a safety concern raised by a member of the public for roadways or intersections under County jurisdiction. The goal of the process is to determine whether a problem exists, to pinpoint it based on the location, and to determine and implement a set of appropriate mitigation measures and/or safety improvements.

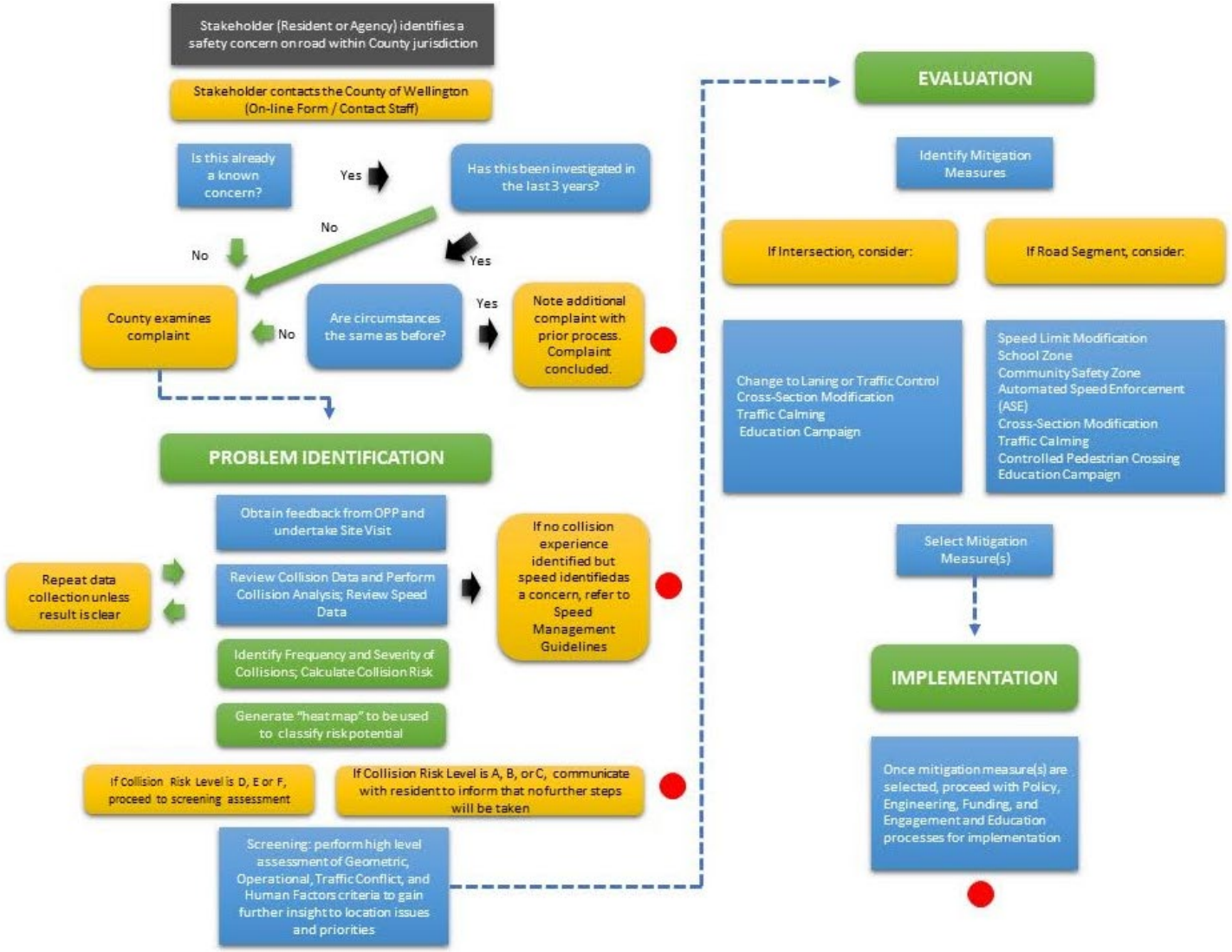

Figure 2: Road Safety Process

4.0 Problem Identification

A site visit is the first step of the process and can assist with the identification of the problem. The purpose of a site visit is to gain a first-hand appreciation of the physical and operational conditions and to better understand some of the potential safety issues. The site should be used as an opportunity to observe factors that may increase the collision risk, regardless of whether there is related collision data, such as worn-out pavement markings or signage, sight obstructions, or poor road lighting, etc. A site visit can also be used to gather data or look for signs of collisions or near misses.

At locations where the on-site review could extend for several hours, this could be done by temporarily introducing a portable camera to help determine driver behaviour, potential conflicts, as well as risks that may be posed to pedestrians and/or cyclists (if applicable) that may not be as clear based on a brief on-site review.

4.1 Collision Analysis

Collision analysis is critical to determine the validity of concerns often expressed by members of the public to the municipality. This is the core of the in-service road safety review. Three to five years of historical data should be analyzed. Reported collisions include valuable and meaningful insight into the safety of an intersection or roadway segment, through an analysis of collision types and primary causation. Any mitigative actions that have taken in the same 3-5 year period will be identified to understand whether it has had any effect) positive or negative) on the identified issue.

The Ontario Provincial Police, County of Wellington Detachment provided an analysis report of intersection related motor vehicle collisions within the County Of Wellington. The analysis was limited to “Reportable Collisions” under the Highway Traffic Act that were recorded in the OPP Collision reporting System (CRS) for the years 2009 through 2019 and does not include “Non-Reportable” collisions or collisions that were only reported under the Niche Records Management System (RMS). The analysis includes temporal, collision classification and primary causation information for each location.

Figure 3, based on information from the OPP Analysis Report, depicts all intersection related motor vehicle collisions in Wellington County that were recorded as occurring on County roads between 2011 and 2019. The brighter red areas on the map indicate a higher number of collisions reported for that location.

The heat map of collision hotspots illustrates a higher number of collisions in the southerly portion of Wellington County, largely surrounding the City of Guelph.

Historical collision data should be reviewed for the intersection or roadway segment in question. The County should first evaluate the frequency, rate, and severity of collisions to determine how the rates compare with industry standards and municipal experience, and determine the

associated risk level (categorize the relationship between frequency and severity). The risk level assessment is documented in later sections of this memo.

If a recurrence of a certain collision type is observed at an intersection or along a segment, it could be an indication of a certain design issue for the road or intersection in question. The methodology below has been based heavily on TAC's 2004 *Canadian Guide to In-Service Road Safety Reviews.*

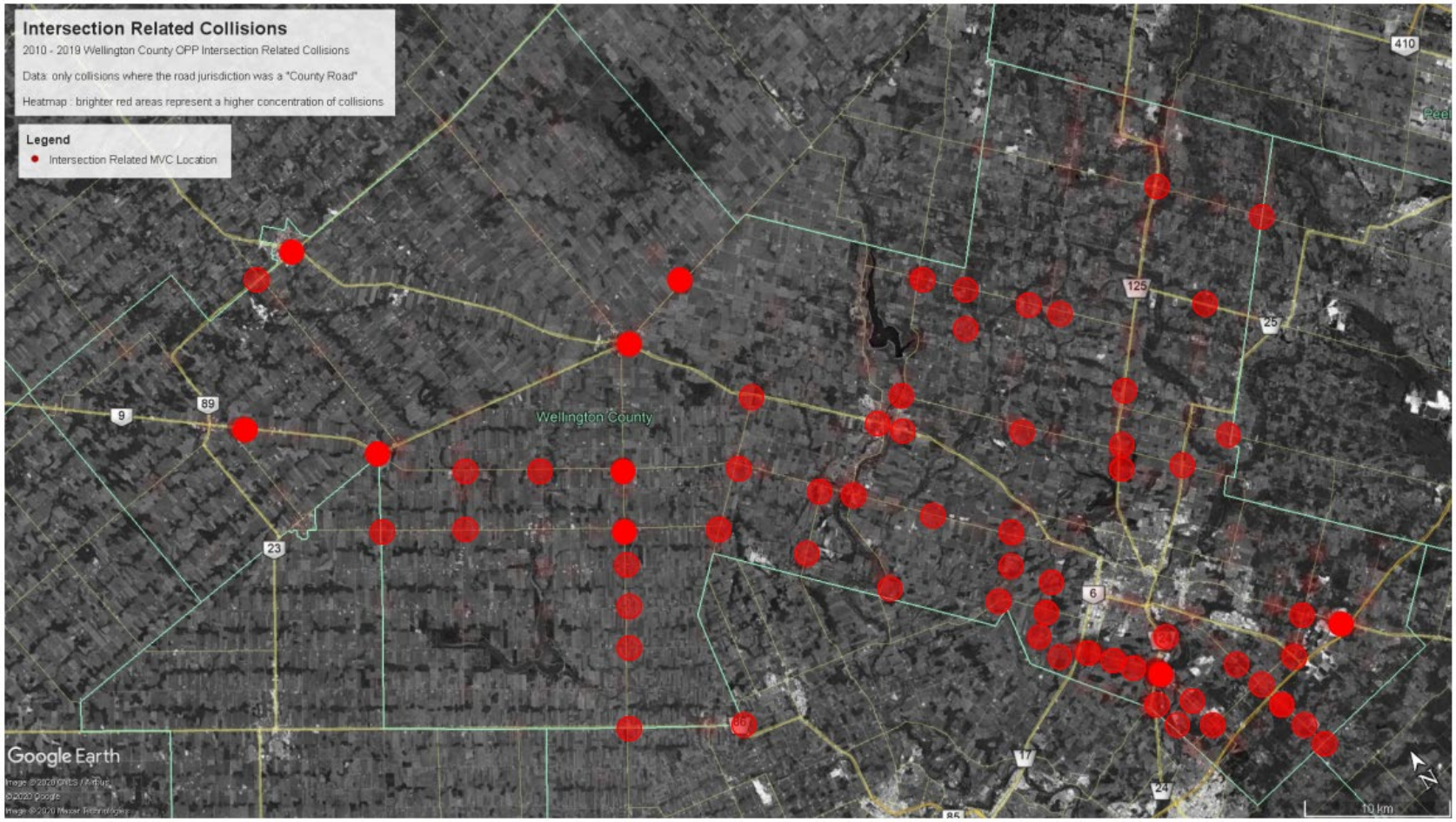

Figure 3: Heat Map of Collision Locations*

**Source: Ontario Provincial Police Analysis Report (with minor adjustments for graphic resolution)*

For the County of Wellington's purposes and within this safety strategy, the thresholds for frequency and severity of collisions will conform to TAC's standards presented in TAC's 2004 *Canadian Guide to In-Service Road Safety Reviews*[1] (as described in Section 2.1.1). **Table 1**, **Table 2** and **Table 3** provide the framework for determining the overall collision risk of an intersection or road segment, based on collision frequency and severity. The thresholds from the TAC guidelines are used to determine the overall collision risk to an intersection or roadway segment and represents a useful relationship for adoption by Wellington County. This method ensures that even rare collision areas (less than 1 collision per 10 years), may merit closer inspection if a severe rating is applied.

Table 1: Collision Frequency Rating

Expected Collision Frequency Due to the Identified Issue	Frequency Rating
10 or more collisions per year	Frequent
1 - 9 collisions per year	Occasional
Less than 1 collision per year, but more than 1 collision in 10 years	Infrequent
Less than 1 collision per 10 years	Rare

It is noted that if a fatality is deemed an isolated incident/accident by the Ontario Provincial Police, or if some collisions are occurring due to environmental factors such as snow or ice, the County should still have the ability to decide whether to proceed or not with any mitigation measure(s).

The collision severity rating takes into account various collision types, which should be sorted based on a severity rating as provided in **Table 2** better determine severity. Primary causes of collisions can include a combination of design factors and human behavioural factors, which should be taken into account for proper engineering judgement, but do not factor into the Collision Risk determination laid out by TAC.

[1] TAC's 2004 Canadian Guide to In-Service Road Safety Reviews, Page 109 and 110

Table 2: Collision Severity Rating

Typical Collision Types Expected Due to the Identified Issue	Expected Collision Severity Due to the Identified Issue	Severity Rating
Collisions involving Pedestrians, Bicycles, Trucks; High-Speed Collisions	Probable Fatality	Extreme
Head-On, Crossing (T-bone, 90°), Off-Road; Medium to High-Speed Collisions	Moderate to Incapacitating Injury	High
Left-Turn, Right-Turn; Medium to Low-Speed Collisions	Minor to Moderate Injury	Medium
Rear-End, Side Swipe; Low-Speed Collisions	Property Damage Only	Low

Once the frequency of collisions and the collision severity of the majority of collisions has been determined, the frequency rating and the severity rating is applied to **Table 3** to determine the Collision Risk.

Table 3: Collision Risk Determination

Frequency Rating	Severity Rating			
	Low	Medium	High	Extreme
Frequent	D	E	F	F
Occasional	C	D	E	F
Infrequent	B	C	D	E
Rare	A	B	C	D

A: Lowest Risk Level;
B: Low-Risk Level;
C: Low to Moderate Risk Level;
D: Moderate to High-Risk Level;
E: High-Risk Level;
F: Highest Risk Level.

After determining the Collision Risk, a location with a risk score of D, E or F should be examined through further analysis and screening of the problem area, and if warranted, mitigation should be considered through the evaluation process.

4.2 Screening of Problem Area

Further screening of the problem area can include any or all of the following analyses. Each of these is laid out in detail within TAC's 2004 *Canadian Guide to In-Service Road Safety Reviews, Section 6.* and is summarized below.

Geometric Analysis

Collect or observe applicable geometric design standards or guidelines for the location in question. Characteristics considered include:

- Horizontal alignment;
- Vertical alignment;
- Cross-sectional elements;
- Combinations (of otherwise low-risk geometric features); and
- Design inconsistency.

Operational Analysis

Assess travel demand / volume data to determine:

- Operational characteristics;
- Operational efficiency; and
- Operation of traffic control devices.

Traffic Conflict Analysis

Prepare conflict diagram, evaluate conflict frequency, rate, severity, type and distribution.

Human Factors Analysis

The human factors review utilizes knowledge of road user abilities and limitations to review the characteristic of the road and the traffic control devices, to minimize the potential for errors and collisions.

5.0 Evaluation

The evaluation stage will take place once the initial screening and review of historical collision data have been undertaken, including the determination of the intersection or roadway segment's Collision Risk score. This will involve the assessment of any previous changes to the infrastructure operating environment and the resultant effect on the operating environment at the locations, as well as the determination of the range of mitigation measures likely to improve

the identified safety issues. Mitigation measures should be selected using a combination of research, knowledge and judgement, based on roadway segment or intersection location types. It is important to consider whether an improvement at another location could affect the collision risk at the study location.

5.1 Identification of Improvement Alternatives

Table 4 and **Table 5** lists some appropriate safety measures available to Wellington County. Each should be considered based on local context and engineering knowledge. Section 6.1 of TAC's 2004 *Canadian Guide to In-Service Road Safety Reviews* does provide some effectiveness metrics for various measures and can be consulted for further information. Certain mitigation measures are more applicable for road segments, while others are more appropriate or effective for intersections.

Table 4: Safety Strategy Collision Analysis – Intersection Countermeasures

	Counter Measure	Application
Intersection	Change to Laning or Traffic Control	Adjustments to lanes and/or traffic control at intersections can improve capacity and reduce crash-risk by separating various movements.
	Cross-Section Modification	Changing the cross-section of a roadway can be done to create or increase space dedicated to vulnerable users. It can also result in a shift in modal priority along a segment or within an area. Changing the cross-section may also help reduce vehicle speeds from a passive standpoint as it may help make the roadway feel tighter, and as a result, overall speeds can often be reduced. Methods/Types of cross section modifications include: provision of auxiliary turn lanes and additional through lanes (typically 3.25-3.75m per lane), provision of pedestrian or cycling environment (typically 1.5-3.0m), and center median control (typically 1-5-2.0m).
	Traffic Calming	Traffic calming measures must be implemented in a way that respects the intended role of the road. County roads are intended to have higher operating speeds and traffic volumes and, in some cases, carry higher volumes of trucks and emergency response vehicles and may not be appropriate for all traffic calming measures.
	Education Campaign	Education campaigns can be a useful component in an overall strategic road safety program and act as a complement to another solution. As such, they are most applicable in combination with another mitigation measure.

Table 5: Safety Strategy Collision Analysis - Road Segment Countermeasures

	Counter Measure	Application
Road Segment	Speed Limit Modification	An adjustment in posted speed limit is applicable in areas where drivers regularly exceed the posted speed limit and safety is a concern.
	School Zone	A School Zone shall be implemented only on roads adjacent to a school and at locations within 150 metres. This can be introduced on a 24/7 basis.
	Community Safety Zone	Community Safety Zones are used to modify driver behaviour to be less aggressive and more cautious and aware to achieve enhanced public safety in these particular locations. Driver behaviour is modified by implementing and enforcing increased fines for traffic violations within the Community Safety Zones through a special designation under the Highway Traffic Act.
	Automated Speed Enforcement (ASE)	In May 2017, an amendment to the Highway Traffic Act (HTA) was made to introduce the use of ASE in municipalities. Under the Highway Traffic Act, ASE is only permitted to be introduced and used in School Zones and/or Community Safety Zones.
	Cross-Section Modification	Changing the cross-section of a roadway can be done to create or increase space dedicated to vulnerable users. It can also result in a shift in modal priority along a segment or within an area. Changing the cross-section may also help reduce vehicle speeds from a passive standpoint as it may help make the roadway feel tighter, and as a result, overall speeds can often be reduced. Methods/Types of cross section modifications include: provision of auxiliary turn lanes and additional through lanes at intersection roads/accesses (typically 3.25-3.75m per lane), provision of pedestrian or cycling environment on each side of road, (typically 1.5-3.0m), and boulevard treatments (typically in urban environments to separate vulnerable users from travelled lanes, (typically 3-5m).
	Traffic Calming	Traffic calming measures must be implemented in a way that respects the intended role of the road. County roads are intended to have higher operating speeds and traffic volumes and, in some cases, carry higher volumes of trucks and emergency response vehicles and may not be appropriate for all traffic calming measures.

	Counter Measure	Application
	Controlled Pedestrian Crossing	Crossovers are often at midblock locations and are applicable in situations where both pedestrian and vehicle volumes are high. These crossovers provide the right-of-way for pedestrians as vehicles will need to stop and yield the right-of-way to any pedestrians. Per the Ontario Traffic Manual (OTM) Book 15: Pedestrian crossovers are installed on roadways with a maximum posted speed of 60km/h and maximum four lanes of two-way traffic.
	Education Campaign	Education campaigns can be a useful component in an overall strategic road safety program and act as a complement to another solution. As such, they are most applicable in combination with another mitigation measure.

A number of these safety measures are detailed within the Speed Management Guidelines (under separate cover). Refer to TAC's 2004 *Canadian Guide to In-Service Road Safety Reviews* for the effectiveness of these and other mitigation measures.

6.0 Implementation

Once a preferred solution set has been identified along a corridor or at an intersection, the following process can be followed for its implementation.

Engineering Process

Based on the selection of available safety measures, the County would need to make a technical decision on if any modifications and/or educational campaigns should be introduced.

Should there be a need to change the geometry (laning) or traffic control at an intersection, there are technical warrants available (i.e. traffic signal warrants, right turn / left turn auxiliary lane warrants) to help guide the decision-making process on whether improvements are necessary. Along corridors, warrants also exist for where School Zones, Community Safety Zones or Controlled Pedestrian Crossings should be introduced. Traffic calming should only be introduced if there is a notable speeding issue determined along the corridor.

A detailed process for determining where traffic calming or cross-section modifications could be introduced along select county road corridors has been outlined within the Speed Management Guidelines (under a separate cover).

Funding Process

An economic evaluation should be conducted as part of the In-service road safety review to quantify the cost-effectiveness of the recommended mitigation measures. The economic study considers the capital and operating costs for each project and compares this with the benefits of the actual project. This requires a strategic costing exercise of implementing (capital and operating costs) versus not implementing (social, property and legal costs). The funding process not only identifies the overall cost of the proposed projects but is also used to inform the determination of County priorities.

Engagement and Education Process

The development and implementation of effective education and communication strategies that inform and influence the stakeholders concerning the need and importance of any mitigation measures are critical components in the success of implementing any engineering solutions. An overall engagement and education process has been outlined within the Speed Management Guidelines.

7.0 Next Steps

The following steps should be taken to adopt the strategy:

- Consult with departments (i.e. Engineering (Roads), Planning and Development (Development Applications, Major Projects), Treasury (Financial Services, Risk Management) ;
- Confirm collision data program;
- Confirm/prioritize criteria and solutions;
- Identify and prioritize projects;
- Alignment with ongoing initiatives/programs; and
- Obtaining the required approvals. As with any infrastructure or service improvement, recommendations by staff are brought to Committee/Council to obtain approval for funding and incorporation of the required infrastructure and equipment into the fiscal budget