TRANSPORTATION PLANNERS AND ENGINEERS

bunt & associates

City of Vernon Highway Crossings

Transportation Report

FINAL VERSION

Prepared for

City of Vernon

Date

May 23, 2025

Project No.

07-24-0038

Bunt & Associates acknowledges and respects the Traditional Territories upon which our work spans, and from which we benefit. We are grateful for the unique cultures and histories of Indigenous Peoples that enrich our understanding and connection to the lands we call home. We honour learning, listening, and truth in our journey to reconciliation.

May 23, 2025
07-24-0038

Anna Huisken, MSc
Transportation Planner
City of Vernon
3001 - 32 Avenue
Vernon, BC
V1T 2L8

Dear Anne:

Re: City of Vernon Highway Crossings – FINAL VERSION

Bunt & Associates Engineering Ltd. (Bunt) has conducted a Highway Crossings Assessment for 15 select Highway intersections to evaluate the existing multi-modal crossing facilities, intersection traffic control, and safety performance. The report also contains Bunt's recommended intersection upgrades and mitigation strategies to help improve crossing facilities and overall intersection safety. This version has been updated from Version 1 to incorporate City and BC MOTT comments.

We trust this Highway Crossings Assessment will help inform the City of Vernon's Transportation Master Plan Updates, capital plans for future transportation upgrades, and collaboration with the Ministry of Transportation and Transit for implementation.

Please do not hesitate to contact us should you have any questions.

Yours truly,
Bunt & Associates





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Project No. 07-24-0038

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Written with respect and gratitude for the Traditional Territories upon which we work and live.

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EXECUTIVE SUMMARY

Introduction

The City of Vernon (City) is updating their Official Community Plan (OCP) and Transportation Master Plan (TMP) to support the vision for the community's long-term growth and identity. The TMP will help guide the City in managing and upgrading its multi-modal transportation system, including roads, public transit, pedestrian networks, and bicycle networks to meet current and future demands. With the BC Government publishing new policies on Transit Oriented Areas (TOAs) and housing, the OCP and TMP updates will help the City align with these new policies.

Bunt & Associates Engineering Ltd. (Bunt) has been retained by the City to conduct a Highway Crossings Assessment at 15 selected intersections to review existing multi-modal crossing facilities and traffic control, and develop upgrades to help support safe active transportation crossings.

Study Area

The study area includes 15 high-profile intersections along Highway 97 and Highway 6 in Vernon, BC. The intersections are presented in the **Table ES.1**.

Table ES.1: Study Intersections

STUDY INTERSECTIONS	
H1 – Highway 6 & Middleton Way & 15th Street	H9 - Highway 97 & 32nd Avenue Intersection
H2 – Highway 6 & Pottery Road	H10 - Highway 97 & 34th Avenue Intersection
H3 – Highway 6 & Kalamalka Lake Road	H11 - Highway 97 & 35th Avenue Intersection
H4- Highway 6 / 30th Street & 25th Avenue	H12 - Highway 97 & 39th Avenue Intersection
H5 - Highway 6 / 25th Avenue & Highway 97 / 32nd Street	H13 - Highway 97 & 41st Avenue Intersection
H6 - Highway 97 & 21st Avenue (Vernon Jubilee Hospital)	H14 - Highway 97 & 43rd Avenue Intersection
H7 – Highway 97 & 16th Avenue Intersection	H15 - Highway 97 & 48th Avenue Intersection
H8 - Highway 97 & 30th Avenue Intersection	

Methodology

To assess each study intersection, Bunt undertook the following activities and analyses:

- Conducted field visits and site observations to investigate existing traffic control devices, traveller behaviour, and intersection geometry.
- Reviewed the sites for active transportation user facilities.

- Analyzed traffic volumes and, where appropriate, collected road user data.
- Analyzed ICBC collision data.
- Undertook a Collision Risk Assessment using the TAC Canadian Guide to In-Service Road Safety Reviews.
- Undertook traffic signal warrants at locations which did not have full traffic signals utilizing the TAC Traffic Signal Warrant Analysis.
- Additional warrants, such as pedestrian crossing warrants (using the Transportation Association of Canada (TAC) Pedestrian Crossing Control Guide, BC), were also undertaken where appropriate.
- Identified issues and problems at the intersections.
- Developed mitigation strategies and upgrade recommendations based on each intersection's findings.

Recommended Crossing Upgrades Summary

A summary of the issues and recommended mitigation strategies developed by Bunt for the study intersections is summarized in **ES.2.**

Table ES.2: Intersection Conclusions & Recommendations

LOCATION	ISSUES IDENTIFIED	RECOMMENDED MITIGATIONS	JURISDICTION
H1 – Highway 6 & Middleton Way & 15th Street	• There is a lack of sidewalk facilities connecting to the intersection. The south leg of the intersection on the east side provides some flexible bollards, painted crossing over Sarson Road and concrete barriers. However, there are no permanent pedestrian sidewalk facilities. • Accessibility provisions onto the median islands are limited and restrictive. The curb letdowns are quite small and narrow, and surfaces are in some places uneven. • Older versions of pedestrian push buttons, Flashing Don't Walk displays, and pedestrian signals are present. • The intersection has visibility limitations in the north / southbound direction due to the vertical curvature along 15 Street, which crests near the northern edge of the intersection restricting sight lines. • There are a high number of crashes that have occurred at the intersection in the last five years with a significant number resulting in casualty crashes (48%). Many of these crashes are rear-end crashes.	1. Provide a separate raised sidewalk facility which connects to the crosswalk facilities on the east side of 15th Street and Middleton Way at a minimum. 2. Undertake an accessibility review and upgrade pedestrian refuge islands at the intersection, ensuring sufficient accessibility provisions, including curb letdown requirements. 3. Regrade the centre of the intersection and the northbound and southbound approaches to provide a flatter continuous road surface to help improve visibility. Alternatively, consider implementing a northbound left-turn protected signal phase to help mitigate the issue and provide time separation between conflicting movements. 4. Provide advanced flasher warning facing eastbound traffic on the southside of Highway 6. Even though the warrant analysis indicated it is not warranted, Bunt suggests that this still be considered based on the changing speed environment and help to prevent/reduce rear-end crashes occurring in the future. 5. Review traffic signal infrastructure for pedestrians and install countdown timers, audible pedestrian signals, and accessible pedestrian push buttons.	(City) (MOTT) (City and MOTT) (MOTT) (MOTT)

LOCATION	ISSUES IDENTIFIED	RECOMMENDED MITIGATIONS	JURISDICTION
H2 – Highway 6 & Pottery Road	• There are no side walks connecting the residents to the north to the southern commercial/industrial area. • There are no crossing facilities at this location or sidewalks to connect pedestrians to a crossing facility. • 68% of recorded crashes between 2019 – 2023 have been casualty crashes.	1. Upgrade the Highway 6 & Pottery Road intersection to a full traffic signal control, following the TAC warrant analysis and guidance. 2. Implement coordinated signal timing plans for the new signal and the signal at Kalamalka Lake Road & Highway 6 to help maintain Highway traffic progression. 3. Undertake an accessibility review and upgrade pedestrian refuge islands at the intersection to ensure sufficient accessibility provisions, including curb letdown requirements. 4. Extend the sidewalk from the NE approach (northside) to the World Health & Fitness driveway access, along the north side of Highway 6. 5. Provide a sidewalk facility on Pottery Road west of Highway 6.	(MOTT) (MOTT) (MOTT) (MOTT) (City)

LOCATION	ISSUES IDENTIFIED	RECOMMENDED MITIGATIONS	JURISDICTION
H3 – Highway 6 & Kalamalka Lake Road	• One pedestrian crash occurred at this intersection in 2020. • The sidewalk connection at the northeast corner of the intersection does not connect to the pedestrian pushbutton on the north side. • Pedestrian curb letdowns are small with surfaces uneven in places. • 23% of crashes recorded at this intersection are side impact crashes, and 34% are rear-end. • Review traffic signal infrastructure for pedestrians and install countdown timers, audible pedestrian signals, and accessible pedestrian push buttons.	1. Undertake an accessibility review to assess pedestrian refuge islands at the intersection to ensure sufficient accessibility provisions, including curb letdown requirements. 2. Provide a clear and protected path or sidewalk to the pedestrian push button at the northeast corner of the intersection. 3. Review the signal clearance parameters and signal timing to ensure adequate clearances are provided. 4. Review traffic signal infrastructure for pedestrians and install audible pedestrian signals and accessible pedestrian push buttons.	(MOTT) (MOTT) (MOTT) (MOTT)

LOCATION	ISSUES IDENTIFIED	RECOMMENDED MITIGATIONS	JURISDICTION
H4- Highway 6 / 30th Street & 25th Avenue	• Awareness of vehicles of vulnerable road users. The site is currently missing pedestrian signage on the channelized right turns and has faded cycle lane paint. In a high trafficked intersection highlighting crossing points and areas where vulnerable users could be present is important to make vehicles aware. • Pedestrian amenities at the crossings are missing audible pedestrian signals, accessible pushbuttons, and tactile pads. • The on-street bicycle lane present on the eastbound leg is mixed with a road which supports a high volume of vehicles including large transport vehicles and trucks. An environment like this creates high risk for cyclists using the bicycle lane. • Sightlines for the southbound left movement are restricted due to the offset of the opposing left turn lane and resulting vehicle shadowing.	1. Undertake an accessibility review and upgrade the pedestrian refuge islands at the intersection to ensuring sufficient accessibility provisions, including let down requirements. 2. Review signal phasing and consider implementing a split phase signal operation to help mitigate sightline challenges. 3. Upon redevelopment of either north corner parcels adjacent to the intersection, acquire land to provide a left turn bay for southbound traffic to help mitigate the sightline limitation. 4. Increase wayfinding signage to the MUP to encourage cyclists to use the off-street facility to help reduce potential conflicts given the high volume of traffic and heavy vehicles. 5. Upgrade the existing marked bicycle lanes on Highway 6 to a facility with higher protection (i.e., buffered bicycle lane, protected bicycle lane, off-street path, etc.) to help reduce potential conflicts between modes. 6. Consider installing a smart-channel right turn for the eastbound channelized right turn (similar to the Highway 97 & 25th Avenue intersection) to reduce the speed of vehicles and help support a safer environment for pedestrians crossing the intersection. 7. Review traffic signal infrastructure for pedestrians and install countdown timers, audible pedestrian signals, and accessible pedestrian push buttons.	(MOTT) (MOTT) (City and MOTT) (City) (MOTT) (MOTT) (MOTT)

LOCATION	ISSUES IDENTIFIED	RECOMMENDED MITIGATIONS	JURISDICTION
H5 - Highway 6 / 25th Avenue & Highway 97 / 32nd Street	• The high volume of traffic at this intersection presents a high risk for vulnerable users. This is shown in the reported crash data, with 3 vulnerable user crashes having occurred in the last 5 years. • 25th Avenue and Highway 6 are truck routes (and have high traffic volumes). However, bicycle lanes are present on-street and result in a lack of protection and high risk to cyclists. • Pedestrian facilities at the crossings are lacking and missing audible signals, tactile pads, accessible pedestrian pushbuttons, and faded paint on crosswalks/bicycle lanes, etc. • It is unclear where the MUP starts after going through the intersection on the southeast corner of the intersection.	1. Undertake an accessibility review to look at the upgrade of pedestrian refuge islands at the intersection to ensure sufficient accessibility provisions, including let-down requirements and audible signals. 2. Repaint on street bicycle lanes and pedestrian crosswalks. 3. Consider redirecting all cyclists off Highway 6 and 25th Avenue to reduce the risk of conflict with vehicles and cyclists. 4. Provide wayfinding for active modes at the end and beginning of the shared paths connecting to the intersection.	(MOTT) (MOTT) (City and MOTT) (City)

LOCATION	ISSUES IDENTIFIED	RECOMMENDED MITIGATIONS	JURISDICTION
H6 - Highway 97 & 21st Avenue (Vernon Jubilee Hospital)	• The signed and marked pedestrian crossing control type appears inadequate for the Highway environment with high vehicle speeds, high heavy vehicle volumes, and a large crossing distance. • The wide cross-section of Highway 97 creates difficulty for pedestrians to cross in one instance. As a result, pedestrians may be left stranded on the median island. • There is limited advance warning of the pedestrian crosswalk to alert vehicles of crossing pedestrians. Rear-end crashes occur likely because the following vehicle cannot anticipate that the front vehicle is stopping for a pedestrian to cross.	1. Upgrade this location to a full traffic signal to support both vehicle and pedestrian movements. At a minimum, upgrade the intersection to a pedestrian-actuated traffic signal with pedestrian pushbuttons to augment the crossing control and help improve safety. 2. Undertake an accessibility review and upgrade the pedestrian refuge islands at the intersection, ensuring sufficient accessibility provisions, including curb letdown requirements and audible signals. 3. When funding is available, upgrade the pedestrian crossing to a full grade-separated crossing, i.e., pedestrian underpass or overpass, ensuring accessibility for all mobility users.	(MOTT) (City) (City and MOTT)

LOCATION	ISSUES IDENTIFIED	RECOMMENDED MITIGATIONS	JURISDICTION
H7 – Highway 97 & 16th Avenue Intersection	• There is no sidewalk connection on the south side of 16th Avenue to the bus stop. • The Tel-A-Friend Motel driveway forms the east legs of the intersection, creating additional conflict points for vehicle and pedestrian traffic. Additionally, this driveway is an uncontrolled access to the intersection. • There are no audible pedestrian signals or accessible pushbuttons installed at the intersection. • Sightlines from 16th Avenue are limited. • The shared through and left laning configuration northbound and southbound on the Highway may create hazardous situations where visibility is limited.	1. Provide crosswalk markings on 16th Avenue. 2. Provide sidewalk facilities on the south side of 16th Avenue for pedestrians to access the bus stop. 3. Provide a stop sign and stop line on the Tel-A-Friend Motel access to help control traffic. Upon redevelopment of this site, close the driveway access from the Highway to this property. 4. Trim and maintain foliage along Highway 97 to ensure appropriate sightlines from 16th Avenue.	(MOTT) (City) (City and MOTT) (City and MOTT)

LOCATION	ISSUES IDENTIFIED	RECOMMENDED MITIGATIONS	JURISDICTION
H8 - Highway 97 & 30th Avenue Intersection	• A high number of active transportation-related crashes were reported, including two pedestrian and three cyclist incidents. • Highway 97 operates near capacity during peak hours with congested traffic conditions and vehicle queues. This results in augmented aggressive driving behaviour, including smaller vehicle headways, yellow and red light running, and reduced yielding behaviour. • The mix of heavy vehicle traffic along Highway 97, intersecting the urban pedestrian high street environment on 30th Avenue. • The conflict between pedestrians utilizing the crosswalks and right-turning vehicles from 30th Avenue. • The coordinated signal cycle length is 120 seconds which is near the upper threshold of typical MOTT signal timing standards and can result in long pedestrian delays waiting to use the crosswalks. • Older style pedestrian pushbuttons not meeting the latest accessibility standards are present.	**Traffic Signal Modifications:** 1. **Option 1:** Prohibit Right Turn on Red for east-west movements onto Highway 97 from 30th Avenue. This should be supported with signage right turn traffic control signals. 2. **Option 2:** Prohibit Right Turn on Red for east-west movements onto Highway 97 from 30th Avenue and install a right turn signal control. 3. **Option 3:** Install Leading Pedestrian Interval for the east-west pedestrian crossings on 30th Avenue. **Signage, Infrastructure, and Maintenance:** 1. Install Additional Signage for Vehicles to 'Watch for Pedestrians'. 2. Trim and maintain foliage on the corners of the intersection to help improve visibility for right-turn vehicle movements onto Highway 97. 3. Install newer-style accessible pedestrian pushbuttons to support travellers of all ages and abilities.	(City and MOTT) (MOTT) (MOTT) (City and MOTT) (City) (MOTT)

LOCATION	ISSUES IDENTIFIED	RECOMMENDED MITIGATIONS	JURISDICTION
H9 - Highway 97 & 32nd Avenue Intersection	• Left-turn movements are very challenging to complete with large Highway 97 through traffic volumes. • There may be limited visibility for left turn movements due to the shared through and left turn lane configuration resulting in vehicle shadowing of opposing left turn movements. • The intersection has experienced one pedestrian and two cyclist crashes in the last 5 years.	1. Prohibit Right Turn on Red for east-west movements onto Highway 97 from 32nd Avenue. Additionally, consideration for installing a dedicated right-turn phase should be made. 2. Install additional Signage for vehicles to 'Watch for Pedestrians'. 3. Consider installing left-turn lanes on Highway 97 and adjust signal operation at a future time upon the redevelopment of surrounding properties. 4. Consider extending the northbound and southbound left turn prohibition to 24/7 to avoid potentially hazardous left turn movements with limited visibility of oncoming traffic. 5. Install newer-style accessible pedestrian pushbuttons to support travellers of all ages and abilities.	(City and MOTT) (City and MOTT) (MOTT) (MOTT) (MOTT)
H10 - Highway 97 & 34th Avenue Intersection	• No pedestrian crossing facilities are provided at this location. • Physical obstructions exist within the existing sidewalk on 34th Avenue. • It is challenging and potentially hazardous to make left turns onto or off of the highway. Additionally, there are no left turn bays present. • The paved road surface on Highway 97 appears narrow, and 5 side swipe collisions were recorded in the same direction at this intersection in the last 5 years.	6. Monitor the intersection and consider additional pedestrian crossing upgrades in the future. The City of Vernon should collect and review traffic movement data at this location and analyze the volumes of the left turning movements. 7. Consider prohibiting the left turn movements from 34th Avenue in the future if they continue to operate in a challenging and potentially hazardous manner.	(City) (City and MOTT)

LOCATION	ISSUES IDENTIFIED	RECOMMENDED MITIGATIONS	JURISDICTION
H11 - Highway 97 & 35th Avenue Intersection	• A high number of side impact crashes occurred, which may be attributed to difficulty when making left turns from 35th Avenue onto Highway 97 and, as a result, smaller gap acceptance from motorists. • Pedestrian crossing demand was observed at this location despite no provision of a formal crossing facility. • 2 pedestrian crashes were recorded between 2019-2023.	1. Continue monitoring vehicle volumes and active transportation demands in the area and reevaluate requirements for a crossing facility regularly. From a network standpoint, a crossing facility at this location may help connect the City's active transportation systems.	(City and MOTT)
H12 - Highway 97 & 39th Avenue Intersection	• The long signal cycle length of over 100 seconds offers reduced Levels of Service to pedestrian and may cause additional delays. Note, there has been one pedestrian crash at this location in the last 5 years. • Green bicycle conflict pavement markings are extremely faded at the intersection. • There have been 3 cyclist related crashes at this intersection in the last 5 years. Bicycle facilities are limited to on-street bicycle lanes. Note, the on-street bicycle markings are faded resulting in less conspicuity. • There are no audible pedestrian signals or accessible pushbuttons installed at the intersection. Furthermore, cyclists have no way to actuate the signal from the bicycle lanes.	1. Reinstall the green conflict pavement markings close to the intersection to add awareness of cyclists for drivers. 2. Provide dedicated bicycle detection for cyclists to activate the signal and corresponding pedestrian crossing phase. Detection could include push buttons activation or magnetic loops in the bicycle lane. 3. Consider signal phasing to accommodate an advanced bicycle crossing interval and review the intersection cycle length. 4. Consider upgrading the on-street bicycle lanes to off-street bicycle facilities in the future at this location to separate cyclists from vehicle traffic.	(City) (MOTT) (MOTT) (City)

LOCATION	ISSUES IDENTIFIED	RECOMMENDED MITIGATIONS	JURISDICTION
H13 - Highway 97 & 41st Avenue Intersection	• The Hotel driveway access forming the west leg of the intersection is uncontrolled. • 41st Avenue has a concrete block, fire hydrant and BC hydro pole installed within the paved road surface, which poses a hazard to vehicle travel.	1. Close hotel driveway access into the intersection upon future redevelopment or with discussions with the property owner. 2. Remove the concrete base and relocate the fire hydrant and BC Hydro poles out of the paved driving surface. Alternatively, provide curb extensions to remove these hazards from the paved driving surface. 3. Provide an additional crosswalk on the north leg of the intersection with supporting signal infrastructure (i.e., pushbutton, audible signals, and pedestrian displays (walk/FDW/countdown). It is not anticipated to create any additional delays for vehicles, and this would support pedestrian desire lines from the hotel to commercial areas/restaurants.	(City and MOTT) (City) (MOTT)
H14 - Highway 97 & 43rd Avenue Intersection	• There have been five vulnerable user crashes recorded at this location between 2019 – 2023. • Provisions for cyclists are limited to one on-street cycle lane on the west leg of 43rd Avenue westbound. • The traffic signal cycle length is 120 seconds which could increase active traveller delay and result in impatient crossing decisions. • There is a gap in the bicycle network connecting to the MUP to the east of the intersection. • High frequency of vehicle crashes occurring. • High number (40%) of rear-end crashes are casualty crashes.	1. Undertake an accessibility review to evaluate and upgrade pedestrian refuge islands at the intersection to ensure sufficient accessibility for all users. 2. Install green pavement markings at the intersection to add awareness of potential conflict areas between cyclists and motorists. 3. Provide bicycle facilities on 43 Avenue to connect the bicycle network (fill in gaps) to 29th Street MUP. 4. Review the signal timing for this intersection and prepare new optimized timing plans to help minimize vehicle queueing and delays. 5. Install newer-style accessible pedestrian pushbuttons to support travellers of all ages and abilities.	(MOTT) (City) (City) (MOTT) (MOTT)

LOCATION	ISSUES IDENTIFIED	RECOMMENDED MITIGATIONS	JURISDICTION
H15 - Highway 97 & 48th Avenue Intersection	• Sign placement for the pedestrian crossing at the northeast corner appears to be in the middle of the unpaved pathway transition. • Traffic islands and curb letdowns appear narrow and may not meet accessibility standards. • Left-turn pavement marking arrows are faded on the Highway 97 approaches. • There are no audible pedestrian signals or accessible pushbuttons installed at the intersection.	1. Relocate the pedestrian crosswalk sign and sign post away from the MUP connection at the northeast corner. 2. Provide wayfinding signage and clear distinction/definition of paths. 3. Reinstall the Highway left turn symbol pavement markings. 4. Undertake an accessibility review to evaluate the upgrade pedestrian refuge islands at the intersection and update curb letdowns median islands as required. 5. Install newer style accessible pedestrian pushbuttons to support travellers of all ages and abilities. 6. Install audible pedestrian signals.	(MOTT) (City) (MOTT) (MOTT) (MOTT) (MOTT)

Collision Risk Assessment

An assessment was undertaken to evaluate and determine the study intersections Collision Risk Assessment rating utilizing guidance from TAC. The ratings can help identify high risk locations and help prioritize implementation of mitigation strategies for the City of Vernon and BC MOTT.

The Collision Risk Ratings are based on the following parameters:

- Historical collision frequency
- Historical collision severity (property damage only, casualty, fatality)
- Collisions involving active transportation travellers
- Interaction of modes (i.e., heavy vehicles with cyclists)
- On-site field observations
- Engineering judgement

A summary of the Collision Risk Ratings for the study intersections is presented in **Table ES.3**.

Table ES.3: Collision Risk Ratings

COLLISION RISK RATING	STUDY INTERSECTIONS	STUDY INT ID
Level D	Highway 97 & 16 Avenue	H7
	Highway 97 & 34 Avenue	H10
	Highway 97 & 41 Avenue	H13
	Highway 97 & 48 Avenue	H15
Level E	Highway 6 & Pottery Road	H2
	Highway 6 & Kalamalka Lake Road	H3
	Highway 97 & 35 Avenue	H11
Level F	Highway 6 & Middleton Street / 15 Street	H1
	Highway 6 & 25 Avenue	H4
	Highway 97 & 21 Avenue (VJH)	H6
	Highway 97 & 25 Avenue	H5
	Highway 97 & 30 Avenue	H8
	Highway 97 & 32 Avenue	H9
	Highway 97 & 39 Avenue	H12
	Highway 97 & 43 Avenue	H14

The Collision Risk Ratings presented in Table ES.3 can help the City with prioritizing pedestrian, cyclist, and intersection upgrades at locations with higher risk (i.e. Level F). Furthermore, any monitoring at intersections including traffic data, collision data, and safety assessments can be prioritized utilizing the subject table.

1. INTRODUCTION

1.1 Study Purpose and Objectives

The City of Vernon (City) is updating their Official Community Plan (OCP) and Transportation Plan (TP) to support the vision for the community's long-term growth and identity. The TMP will help guide the City in managing and upgrading its multi-modal transportation system, including roads, public transit, pedestrian networks, and bicycle networks to meet current and future demands. With the BC Government publishing new policies on Transit Oriented Areas (TOAs) and housing, the OCP and TP updates will help the City align with these new policies.

Bunt & Associates Engineering Ltd. (Bunt) has been retained by the City to conduct a Highway Crossings Assessment at 15 selected intersections to review existing multi-modal crossing facilities and traffic control, and develop upgrades to help support safe active transportation crossings. Note, Bunt was also retained by the City to review and prepare traffic models for 40 intersections and multiple future horizons locations which will be documented in a separate report.

Bunt also notes that the BC Ministry of Transportation and Transit (MOTT) commissioned a Traffic Management Study in 2015 in addition to an ongoing study of the Highway 97 & 43 Street intersection. The findings of those studies may be different from the findings and recommendations of this study, considering that the road agencies may have different road user hierarchies and priorities. This study evaluated road safety with a particular focus on active transportation (pedestrians and cyclists) and improving crossing safety to help meet the City of Vernon's Vision Zero objective and to inform the Transportation Plan updates. It will be important that the recommendations of both studies be considered holistically when determining appropriate roadway upgrades and countermeasures.

1.2 Study Scope

As part of the Highway Crossing Safety Study the City of Vernon requested a safety analysis be completed on select Highway intersections. These intersections are outlined below and depicted in **Exhibit 1.1**.

Table 1.1: Study Intersections

STUDY INTERSECTIONS	
H1 – Highway 6 & Middleton Way & 15th Street	H9 - Highway 97 & 32nd Avenue Intersection
H2 – Highway 6 & Pottery Road	H10 - Highway 97 & 34th Avenue Intersection
H3 – Highway 6 & Kalamalka Lake Road	H11 - Highway 97 & 35th Avenue Intersection
H4- Highway 6 / 30th Street & 25th Avenue	H12 - Highway 97 & 39th Avenue Intersection
H5 - Highway 6 / 25th Avenue & Highway 97 / 32nd Street	H13 - Highway 97 & 41st Avenue Intersection
H6 - Highway 97 & 21st Avenue (Vernon Jubilee Hospital)	H14 - Highway 97 & 43rd Avenue Intersection
H7 – Highway 97 & 16th Avenue Intersection	H15 - Highway 97 & 48th Avenue Intersection
H8 - Highway 97 & 30th Avenue Intersection	

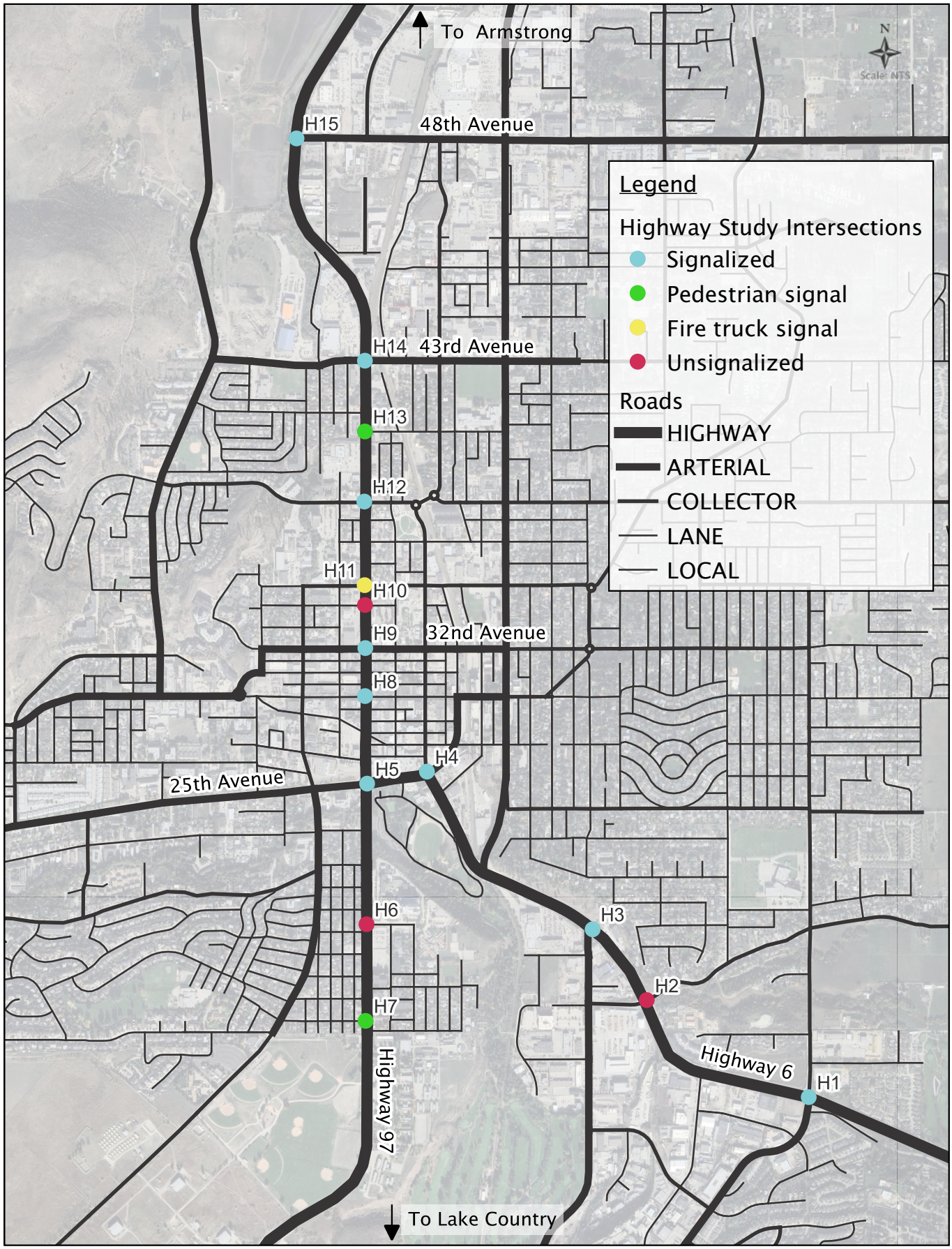
To complete the study, Bunt undertook the following activities for each intersection:

- Undertook site visit.
- Reviewed the sites for active transportation user facilities.
- Analyzed traffic volumes and, where appropriate, collected road user data.
- Analyzed ICBC collision data.
- Undertook a collision risk assessment using the TAC Canadian Guide to In-Service Road Safety Reviews.
- Undertook traffic signal warrants at locations which did not have full traffic signals, using the MOTT Traffic Signal Warrant Analysis.
- Additional warrants, such as pedestrian crossing warrants (using the Transportation Association of Canada (TAC) Pedestrian Crossing Control Guide, BC), were also undertaken where appropriate.
- Identified areas for improvement at the intersections.
- Provided recommendations based on each intersection's findings.

1.3 Organization of Report and Study Scope

The sections of this report have been organized as follows:

- **Section 1** presents the study purpose, key tasks, and an overview of the traffic network and collision risk assessment for the study intersections.
- **Sections 2 to 16** provide a detailed assessment at each crossing location, including key site visit observations, traffic volumes, signal timing plans, collision data, risk assessment, and recommended mitigations.
- **Section 17** details the collision risk assessment.
- **Section 18** summarizes the key conclusions and mitigation recommendations.



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Exhibit 1.1

Highway Study Intersections

bunt & associates

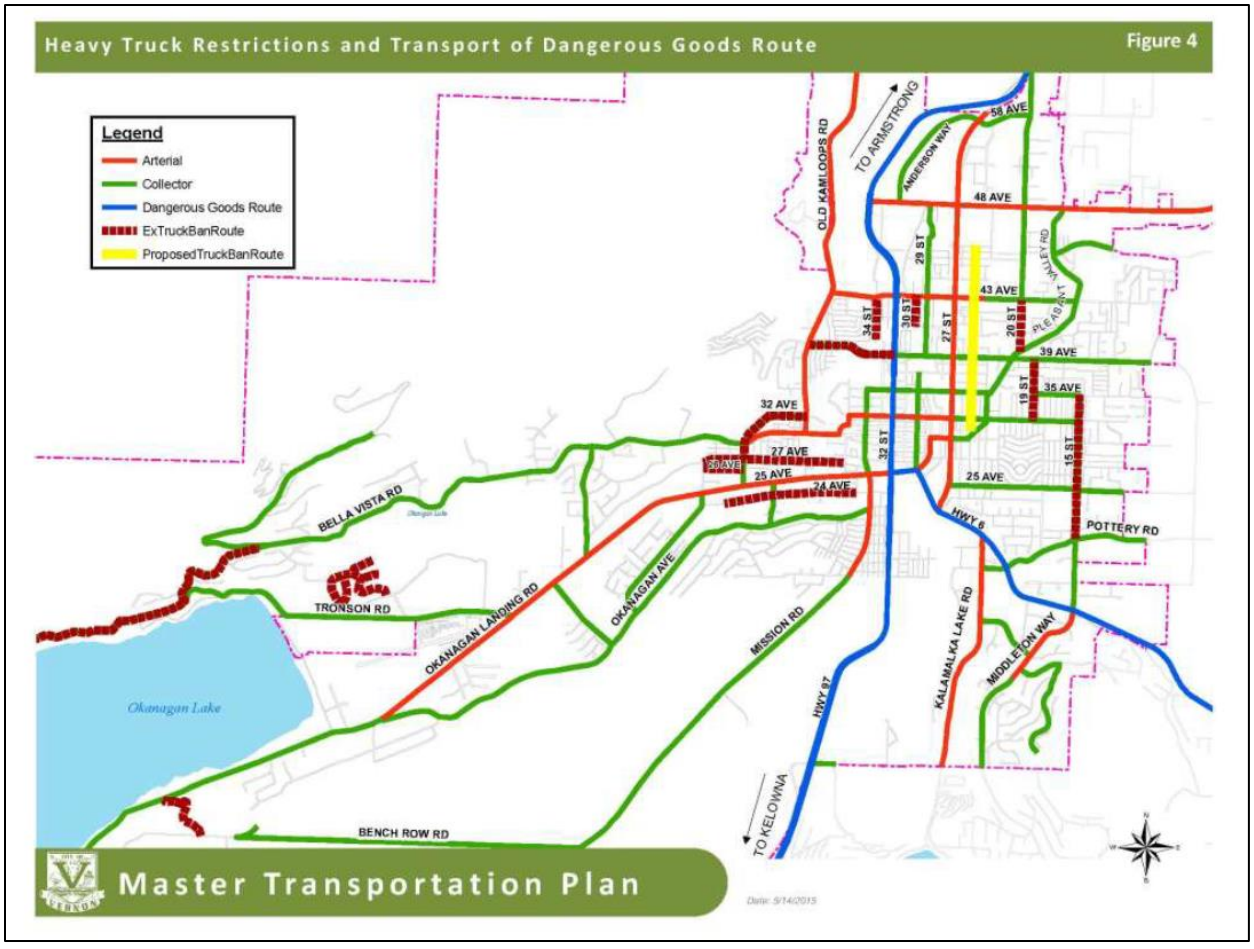
1.4 Transportation Network Overview

In order to understand the needs and function of the selected intersections, Bunt reviewed the surrounding transportation network through the lens of each type of road user.

Heavy Vehicle Network

Both Highway 97 & Highway 6 are identified within Vernon's 25-Year Master Transportation Plan[1] as dangerous goods routes. **Figure 1.2** presents the heavy vehicle network and restrictions in Vernon.

Figure 1.2: Heavy Vehicle Routes in Vernon



Source: Vernon 25 Year Transportation Master Plan.

[1] https://www.vernon.ca/sites/default/files/docs/bylaws/OCP/25_year_master_transportation_plan.pdf

Using traffic data collected for the project, Bunt estimated an approximate heavy vehicle percentage for the Highway 6 and Highway 97 corridors. These spot locations were taken at Pottery Road on Highway 6 and at 21st Avenue (Vernon Jubilee Hospital) on Highway 97 and are presented in **Table 1.2**).

Table 1.2: Highway 6 & Highway 97 Heavy Vehicle Percentages

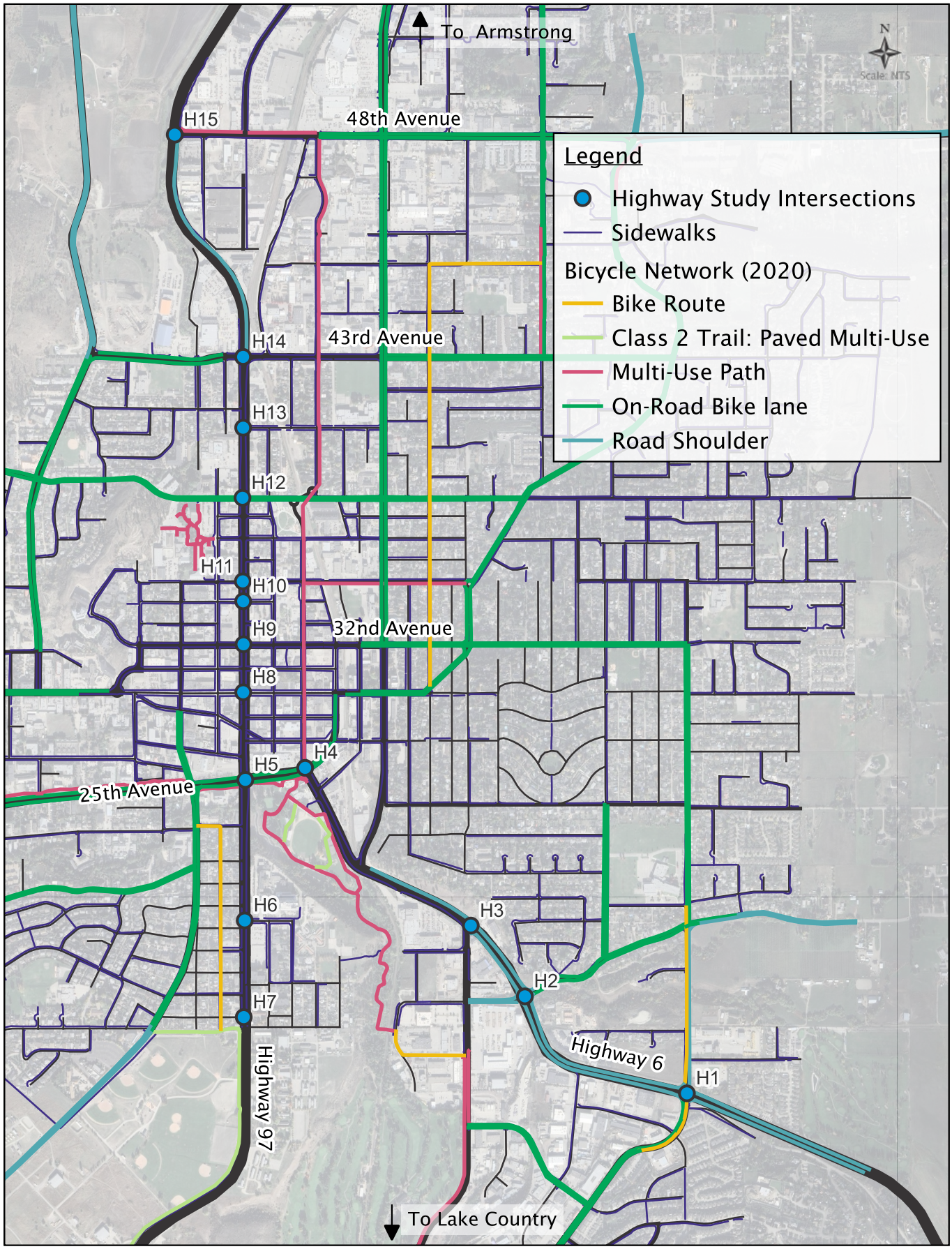
DIRECTION	HIGHWAY 6		HIGHWAY 97	
	AM	PM	AM	PM
Northbound	6% - 7%	2% - 3%	8%	4%
Southbound	4% - 5%	2%	6%-8%	5% - 6%

The high heavy vehicle percentages are expected for highway corridors; however, it is noted that heavy vehicles can often create a higher risk for vulnerable users on and around the roadway.

Note, Highway 6 and Highway 97 are under the jurisdiction of the BC Ministry of Transportation and Transit (BC MOTT), whilst the intersecting side roads are under the jurisdiction of the City.

Pedestrian and Cyclist Network

Vernon is continuing to develop their walking and cycling network. **Exhibit 1.2** presents the current network surrounding the study intersections. As part of the study, a strong consideration has been given to the safety of vulnerable road users. Each intersection will explore the details of the walking and cycling network within the subject intersection vicinity. Bunt notes that many of the study intersections interface with pedestrian and cycling connections and the City's network.



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Exhibit 1.2

Existing Walking and Cycling Network

bunt & associates

2. H1: HIGHWAY 6 & MIDDLETON WAY / 15 STREET

2.1 Intersection Description

The Highway 6 & Middleton Way / 15th Street intersection is located near the East Hills neighbourhood of Vernon. Highway 6 operates east-west and provides a connection from Vernon to Lumby. This site is close to the boundary of the Vernon area. The Highway 6 & Middleton Way/15th Street intersection is a signalized intersection with pedestrian crosswalks in all directions. The intersection provides two vehicle travel lanes in each direction on the highway, plus left-turning lanes and one vehicle travel lane in each direction on the side streets (Middleton Way and 15th Street), plus left-turning lanes. All legs of the intersection provide channelized right turns with zebra pedestrian crosswalks. There are small, paved areas with flexible bollards adjacent to the northbound right-turn and the southbound right-turn, acting as a pedestrian sidewalk. All other legs maintain a standard shoulder with no additional pedestrian facilities. The intersection is noted to provide a shoulder for cycling on Highway 6 and on-street bike lanes on Middleton Way and 15th Street.

Highway 6 has a posted speed of 60km/hr at this intersection, while 15 Street and Middleton Way have posted speeds of 50 km/hr. However, approximately 300m to the east of the intersection, the Highway 6 speed limit transitions to an 80km/hr posted speed limit. A plan view of the intersection is provided in **Figure 2.1**. 15th Street has an uphill grade approaching the intersection, while Middleton Way has a downhill grade approach. Along Highway 6, there is generally an uphill road gradient going west to east.

Figure 2.1: H1- Highway 6 & Middleton Way Intersection



2.2 Site Visit Observations

Bunt undertook a site visit on September 26th, 2024, in the early afternoon to observe the intersection of Highway 6 & Middleton Way. The weather conditions were sunny and clear. This section outlines the observation notes and pictures taken at the intersection (**Figures 2.2** to **2.7**).

Site Notes

- A multi-use pathway (MUP) is installed on the southeast leg of the intersection.
- Sarsons Road is located very close to the intersection.
- The accessibility of the pedestrian islands is restrictive and limited. Mobility users may experience challenges.
- No audible pedestrian signals were observed.
- No pedestrian countdown timers were present for the pedestrian crosswalks (Only flashing hand display present).
- 'Old' style pedestrian push buttons were observed with limited accessibility provisions.
- The roadway dips downwards through the centre of the intersection, which restricts the north/ southbound visibility.
- Due to the grade of 15th Street, visibility is restricted.

Figure 2.2: H1- Southbound approach, bollards protecting pedestrians and cyclists

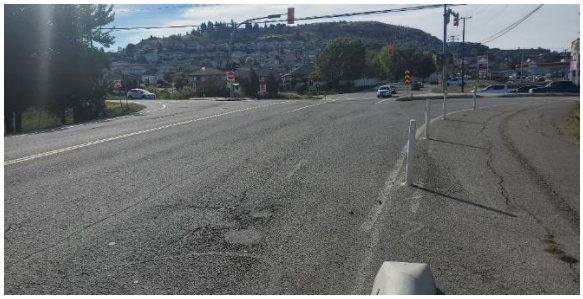


Figure 2.3: H1- Southern leg pedestrian facility



Figure 2.4: H1- Northbound approach shared path



Figure 2.5: H1- Southbound approach yield right and crossing facilities



Figure 2.6: H1- Pedestrian facilities



Figure 2.7: H1- Westbound approach



2.3 Traffic Volumes

The following table reports historic traffic data from Bunt's traffic count database. Data was collected on Tuesday, 7th June, 2022 with clear sunny weather conditions. Traffic volumes have been reproduced for the AM and PM peak hours in **Table 2.1**.

Table 2.1: H1- Highway 6 & Middleton Way Intersection Traffic Volumes

TRAFFIC VOLUMES	NORTHBOUND (MIDDLETON WAY)			SOUTHBOUND (15TH STREET)			EASTBOUND (HIGHWAY 6)			WESTBOUND (HIGHWAY 6)			TOTAL
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT	
AM Peak Hour (7:45AM – 8:45AM)	270	240	35	130	155	75	100	315	125	50	675	135	2,295
PM Peak Hour (4:00PM – 5:00PM)	220	180	80	150	200	65	80	635	295	55	430	155	2,555

Note: Volumes have been rounded to the nearest 5 vehicles

Based on Bunt's traffic database, heavy vehicles on the highway at this location fall between 5% and 11%, depending on time of day and direction.

2.4 Signal Timing Plan

The Signal Timing Plan (STP) appears to follow standards and guidelines from the BC Ministry of Transportation & Transit. All left-turning movements are permissive. This signal is not coordinated with any other on the Highway 6 corridor. The signal was last updated in December 2022. The signal has a cycle length of 60 seconds.

2.5 Collision Data

Table 2.2 presents the total number of ICBC-reported crashes between 2019 and 2023 (full dataset in **Appendix B**). It is noted that none of these reported crashes involved vulnerable road users (i.e. pedestrians and cyclists).

Table 2.2: H1- Highway 6 & Middleton Way Intersection ICBC data, Severity

YEAR	CASUALTY CRASH	PROPERTY DAMAGE ONLY	TOTAL
2019	11	10	21
2020	5	6	11
2021	7	3	10
2022	12	14	26
2023	6	12	18
TOTAL	41	45	86

Source: ICBC Reported Crashes: https://public.tableau.com/app/profile/icbc/viz/ICBCReportedCrashes/ICBCReportedCrashes

Note, 48% of the reported crashes in the last 5 years were casualty crashes.

Table 2.3 details the crash types experienced at this intersection.

Table 2.3: H1- Highway 6 & Middleton Way Intersection ICBC data, Crashes by Crash Type

YEAR	HEAD ON	REAR END	SIDE IMPACT	SIDE SWIPE OPPOSITE DIRECTION	SIDE SWIPE SAME DIRECTION	SINGLE VEHICLE	TOTAL
2019		8	7	3	1		19
2020	1	5	1			1	8
2021	1	4	3	1			9
2022	1	11	5		1	6	24
2023	1	7	5		1	3	17
TOTAL	4	35	21	4	3	10	77

Note: Conflicted crashes (i.e. conflicting driver statements) and undetermined crashes have been removed.

The most frequent crash type was rear-end crashes. Rear-end crashes may occur due to the changing of traffic signals, where vehicles stop and the following vehicle does not realize, or is following too closely, colliding with the vehicle in front. This may also be a result of congested over-capacity traffic conditions where motorists travel with reduced headways, and unexpected vehicle queues may be present. The second most common occurrence is side impact crashes. Side impact crashes indicate that vehicles may be making inappropriate gap selection when making a left turn or failing to follow right of way as directed by the traffic signal.

Table 2.4 presents the time of day which the crashes occurred at the intersection.

Table 2.4: H1- Highway 6 & Middleton Way Intersection ICBC data, By Time-of-Day Crashes

YEAR	12:00 AM – 2:25 AM	6:00 AM - 8:59 AM	9:00 AM – 11:59 AM	12:00 PM – 2:59 PM	3:00 PM – 5:59 PM	6:00 PM - 8:59 PM	9:00 PM – 11:59 PM	TOTAL
2019		5	2	3	7	1	3	21
2020		2	2	3	2	1	1	11
2021		2	1	2	5			10
2022	1	2	5	12	4	1	1	26
2023		6		7	3	2		18
TOTAL	1	17	10	27	21	5	5	86

The table indicates that crashes most frequently occur between 9AM -6PM, which align with typical business hours.

Exhibit 2.1 showcases a summary of the crash history presented in this section.

2.5.1 Collision Risk Assessment

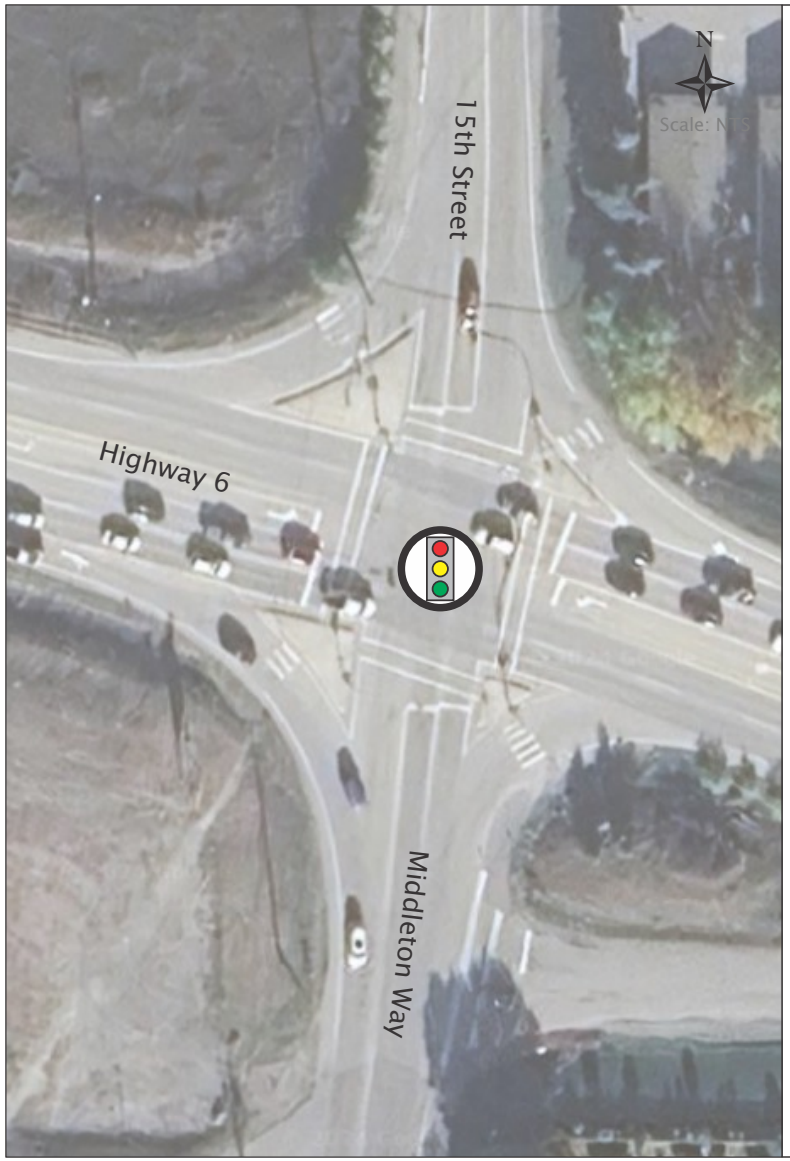
A collision risk assessment was completed to evaluate the overall safety of the Highway 6 & Middleton Way Intersection. The assessment was completed by drawing upon the available data and information presented in the above sections. The methodology of how the collision risk is determined is outlined in **Section 17**.

Table 2.5 presents the assessment details and considerations for the intersection of Highway 6 & Middleton Way.

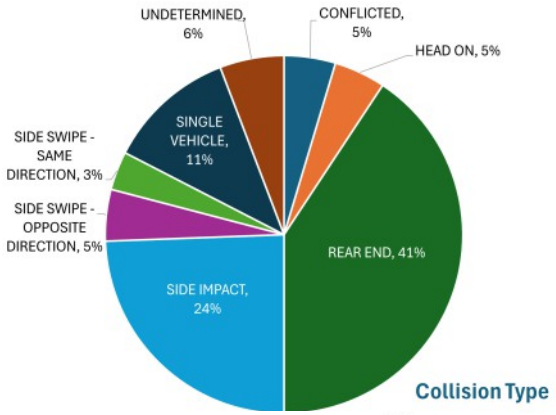
Table 2.5: H1- Highway 6 & Middleton Way Intersection Collision Risk Assessment

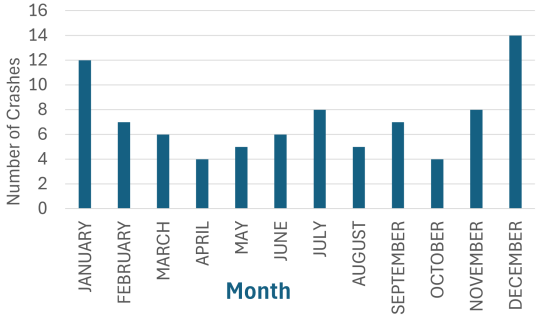
FREQUENCY RATING	SEVERITY RATING	COLLISION RISK
Frequent - 10 or more collisions per year 172 collisions / 10 years 17 collisions per year	**Extreme (Probable Fatal)** 52% of observed crashes between 2019 - 2023 were noted as 'casualty crashes'. This intersection supports pedestrian and cyclist facilities including on street bicycle lanes. Further, at this location Highway 6 supports between 5% - 11% heavy vehicles.	**Highest Risk Level (F)**

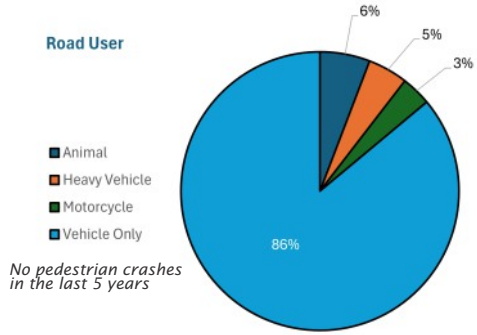
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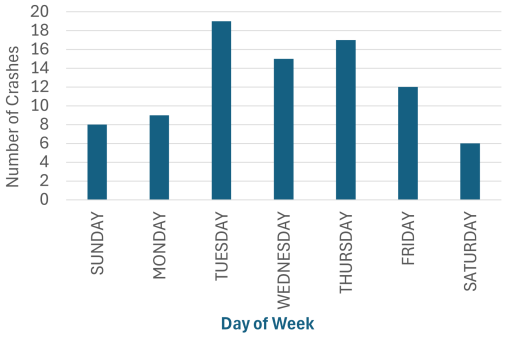


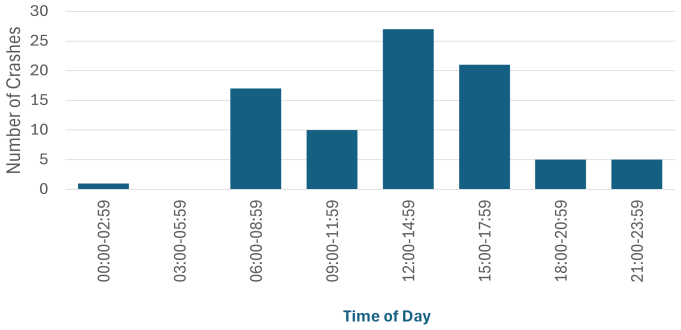
Collision Analysis (2019 - 2023): 86 Incidents











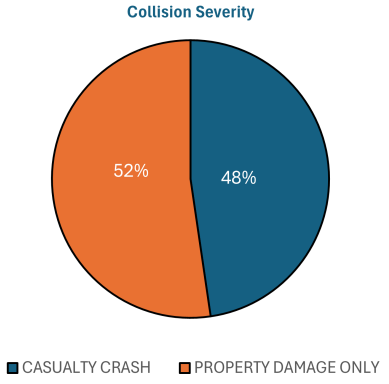


Exhibit 2.1

H1 - Highway 6 & Middleton Way

City Of Vernon Traffic Modelling Services
07-24-0038 March 2025

bunt & associates

2.6 Issue Identification

Based on the information presented in this section, there are notable deficiencies at this intersection, and these are summarized in the following points.

- There is a lack of sidewalk facilities connecting to the intersection. The south leg of the intersection on the east side provides some flexible bollards, painted crossing over Sarson Road and concrete barriers. However, there are no permanent pedestrian sidewalk facilities.
- Accessibility provisions onto the median islands are limited and restrictive. The curb letdowns are quite small and narrow, and surfaces are, in some places, uneven.
- Older versions of pedestrian push buttons, Flashing Don't Walk displays, and pedestrian signals are present.
- The intersection has visibility limitations in the north/southbound direction due to the vertical curvature along 15 Street, which crests near the northern edge of the intersection, restricting sight lines.
- There are a high number of crashes that have occurred at the intersection in the last five years with a significant number resulting in casualty crashes (48%). Many of these crashes are rear-end crashes.

2.7 Recommended Mitigations

2.7.1 Warrant Analysis

The intersection is already fully signalized so a traffic signal warrant analysis was not required. However, Bunt has undertaken an Advanced Warning Flasher (AWF) warrant as a potential countermeasure to assist with the rear-end crashes occurring in the westbound direction (eastbound AWF already exists).

Advance Warning Flashers (402.6.10, MOTT Signal Design)

In order for an advanced warning flasher to be warranted, one of the following should be satisfied:

1. The posted speed limit on the roadway is 70km/hr or greater
2. The view of the signals is obstructed due to vertical or horizontal alignment, regardless of the posted speed limit, such that a safe stopping distance is not available.
3. There is a grade approaching an intersection sufficient to require more than the normal breaking effort.
4. In cases where drivers are exposed to many kilometres of high-speed driving, regardless of the posted speed limit, and then encounter the first signal in a built-up community.

The intersection does not meet the requirements for an advanced warning flasher; therefore, the advanced warning flasher is not warranted.

2.7.2 Recommendations

- Provide a separate raised sidewalk facility which connects to the crosswalk facilities on the east side of 15th Street and Middleton Way at a minimum.
- Undertake an accessibility review and upgrade pedestrian refuge islands at the intersection, ensuring sufficient accessibility provisions, including curb letdown requirements.

- It is recommended to regrade the centre of the intersection and the northbound and southbound approaches to provide a flatter continuous road surface to help improve. Alternatively, consider implementing a northbound left turn-protected signal phase to help mitigate the issue and provide time separation between conflicting movements.
- Provide advanced flasher warning facing eastbound traffic on the southside of Highway 6. Even though the warrant analysis indicated it is not warranted, Bunt suggests that this still be considered based on the changing speed environment and help to prevent/reduce rear-end crashes occurring in the future.
- Review traffic signal infrastructure for pedestrians and install countdown timers, audible pedestrian signals, and accessible pedestrian push buttons.

3. H2: HIGHWAY 6 & POTTERY ROAD

3.1 Intersection Description

The Highway 6 & Pottery Road intersection is located on Highway 6, the route southeast of Vernon connecting to Lumby. It has residential neighbourhoods to the north and commercial industrial areas to the southwest. It is an unsignalized intersection with no designated pedestrian crossing facilities. The intersection provides 2 lanes in each direction on the highway, plus left-turning lanes and 1 lane in each direction on the side streets (Pottery Road) plus left-turning lanes. All legs of the intersection provide a yield right turn slip lane. There is one paved sidewalk adjacent to the northeast approach on Pottery Road, which extends back to 18th Street and into the residential neighbourhood. The sidewalk stops at the intersection of Highway 6 and does not continue, although there is a short section of sidewalk on Highway 6 to the north, just south of the World Fitness & Health Gym.

Highway 6 provides shoulders that support cycling as well as the west leg of Pottery Road. The east leg of Pottery Road also provides an on-street bike lane.

Although Pottery Road has a slight grade, the intersection appears to have appropriate sightlines and visibility. The posted speed on Highway 6 is 50km/hr at this location. The posted speed limit on Pottery Road is 50 km/hr.

A plan view of the intersection is provided in **Figure 3.1**.

Figure 3.1: H2- Highway 6 & Pottery Road Intersection



3.2 Site Visit Observations

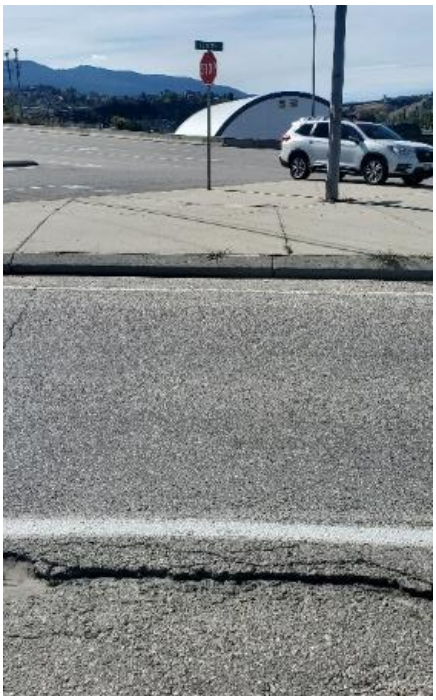
Bunt undertook a site visit on September 26th, 2024, in the early afternoon to observe the intersection of Highway 6 & Pottery Road. The weather conditions during the field visit were sunny and clear. This section outlines the observation notes and pictures taken at the intersection (**Figure 3.2**).

Site Notes

- No crosswalks are provided. If a pedestrian wants to cross the highway, they will have to walk to the Highway 6 & Kalamalka Lake Road Intersection (~300m away), along the highway shoulder.
- One side of Pottery Road has a sidewalk.

Figure 3.2: H2- Pedestrian infrastructure on northeast (north) leg





3.3 Traffic Volumes

Bunt collected traffic data on the 29th of January 2025 to inform the vehicle volumes on Pottery Road and Highway 6 and to confirm if there were any pedestrians trying to cross at this location. The findings are outlined in **Table 3.1** and the full data can be found in **Appendix A**.

Table 3.1: H2- Collected Traffic Data at Highway 6 & Pottery Road Intersection

TRAFFIC VOLUMES	HIGHWAY 6						POTTERY ROAD						
	NBL	NBT	NBR	SBL	SB	SBR	EBL	EBT	EBR	WBL	WBT	WBR	TOTAL
AM Peak Hour (7:45AM – 8:45AM)	84	967	7	110	464	4	1	10	32	0	45	203	1,927
PM Peak Hour (4:00PM – 5:00PM)	60	746	5	194	913	12	2	27	86	2	22	131	2,200

From the traffic data collected as part of the study, it is noted that during the AM peak hour, 1 pedestrian crossed the Highway on the north leg, and in the PM peak hour, 3 pedestrians crossed. Note, Highway 6 at this location experiences heavy vehicle traffic, up to 7% of the daily traffic, depending on the time of day and direction.

Additionally, the traffic data collected indicates that there are 32 & 45 vehicles travelling eastbound through and westbound through (across the highway), respectively in the AM peak hour. This number increases in the PM peak hour to 86 vehicles eastbound through, and slightly decreases for the westbound through. These highway crossing volumes are relatively high for a high driver workload movement with limited gaps in Highway traffic.

3.4 Signal Timing Plan

This intersection is unsignalized, and therefore, there is no STP.

3.5 Collision Data

Table 3.2 presents the total number of ICBC reported crashes between 2019 – 2023 (full dataset in **Appendix B**). It is noted that none of these crashes involved vulnerable road users (i.e. pedestrians and cyclists).

Table 3.2: H2- Highway 6 & Pottery Road Intersection ICBC data – Severity

YEAR	CASUALTY CRASH	PROPERTY DAMAGE ONLY	TOTAL
2019	8	2	10
2020	3	2	5
2021	8	4	12
2022	5	8	13
2023	6	3	9
TOTAL	30	19	49

Source: ICBC Reported Crashes: https://public.tableau.com/app/profile/icbc/viz/ICBCReportedCrashes/ICBCReportedCrashes

More than half of the reported crashes at this intersection are casualty crashes (61%). **Table 3.3** displays the causality crash types experienced at this intersection.

Note: Due to the high number of casualty crashes, this table only outlines the casualty crashes, crash type.

Table 3.3: H2- Highway 6 & Pottery Road Intersection ICBC data, Casualty Crashes by Crash Type

YEAR	HEAD ON	REAR END	SIDE IMPACT	TOTAL
2019	2	3	2	7
2020		2	1	3
2021		6	1	7
2022		2	3	5
2023		4	2	6
TOTAL	2	17	9	28

Note: Conflicted crashes (i.e. conflicting driver statements) have been removed.

Rear end crashes were the most commonly occurring casualty crash. 82% of the rear end crashes occurred on Pottery Road – indicating that vehicles may have challenges exiting Pottery Road onto the highway and are accepting smaller gaps and vehicle headways to complete the maneuver. The rear end crash is likely to occur when the front vehicle decides not to take the gap and the following vehicle does not realise.

Side impact crashes indicate that vehicles may be making inappropriate gap selection when entering or crossing the highway.

Two head on crashes occurred at this intersection in 2019. Although the data analysed does not go into detail of severity of the casualty crashes, head on crashes when travelling in a high-speed environment are one of the types of crashes resulting in severe injuries. It is noted that one collision occurred on Highway 6 and one occurred on Pottery Road.

Table 3.4 displays the time of day which the crashes occurred at the intersection.

Table 3.4: H2- Highway 6 & Pottery Road Intersection ICBC data, By Time-of-Day Crashes

YEAR	12:00AM – 2:25AM	3:00AM – 5:59AM	6:00AM - 8:59AM	9:00AM – 11:59AM	12:00PM – 2:59PM	3:00PM – 5:59PM	6:00PM - 8:59PM	9:00PM - 11:59PM	TOTAL
2019			2	2	2	2	1	1	10
2020				3	1	1			5
2021			1	1	3	7			12
2022	1		4	1	1	6			13
2023			1	3	3	2			9
TOTAL	1		8	10	10	18	1	1	49

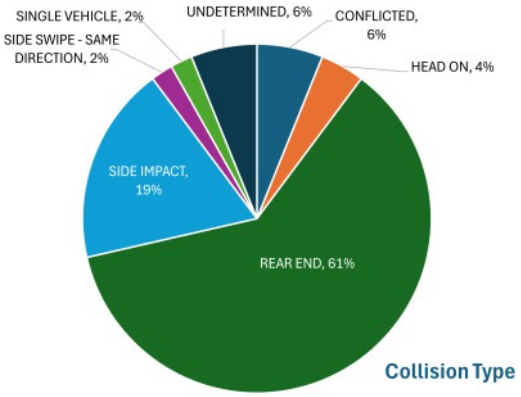
The table indicates that the most crashes are occurring during between 9am - 6pm, typical business hours. This is intuitive as Highway 6, is a high volume roadway bisecting a route to two neighbourhood areas, where there is local traffic.

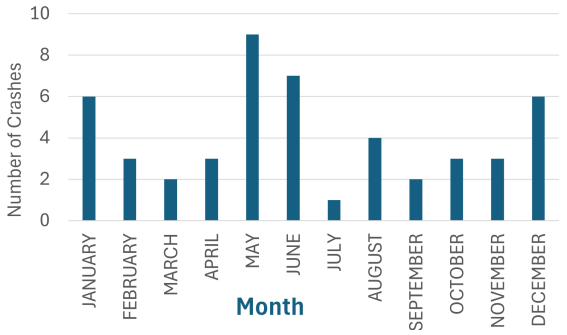
Exhibit 3.1 showcases a summary of the crash history presented in this section.

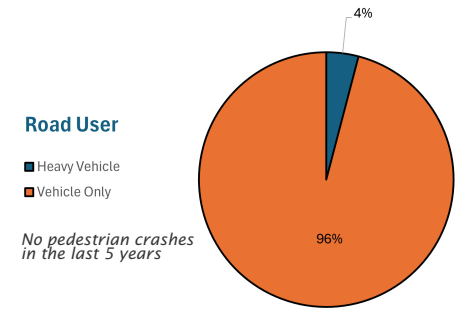
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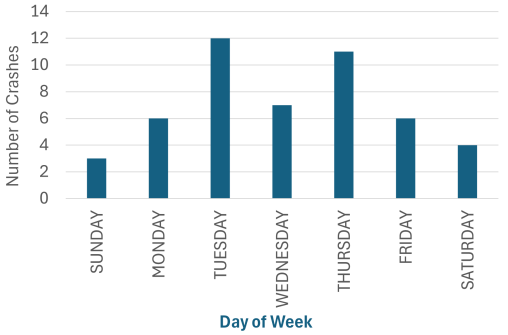


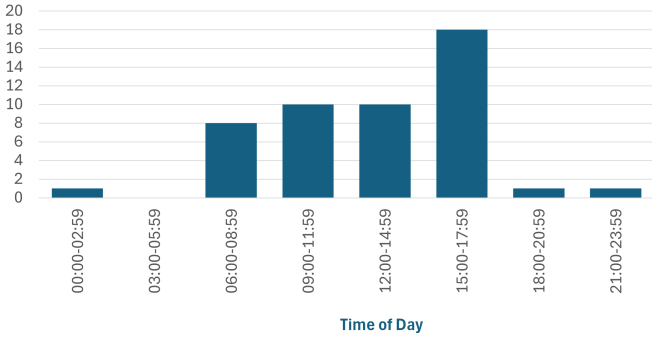
Collision Analysis (2019 - 2023): 49 Incidents











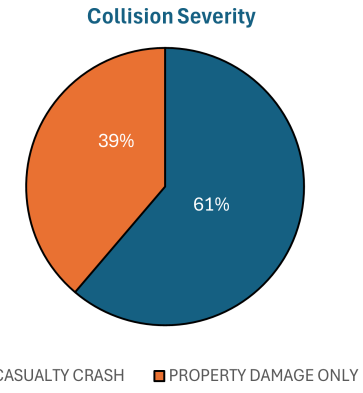


Exhibit 3.1

H2 - Highway 6 & Pottery Road

City Of Vernon Traffic Modelling Services
07-24-0038 March 2025

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3.5.1 Collision Risk Assessment

The collision risk assessment was completed to support the overall safety assessment of the Highway 6 & Pottery Road Intersection and has been conducted drawing upon the available data and information presented in the above sections. The details of how the collision risk is determined are outlined in **Section 17**.

Table 3.5 outlines the assessment details and considerations for the intersection of Highway 6 & Pottery Road.

Table 3.5: H2 Highway 6 & Pottery Road Intersection Collision Risk Assessment

FREQUENCY RATING	SEVERITY RATING	COLLISION RISK
Frequent - 10 or more collisions per year 98 collisions / 10 years 10 collisions per year	**Medium (Minor to Moderate Injury)** A higher number of casualty crash types were reported than property damage. The crash types (such as head-on and side-impact) that are generally associated with high severity were less than 40% of the casualty crashes. The intersection experiences up to 7% of heavy vehicle traffic at certain times of day. On-street bicycle lanes are provided on the Highway approaches to this intersection.	**High-Risk Level (E)**

3.6 Issue Identification

Based on the information presented in this section, there are two main issues present at this intersection:

- There are no sidewalks or pedestrian facilities connecting the residents to the north to the southern commercial-industrial area. Furthermore, there are no pedestrian crossing facilities at this location or sidewalks to connect pedestrians to a crossing facility.
- There have been a large number of crashes which occurred in the past 5 years, of which 68% have been casualty crashes.

3.7 Recommended Mitigations

3.7.1 Warrant Analysis

Bunt has undertaken three warrants for this intersection (as listed below) to explore opportunities to make intersection improvements.

- MOTT Traffic Signal Warrant 4: Collision Experience (402.3.5 MOTT Signal Design)
- Concrete Median Barrier Warrant – separating traffic and helping to prevent head-on collisions
- Pedestrian Crossing Control Warrant & Traffic Signal Warrant (TAC)

Warrant 4: Collision Experience (402.3.5 MOTT Signal Design)

Table 3.6. Presents the requirements for this warrant and the applicable site intersection environment, which relates to the requirements.

Table 3.6: H2- Traffic Signal Warrant – Warrant 4: Collision Experience (402.3.5 MOTT Signal Design)

WARRANT 4 REQUIREMENTS	INTERSECTION ENVIRONMENT
Adequate trials of less restrictive remedies with satisfactory observance and enforcement have failed to reduce the collision frequency.	To Bunt's knowledge, no alternatives have been trialled.
Five or more reported collisions of types "susceptible" to correction by traffic signal control have occurred within a 12-month period, with each collision involving personal injury or property damage of $5000 or more.	It is believed that both the rear-end crashes and side-impact crashes that resulted in casualties could be reduced with the provision of a signal, allowing a more controlled environment for vehicles to choose gaps in traffic to enter or exit the Highway.
The installation of a signal would allow progressive traffic flow.	Traffic signals will help facilitate the flow of traffic on Pottery Road, providing gaps in Highway traffic. Signal coordination with the Traffic Signal at Kalamalka Lake Road could help with the progression of traffic on Highway 6 if a signal is installed.

Concrete Median Barrier Warrant – supplement to the TAC Geometric Design Guide 630.01

Section 630.01 of the supplement to the TAC indicates that median treatments are primarily used to eliminate the risk of head-on collisions and to control access. There are three types of treatments:

1. No median separation (undivided road).
2. Narrow flush median with or without barrier.
3. Depressed median with traversable slopes.

The methodology to select the type of treatment is summarized in Section 630 and Figure 630.B (see **Appendix C** for Figure 630.B.). The AADT for Highway 6 is approximately 16,875 vehicles per day (AM+PM peak hours x5), and the median space at this intersection is approximately 1.0m, whereas along the corridor, it is approximately 3.0m.

This indicates that a barrier is optional and should be considered if indicated by collision history. Bunt notes that this provision could be challenging to implement at the intersection. However, a holistic application to the corridor may be more suitable.

Pedestrian Crossing and Traffic Signal Warrant

Bunt has followed the Transportation Association of Canada (TAC) Pedestrian Crossing Control Guide, BC, as a preliminary assessment to identify whether this location is a candidate for pedestrian crossing control.

As an initial step in this process, Bunt completed a Traffic Signal Warrant, which can be found in **Appendix C**. The outcome of this process was that a traffic signal is Warranted at this location. No further analysis of the pedestrian crossing warrant was undertaken. The results of the Traffic Signal Warrant are presented in **Table 3.7**.

Table 3.7: H2- Traffic Signal Warrant Results at Highway 6 & Pottery Road

VEHICLE SCORE	PEDESTRIAN SCORE	TOTAL SCORE	RESULT
124	3	127	WARRANTED

Note: The Threshold total score is 100

The score of 127 indicates a strong case for traffic signal implementation at this location.

3.7.2 Recommendations

Based on the findings of this section, the following recommendations have been made for consideration.

- Upgrade the Highway 6 & Pottery Road intersection to a full traffic signal control, following the TAC warrant analysis and guidance.
- Implement coordinated signal timing plans for the new signal and the signal at Kalamalka Lake Road & Highway 6 to help maintain Highway traffic progression.
- Undertake an accessibility review and upgrade pedestrian refuge islands at the intersection to ensure sufficient accessibility provisions, including curb letdown requirements.
- Extend the sidewalk from the NE approach (northside) to the World Health & Fitness driveway access, along the north side of Highway 6.
- Provide a sidewalk facility on Pottery Road west of Highway 6.

4. H3: HIGHWAY 6 & KALAMALKA LAKE ROAD

4.1 Intersection Description

The Highway 6 & Kalamalka Lake Road intersection is a signalized 'T'-intersection located on Highway 6, the route southeast of Vernon connecting to Lumby. There are residential neighbourhoods located north of the highway and commercial industrial areas to the south, with Kalamalka Lake Road connecting directly to the Kal Beach. The intersection has pedestrian crosswalks across the south and east legs and supplies 2 vehicle travel lanes in each direction on the highway, plus left-turning lanes and dual-left lanes on Kalamalka Lake Road. The northbound and southeastbound legs of the intersection provide channelized right turns with zebra pedestrian crosswalks. There are sidewalk connections to each of the crosswalk facilities. Highway 6 is noted to have a shoulder that supports cycling.

Although Kalamalka Lake Road has a slight uphill grade, the intersection and signal heads appear to have appropriate sightlines and visibility. The posted speed on Highway 6 at this section is 50km/hr. Kalamalka Lake Road also have a posted speed limit of 50 km/hr.

A plan view of the intersection is provided in **Figure 4.1**.

Figure 4.1: H3- Highway 6 & Kalamalka Lake Road Intersection



4.2 Site Visit Observations

Bunt undertook a site visit on September 26th, 2024, in the early afternoon to observe the intersection of Highway 6 & Kalamalka Lake Road. The weather conditions were sunny and clear. This section outlines the observation notes and pictures taken at the intersection (**Figure 4.2**).

Site Notes:

- Poor accessibility provisions for the pedestrian islands.
- There is a sidewalk located on the north side of the Highway. However, the sidewalk terminates before reaching the pedestrian pushbutton at the signal, forcing pedestrians to walk on the highway shoulder or an uneven dirt surface. As such, the pedestrian push button on the northside of the highway is not easily accessed.
- No audible pedestrian signals are installed, and existing pushbuttons have limited accessibility provisions.

Figure 4.2: H3- Crosswalk facilities



4.3 Traffic Volumes

Bunt collected traffic data on the 29th of January 2025 at the Highway 6 & Pottery Road intersection. By drawing a screen line north-west of the Highway 97 & Pottery Road intersection, Bunt calculated the eastbound and westbound highway movements east of Kalamalka Lake Road. This is outlined in **Table 4.1**.

Table 4.1: H3- Collected Traffic Data, Highway 6 Screen Line East of Kalamalka Lake Road

TRAFFIC VOLUMES	WESTBOUND	EASTBOUND	TOTAL
AM Peak Hour (7:45AM – 8:45AM)	1,170	580	1,750
PM Peak Hour (4:00PM – 5:00PM)	880	1,120	2,000

The heavy vehicles recorded along this screen line were in the range of 2- 6% of the total traffic volume.

4.3.1 MOTT Signal Timing Plan

The STP appears to follow standards and guidelines from MOTT traffic signal timing design. Northwest-bound left-turning vehicles operate on a protected left-turn phase. The intersection is coordinated with Highway 6 intersections at 30th Street and 27th Street. Depending on the time of day and the coordination plan, the intersection has a cycle length between 80 to 90 seconds.

4.4 Collision Data

Table 4.2 presents the total number of ICBC reported crashes between 2019 – 2023 (full dataset in **Appendix B**). It is noted that there was one reported crash involving a pedestrian in 2020.

Table 4.2: H3- Highway 6 & Kalamalka Lake Road Intersection ICBC data – Severity

YEAR	CASUALTY CRASH	PROPERTY DAMAGE ONLY	TOTAL
2019	5	10	15
2020	5	14	19
2021	6	7	13
2022	3	11	14
2023	4	13	17
TOTAL	23	55	78

Source: ICBC Reported Crashes: https://public.tableau.com/app/profile/icbc/viz/ICBCReportedCrashes/ICBCReportedCrashes

Note: Rear to rear crash types have been removed, as has been deemed to miss coded and to be associated to the parking lot adjacent to the highway.

Table 4.3 displays the crash types experienced at this intersection.

Table 4.3: H3- Highway 6 & Kalamalka Lake Road Intersection ICBC data, Crashes by Crash Type

YEAR	HEAD ON	REAR END	SIDE IMPACT	SIDE SWIPE SAME DIRECTION	SINGLE VEHICLE	TOTAL
2019		4	6	1	2	13
2020		7	4	1	2	14
2021		6	3	1	1	11
2022	1	4	3		1	9
2023	1	6	2		4	13
TOTAL	2	27	18	3	10	60

Note: Conflicted crashes (i.e. conflicting driver statements) and undetermined crashes have been removed.

The most common occurrence was rear-end crashes. Rear-end crashes may occur due to the changing of traffic signals, where vehicles stop, and the following vehicle does not realize or is following too closely to stop before colliding with the vehicle in front. This may also be a result of congested over-capacity traffic conditions where motorists travel with reduced headways, and unexpected vehicle queues may be present. The second most common occurrence is side impact crashes. Side impact crashes indicate that vehicles may be making inappropriate gap selection when making a left turn or failing to follow right of way as directed by the traffic signal.

Table 4.4 presents the time of day in which the recorded crashes occurred at this intersection.

Table 4.4: H3 - Highway 97 & Kalamalka Lake Road Intersection ICBC data, By Time-of-Day Crashes

YEAR	12:00AM – 2:25AM	3:00AM – 5:59AM	6:00AM - 8:59AM	9:00AM – 11:59AM	12:00PM – 2:59PM	3:00PM – 5:59PM	6:00PM - 8:59PM	9:00PM - 11:59PM	TOTAL
2019			2	2	4	6	1		15
2020			3	4	5	4	3		19
2021			1	1	6	5			13
2022			2	1	3	3	4	1	14
2023			2	3	5	4	3		17
TOTAL			10	11	23	22	11	1	78

Most crashes reported were between 12:00PM and 5:59PM. This typically aligns with weekday commuter traffic patterns for highways. Higher exposure due to higher traffic volumes is likely to lead to a higher risk or chance of a crash occurring.

Exhibit 4.1 showcases a summary of the crash history presented in this section.

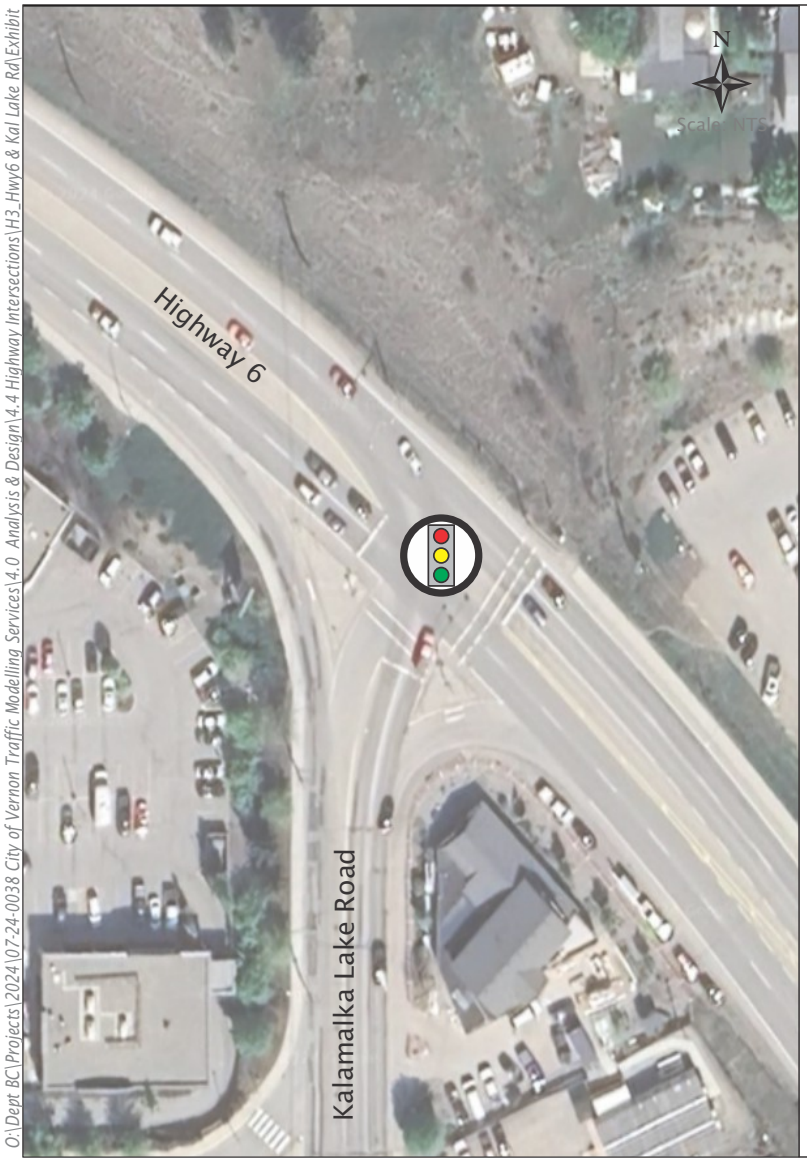
4.4.1 Collision Risk Assessment

The Collision Risk Assessment was completed to support the overall safety assessment of the Highway 6 & Kalamalka Lake Road Intersection and has been completed by drawing upon the available data and information presented in the above sections. The details of how the collision risk is determined are outlined within **Section 17**. **Table 4.5** outlines the assessment details and considerations for the intersection of Highway 6 & Kalamalka Lake Road.

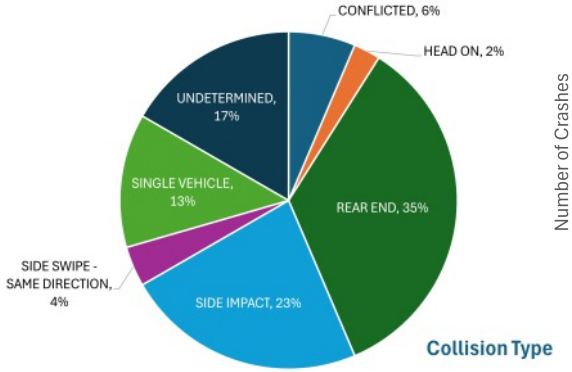
Table 4.5: H3 - Highway 97 & 39th Avenue Intersection Collision Risk Assessment

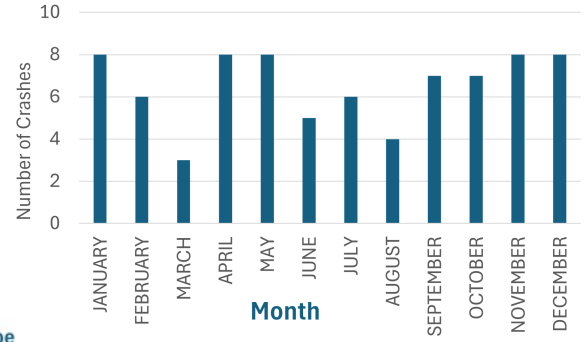
FREQUENCY RATING	SEVERITY RATING	COLLISION RISK
Frequent - 10 or more collisions per year 156 collisions / 10 years 16 collisions per year	**High** **(Moderate to Incapacitating Injury)** Collisions involved 1 pedestrian between 2019-2023. However, due to the surrounding land uses and limited pedestrian and cycling connections not many pedestrians or cyclists are expected at this intersection. Heavy vehicles play a large role in the severity of a potential crash. At this location, they are between 2%-6% on the east leg of Highway 6. When considering the above, the intersection has been rated with severity 'High'.	**High-Risk Level (E)**

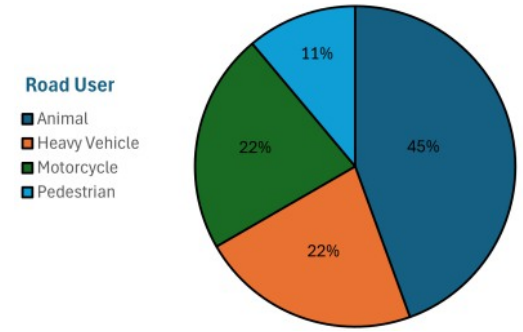
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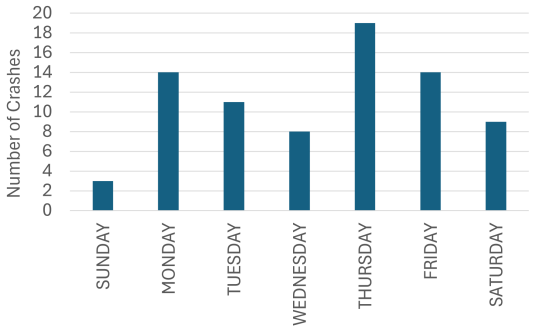


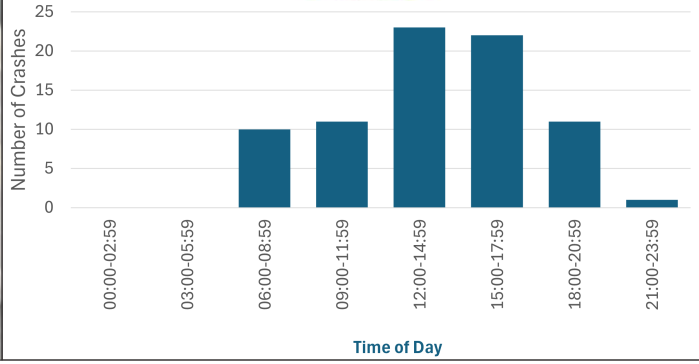
Collision Analysis (2019 - 2023): 78 Incidents











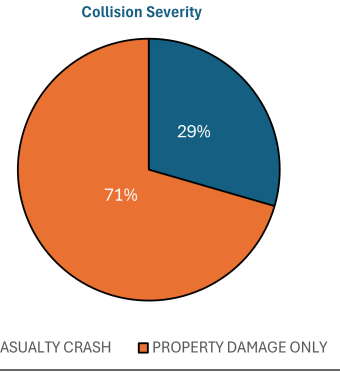


Exhibit 4.1

H3 - Highway 6 & Kalamalka Lake Road

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4.5 Issue Identification

Based on the information presented in this section, there are notable deficiencies at this intersection in relation to the pedestrian facilities. These issues are summarized in the following points:

- One pedestrian crash occurred at this intersection in 2020.
- Sidewalk connection at the northeast corner of the intersection does not connect to the pedestrian pushbutton on the northside.
- Pedestrian curb letdowns are small with surfaces uneven in places.
- 23% of crashes recorded at this intersection are side impact crashes and 34% are rear end.
- Review traffic signal infrastructure for pedestrians and install countdown timers, audible pedestrian signals, and accessible pedestrian push buttons.

4.6 Recommended Mitigations

4.6.1 Intersection Warrants

The intersection is already signalized. Intersection warrant completion was not required.

4.6.2 Recommendations

- Undertake an accessibility review to assess pedestrian refuge islands at the intersection to ensure sufficient accessibility provisions, including curb letdown requirements.
- Provide a clear and protected path or sidewalk to the pedestrian push button at the northeast corner of the intersection.
- Review the signal clearance parameters and signal timing to ensure adequate clearances are provided.
- Review traffic signal infrastructure for pedestrians and install audible pedestrian signals and accessible pedestrian push buttons.

5. H4: HIGHWAY 6 / 30TH STREET & 25TH AVENUE

5.1 Intersection Description

The Highway 6 / 30th Street & 25th Avenue intersection is located just south of Vernon's downtown. It is a signalized intersection with pedestrian crosswalks on all legs. The southbound and eastbound legs of the intersection provide channelized right turns with zebra pedestrian crosswalks. The channelized right turns in the southbound and eastbound direction both add a lane to the receiving leg. The intersection provides 2 vehicle travel lanes in each direction on the highway approaches (eastbound and northbound) plus a left turning lane in the eastbound direction. The northbound approach supplies a left turn lane and a through and right turn lane. The southbound approach provides a through and left turn and a right turn slip lane. The westbound provides one through and right turn lane and a left turn lane. There are sidewalk connections to each of the crosswalk facilities, and a bicycle lane present on eastbound Highway 6, plus a multi-use path (MUP) off-street. The posted speed limit at the intersection is 50km/hr for all approaches.

A plan view of the intersection is provided in **Figure 5.1**.

Figure 5.1: H4- Highway 6 /30th Street & 25th Avenue Intersection



5.2 Site Visit Observations

Bunt undertook a site visit on September 26th, 2024, in the early afternoon to observe the intersection of Highway 6 & 30 Street. The weather conditions were clear and sunny. This section outlines the observation notes and pictures taken at the intersection (**Figure 5.2** to **Figure 5.4**).

Site Notes:

- Pedestrian Crosswalk signs are missing at the channelized right turns.
- The green bicycle lane marking is faded across the eastbound right turn.
- No audible pedestrian signals were observed.
- No tactile pads for pedestrians with accessibility issues were observed.
- There was limited sight distance for the southbound left movements from the shared left and through lane due to the offset of the opposing left turn lane and resulting vehicle shadowing.
- Long vehicle queue lengths for the left turn from Highway 6 were observed during the site visit.
- The overhead lane designation signage appeared to be faded for the Highway 6 northbound approach.

Figure 5.2: H4- Pedestrian and cycling facilities



Figure 5.3: H4- Faded bicycle conflict marking



Figure 5.4: H4- Queue extending south on Hwy6



5.3 Traffic Volumes

Traffic volume data was provided by MOTT through the extraction of loop detector counts. Data was provided for the dates of 6th October 2024 to 16th October 2024. When analyzing the provided traffic volumes for typical weekday scenarios (i.e. Tuesday to Thursday), Bunt found that Thursdays experienced a much higher daily traffic. Thursday, October 10, 2024, traffic volumes for the AM and PM peak hours are presented in **Table 5.1**.

Table 5.1: H4- Highway 6 /30th Street & 25th Avenue Intersection Traffic Volumes

TRAFFIC VOLUMES	NBL	NBT	SB	EBL	EBT	WBL	WBT	TOTAL
AM Peak Hour (7:45 AM – 8:45 AM)	650	390	130	50	260	10	610	2,100
PM Peak Hour (4:00 PM – 5:00 PM)	640	330	370	40	340	30	720	2,470
Daily Traffic Volumes	7,990	3,780	3,060	720	4,130	370	8,230	28,270

Note: Volumes have been rounded to the nearest 10 vehicles or 5 for single-digit numbers.

Bunt was unable to obtain specific heavy vehicle percentages at this location. However, a heavy vehicle presence was observed whilst undertaking the site visit.

5.4 MOTT Signal Timing Plan

The STP appears to follow the MOTT standard traffic signal timing design. Left-turning vehicles to operate on a permissive left turn, except for the Northbound left movement, which has a protected phase. The intersection is coordinated with the 27th Street and Kalamalka Lake Road intersections. The cycle length for this intersection falls between 66 and 76 seconds. The intersection is linked to the Vernon Fire Department with a 'Fire pre-emption setting'. The Fire Hall is located on the corner of 35th Avenue & 30th Street and, therefore, connected in a direct line to the Highway 6 /30th Street & 25th Avenue Intersection.

5.5 Collision Data

Table 5.2 presents the total number of ICBC-reported crashes between 2019–2023 (full dataset in **Appendix B**). It is noted that one of these crashes involved a cyclist.

Table 5.2: H4- Highway 6 /30th Street & 25th Avenue Intersection ICBC data – Severity

YEAR	CASUALTY CRASH	PROPERTY DAMAGE ONLY	TOTAL
2019	4	3	7
2020	11	6	17
2021	7	4	11
2022	5	11	16
2023	7	8	15
TOTAL	34	32	66

Source: ICBC Reported Crashes: https://public.tableau.com/app/profile/icbc/viz/ICBCReportedCrashes/ICBCReportedCrashes

It is noted that more than 50% of the crashes at this intersection result in casualties.

Table 5.3 displays the crash types experienced at this intersection.

Table 5.3: H4- Highway 6 /30th Street & 25th Avenue Intersection ICBC data, Crashes by Crash Type

YEAR	HEAD ON	REAR END	SIDE IMPACT	SIDE SWIPE - OPPOSITE DIRECTION	SIDE SWIPE SAME DIRECTION	SINGLE VEHICLE	TOTAL
2019		3	1				4
2020	1	9	5			1	16
2021	1	4	3	1			9
2022	2	7	1		2	1	13
2023	1	6	3		1		11
TOTAL	5	29	13	1	3	2	53

Note: Conflicted crashes (i.e. conflicting driver statements) and undetermined crashes have been removed.

The most common occurrence was rear-end crashes. Generally, rear-end crashes occur due to the changing of traffic signals, where vehicles stop and the following vehicle does not realize, or is following too closely to stop before hitting the vehicle in front. This may also be a result of congested over-capacity traffic conditions where motorists travel with reduced headways, and unexpected vehicle queues may be present.

The second most common occurrence is side impact crashes. Side impact crashes indicate that vehicles may be making inappropriate gap selection when making a left turn or failing to yield the right of way as instructed by the traffic signals. This could also be attributed to the permissive left turn phase at the traffic signals.

Table 5.4 presents the time of day at which the recorded crashes occurred at this intersection.

Table 5.4: H4 - Highway 6 /30th Street & 25th Avenue Intersection ICBC data, By Time-of-Day Crashes

YEAR	12:00AM – 2:25AM	3:00AM – 5:59AM	6:00AM - 8:59AM	9:00AM – 11:59AM	12:00PM – 2:59PM	3:00PM – 5:59PM	6:00PM - 8:59PM	9:00PM - 11:59PM	TOTAL
2019			1	2	2		2		7
2020			1	3	3	6	4		17
2021			2	1	4	4			11
2022			2	4	5	4		1	16
2023			1	5	3	5	1		15
TOTAL			7	15	17	19	7	1	66

The table indicates that the most crashes occur between 9 am and 6 pm, aligning with typical business hours. This is intuitive for the Highway as it facilitates a large volume of traffic passing through, and the area is close to the main downtown core of Vernon, where there is demand for local traffic movement.

Exhibit 5.1 presents a summary of the crash history presented in this section.

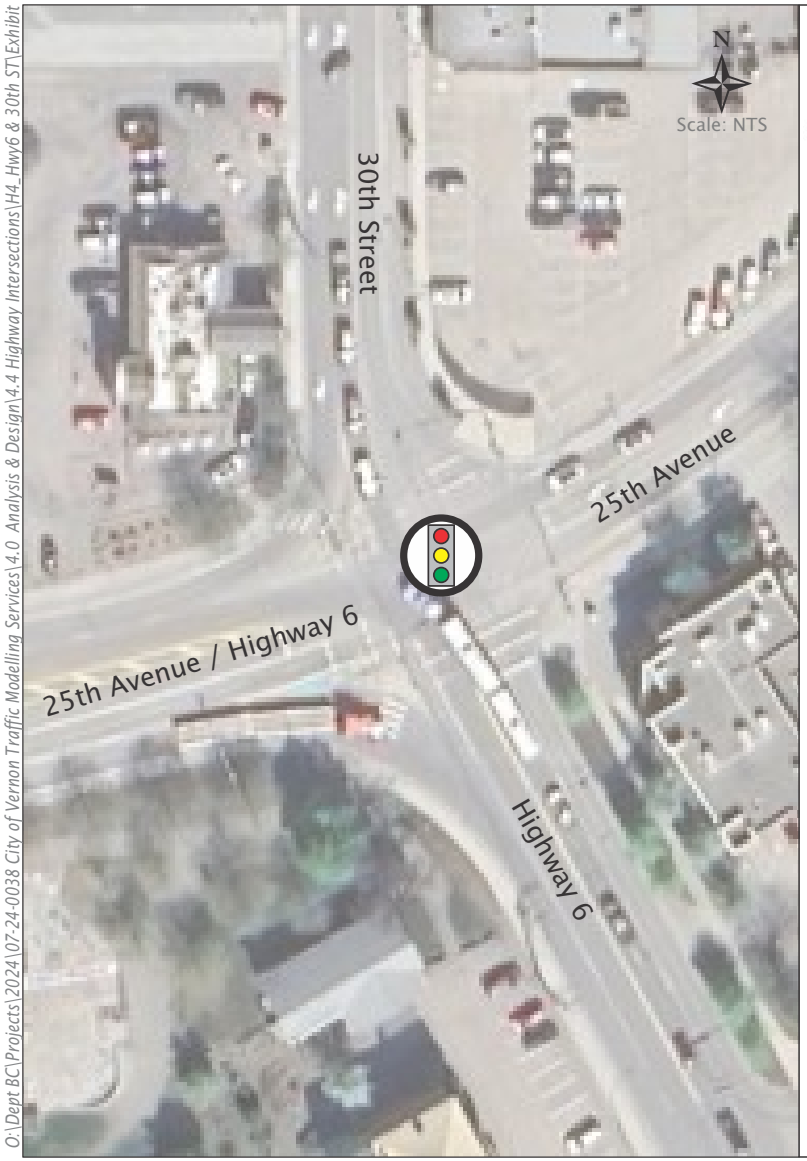
5.5.1 Collision Risk Assessment

The Collisions Risk Assessment was completed to assess the overall safety of the Highway 6 / 30th Avenue & 25th Avenue Intersection and has been completed by drawing upon the available data and information presented in the above sections. The details of how the collision risk is determined are outlined within **Section 17.**

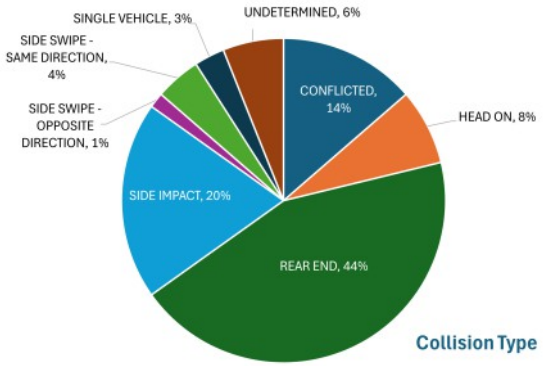
Table 5.5 outlines the assessment details and considerations for the intersection of Highway 6 / 30th Avenue & 25th Avenue.

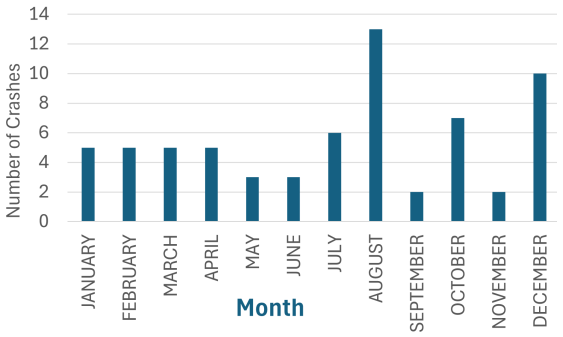
Table 5.5: H4- Highway 6 /30th Street & 25th Avenue Collision Risk Assessment

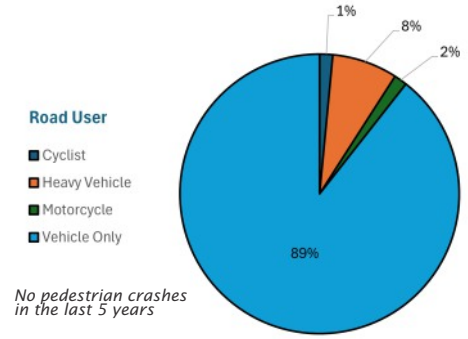
FREQUENCY RATING	SEVERITY RATING	COLLISION RISK
Frequent - 10 or more collisions per year 132 collisions / 10 years 13 collisions per year	**Extreme (Probable Fatal)** High number of collisions involved cyclists (1) and pedestrians (2) between 2019 - 2023. This intersection is located on the edge of the downtown, and it would be expected to have a high pedestrian presence. Further to this there are on-street bike lanes located on 25th Avenue. Heavy vehicles play a large role in the severity of a potential crash. A large heavy vehicle presence was noticed onsite when undertaking the site visit. When considering the above the intersection has been rated it with severity 'Extreme'.	**Highest Risk Level (F)**

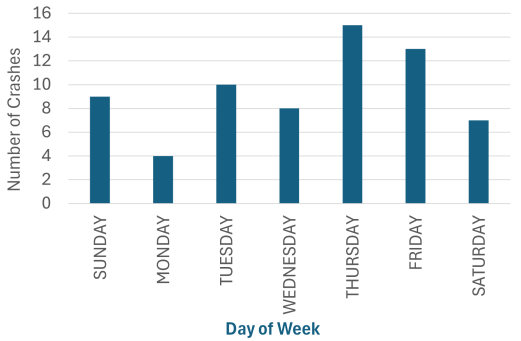


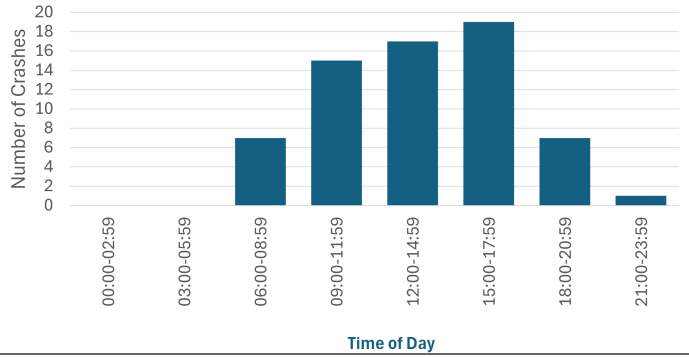
Collision Analysis (2019 - 2023): 66 Incidents











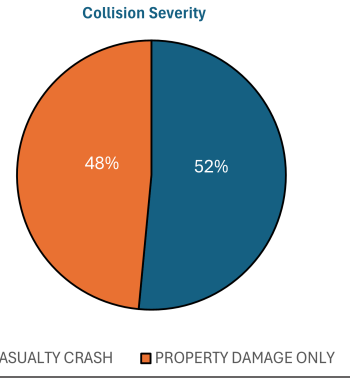


Exhibit 5.1

H4 - Highway 6 / 30th Street & 25th Avenue

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5.6 Issue Identification

Based on the information presented in this section, the following have been identified as issues:

- Awareness of vehicles of vulnerable road users. The site is currently missing pedestrian signage on the channelized right turns and has faded cycle lane paint. In a high-trafficked intersection, highlighting crossing points and areas where vulnerable users could be present is important to make vehicles aware.
- Pedestrian amenities at the crossings are missing audible pedestrian signals, accessible pushbuttons, and tactile pads.
- The on-street bicycle lane present on the eastbound leg is mixed with a road which supports a high volume of vehicles including large transport vehicles and trucks. An environment like this creates a high risk for cyclists using the bicycle lane.
- Sightlines for the southbound left movement are restricted due to the offset of the opposing left turn lane and resulting vehicle shadowing.

5.7 Recommended Mitigations

5.7.1 Intersection Warrants

Intersection is already signalized. Intersection warrant completion was not required.

5.7.2 Recommendations

- Undertake an accessibility review and upgrade the pedestrian refuge islands at the intersection to ensuring sufficient accessibility provisions, including let down requirements.
- Review signal phasing and consider implementing a split phase signal operation to help mitigate sightline challenges.
- Upon redevelopment of either north corner parcels adjacent to the intersection, acquire land to provide a left turn bay for southbound traffic to help mitigate the sightline limitation.
- Increase wayfinding signage to the MUP to encourage cyclists to use the off-street facility to help reduce potential conflicts given the high volume of traffic and heavy vehicles.
- Upgrade the existing marked bicycle lanes on Highway 6 to a facility with higher protection (i.e., buffered bicycle lane, protected bicycle lane, off-street path, etc.) to help reduce potential conflicts between modes.
- Consider installing a smart-channel right turn for the eastbound channelized right turn (similar to the Highway 97 & 25th Avenue intersection) to reduce the speed of vehicles and help support a safer environment for pedestrians crossing the intersection.
- Review traffic signal infrastructure for pedestrians and install countdown timers, audible pedestrian signals, and accessible pedestrian push buttons.

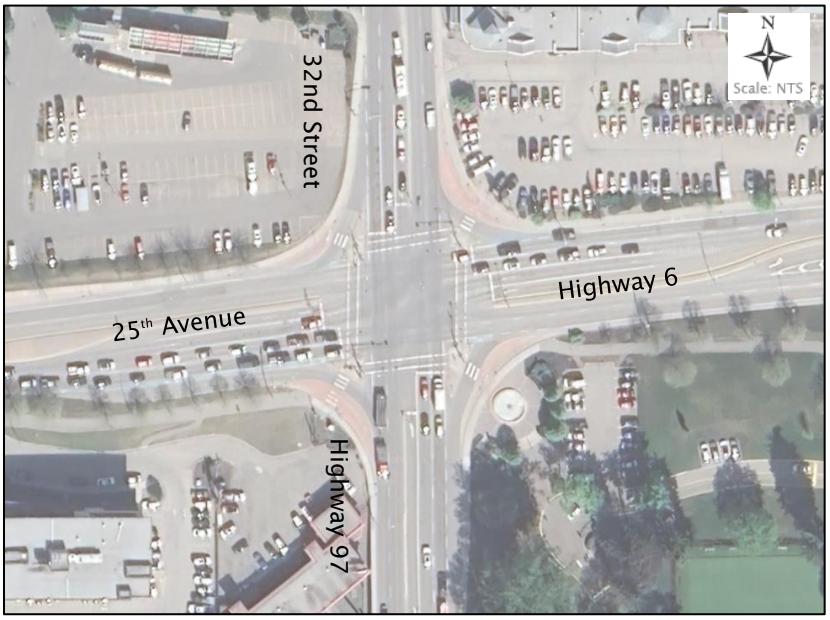
6. H5: HIGHWAY 6 / 25TH AVENUE & HIGHWAY 97 / 32ND STREET

6.1 Intersection Description

Highway 6 / 25th Avenue & Highway 97 / 32nd Street intersection is located just south of Vernon's downtown, where Highway 97 meets Highway 6. It is a signalized intersection with pedestrian crosswalks across all legs. Additionally, each leg of the intersection provides a channelized right turn with a zebra pedestrian crosswalk. The intersection provides two through lanes on all approaches. The east and westbound approaches provide dual left-turn lanes, and the north and southbound approaches provide one left-turn lane. There are sidewalk connections to each of the crosswalk facilities and a curb build-out (Smart Channel) on the channelized right turns to help guide and slow the vehicles. The intersection appears to have appropriate sightlines and visibility. There are on-street bike lanes present on both sides of 25th Avenue and a multi-use path (MUP) along the south edge of 25th Avenue. The posted speed limit for all roadway approaches to the intersection is 50km/hr.

A plan view of the intersection is provided in **Figure 6.1.**

Figure 6.1: H5- Highway 6 / 25th Avenue & Highway 97 / 32nd Street Intersection



6.2 Site Visit Observations

Bunt undertook a site visit on September 26th, 2024, in the early afternoon to observe the intersection of Highway 6 / 25th Avenue & Highway 97 / 32nd Street. The weather conditions were sunny and clear. This section outlines the field observation notes and pictures taken at the intersection (**Figure 6.2** to **Figure 6.5**).

Notes:

- The green bicycle conflict marking was faded in some areas on 25th Avenue.
- The intersection was very busy (even during the middle of the day at the time of the site visit).
- The existing bicycle facilities provide limited protection for cyclists from vehicle traffic.
- All roadway approaches are designated truck routes. A high volume of heavy vehicles was observed.
- Lots of signage was installed for vulnerable users (pedestrians and cyclists).
- There is a MUP that runs parallel to southside of 25th Avenue west of the intersection.
- Wayfinding signage for the shared path is provided at the southeast corner of the intersection.
- No audible pedestrian signals were observed.
- No tactile pads for pedestrians with accessibility issues were observed.

Figure 6.2: H5- Smart channel buildout & share pathway southwest corner



Figure 6.3: H5- 25th Avenue Pedestrian crossing signage



Figure 6.4: H5- Pedestrian and cycling facilities



Figure 6.4: H5- 25th Avenue bike route



6.3 Traffic Volumes

Traffic volume data has been provided by MOTT, through the extraction of loop detector counts. Data was provided for the dates 6th October 2024 to 16th October 2024. When analyzing the provided traffic volumes for typical weekday scenarios (i.e. Tuesday – Thursday) Bunt determined that Thursdays experienced a much higher daily traffic. Traffic data, including AM and PM peak hours and daily traffic volumes for Thursday, October 10, are presented in **Table 6.1**.

Table 6.1: H5- Highway 6 / 25th Avenue & Highway 97 / 32nd Street Intersection Traffic Volumes

TRAFFIC VOLUMES	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR	TOTAL
AM Peak Hour (8:00AM – 9:00AM)	150	600	190	130	610	150	300	660	170	350	540	100	3,940
	940			890			1,130			990			
PM Peak Hour (4:00PM – 5:00PM)	190	700	320	190	710	230	320	670	190	290	760	80	4,650
	1,210			1,130			1,180			1,130			
Daily Traffic Volumes	2,210	8,510	3,310	2,310	9,150	3,020	4,090	8,420	2,350	4,030	8,280	1,240	56,920
	14,030			14,480			14,860			13,550			

Note: Volumes have been rounded to the nearest 10 vehicles or 5 for single digit numbers.

The table presents the high traffic volumes that travel through this intersection on a daily basis and that the approach volumes are well balanced.

6.4 MOTT Signal Timing Plan

The STP reflects standard MOTT traffic signal timing. Left-turning vehicles in the eastbound and westbound directions have dual left turn lanes and operate with protected only left turn phasing. Northbound and southbound left-turn movements have protected/permissive signal phasing. The intersection is coordinated with Highway 97 at 30th Avenue and 32nd Avenue. A full cycle at this intersection is 120 seconds during its coordinated hours.

6.5 Collision Data

Table 6.2 presents the total number of ICBC-reported crashes between 2019 and 2023 (full dataset in **Appendix B**). It is noted that there have been 2 crashes involving pedestrians (2020 & 2022) and 1 involving a cyclist (2023).

Table 6.2: H5- Highway 6 / 25th Avenue & Highway 97 / 32nd Street Intersection ICBC data – Severity

YEAR	CASUALTY CRASH	PROPERTY DAMAGE ONLY	TOTAL
2019	11	19	30
2020	10	34	44
2021	11	34	45
2022	12	34	46
2023	8	25	33
TOTAL	52	146	198

Source: ICBC Reported Crashes: https://public.tableau.com/app/profile/icbc/viz/ICBCReportedCrashes/ICBCReportedCrashes

The percentage of total crashes have been split below by the crash locations primary street (as per ICBC records):

- 32nd Avenue (northern leg): 14%
- Highway 97 (southern leg): 50%
- 25th Avenue (western leg): 25%
- Highway 6 (eastern leg): 11%

The north / south direction (Highway 97) account for 75% of the primary crash locations across the last 5 years.

Out of all the study intersections, this intersection has the most recorded crashes in the 5-year period from 2019 – 2023.

Table 6.3 details the crash types experienced at this intersection.

Table 6.3: H5- Highway 6 / 25th Avenue & Highway 97 / 32nd Street Intersection ICBC data, Crashes by Crash Type

YEAR	HEAD ON	REAR END	SIDE IMPACT	SIDE SWIPE - OPPOSITE DIRECTION	SIDE SWIPE SAME DIRECTION	SINGLE VEHICLE	TOTAL
2019		14	5		3	2	24
2020		21	5	1	7		34
2021	1	23	8		4	2	38
2022		20	12		5	5	42
2023		14	7		4	3	28
TOTAL	1	92	37	1	23	12	166

Note: Conflicted crashes (i.e. conflicting driver statements) and undetermined crashes have been removed.

Note: Additionally, Rear to Rear crashes have been removed, as this generally suggests that the crash was recorded in a near by parking lot.

The most common occurrence was rear-end crashes. Generally, rear-end crashes occur due to the changing of traffic signals, where vehicles stop, and the following vehicle does not realize or is following too closely to stop before hitting the vehicle in front. In this case, 55% of the recorded crashes are rear-end crashes, and 89% of the rear-end crashes occurred on the north / south movements (Highway 97). This may also be a result of congested over-capacity traffic conditions where motorists travel with reduced headways and unexpected vehicle queues may be presented.

The second most common occurrence is side impact crashes. Side impact crashes indicate that vehicles may be making inappropriate gap selections or failing to yield the right of way as directed by the traffic signals. This could be attributed to the permissive left turn phase at the traffic signals. 70% of the side impact crashes were northbound or southbound movements.

Additionally at this intersection, the sideswipe same direction crash type accounts for 14% of the total crashes that occurred. The percentage of this crash type is higher than what has occurred at other intersections within the study.

Table 6.4 displays the time of day in which the recorded crashes occurred at this intersection.

Table 6.4: H5 - Highway 6 / 25th Avenue & Highway 97 / 32nd Street Intersection ICBC data, By Time-of-Day Crashes

YEAR	12:00AM – 2:25AM	3:00AM – 5:59AM	6:00AM - 8:59AM	9:00AM – 11:59AM	12:00PM – 2:59PM	3:00PM – 5:59PM	6:00PM - 8:59PM	9:00PM - 11:59PM	TOTAL
2019				10	8	7	4	1	30
2020		1	5	11	11	14	1	1	44
2021	1		2	6	18	12	3	3	45
2022	1	2	3	10	11	10	7	2	46
2023			4	11	5	7	4	2	33
TOTAL	2	3	14	48	53	50	19	9	198

The table indicates that most crashes occur between 9AM and 6PM, aligning with typical business hours. This aligns with traffic patterns in the area, which have high throughput of traffic passing through and traffic associated with the downtown core of Vernon, where there is demand for movement of local traffic.

Exhibit 6.1 showcases a summary of the crash history presented in this section.

6.5.1 Collision Risk Assessment

The Collision Risk Assessment was completed to support the overall safety assessment of the Highway 6 / 25th Avenue & Highway 97 / 32nd Street Intersection and has been completed by drawing upon the available data and information presented in the above sections. The details of how the collision risk is determined is outlined within **Section 17.**

Table 6.5 outlines the assessment details and considerations for the intersection of Highway 6 / 25th Avenue & Highway 97 / 32nd Street.

Table 6.5: H5- Highway 6 / 25th Avenue & Highway 97 / 32nd Street Collision Risk Assessment

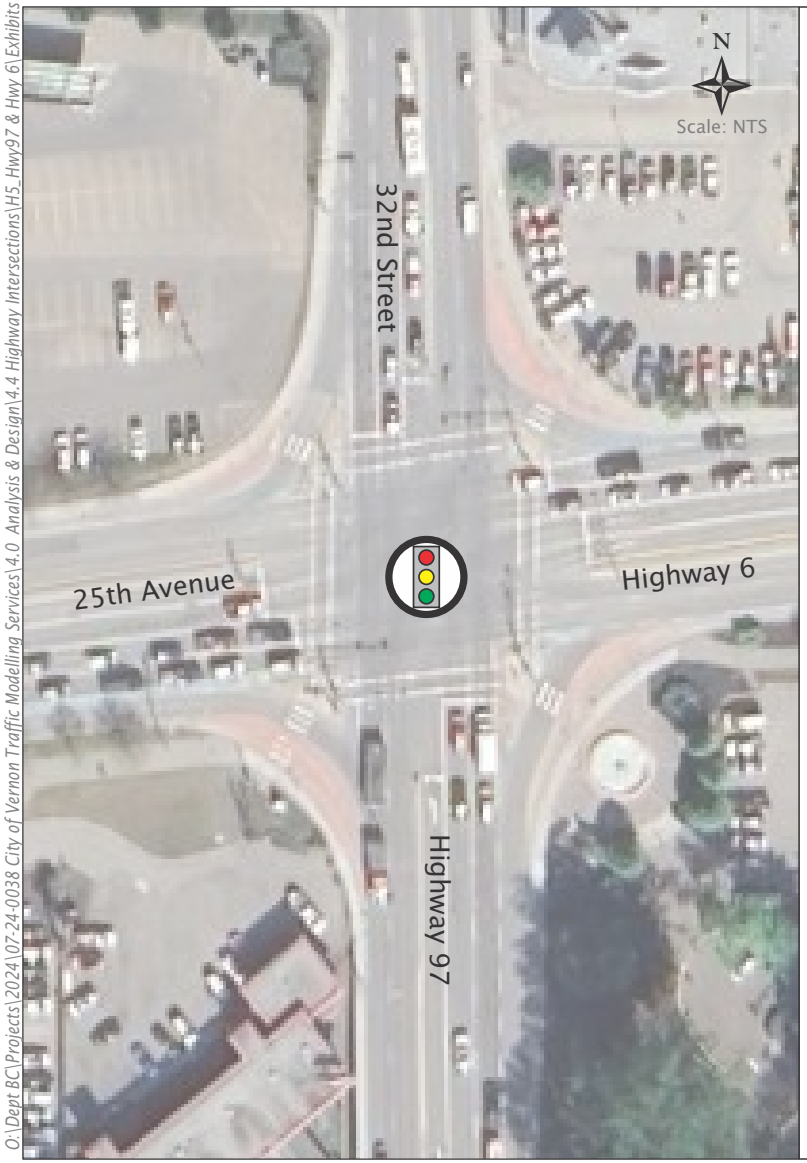
FREQUENCY RATING	SEVERITY RATING	COLLISION RISK
Frequent - 10 or more collisions per year 392 collisions / 10 years 40 collisions per year	**Extreme (Probable Fatal)** The collision involved 1 cyclist between 2019-2023. Due to the presence of the MUP and cycle lanes at this intersection overlapping with the high volume of vehicle traffic and particularly the high volume of trucks and large vehicles, this intersection has been rated as extreme.	**Highest Risk Level (F)**

6.5.2 Issue Identification

Based on the information presented in this section, the following issues have been identified:

- The high volume of traffic at this intersection presents a high risk for vulnerable users. This is shown in the reported crash data, with 3 vulnerable user crashes having occurred in the last 5 years.
- 25th Avenue and Highway 6 are truck routes (and have high traffic volumes). However, bicycle lanes are present on the street and result in a lack of protection and a high risk to cyclists.
- Pedestrian facilities at the crossings are lacking and missing audible signals, tactile pads, accessible pedestrian pushbuttons, and faded paint on crosswalks/bicycle lanes, etc.
- It is unclear where the MUP starts after going through the intersection on the southeast corner of the intersection.

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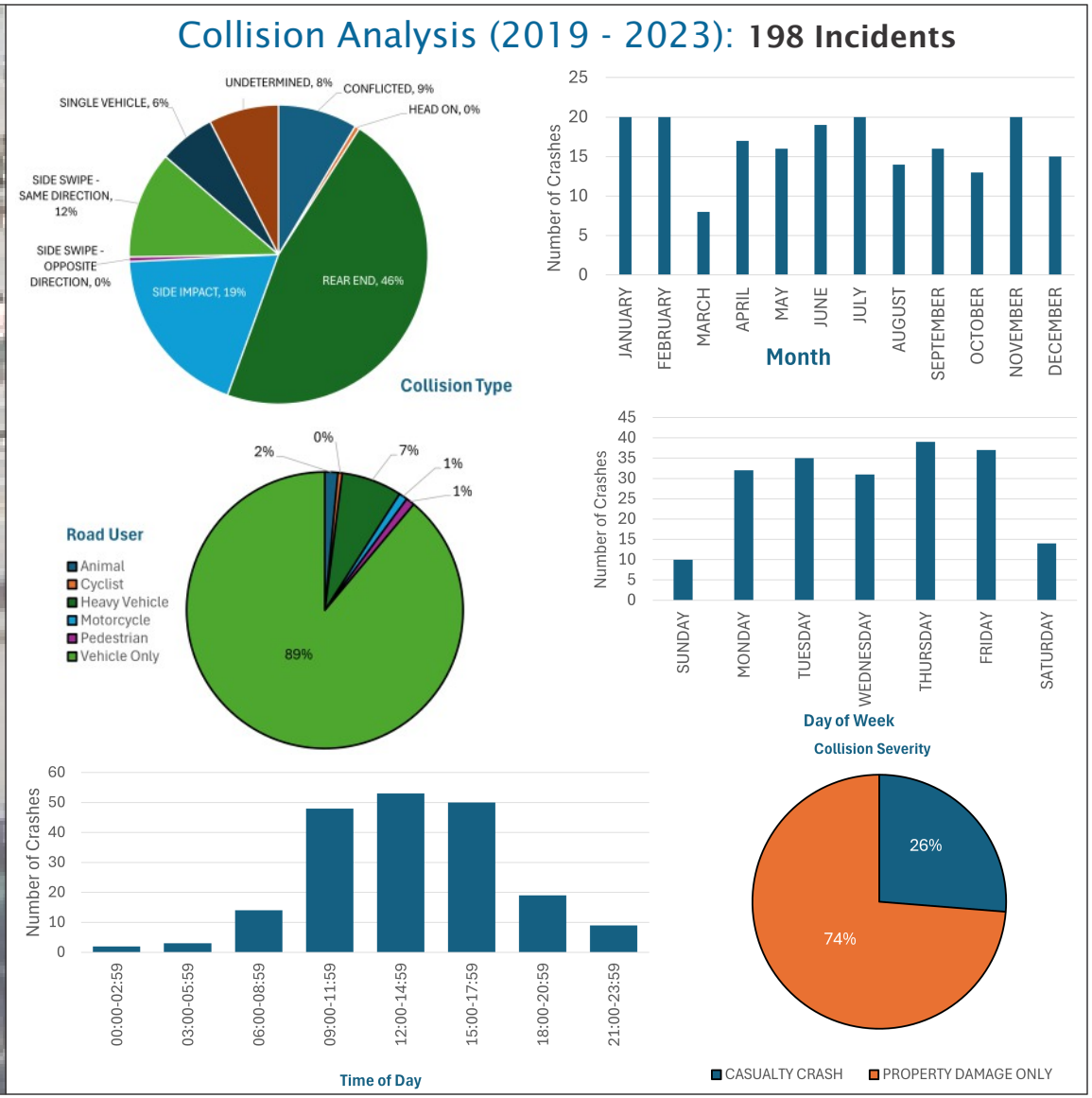


Exhibit 6.1

H5 - Highway 6 / 25th Avenue & Highway 97 / 32nd Street

City Of Vernon Traffic Modelling Services
07-24-0038 March 2025

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6.6 Recommended Mitigations

6.6.1 Intersection Warrants

Intersection is already signalized. Intersection warrant completion was not required.

6.6.2 Recommendations

- Undertake an accessibility review to look at the upgrade of pedestrian refuge islands at the intersection to ensure sufficient accessibility provisions, including let-down requirements, audible signals, etc...
- Repaint on street cycle lanes and pedestrian crosswalks.
- Consider redirecting all cyclists off Highway 6 and 25th Avenue to reduce the risk of conflict with vehicles and cyclists.
- Provide clear wayfinding for active modes where the MUP connects to the intersection.

7. H6: HIGHWAY 97 & 21ST AVENUE (VERNON JUBILEE HOSPITAL)

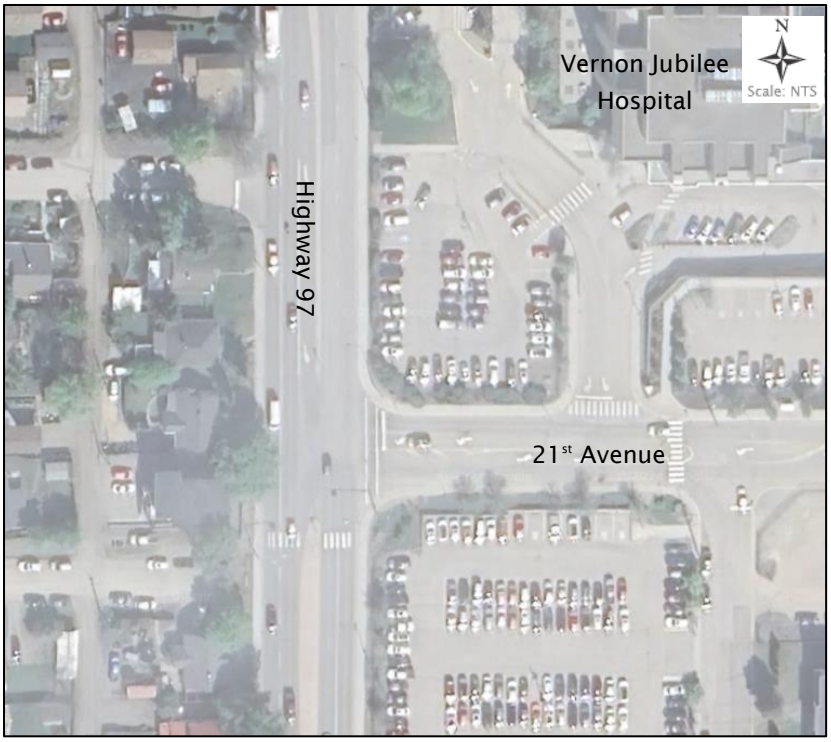
7.1 Intersection Description

The Highway 97 & 21st Avenue intersection is located south of Vernon's downtown and is one of the first few intersections with pedestrian facilities crossing the highway as you enter the urban area of Vernon from the south. The intersection is an unsignalized intersection with a pedestrian crosswalk on the east leg and a two-stage signed and marked zebra crossing on the south leg, which is equipped with overhead pedestrian signage. Additionally, warning signs with flashing lights are mounted on light poles to the side of the highway 80m and 110m from the crosswalk and flash constantly to notify drivers they are approaching a pedestrian crossing. When approaching the crosswalk travelling in the northbound direction the crosswalk is on a downward sloped grade. There are sidewalk connections to each of the crosswalk facilities.

The intersection appears to have appropriate sightlines and visibility. The posted speed limits along Highway 97 at this segment and 21st Avenue are 50km/hr.

A plan view of the intersection is provided in **Figure 7.1**.

Figure 7.1: H6- Highway 97 & 21st Avenue Intersection (Vernon Jubilee Hospital)



7.2 Site Visit Observations

Bunt undertook a site visit on September 26th, 2024, in the early afternoon to observe the intersection of Highway 97 & 21st Avenue. The day was fine weather conditions. This section outlines the observation notes and pictures taken at the intersection (**Figure 7.2** to **Figure 7.3**).

Site Notes:

- Pedestrians were observed utilizing the crosswalk when on site.
- No pedestrian overhead flashers attached to overhead pedestrian sign.
- The cross-section of the road is wide and requires pedestrians to cross a large distance, with a small centre island.
- The median island appears to present some accessibility constraints due to the narrow letdowns.
- The crossing protection felt inadequate for the high volume of traffic including heavy vehicles on Highway 97 and the large crossing distance.
- Observation: A general feeling of vulnerability/discomfort when crossing the road using this facility was experienced.

Figure 7.2: H6- Pedestrian Crosswalk with Overhead Signage Facing East



Figure 7.3: H6- Pedestrian Crosswalk and Median Crosswalk Facing West



7.3 Traffic Volumes

Bunt collected traffic data on the 29th of January 2025 to inform the vehicle volumes on 21st Avenue and Highway 97 and to confirm the number of pedestrians crossing at this location. The findings are outlined in **Table 7.1** and the full data is located in **Appendix A**.

Table 7.1: H6- Collected Traffic Data at Highway 6 & Pottery Road Intersection

TRAFFIC VOLUMES	HIGHWAY 97				21ST AVENUE (VERNON JUBILEE HOSPITAL)		
	NBT	NBR	SBL	SBT	WBL	WBR	TOTAL
AM Peak Hour (7:45AM – 8:45AM)	785	61	293	722	3	101	1,965
PM Peak Hour (3:45PM – 4:45PM)	1003	19	165	881	5	290	2,363

During the AM peak hour, 16 pedestrians crossed the Highway on the north leg, and in the PM peak hour, 23 pedestrians crossed.

Based on the traffic data collected as part of the study, Highway 6 at this location experiences heavy vehicle traffic up to 8% of the daily traffic depending on time of day and direction.

7.4 MOTT Signal Timing Plans

This intersection is not controlled by traffic signals as such there is no STP.

7.5 Collision Data

Table 7.2 presents the total number of ICBC reported crashes between 2019 – 2023 (full dataset in **Appendix B**). It is noted that none of these crashes involved vulnerable road users (i.e. pedestrians and cyclists) however, Bunt has been made aware that there have been incidents with vulnerable users at this location previous to this data period.

Table 7.2: H6- Highway 97 & 21st Avenue Intersection (Vernon Jubilee Hospital) ICBC data – Severity

YEAR	CASUALTY CRASH	PROPERTY DAMAGE ONLY	TOTAL
2019	5	5	10
2020	6	2	8
2021	2	2	4
2022	2	3	5
2023	2	5	7
TOTAL	17	17	34

Source: ICBC Reported Crashes: https://public.tableau.com/app/profile/icbc/viz/ICBCReportedCrashes/ICBCReportedCrashes

The table above indicates that 50% of the crashes that occurred at this location over the past 5 years were casualty crashes. Typically, it is expected for more property damage crashes to be reported than casualty crashes.

Table 7.3 displays the crash types experienced at this intersection.

Table 7.3: H6- Highway 97 & 21st Avenue Intersection (Vernon Jubilee Hospital) ICBC data, Crashes by Crash Type

YEAR	REAR END	SIDE IMPACT	SIDE SWIPE SAME DIRECTION	SINGLE VEHICLE	TOTAL
2019	6	2			8
2020	4		1	1	6
2021	2	1	1		4
2022	2		1		3
2023	4	1	1	1	7
TOTAL	18	4	4	2	28

Note: Conflicted crashes (i.e. conflicting driver statements) and undetermined crashes have been removed.

The most common occurrence of crash type is rear-end crashes. This is often caused by vehicles stopping and the following vehicle, either not realizing or, following too closely to stop before hitting the vehicle in front. The crash data indicated that most of the rear-end incidents occurred on the Highway, and the majority of them were in the northbound direction (which is downhill on this section of road).

The grade and limited advanced warning of vehicles stopping for the pedestrian crossing may be a significant factor contributing to rear-end crashes.

Table 7.4 displays the time of day when the crashes occurred at the intersection.

Table 7.4: H6 - Highway 97 & 21st Avenue Intersection (Vernon Jubilee Hospital) ICBC data, By Time-of-Day Crashes

YEAR	12:00AM – 2:25AM	3:00AM – 5:59AM	6:00AM - 8:59AM	9:00AM – 11:59AM	12:00PM – 2:59PM	3:00PM – 5:59PM	6:00PM - 8:59PM	9:00PM - 11:59PM	TOTAL
2019			3	3	1	3			10
2020			2		3	3			8
2021			1	1	2				4
2022			3			1	1		5
2023			2		2	3			7
TOTAL			11	4	8	10	1		34

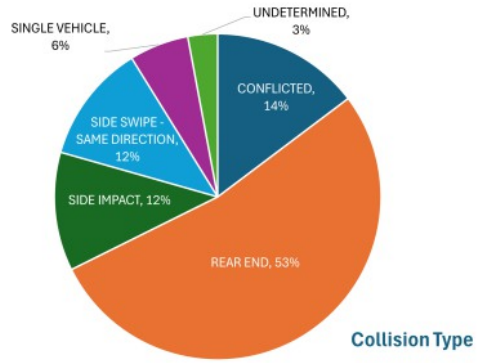
The table indicates that the most crashes are occurring during the peak traffic hours. This is expected as at these times there is more vehicles on the road and therefore the increased exposure to traffic, increases the risk of a crash occurring.

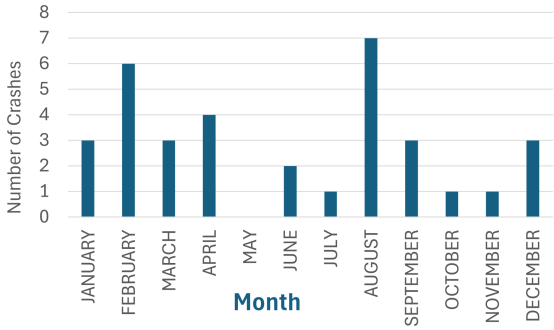
Exhibit 7.1 showcases a summary of the crash history presented in this section.

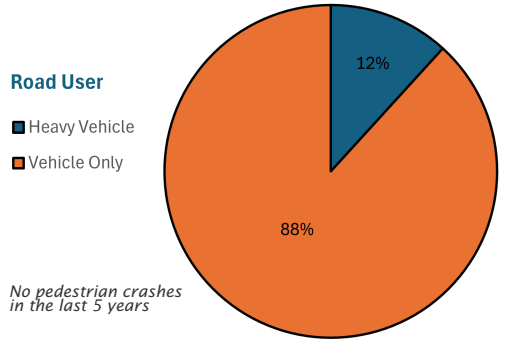
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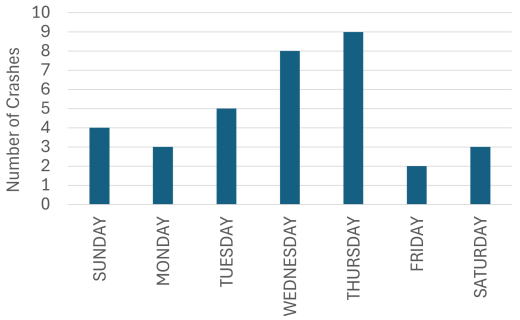


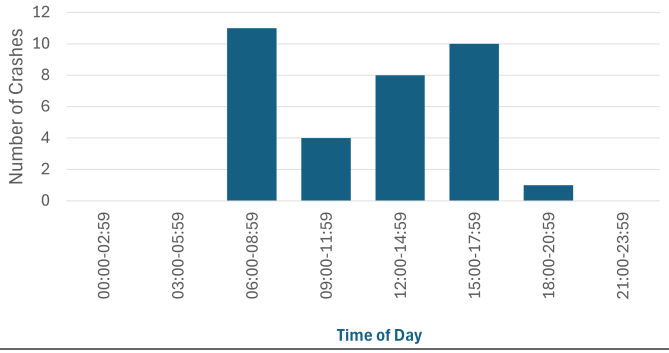
Collision Analysis (2019 - 2023): 34 Incidents











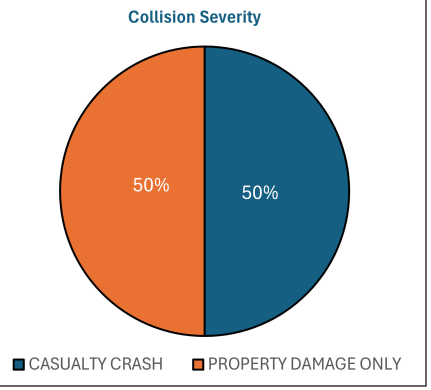


Exhibit 7.1

H6 - Highway 97 & 21st Avenue (Vernon Jubilee Hospital)

City Of Vernon Traffic Modelling Services
07-24-0038 March 2025

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7.5.1 Collision Risk Assessment

The Collision Risk Assessment was completed to support the overall safety assessment of the Highway 97 & 21st Avenue Intersection and has been completed by drawing upon the available data and information presented in the above sections. The details of how the collision risk is determined is outlined within **Section 17. Table 7.5** displays the assessment details and considerations for the intersection of Highway 97 & 21st Avenue.

Table 7.5: H6- Highway 97 & 21st Avenue Intersection Collision Risk Assessment

FREQUENCY RATING	SEVERITY RATING	COLLISION RISK
Occasional -1 to 9 collisions per year 68 collisions / 10 years 7 collisions per year	**Extreme (Probable Fatal)** 50% of the reported crashes between 2019 - 2023 were casualty crashes. Based on the location of this crossing (outside of the hospital) and potential for pedestrians to have accessibility limitations combined with the high volume of traffic, high percentage of heavy vehicles and trucks and steep grade at the intersection, this has been rated as an extreme.	**Highest Risk Level (F)**

7.6 Issue Identification

Based on the information presented in this section, the following issues have been identified:

- The signed and marked pedestrian crossing control type appears inadequate for the Highway environment with high vehicle speeds, high heavy vehicle volumes, and a large crossing distance.
- The wide cross-section of Highway 97 creates difficultly for pedestrians to cross in one instance. As a result, pedestrians may be left stranded on the median island.
- There is limited advance warning of the pedestrian crosswalk to alert vehicles of crossing pedestrians. Rear-end crashes occur likely because the following vehicle cannot anticipate that the front vehicle is stopping for a pedestrian to cross.

7.7 Recommended Mitigations

7.7.1 Pedestrian Crossing and Traffic Signal Warrant

Bunt followed the Transportation Association of Canada (TAC) Pedestrian Crossing Control Guide as a preliminary assessment to identify whether this location is a candidate for upgraded pedestrian crossing control.

As an initial step in this process, Bunt completed a Traffic Signal Warrant, which can be found in **Appendix C.** The outcome of this process was that a traffic signal is Warranted at this location. No further analysis of the pedestrian crossing warrant was undertaken. The results of the Traffic Signal Warrant are presented in **Table 7.6**.

Table 7.6: H6- Traffic Signal Warrant Results at Highway 97 & 21st Avenue

VEHICLE SCORE	PEDESTRIAN SCORE	TOTAL SCORE	WARRANTED OR NOT WARRANTED
161	26	187	WARRANTED

Note: Threshold total score is 100

A score of 187 indicates the intersection is warranted for an upgrade to a full traffic signal control.

7.7.1 Recommendations

- Upgrade this location to a full traffic signal to support both vehicle and pedestrian movements. At a minimum, upgrade the intersection to a pedestrian-actuated traffic signal with pedestrian pushbuttons to augment the crossing control and help improve safety.
- Undertake an accessibility review and upgrade the pedestrian refuge islands at the intersection, ensuring sufficient accessibility provisions, including curb letdown requirements and audible signals.
- When funding is available, upgrade the pedestrian crossing to a full grade-separated crossing, i.e., pedestrian underpass or overpass ensuring accessibility for all mobility users.

8. H7: HIGHWAY 97 & 16TH AVENUE INTERSECTION

8.1 Intersection Description

The intersection of Highway 97 & 16th Avenue is located south of Vernon's downtown and is one of the gateway intersections with pedestrian facilities as you enter the urban area of Vernon from the south. In terms of traffic control, the intersection is equipped with a pedestrian actuated traffic signal to control traffic and facilitate a pedestrian crossing across Highway 97. The Highway provides two vehicle travel lanes in each direction and 16th Avenue has one lane. There are no left turn lanes at this location. The intersection is in close proximity to 15th Avenue (approximately 35m) which is unsignalized and creates an offset 'T' arrangement.

At the intersection there are sidewalks along Highway 97 connecting to the crossing. However, sidewalks are not present on the 16th Avenue and there is no crosswalk across 16th Avenue. The posted speed limit on Highway 97 and 16th Avenue are this location is 50km/hr.

A plan view of the intersection is provided in **Figure 8.1**.

Figure 8.1: H7- Highway 97 & 16th Avenue Intersection



8.2 Site Visit Observations

Bunt undertook a site visit on September 26th, 2024, in the early afternoon to observe the intersection of Highway 97 & 16th Avenue. The weather conditions were clear and sunny. This section outlines the observation notes and pictures taken at the intersection (**Figure 8.2** to **Figure 8.5**).

Notes:

- A private driveway providing access to the Tel-A-Friend Motel forms the east leg of the intersection.
- There are no sidewalks on 16th Avenue though there is a bus stop located on the south side of 16th Avenue.
- There are visibility limitations from 16th Avenue due to foliage growth when looking south.
- The Okanagan College Connector multi-use pathway (MUP) is located to the south of 16th Avenue intersection across from 15 Avenue.
- The Highway 97 lane configurations include shared through and left turn movements which could create visibility limitations and increase risk of rear-end of side-impact crashes.
- Audible pedestrian signals and accessible pedestrian pushbuttons are missing.

Figure 8.2: H7- Southbound view from 16th Avenue (obstructed sightlines)



Figure 8.3: H7- Northbound view from 16th Avenue (obstructed sightlines)



Figure 8.4: H7- 16th Avenue pedestrian facilities



Figure 8.5: H7- Northbound view and motel driveway entrance



8.3 Traffic Volumes

Bunt collected traffic data on January 29th , 2025 to at the Highway 97 & 21st Avenue intersection. By drawing a screen line south of 21st Avenue, Bunt has displayed the northbound and southbound highway movements north of the 16th avenue intersection. This is outlined in **Table 8.1** and full information presented in **Appendix A**.

Table 8.1: H7- Collected Traffic Data, Highway 97 Screen Line North of 16th Avenue

TRAFFIC VOLUMES	NORTHBOUND	SOUTHBOUND	TOTAL
AM Peak Hour (7:45AM – 8:45AM)	846	725	1,571
PM Peak Hour (3:45PM – 4:45PM)	1,022	886	1,908

The heavy vehicles recorded along this screen line were between 4% - 8% of the total traffic.

8.4 MOTT Signal Timing Plan

No signal timing plan was provided for this intersection. However, based on field observations, the pedestrian signal appears to follow standard MOTT signal timing practices.

8.5 Collision Data

Table 8.2 presents the total number of ICBC reported crashes between 2019 – 2013 at the Highway 97 & 16th Avenue Intersection and also between this intersection and the Highway 97 & 15th Avenue intersection (full dataset in **Appendix B**). It is noted that none of the reported crashes involved vulnerable road users (i.e. pedestrians and cyclists).

Table 8.2: H7- Highway 97 & 16th Avenue Intersection ICBC data – Severity

YEAR	CASUALTY CRASH	PROPERTY DAMAGE ONLY	TOTAL
2019	3	3	6
2020	4	5	9
2021	3	1	4
2022	2	3	5
2023	1	3	4
TOTAL	13	15	28

Source: ICBC Reported Crashes: https://public.tableau.com/app/profile/icbc/viz/ICBCReportedCrashes/ICBCReportedCrashes

Table 8.3 displays the crash types experienced at this intersection.

Table 8.3: H7- Highway 97 & 16th Avenue Intersection ICBC data, Crashes by Crash Type

YEAR	HEAD ON	REAR END	SIDE IMPACT	SIDE SWIPE OPPSITE DIRECTION	SIDE SWIPE SAME DIRECTION	SINGLE VEHICLE	TOTAL
2019		3			1		4
2020	1	1	2		1	4	9
2021		3				1	4
2022		1	4				5
2023		3		1			4
TOTAL	1	11	6	1	2	5	26

Note: Conflicted crashes (i.e. conflicting driver statements) and undetermined crashes have been removed.

The most common occurrence of crash type is rear-end crashes. This is often caused by vehicles stopping and the following vehicle, either not realizing or, following too closely to stop before hitting the vehicle in front. The crash data indicated that most of the rear-end incidents occurred on the Highway. This may also be a result of congested over-capacity traffic conditions where motorists travel with reduced headways and unexpected vehicle queues may be presented.

The second most common occurrence is side impact crashes, indicating that vehicles may be making inappropriate gap selection when travelling out of the side street (the pedestrian signals are only activated when there are pedestrians wanting to cross).

Table 8.4 displays the time of day when the crashes occurred at the intersection.

Table 8.4: H7- Highway 97 & 16th Avenue Intersection ICBC data, By Time-of-Day Crashes

YEAR	12:00AM – 2:25AM	3:00AM – 5:59AM	6:00AM - 8:59AM	9:00AM – 11:59AM	12:00PM – 2:59PM	3:00PM – 5:59PM	6:00PM - 8:59PM	9:00PM - 11:59PM	TOTAL
2019				2	1	3			6
2020	1		1	1	2	2	2		9
2021			1	1		1	1		4
2022			2		2	1			5
2023						4			4
TOTAL	1		4	3	5	11	3		28

The table indicates that most crashes are occurring during the PM peak traffic hours. This is expected as this time period has higher vehicle volumes on the road therefore increasing crash risk exposure.

Exhibit 8.1 showcases a summary of the crash history presented in this section.

8.5.1 Collision Risk Assessment

The collision assessment was completed to support the overall safety assessment of the Highway 97 & 16th Avenue Intersection and has been completed by drawing upon the available data and information presented in the above sections. The details of how the collision risk is determined is outlined within **Section 17.**

Table 8.5 displays the assessment details and considerations for the intersection of Highway 97 & 16th Avenue.

Table 8.5: H7- Highway 97 & 16th Avenue Intersection Collision Risk Assessment

FREQUENCY RATING	SEVERITY RATING	COLLISION RISK
Occasional - 1 to 9 collisions per year 56 collisions / 10 years 6 collisions per year	**Medium (Minor to Moderate Injury)** Casualty crashes were reported at this intersection, however less than property damage. Additionally of the casualty crash types reported, the crash types such as head on and side impact that generally are associated with high severity was less than 35% of the casualty crashes. Heavy vehicles at this location were recorded between 4% and 8%.	**Medium Risk Level (D)**

8.6 Issue Identification

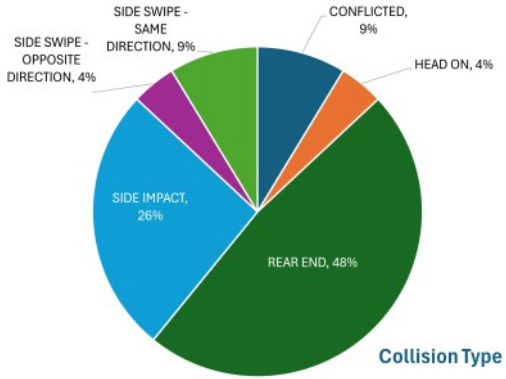
Based on the information presented in this section, the following issues have been identified:

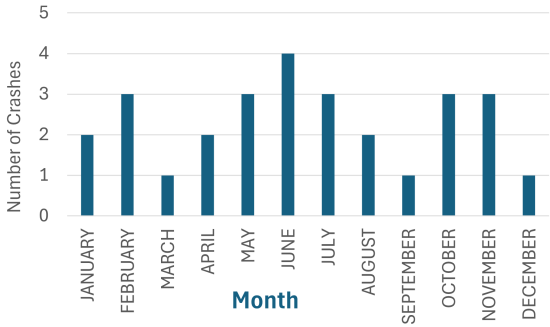
- There is no sidewalk connection on the south side of 16th Avenue to the bus stop.
- The Motel driveway forms the east legs of the intersection creating additional conflict points for vehicle and pedestrian traffic. Additionally this driveway is an uncontrolled access into the intersection.
- There are no audible pedestrian signals or accessible pushbuttons installed at the intersection.
- Sightlines from 16th Avenue are limited.
- The shared through and left laning configuration northbound and southbound on the Highway may create hazardous situations where visibility is limited.

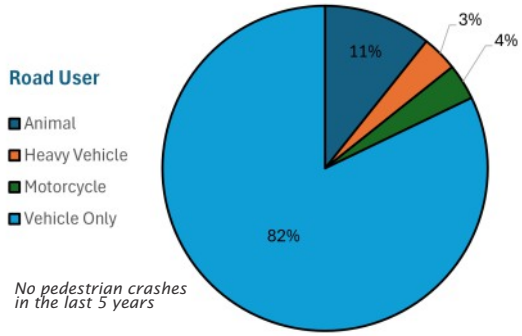
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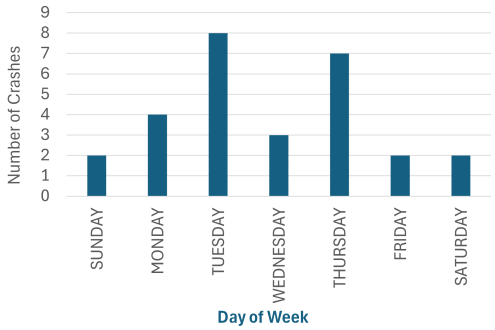


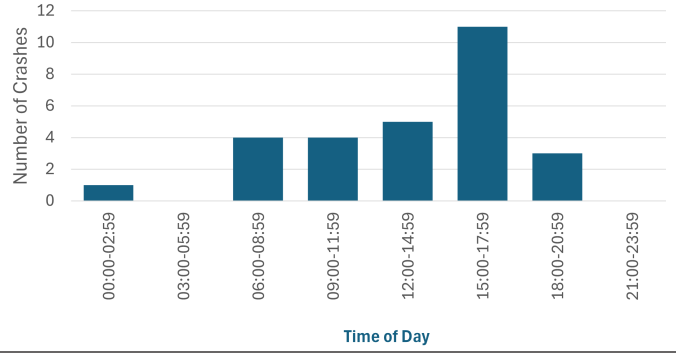
Collision Analysis (2019 - 2023): 28 Incidents











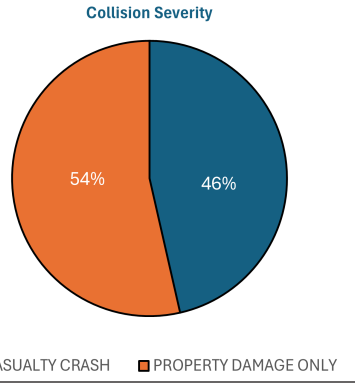


Exhibit 8.1

H7 - Highway 97 & 16th Avenue

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8.7 Recommended Mitigations

8.7.1 Intersection Warrants

Although this intersection is already a pedestrian signal, as part of the review process, Bunt has reviewed the intersection to see if it warrants an upgrade to a full intersection. Bunt used the TAC Traffic Signal Warrant Analysis process to complete this warrant.

The Traffic Signal Warrant can be found in **Appendix C**. The outcome of this process was that a traffic signal is NOT Warranted at this location. Results of the Traffic Signal Warrant is presented in **Table 8.6**.

Table 8.6: H7- Traffic Signal Warrant Results at Highway 97 & 21st Avenue

VEHICLE SCORE	PEDESTRIAN SCORE	TOTAL SCORE	WARRANTED OR NOT WARRANTED
37	9	46	NOT WARRANTED

Note: Threshold total score is 100

8.7.2 Recommendations

- Provide crosswalk markings on 16th Avenue.
- Provide sidewalk facilities on the south side of 16th Avenue for pedestrians to access the bus stop.
- Provide a stop sign and stop line on the Tel-A-Friend Motel access to help control traffic. Upon redevelopment of this site, close the driveway access from the Highway to this property.
- Trim and maintain foliage along Highway 97 to ensure appropriate sightlines from 16th Avenue.

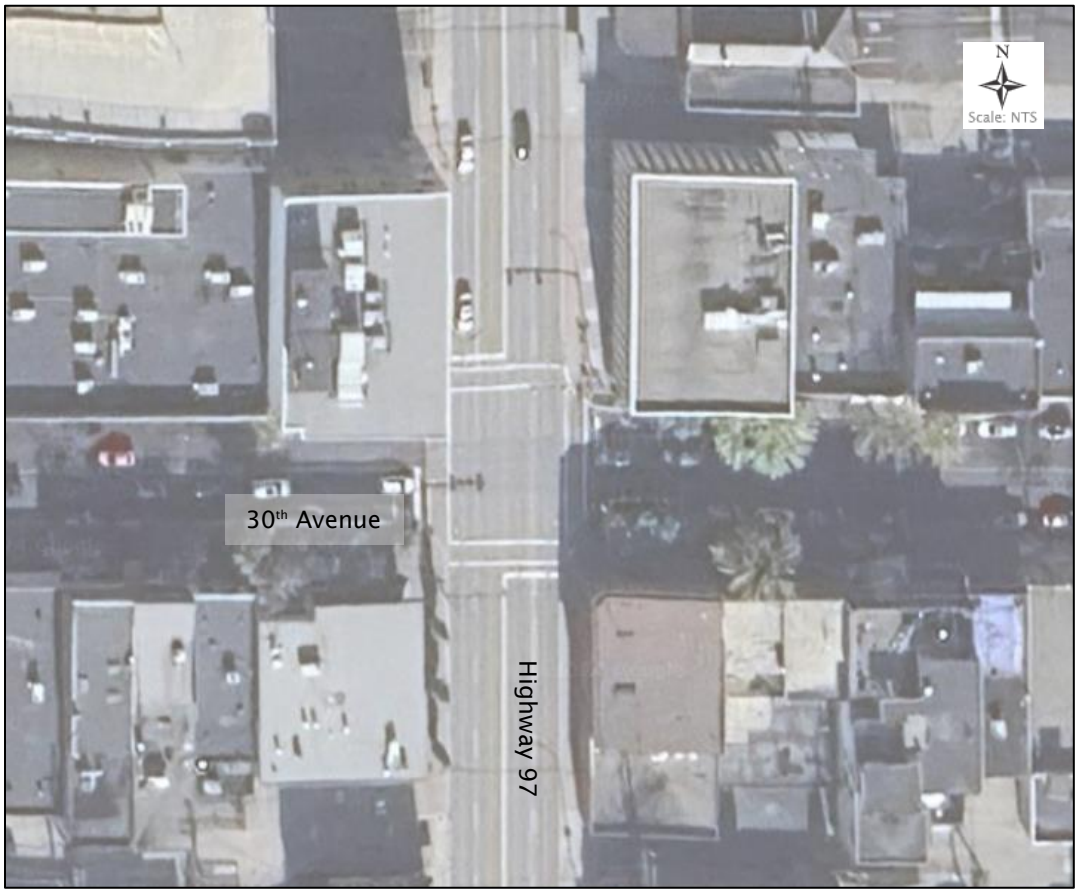
9. H8 - HIGHWAY 97 & 30TH AVENUE INTERSECTION

9.1 Intersection Description

The intersection of Highway 97 & 30th Avenue intersection is located in the centre of the Vernon downtown area. 30th Avenue is classified as a local street which supports a large commercial presence. The intersection is a signalized intersection with pedestrian crosswalks across all legs. It provides 2 vehicle travel lanes in each direction on Highway 97, a through lane and a right turn lane on 30th Avenue. The intersection prohibits left turn movements from all legs. For pedestrians, there are wide sidewalks with boulevards providing separation from traffic connected to all legs of the intersection. The posted speed limit along Highway 97 and 30th Avenue at the intersection is 50km/hr.

A plan view of the intersection is provided in **Figure 9.1**.

Figure 9.1: H8 - Highway 97 & 30th Avenue Intersection



9.2 Site Visit Observations

Bunt undertook a site visit on September 26th, 2024, in the early afternoon to observe the intersection of Highway 97 & 30th Street. The weather conditions were sunny and clear. This section outlines the observation notes and pictures taken at the intersection (**Figure 9.2** and **Figure 9.3**).

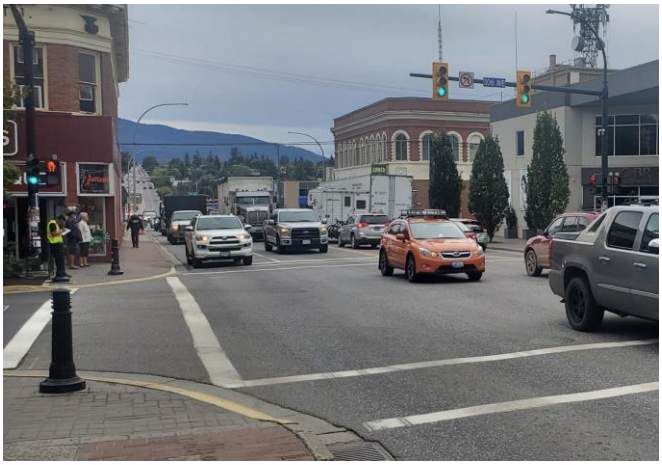
Site Notes:

- The intersection was busy with vehicle traffic and pedestrian volumes.
- The west leg of the intersection was closed at the time of the field visit due to construction.
- Pushbuttons are of an older style and do not meet the latest accessibility standards.

Figure 9.2: H8- Pedestrian push button facilities



Figure 9.3: H8- Southbound approach from northeast corner – high volume of traffic



9.3 Traffic Volumes

Traffic volume data was provided by MOTT through the extraction of loop detector counts. Data was provided for the dates of October 6th to 16th, 2024. When analyzing the provided traffic volumes for typical weekday scenarios (i.e. Tuesday – Thursday) It was determined that Thursdays experienced significantly higher daily traffic volumes.

A summary of the traffic volumes is presented in **Table 9.1**.

Table 9.1: H8- Highway 97 Volumes at 30th Avenue

TRAFFIC VOLUMES	NORTHBOUND	SOUTHBOUND	EASTBOUND	WESTBOUND	TOTAL
AM Peak Hour (8:00AM – 9:00AM)	995	910	185 (0 RT)	175 (13 RT)	2,265
PM Peak Hour (4:00PM – 5:00PM)	1,140	1,100	315 (0 RT)	285 (27 RT)	2,840
Daily Traffic Volumes	14,24	14,780	3,300	3,190	35,560

Note: Volumes have been rounded to the nearest 5 vehicles

Note: Southbound vehicles are approximate as detailed turning movement information not available from loop detectors.

9.4 MOTT Signal Timing Plan

The STP reflects appears to follow MOTT standard signal timing practices. The traffic signal is coordinated with Highway 6 / 25th Avenue & Highway 97 and Highway 97 & 32nd Avenue and has a coordinated cycle length of 120 seconds. The signal timing plan was last updated in September of 2022.

9.5 Collision Data

Table 9.2 presents the total number of ICBC reported crashes between 2019 – 2023 at the Highway 97 & 30th Avenue Intersection (full dataset in **Appendix B**). It is noted that two of the reported crashes involved pedestrians and three involved cyclists. Additionally, Bunt is aware that in August of 2024, a pedestrian was fatally struck by a pick-up truck turning right onto Highway 97 from 30th Avenue.

Table 9.2: H8- Highway 97 & 30th Avenue Intersection ICBC data – Severity

YEAR	CASUALTY CRASH	PROPERTY DAMAGE ONLY	TOTAL
2019	8	8	16
2020	1	6	7
2021	4	4	8
2022	2	8	10
2023	3	2	5
TOTAL	18	28	46

Source: ICBC Reported Crashes: https://public.tableau.com/app/profile/icbc/viz/ICBCReportedCrashes/ICBCReportedCrashes

Table 9.3 displays the crash types experienced at this intersection.

Table 9.3: H8- Highway 97 & 30th Avenue Intersection ICBC data, Crashes by Crash Type

YEAR	REAR END	SIDE IMPACT	SIDE SWIPE SAME DIRECTION	SINGLE VEHICLE	TOTAL
2019	5	6		1	15
2020	2	1	1	1	5
2021	5	1		1	7
2022	3	2	2	1	8
2023	3	2			5
TOTAL	18	12	3	4	37

Note: Conflicted crashes (i.e. conflicting driver statements) and undetermined crashes have been removed.

The most common occurrence of crash type is rear end crashes. The rear end crash type tends to occur due to the changing of traffic signals, where vehicles stop and the following vehicle does not realize or, is following too closely to stop before hitting the vehicle in front. This may also be a result of congested over-capacity traffic conditions where motorists travel with reduced headways and unexpected vehicle queues may be presented.

The second most common occurrence are side impact crashes. Side impact crashes indicate that vehicles may be making inappropriate gap selection when making a left turn or failing to follow right of way as directed by the traffic signal. **Table 9.4** displays the time of day which the crashes occurred at the intersection.

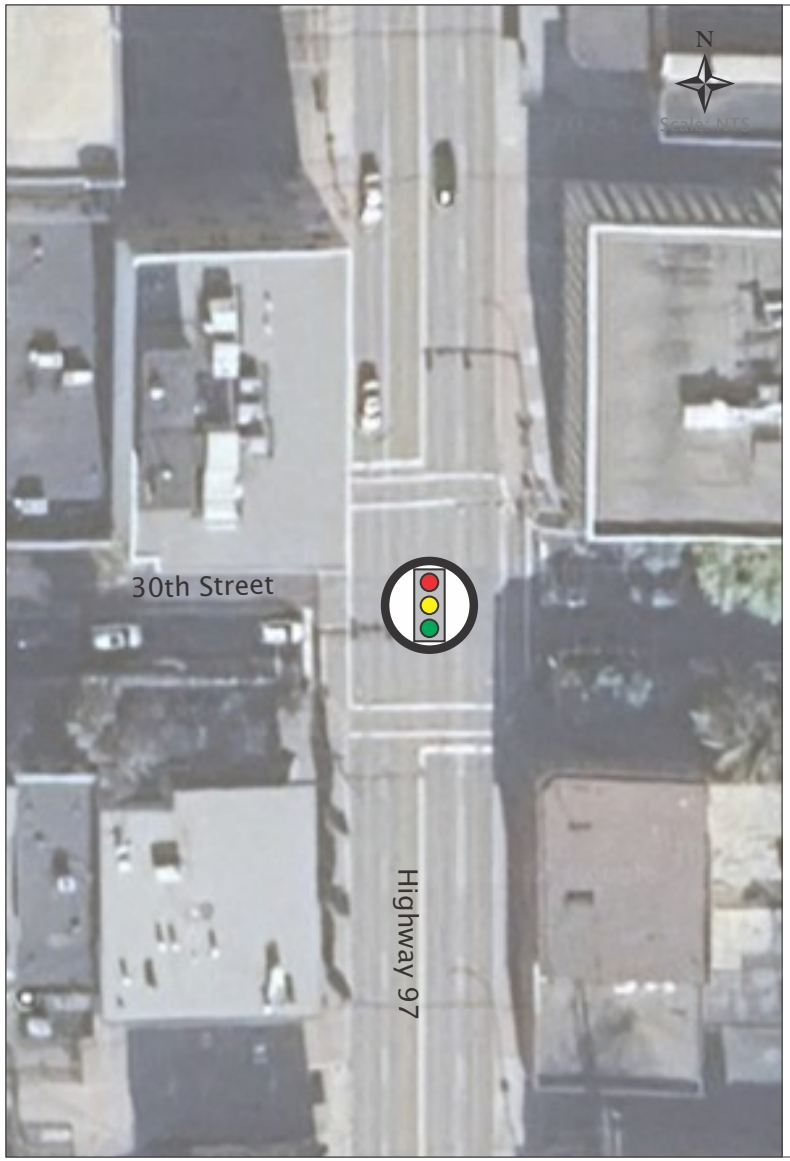
Table 9.4: H8- Highway 97 & 30th Avenue Intersection ICBC data, By Time-of-Day Crashes

YEAR	12:00AM–2:25AM	3:00AM–5:59AM	6:00AM - 8:59AM	9:00AM–11:59AM	12:00PM–2:59PM	3:00PM–5:59PM	6:00PM-8:59PM	9:00PM 11:59PM	TOTAL
2019	1		3	2	5	5			16
2020				3	3	1			7
2021				4	2	1	1		8
2022	1		1		2	4	2		10
2023			1	1	2		1		5
TOTAL	2		5	10	14	11	4		46

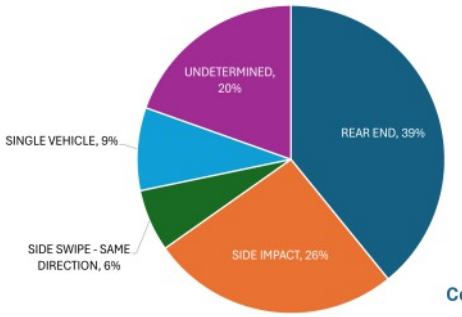
The table indicates that the most crashes are occurring during between noon and 3pm. However, the majority of the crashes are occurring between 9:00AM and 5:59PM, typical business hours. This would make sense as Highway 97, which facilitates high throughput of traffic is passing through the downtown area (high employment) and so there is a large mix of local traffic and through traffic during these hours.

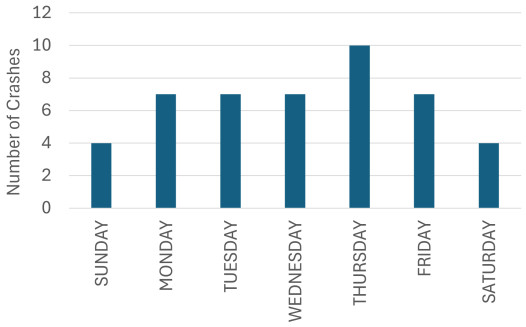
Exhibit 9.1 showcases a summary of the crash history presented in this section.

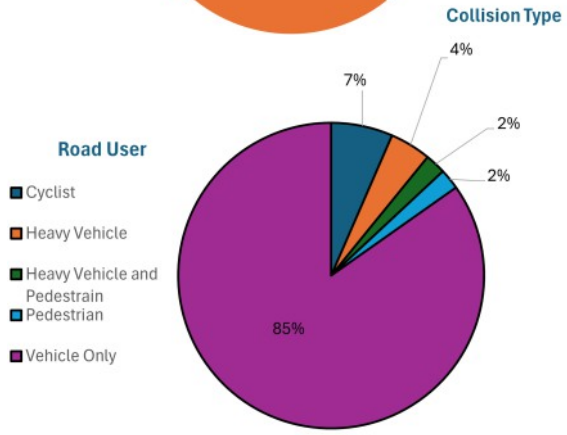
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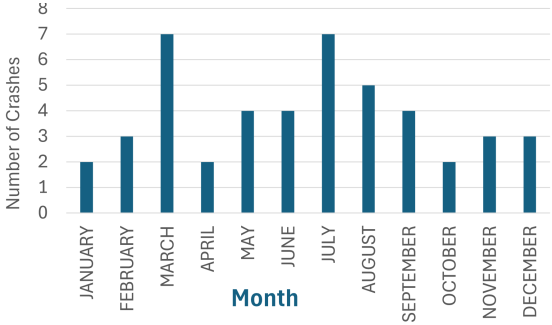


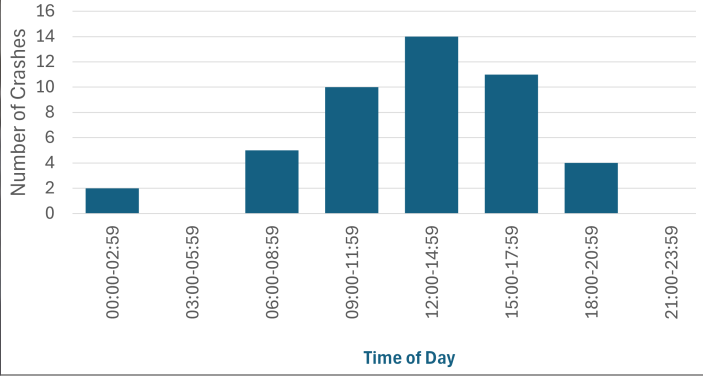
Collision Analysis (2019 - 2023): 46 Incidents











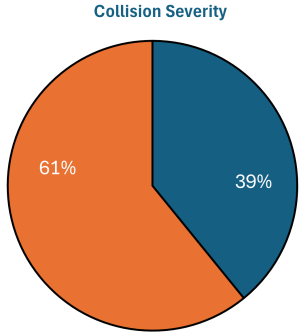


Exhibit 9.1

H8 - Highway 97 & 30th Avenue

City Of Vernon Traffic Modelling Services
07-24-0038 March 2025

bunt & associates

9.5.1 Collision Risk Assessment

The Collision Risk Assessment was completed to support the overall safety assessment of the Highway 97 & 30th Avenue Intersection and has been completed by drawing upon the available data and information presented in the above sections. The details of how the collision risk is determined is outlined within **Section 17. Table 9.5** displays the assessment details and considerations for the intersection of Highway 97 & 30th Avenue.

Table 9.5: H8- Highway 97 & 30th Avenue Intersection Collision Risk Assessment

FREQUENCY RATING	SEVERITY RATING	COLLISION RISK
Occasional - 1 to 9 collisions per year 92 collisions / 10 years 9 collisions per year	**Extreme (Probable Fatal)** Fatal collision occurred at the intersection in 2024 and in 2019-2023 3 cyclists and 2 pedestrians were involved in collisions. Additionally, there are a high number of high side impact collisions. Although no specific heavy vehicle data was available for this intersection, given the nature of the other location along Highway 97 and the note that it is a dangerous good routes, indicates that it would be reasonable to expect a high percentage of heavy vehicles passing through this intersection.	**Highest Risk Level (F)**

9.6 Issue Identification

- A high number of active transportation-related crashes were reported, including two pedestrian and three cyclist incidents.
- Highway 97 operates near capacity during peak hours with congested traffic conditions and vehicle queues. This results in augmented aggressive driving behaviour, including smaller vehicle headways, yellow and red light running, and reduced yielding behaviour.
- The mix of heavy vehicle traffic along Highway 97 intersecting the urban pedestrian high street environment on 30th Avenue.
- The conflict between pedestrians utilizing the crosswalks and right turning vehicles from 30th Avenue.
- The coordinated signal cycle length is 120 seconds which is near the upper threshold of typical MOTT signal timing standards and can result in long pedestrian delays waiting to use the crosswalks.
- Older style pedestrian pushbuttons not meeting the latest accessibility standards are present.

9.7 Recommended Mitigations

This section is intended to outline suggested mitigations that could be applied to the current intersection.

9.7.1 Intersection Warrants

The intersection is already fully signalized. As such, no intersection warrant analysis was completed.

Guidance from the TAC Manual of Uniform Traffic Control Devices for Canada 6th Edition (MUTCDC) was also reviewed to assess applicability of Right Turn on Red (RTOR) turn control measures. Criteria from the TAC MUTCDC indicates that a RTOR restriction may be required for any of the following conditions:

1. Inadequate sight distance or restrictive geometrics.
2. Irregular intersection with more than four approaches and multi-phase control.
3. Conflicts with a protected pedestrian phase or conflicts with a particularly heavily used pedestrian crosswalk.
4. The existence of unusual movements such as double left turns by opposing traffic or double right turns.
5. A history of RTOR or LTOR collisions on a particular approach.
6. The proximity of a railroad crossing with signal pre-emption on that approach.

Based on the criteria above, the EB and WB 30th Avenue approaches would be recommended for RTOR restrictions due to criteria 3 and 5 above.

9.7.2 Recommendations

To address the conflict between vulnerable road users and the high volume of traffic in this area, Bunt recommends the following mitigation measures options:

1. **Prohibit Right Turn on Red for east-west movements on to Highway 97 from 30th Avenue.** This should be supported with signage (**Figure 9.4 and Figure 9.5**) or right turn traffic control signals. Note, removing the ability to right turn on red may impact the vehicle capacity at the intersection.

Figure 9.4: H8- Example of no right turn on Red Implementation



Source: Bunt site visit, Wartkiss Way & Burnside Road, View Royal

Figure 9.5: H8- Example of No Right Turn on Red Implementation



Source: https://www.atstraffic.ca/wp-content/uploads/2016/08/MoST_PM.pdf

2. **Prohibit Right Turn on Red for east-west movements on to Highway 97 from 30th Avenue and install a right turn signal control.**

Note, the addition of a right turn arrow would require an additional phase to separate pedestrians and vehicle traffic. This results in additional time requirements for east-west movements and in turn reduces the allocation of green time to the Highway 97 movements and overall capacity.

Figure 9.6 and **Figure 9.7** showcase examples of how a signalized right turn could operate.

Figure 9.6: H8- South-west Marine Drive & Cambie Street, Vancouver, Signaled Right Turn



Source: Google Street View
Note: Cycle lane is operating on the inside (left side) of the right turn lane.

Figure 9.7: H8- Beatty Street & Smithe Street, Vancouver, Signaled Right Turn



Source: Google Street View

3. **Install Leading Pedestrian Interval for the east-west pedestrian crossings on 30th Avenue.**

This strategy would allow pedestrians to get ahead start into the crosswalk and establish their presence in the view of right turning vehicles. This measure is not anticipated to have any effect or additional lost time for Highway 97 movements as the cycle length can be adjusted to maintain Highway green times.

4. **Install Additional Signage for Vehicles to 'Watch for Pedestrians'.**

5. **Trim and maintain foliage on the corners of the intersection to help improve visibility for right turn vehicle movements onto Highway 97.**

It is noted that Bunt considered implementation of a pedestrian scramble phase at this location. However, due to high vehicle through volumes on Highway 97, providing a scramble pedestrian phases would have a significant reduction on green time for Highway traffic and overall intersection capacity. With at or over capacity behaviour for motorists in this area already occurring, Bunt recommends implementing other measures before considering a scramble crossing.

6. **Install newer style accessible pedestrian pushbuttons to support travellers of all ages and abilities.**

10. H9: HIGHWAY 97 & 32ND AVENUE INTERSECTION

10.1 Intersection Description

The intersection of Highway 97 & 32nd Avenue intersection is located in the centre of the Vernon downtown area, one street north of the main street. It is a signalized intersection with pedestrian crosswalks across on all legs. The intersection provides 2 vehicle travel lanes in each direction on Highway 97 and a shared through and right turn lane and a left turn lane on both legs of 32nd Avenue. The intersection prohibits left turn movements on Highway 97 between 9AMto 6PM Monday to Friday. Furthermore, there are no turning bays provided on the Highway to support these movements in non-restricted hours. 32nd Avenue is classified as an arterial road which facilitates a large commercial presence around the intersection. The west leg of the intersection has a raised median controlling the turning movements to right in only from the adjacent property to the north. There are sidewalks connected to all legs of the intersection. The posted speed limit on Highway 97 and 32nd Avenue at the intersection is 50km/hr.

A plan view of the intersection is provided in **Figure 10.1**.

Figure 10.1: H9- Highway 97 & 32nd Avenue Intersection



10.2 Site Visit Observations

Bunt undertook a site visit on September 26th, 2024, in the early afternoon to observe the intersection of Highway 97 & 32nd Street. The weather conditions were cloudy and overcast. This section displays the observation notes and pictures taken at the intersection (**Figure 10.2**). Additionally, this intersection was driven on the 25th of December 2024 and recorded with dashcam footage. A screenshot of the footage is shown in **Figure 10.3.**

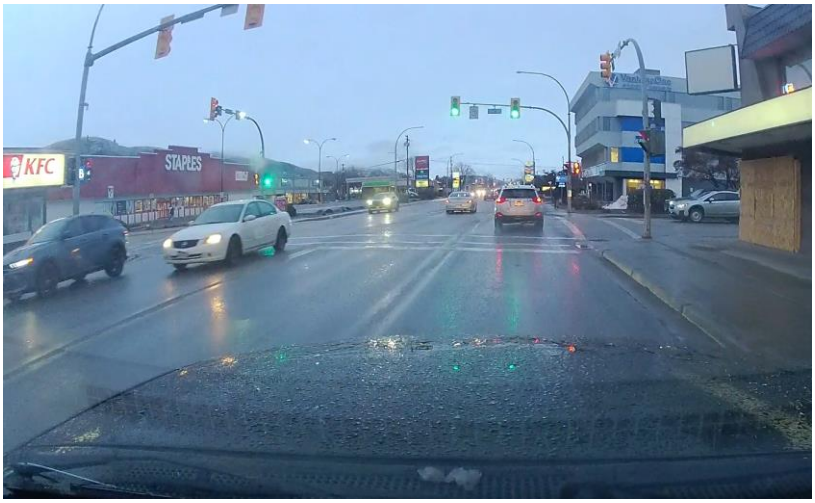
Site Notes:

- Long vehicle queues on 32nd Avenue were observed.
- Older style pedestrian pushbuttons not meeting the latest accessibility standards are present.

Figure 10.2: H9- Pedestrian Provisions



Figure 10.3: H9- Northbound



10.3 Traffic Volumes

Traffic volume data has been provided by MOTT through the extraction of loop detector counts. Data was provided for the dates 6th October 2024 to 16th October 2024. When analyzing the provided traffic volumes for typical weekday scenarios (i.e. Tuesday – Thursday), Bunt found that Thursdays experienced largest higher daily traffic volume. Thursday, October 10, 2024 traffic volumes are presented for the daily traffic and AM and PM peak hours in **Table 10.1**.

Table 10.1: H9 - Highway 97 & 32nd Avenue Intersection Traffic Volumes

TRAFFIC VOLUMES	NORTHBOUND	SOUTHBOUND	EASTBOUND	WESTBOUND	TOTAL
AM Peak Hour (8:00AM – 9:00AM)	950	880	275	305	2,410
PM Peak Hour (4:30PM – 5:30PM)	1,120	1,100	420	375	3,015
Daily Traffic Volumes	13,890	14,465	4,100	4,020	36,480

Note: Volumes have been rounded to the nearest 5 vehicles

10.4 MOTT Signal Timing Plan

The STP appears to follow standard MOTT traffic signal timing practice. The traffic signal is coordinated with Highway 6 / 25th Avenue & Highway 97 and Highway 97 & 30th Avenue and operates on a cycle length of 120 seconds. The left turns on the east and west movements are permissive (north south when permitted also operates as a permissive movement). The signal timing plan was last updated in September of 2022.

10.5 Collision Data

Table 10.2 presents the total number of ICBC reported crashes between 2019 – 2023 at the Highway 97 & 30th Avenue Intersection (full dataset in **Appendix B**). It is noted that two of the reported crashes involved pedestrians and one involved a cyclist.

Table 10.2: H9- Highway 97 & 32nd Avenue Intersection ICBC data – Severity

YEAR	CASUALTY CRASH	PROPERTY DAMAGE ONLY	TOTAL
2019	4	6	10
2020	5	6	11
2021	4	10	14
2022	7	10	17
2023	3	7	10
TOTAL	23	39	62

Source: ICBC Reported Crashes: https://public.tableau.com/app/profile/icbc/viz/ICBCReportedCrashes/ICBCReportedCrashes

Table 10.3 displays the crash types experienced at this intersection.

Table 10.3: H9- Highway 97 & 32nd Avenue Intersection ICBC data, Crashes by Crash Type

YEAR	REAR END	SIDE IMPACT	SIDE SWIPE SAME DIRECTION	SINGLE VEHICLE	TOTAL
2019	8	1		1	10
2020	3	2	2	2	9
2021	6	4	3		13
2022	6	4	2	1	13
2023	4	3		2	9
TOTAL	27	14	7	6	54

Note: Conflicted crashes (i.e. conflicting driver statements) and undetermined crashes have been removed.

The most common occurrence of crash type is rear end crashes. Generally rear-end crashes tend to occur due to the changing of traffic signals, where vehicles stop and the following vehicle does not realize or, is following too closely to stop before hitting the vehicle in front. This may also be a result of congested over-capacity traffic conditions where motorists travel with reduced headways and unexpected vehicle queues may be presented.

The second most common occurrence are side impact crashes. Side impact crashes indicate that vehicles may be making inappropriate gap selection when making a left turn or failing to follow right of way as directed by the traffic signal. It is also noted that at this intersection left turns are prohibited from Highway 97 to 32nd Avenue between 9AM to 6PM everyday.

Table 10.4 displays the time of day which the crashes occurred at the intersection.

Table 10.4: H9- Highway 97 & 32nd Avenue Intersection ICBC data, By Time-of-Day Crashes

YEAR	12:00AM – 2:25AM	3:00AM – 5:59AM	6:00AM - 8:59AM	9:00AM – 11:59AM	12:00PM – 2:59PM	3:00PM – 5:59PM	6:00PM - 8:59PM	9:00PM - 11:59PM	TOTAL
2019			1	4	3	2			10
2020	1		1	4	2	2	1		11
2021				4	4	5	1		14
2022		1	2	3	5	4	1	1	17
2023			1	2	3	2	2		10
TOTAL	1	1	5	17	17	15	5	1	62

The table indicates that the most crashes are occurring during between 9AM -3PM. However, the majority of the crashes are occurring between 9:00AM and 5:59PM, typical business hours. This would make sense as the highway, which is high throughput of traffic is passing through the downtown area (high employment) and so there is a large mix of local traffic and through traffic during these hours.

Exhibit 10.1 showcases a summary of the crash history presented in this section.

10.5.1 Collision Risk Assessment

The collision assessment was completed to support the overall safety assessment of the Highway 97 & 32nd Avenue Intersection and has been completed by drawing upon the available data and information presented in the above sections. The details of how the collision risk is determined is outlined within **Section 17**. **Table 10.5** displays the assessment details and considerations for the intersection of Highway 97 & 32nd Avenue.

Table 10.5: H9- Highway 97 & 32nd Avenue Intersection Collision Risk Assessment

FREQUENCY RATING	SEVERITY RATING	COLLISION RISK
Frequent - 10 or more collisions per year 124 collisions / 10 years 12 collisions per year	**Extreme (Probable Fatal)** High number of collisions involved cyclists (1) and pedestrians (2) between 2019 - 2023. Additionally, two pedestrians were hospitalized in 2024. Although no specific heavy vehicle data was available for this intersection, given the nature of the other location along Highway 97 and the note that it is a dangerous good routes, indicates that it would be reasonable to expect a high percentage of heavy vehicles passing through this intersection.	**Highest Risk Level (F)**

10.6 Issue Identification

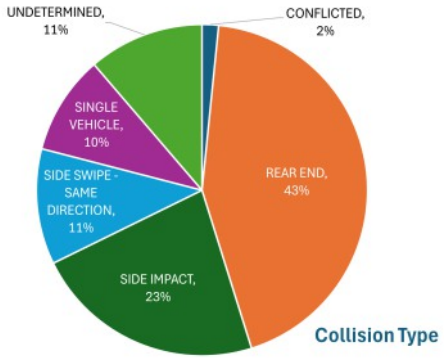
Based on the information presented in this section, the following issues have been identified:

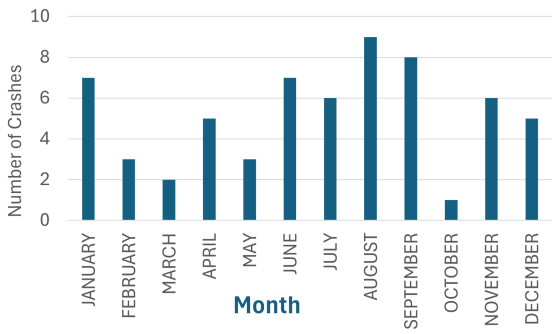
- Left-turns movements are very challenging to complete with large Highway 97 through traffic volumes.
- There may be limited visibility for left-turn movements due to the shared through and left-turn lane configuration resulting in vehicle shadowing of opposing left-turn movements.
- The intersection has experienced one pedestrian and two cyclist crashes in the last 5 years.

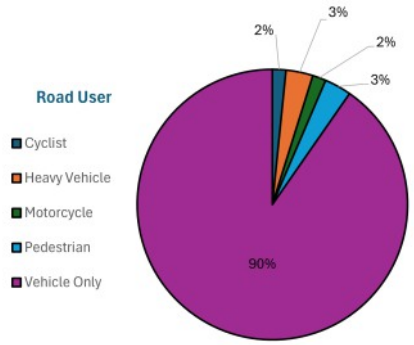
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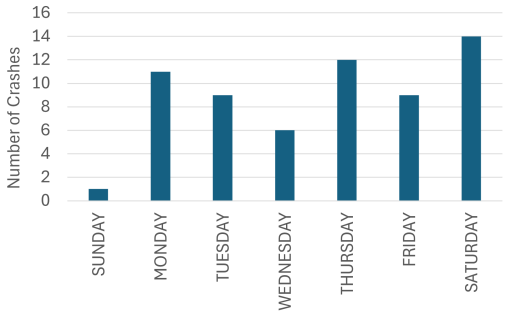


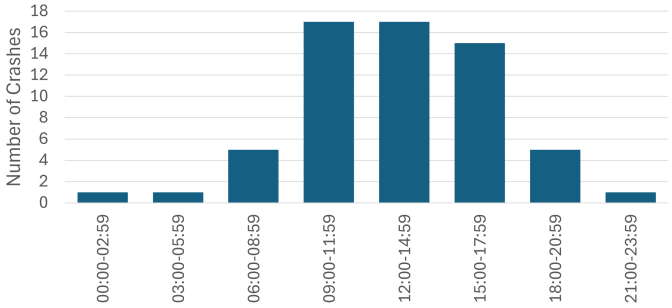
Collision Analysis (2019 - 2023): 62 Incidents











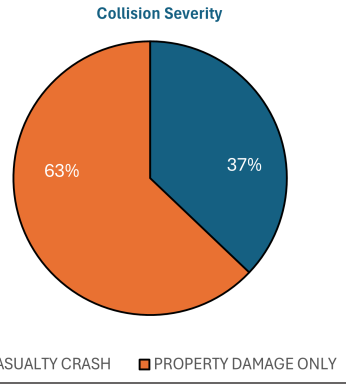


Exhibit 10.1

H9 - Highway 97 & 32nd Avenue

City Of Vernon Traffic Modelling Services
07-24-0038 March 2025

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10.7 Recommended Mitigations

10.7.1 Intersection Warrants

This intersection is already fully signalized. As such, a traffic signal warrant analysis was not completed.

Guidance from the TAC Manual of Uniform Traffic Control Devices for Canada 6th Edition (MUTCDC) was also reviewed to assess applicability of Right Turn on Red (RTOR) turn control measures. Criteria from the TAC MUTCDC indicates that a RTOR restriction may be required for any of the following conditions:

1. Inadequate sight distance or restrictive geometrics.
2. Irregular intersection with more than four approaches and multi-phase control.
3. Conflicts with a protected pedestrian phase or conflicts with a particularly heavily used pedestrian crosswalk.
4. The existence of unusual movements such as double left turns by opposing traffic or double right turns.
5. A history of RTOR or LTOR collisions on a particular approach.
6. The proximity of a railroad crossing with signal pre-emption on that approach.

Based on the criteria above, the EB and WB 32nd Avenue approaches would be recommended for RTOR restrictions due to criteria 3 and 5 above.

10.7.2 Recommendations

The intersection faces similar conflicts with vulnerable road users as the Highway 97 & 30th Avenue intersection. Therefore, the following are recommended:

- Prohibit Right-Turn-on-Red for east-west movements onto Highway 97 from 32nd Avenue. Additionally, consideration for installing a dedicated right-turn phase should be made.
- Install additional Signage for vehicles to 'Watch for Pedestrians'.
- Consider installing left-turn lanes on Highway 97 and adjust signal operation at a future time upon the redevelopment of surrounding properties.
- Consider extending the northbound and southbound left turn prohibition to 24/7 to avoid potentially hazardous left turn movements with limited visibility of oncoming traffic.
- Install newer style accessible pedestrian pushbuttons to support travellers of all ages and abilities.

11. H10 - HIGHWAY 97 & 34TH AVENUE INTERSECTION

11.1 Intersection Description

The intersection of Highway 97 & 34th Avenue intersection is an unsignalized intersection with stop control on both legs of 34th Avenue located in the centre of Vernon. Highway 97 provides 2 vehicle travel lanes, including a left-turn/through and a through/right-turn lane for northbound and southbound directions. 34th Avenue supplies one shared left-turn/through/right-turn lane on both eastbound and westbound approaches. There are sidewalks installed along all approaches to the intersection and marked crosswalks across 34th Avenue. The posted speed limits along Highway 97 and 34 Avenue at the intersection are 50km/hr.

A plan view of the intersection is provided in **Figure 11.1**.

Figure 11.1: H10- Highway 97 & 34th Avenue Intersection



11.2 Site Visit Observations

Bunt undertook a site visit on September 26th, 2024, in the early afternoon to observe the intersection of Highway 97 & 34th Street. The weather conditions were cloudy and overcast. This section displays the field observation notes.

Notes:

- No pedestrian crosswalks are provided across Highway 97.
- Poor accessibility provisions were observed on the sidewalk on 34th Avenue. This includes a narrow width and obstructions within the sidewalk.
- Due to the heavy through volumes on Highway 97, the left turn movements from 34th Avenue are challenging and potentially hazardous to complete.
- There is limited clear zone space between the sidewalks along Highway 97 and the vehicle travel lanes.

11.3 Traffic Volumes

Traffic volume data was unavailable at Highway 97 and 34th Street for this analysis. However, by drawing a screen line south of 32nd Avenue, Bunt has calculated the northbound and southbound Highway 97 movements north of the 30th Avenue intersection. The screen line calculation was conducted for Thursday, October 10th, 2024. The subject traffic volumes for the AM and PM peak hours and daily total are presented in **Table 11.1**.

Table 11.1: H10- Highway 97 Volumes, Screen Line South of 32nd Avenue

TRAFFIC VOLUMES	NORTHBOUND	SOUTHBOUND	TOTAL
AM Peak Hour (8:00AM – 9:00AM)	950	880	1,830
PM Peak Hour (4:30PM – 5:30PM)	1,120	1,100	2,220
Daily Traffic Volumes	13,890	14,465	28,355

Note: Volumes have been rounded to the nearest 10 vehicles

Note: Southbound vehicles are approximate as detailed turning movement information not available from loop detectors.

11.4 MOTT Signal Timing Plan

There is no STP as this is an unsignalized intersection.

11.5 Collision Data

Table 11.2 presents the total number of ICBC-reported crashes between 2019 and 2023 at the Highway 97 & 34th Avenue Intersection (full dataset in **Appendix B**). It is noted that one of the reported crashes involved a cyclist.

Table 11.2: H10- Highway 97 & 34th Avenue Intersection ICBC data – Severity

YEAR	CASUALTY CRASH	PROPERTY DAMAGE ONLY	TOTAL
2019	1	3	4
2020	2	2	4
2021	2	6	8
2022	2	2	4
2023	3	9	12
TOTAL	10	22	32

Source: ICBC Reported Crashes: https://public.tableau.com/app/profile/icbc/viz/ICBCReportedCrashes/ICBCReportedCrashes

Table 11.3 displays the crash types experienced at this intersection.

Table 11.3: H10- Highway 97 & 34th Avenue Intersection ICBC data, Crashes by Crash Type

YEAR	REAR END	SIDE IMPACT	SIDE SWIPE OPPOSITE DIRECTION	SIDE SWIPE SAME DIRECTION	SINGLE VEHICLE	TOTAL
2019	1		1	1		3
2020	1	1		1		3
2021		3		2	1	6
2022	2					2
2023	2	3		1	3	9
TOTAL	6	7	1	5	4	23

Note: Conflicted crashes (i.e. conflicting driver statements) and undetermined crashes have been removed.

The most common occurrence are side impact crashes. Side impact crashes indicate that vehicles may be making inappropriate gap selection turning out from 34 Avenue.

The second most common occurrence was rear end crashes. Typically rear end crashes occur due to the changing of traffic signals, where vehicles stop and the following vehicle does not realize or, is following too closely to stop before hitting the vehicle in front. However, as there are no signals present, this is may be attributed to vehicles slowing or stopping to make a left turn or general congestion from upstream intersections.

Table 11.4 displays the time of day which the crashes occurred at the intersection.

Table 11.4: H10- Highway 97 & 34th Avenue Intersection ICBC data, By Time-of-Day Crashes

YEAR	12:00AM – 2:25AM	3:00AM – 5:59AM	6:00AM - 8:59AM	9:00AM – 11:59AM	12:00PM – 2:59PM	3:00PM – 5:59PM	6:00PM - 8:59PM	9:00PM - 11:59PM	TOTAL
2019				1	1	2			4
2020				1	2	1			4
2021				3	2	3			8
2022			1		2	1			4
2023			2	2	4	1	2	1	12
TOTAL			3	7	11	8	2	1	32

The table indicates that the most crashes are occurring during between 9AM-6PM, aligning with typical business hours. This would make sense as Highway 97, which is high throughput of traffic is passing through the centre of Vernon, where there is demand for conflicting movements of local traffic.

Exhibit 11.1 showcases a summary of the crash history presented in this section.

11.5.1 Collision Risk Assessment

The collision assessment was completed to support the overall safety assessment of the Highway 97 & 34th Avenue Intersection and has been completed by drawing upon the available data and information presented in the above sections. The details of how the collision risk is determined is outlined within **Section 17**. **Table 11.5** displays the assessment details and considerations for the intersection of Highway 97 & 34th Avenue.

Table 11.5 : H10- Highway 97 & 34th Avenue Intersection Collision Risk Assessment

FREQUENCY RATING	SEVERITY RATING	COLLISION RISK
Occasional - 1 to 9 collisions per year 64 collisions / 10 years 6 collisions per year	**Medium (Minor to Moderate Injury)** One cyclist involved in a collision between 2019-2023. Although no specific heavy vehicle data was available for this intersection, given the nature of the other location along Highway 97 and the note that it is a dangerous good routes, indicates that it would be reasonable to expect a high percentage of heavy vehicles passing through this intersection. However, there are not any pedestrian crossings or cycling connections at this intersection and therefore has been graded at Medium.	**Moderate Risk Level (D)**

11.6 Issue Identification

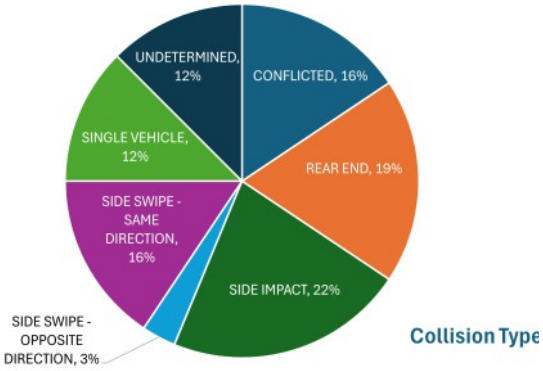
At this location the issues identified have been summarized below:

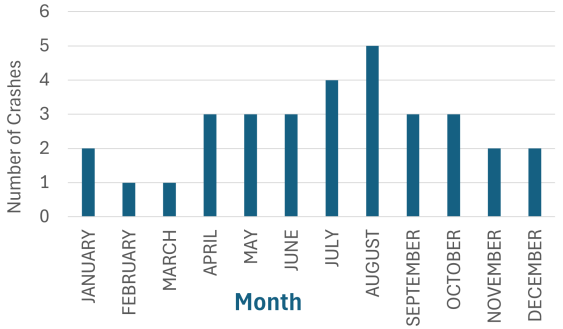
- No pedestrian crossing facilities are provided at this location.
- Physical obstructions exist within the existing sidewalk on 34 Street.
- It is challenging and potentially hazardous to make left turns onto or off of the highway. Additionally, there are no left turn bays present.
- The paved road surface on Highway 97 appears narrow and 5 side swipe same direction collisions were recorded at this intersection in the last 5 years.

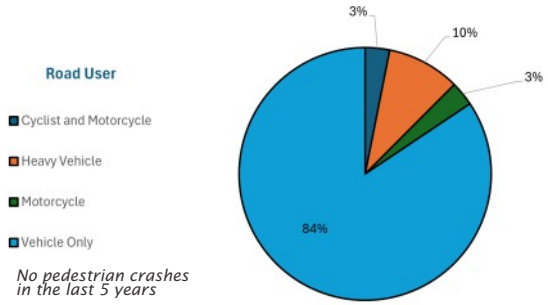
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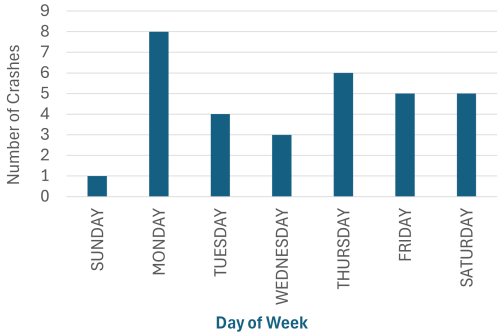
Collision Analysis (2019 - 2023): 32 Incidents

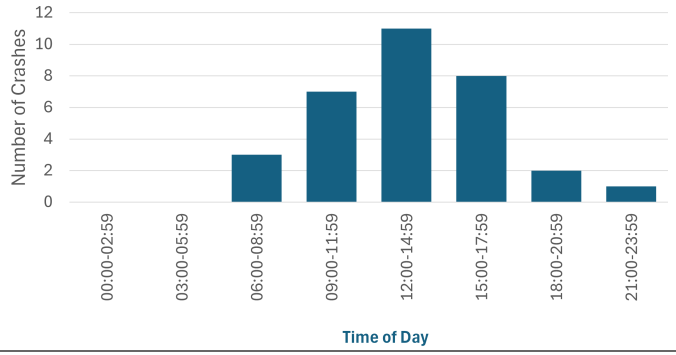






No pedestrian crashes in the last 5 years





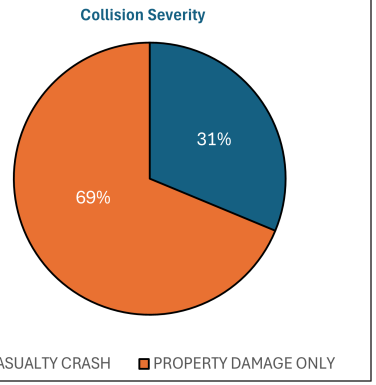


Exhibit 11.1

H10 - Highway 97 & 34th Avenue

City Of Vernon Traffic Modelling Services
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11.7 Recommended Mitigations

11.7.1 Intersection Warrants

No intersection warrants were undertaken at this location due to unavailability of traffic turning movement data and low priority of analysis at this intersection.

11.7.2 Recommendations

As this intersection is of lower priority than others on this corridor, Bunt recommends that this intersection be monitored for future upgrades. The City of Vernon should collect and review traffic movement data at this location and analyze the volumes of the left turning movements. Considerations should be made to prohibit the left-turn movement from 34th Avenue in the future.

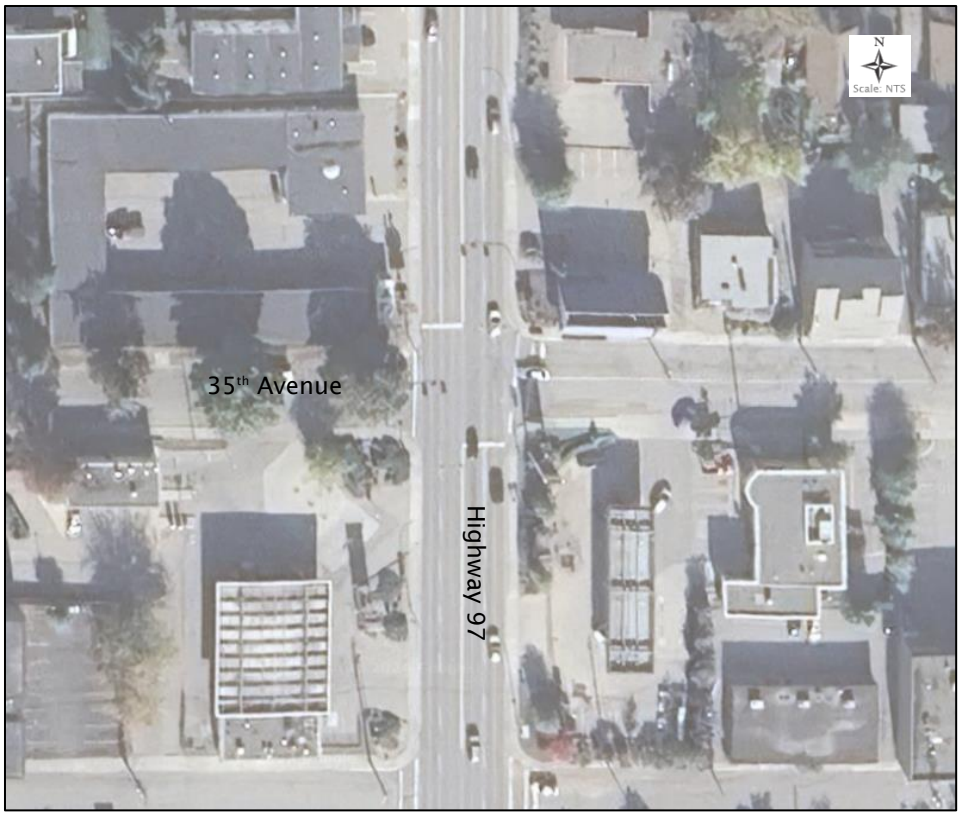
12. H11 - HIGHWAY 97 & 35TH AVENUE INTERSECTION

12.1 Intersection Description

The intersection of Highway 97 & 35th Avenue is located in the centre of Vernon, it is an intersection that provides traffic signals for fire emergency activation. The Vernon Fire Department is located on the corner of 35th Avenue & 30th Street. There are crosswalks across 35th Avenue, but no crosswalks available to cross Highway 97. The intersection provides 2 vehicle travel lanes in each direction on the highway and a one-vehicle travel lane approach on 35th Avenue. The through and left turn movements share a lane on Highway 97, while 35 Avenue provides a shared through, left turn, and right turn lane. Note, 35th Avenue is classified as a collector road. There are sidewalks connected to all legs of the intersection. However, on the northwest side of 35th Avenue, the sidewalk terminates and does not continue along 35th Avenue's north side. A plan view of the intersection is provided in **Figure 12.1**. The posted speed limit at the intersection is 50km/hr for Highway 97 and 35 Avenue.

Bunt also notes that there is a multi-use path facility to the east on 35th Avenue, which continues east and north/south at 30th Street.

Figure 12.1: H11- Highway 97 & 35th Avenue Intersection



12.2 Site Visit Observations

Bunt undertook a site visit on September 26th, 2024, in the early afternoon to observe the intersection of Highway 97 & 35th Street. The weather conditions were dry and overcast. This section outlines the observation notes and pictures taken at the intersection (**Figure 12.2** and **Figure 12.3**).

Site Notes:

- No crosswalk facilities are present across Highway 97. Additionally, there aren't any nearby crossing opportunity for pedestrians.
- The left turn movements from 35th Avenue onto Highway 97 is challenging and potentially hazardous due to high traffic volumes and limited gaps in traffic along Highway 97.

Figure 12.2: H11- View of east approach



Figure 12.3: H11- West approach stop bar



12.3 Traffic Volumes

Bunt collected traffic data on January 29, 2025 to assess vehicle volumes on 35th Avenue and Highway 97 and to confirm the number of pedestrians crossing at this location. The findings are outlined in **Table 12.1** and full information presented in **Appendix A**.

Table 12.1: H11- Collected Traffic Data at Highway 97 & 35th Avenue Intersection

TRAFFIC VOLUMES	HIGHWAY 97						35TH AVENUE						
	NBL	NBT	NBR	SBL	SBT	SBR	WBL	WBT	WBR	EBL	EBT	EBR	TOTAL
AM Peak Hour (7:45AM – 8:45AM)	16	720	40	22	727	11	2	1	12	2	3	14	1,595
PM Peak Hour (4:00PM – 5:00PM)	21	1,029	22	14	911	24	2	3	32	13	3	74	2,148

During the AM peak hour 7 pedestrians crossed the Highway and in the PM peak hour 2 pedestrians crossed.

Based on the traffic data collection, Highway 97 at this location accommodates heavy vehicle traffic up to 8% of total volumes depending on the time of day and direction.

12.4 MOTT Signal Timing Plan

No Signal Timing Plan was obtained for this intersection as signalization is only provided for Fire Trucks and Fire Pre-Emption.

12.5 Collision Data

Table 12.2 presents the total number of ICBC reported crashes between 2019 – 2023 at the Highway 97 & 35th Avenue Intersection (full dataset in **Appendix B**). It is noted that two of the reported crashes involved pedestrians.

Table 12.2: H11- Highway 97 & 35th Avenue Intersection ICBC data – Severity

YEAR	CASUALTY CRASH	PROPERTY DAMAGE ONLY	TOTAL
2019	1	5	6
2020	2	2	4
2021	2	4	6
2022		7	7
2023	2	3	5
TOTAL	7	21	28

Source: ICBC Reported Crashes: https://public.tableau.com/app/profile/icbc/viz/ICBCReportedCrashes/ICBCReportedCrashes

Table 12.3 displays the crash types experienced at this intersection.

Table 12.3: H11- Highway 97 & 35th Avenue Intersection ICBC data, Crashes by Crash Type

YEAR	REAR END	SIDE IMPACT	SIDE SWIPE SAME DIRECTION	SINGLE VEHICLE	TOTAL
2019		2	1	2	5
2020	1	3			4
2021	2	3			5
2022	2	1	1		4
2023		4	1		5
TOTAL	5	13	3	2	23

Note: Conflicted crashes (i.e. conflicting driver statements) and undetermined crashes have been removed.

The most frequent crash type is side impact crashes followed by rear end crashes. Side impact crashes indicate that vehicles may be making inappropriate gap selection when making a left turn on to or off of the Highway.

Second most common crashes are rear end crashes. Generally rear end crashes occur due to the changing of traffic signals, where vehicles stop and the following vehicle does not realize or, is following too closely to stop before hitting the vehicle in front. Rear end crashes may also occur in areas with high traffic congestion where vehicle headways are reduced and queue spillback is present.

Table 12.4 displays the time of day which the crashes occurred at the intersection.

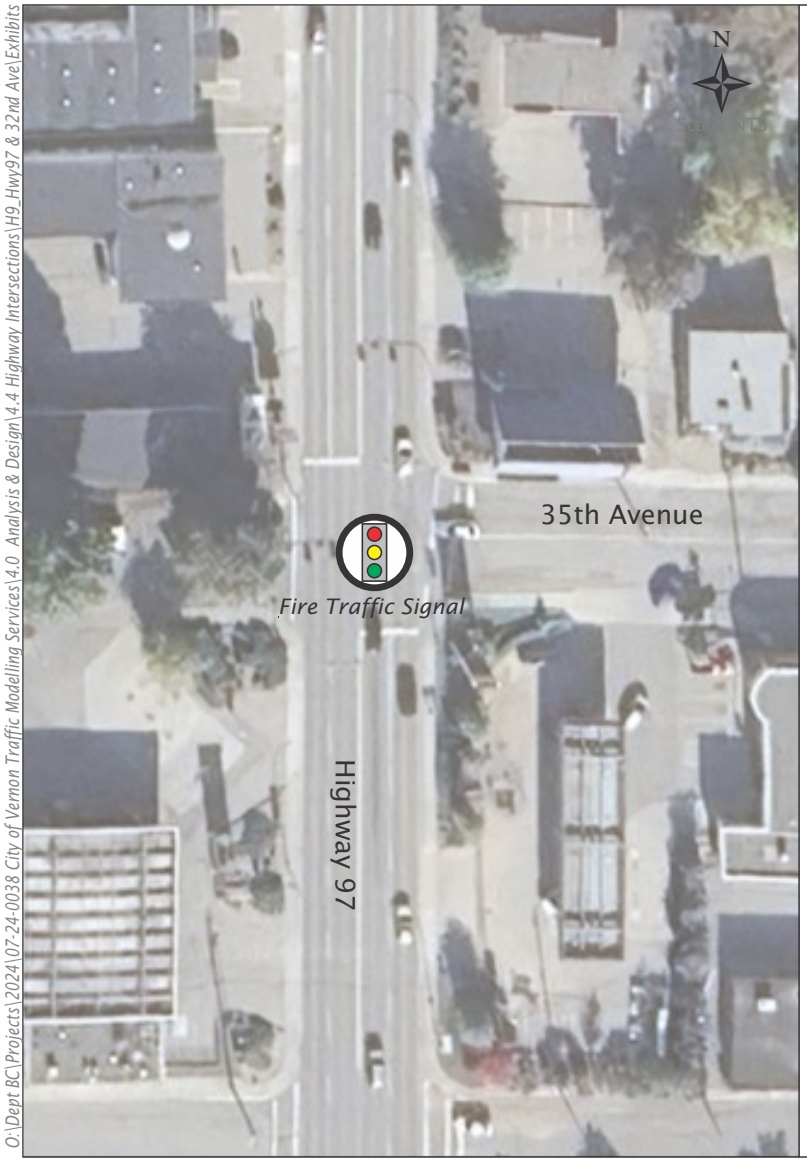
Table 12.4: H11- Highway 97 & 35th Avenue Intersection ICBC data, By Time-of-Day Crashes

YEAR	12:00AM – 2:25AM	3:00AM – 5:59AM	6:00AM - 8:59AM	9:00AM – 11:59AM	12:00PM – 2:59PM	3:00PM – 5:59PM	6:00PM - 8:59PM	9:00PM - 11:59PM	TOTAL
2019			1	2	1	2			6
2020					3	1			4
2021			1	3	1		1		6
2022				2	3	2			7
2023				3	2				5
TOTAL			2	10	10	5	1		28

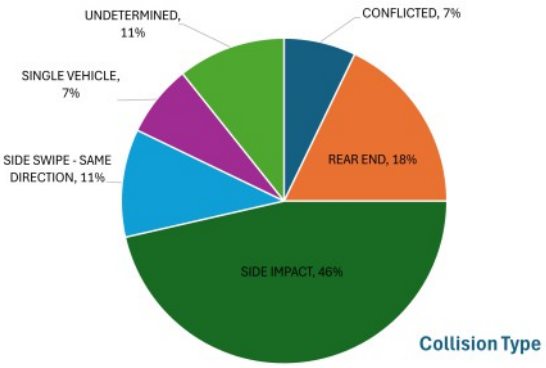
The table indicates that the most crashes are occurring during between 9AM -3PM. However, the majority of the crashes are occurring between 9:00AM and 5:59PM, typical business hours. This would make sense as the Highway throughput traffic volumes are high in conjunction with intersecting traffic travelling to and from the downtown area (high employment). As a result, there is a large mix of local traffic and through traffic during these hours.

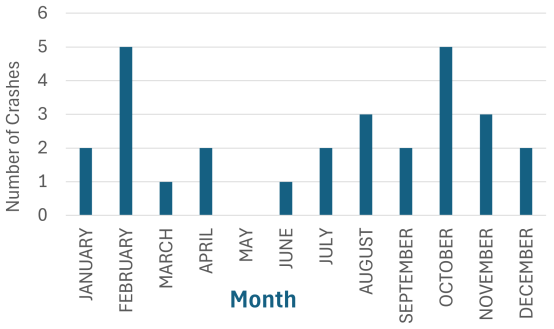
Exhibit 12.1 showcases a summary of the crash history presented in this section.

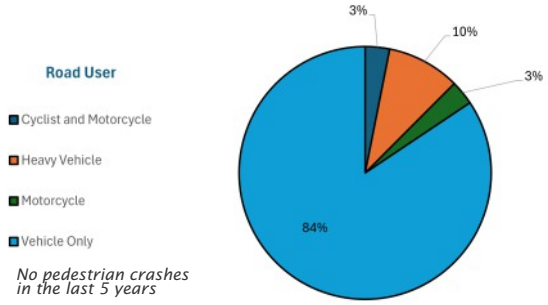
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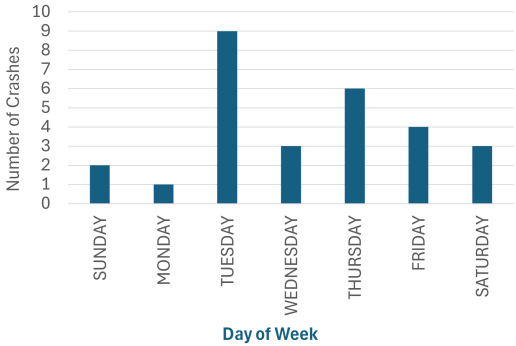
Collision Analysis (2019 - 2023): 28 Incidents

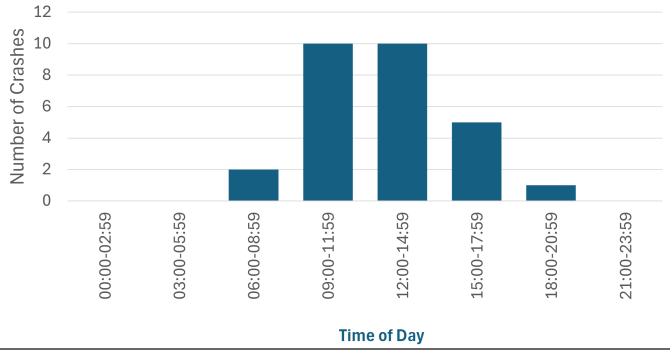






No pedestrian crashes in the last 5 years





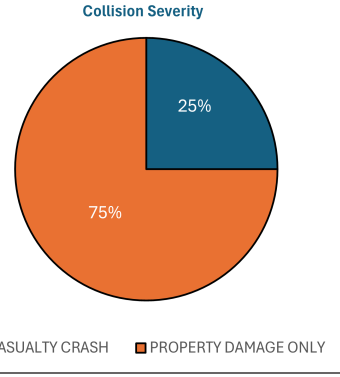


Exhibit 12.1

H11 - Highway 97 & 35th Avenue

City Of Vernon Traffic Modelling Services
07-24-0038 March 2025

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12.5.1 Collision Risk Assessment

The Collision Risk Assessment was completed to support the overall safety assessment of the Highway 97 & 35th Avenue Intersection and has been completed by drawing upon the available data and information presented in the above sections. The details of how the collision risk is determined is outlined within **Section 17**.

Table 12.5 displays the assessment details and considerations for the intersection of Highway 97 & 35th Avenue.

Table 12.5: H11- Highway 97 & 35th Avenue Intersection Collision Risk Assessment

FREQUENCY RATING	SEVERITY RATING	COLLISION RISK
Occasional - 1 to 9 collisions per year 56 collisions / 10 years 6 collisions per year	**High (Moderate to Incapacitating Injury)** Collisions involve two pedestrians between 2019-2023. Up to 8% of Vehicles that pass through this intersection on the highway are heavy vehicles	**High Risk Level (E)**

12.6 Issue Identification

Based on the information presented in this section, the following issues have been identified:

- A high number of side impact crashes occurred which may be attributed to difficulty when making left turns from 35th Avenue onto Highway 97 and as a result smaller gap acceptance from motorists.
- Pedestrian crossing demand was observed at this location despite no provision of a formal crossing facility.
- 2 pedestrian crashes were recorded between 2019-2023.

12.7 Recommended Mitigations

12.7.1 Intersection Warrants

Bunt followed the Transportation Association of Canada (TAC) Pedestrian Crossing Control Guide, BC as a preliminary assessment to identify whether this location is a candidate for a pedestrian crossing control.

Traffic Signal Warrant

As an initial step in this process Bunt completed a Traffic Signal Warrant, which can be found in **Appendix C**. The outcome of this process was that a traffic signal is Not Warranted at this location. Results of the Traffic Signal Warrant is presented in **Table 12.6**.

Table 12.6: H11- Traffic Signal Warrant Results at Highway 97 & 35th Avenue

VEHICLE SCORE	PEDESTRIAN SCORE	TOTAL SCORE	WARRANTED OR NOT WARRANTED
35	7	42	NOT WARRANTED

Note: Threshold total score is 100

Pedestrian Crossing Warrant

As a full traffic signal is not warranted at this location, the second step within the TAC Pedestrian Crossing Control Guide is to evaluate the pedestrian volumes. The minimum threshold at which installation of a pedestrian crossing control treatment should be installed is 105 Equivalent Adult Units (EAU's) over a 7-hour count period within a single day.

Bunt counted 6 hours, where the total number of pedestrians crossing the highway at this location recorded was 32 people. By taking the average across 6 hours and adding this number to the total would account for 7 hours (37 people). Even if every pedestrian was a child or physically challenged (the highest weighted EAU of 2.0) the total EAU's would be 74 which falls under the threshold of 105 (or 15 EAU per hour).

The closest full crossing facility is at a traffic signal located over 200m away at 32nd Avenue or at 39th Avenue. Additionally, there is no latent demand at this location. Although there is a MUP connection a few blocks to the east of the site there is currently no connection to the west. At this time, these is no evidence of a strong desire line to cross Highway 97 at this location, however there may be opportunity for pedestrian demand in the future as the active transportation network expands.

12.7.2 Recommendations

From a network standpoint, this location could be practical for a traffic signal or signalized pedestrian crossing since it is located more than 200m away from 39th Avenue and 32nd Avenue. Additionally, with an existing MUP to the east of the intersection on 30th Street, there may be increased east-west pedestrian demand as the City's active transportation network continues to expand. As such, it is recommended to continue monitoring vehicle volumes and active transportation demands in the area and reevaluate requirements for a crossing facility regularly.

13. H12 - HIGHWAY 97 & 39TH AVENUE INTERSECTION

13.1 Intersection Description

The intersection of Highway 97 & 39th Avenue intersection is fully signalized intersection and located within the central area of Vernon. Highway 97 provides 2 through vehicle travel lanes and 1 left turn lane at the intersection whilst 39th Avenue provides through and right turn lane and one left turn lane. 39th Avenue is classified as a collector roadway. There are sidewalks for all approaches of the intersection with crosswalks provided on all legs and marked on-street bike lanes on 39th Avenue. The posted speed limit on Highway 97 and 39 Avenue at the intersection is 50 km/hr. The Highway 97 approaches also provide a concrete median dividing opposing directions of vehicle travel.

It is also highlighted that 39th Avenue forms part of the bicycle network (**Exhibit 1.2**) and provides marked on-street bicycle lanes which pass connect east-west through this intersection. Furthermore, to the east of the site the on-street bicycle lanes connect to a multi-use path.

A plan view of the intersection is provided in **Figure 13.1**.

Figure 13.1: H12- Highway 97 & 39th Avenue Intersection



13.2 Site Visit Observations

Bunt undertook a site visit on September 26th, 2024, in the early afternoon to observe the intersection of Highway 6 & Pottery Road. The weather conditions were dry and overcast. This section outlines the observation notes taken at the intersection.

Notes:

- Marked on-street bike lanes are installed on both sides and approaches of 39th Avenue. However, green conflict markings are only located on one side of 39th Avenue and are in a faded condition.
- There are no audible pedestrian signals and the pedestrians appear to be the older style with limited accessibility for mobility restricted users.
- Cyclists are not able to actuate the signal and call the concurrent vehicle phase from the bicycle lane.

Figure 13.2 to **Figure 13.4** present the intersection and active modes at the intersection using Google Street View.

Figure 13.2: H12- Eastbound approach & cycle lane

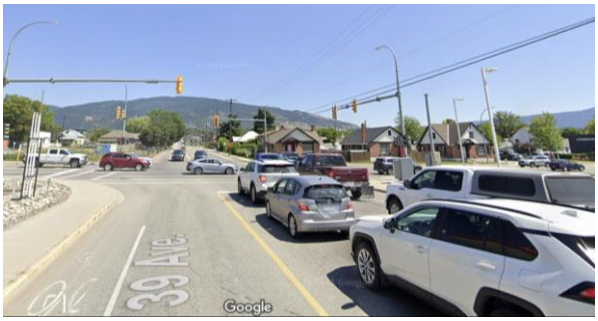


Figure 13.3: H12- Westbound approach & pedestrians



Figure 13.4: Active Modes Westbound on 39th Avenue



13.3 Traffic Volumes

Traffic volume data was provided by MOTT through the extraction of loop detector counts. Data was provided for October 6th to 16th October, 2024. When analyzing the provided traffic volumes for typical weekday scenarios (i.e. Tuesday – Thursday) it was identified that Thursdays experience the highest magnitude of daily traffic. Traffic volumes for Thursday, October, 10th, 2024 are presented in **Table 13.1**.

Table 13.1: H12- Highway 97 & 39th Avenue Intersection Traffic Volumes

TRAFFIC VOLUMES	NBL	NBT	SBL	SBT	EBL	EBT	WBL	WBT	TOTAL
AM Peak Hour (8:00AM – 9:00AM)	50	890	50	880	140	240	80	250	2,580
	940		930		380		330		
PM Peak Hour (4:00PM – 5:00PM)	70	1,150	40	1,150	240	300	100	390	3,440
	1,220		1190		540		490		
Daily Traffic Volumes	920	14,120	630	14,750	2,730	3,130	1,010	4,300	41,590
	15,040		15,380		5,860		5,310		

13.4 MOTT Signal Timing Plan

The STP appears to follow standard MOTT traffic signal timing practice. The traffic signal is coordinated with Highway 97 & 41st Avenue and Highway 97 & 43rd Avenue. The left turn movements travelling northbound, southbound, and eastbound operate with protected/permissive signal phasing. The signal timing plan was last updated in September of 2022.

The cycle length at the intersection is 120 seconds. It is noted that cycle lengths above 100 seconds may offer reduced levels of service to pedestrians and cause additional delay.

13.5 Collision Data

Table 13.2 presents the total number of ICBC reported crashes between 2019 – 2023 at the Highway 97 & 35th Avenue Intersection (full dataset in **Appendix B**). It is noted that one of the reported crashes involved pedestrians and three involved cyclists.

Table 13.2: H12- Highway 97 & 39th Avenue Intersection ICBC data – Severity

YEAR	CASUALTY CRASH	PROPERTY DAMAGE ONLY	TOTAL
2019	8	5	13
2020	7	6	13
2021	7	10	17
2022	6	10	16
2023	6	11	17
TOTAL	34	42	76

Source: ICBC Reported Crashes: https://public.tableau.com/app/profile/icbc/viz/ICBCReportedCrashes/ICBCReportedCrashes

Table 13.3 displays the crash types experienced at this intersection.

Table 13.3: H12- Highway 97 & 39th Avenue Intersection ICBC data, Crashes by Crash Type

YEAR	HEAD ON	REAR END	SIDE IMPACT	SIDE SWIPE SAME DIRECTION	SINGLE VEHICLE	TOTAL
2019		7	2		2	11
2020		8	2	1	1	12
2021		7	5	1		13
2022		6	4	1		11
2023	1	6	4	3	1	15
TOTAL	1	34	17	6	4	62

Note: Conflicted crashes (i.e. conflicting driver statements) and undetermined crashes have been removed.

The most frequent crash type is rear end crashes. This crash type can be a result of the changing of traffic signals, where vehicles stop and the following vehicle does not realize or, is following too closely to stop before hitting the vehicle in front or congested traffic conditions where vehicle headways are reduced.

The second most frequent crash type is side impact crashes. This crash type may indicate that vehicles are making inappropriate gap selection when making a left turn or failing to yield the right-of-way as directed by the traffic signals.

Table 13.4 displays the time of day which the crashes occurred at the intersection.

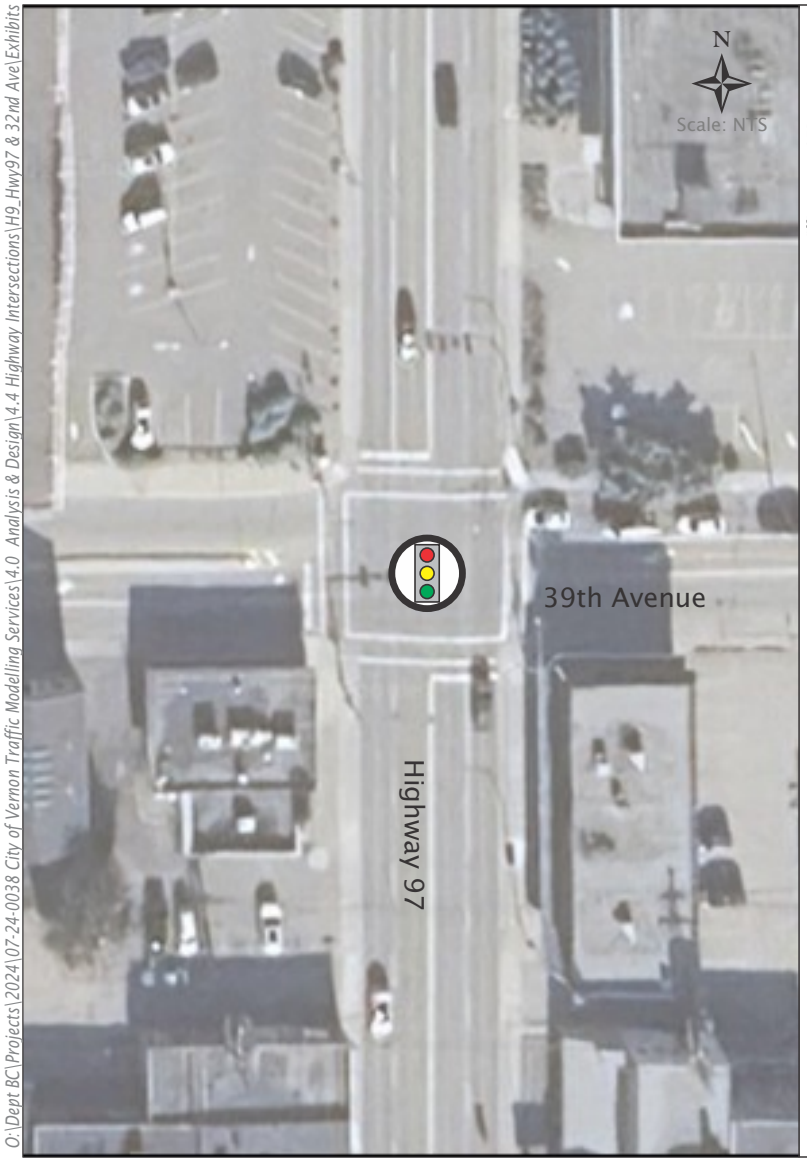
Table 13.4: H12- Highway 97 & 39th Avenue Intersection ICBC data, By Time-of-Day Crashes

YEAR	12:00AM – 2:25AM	3:00AM – 5:59AM	6:00AM - 8:59AM	9:00AM – 11:59AM	12:00PM – 2:59PM	3:00PM – 5:59PM	6:00PM - 8:59PM	9:00PM - 11:59PM	TOTAL
2019			1	3	5	4			13
2020				3	7	3			13
2021			1	7	4	4	1		17
2022				6	5	2	2	1	16
2023	1		3	4	1	7	1		17
TOTAL	1		5	23	22	20	4	1	76

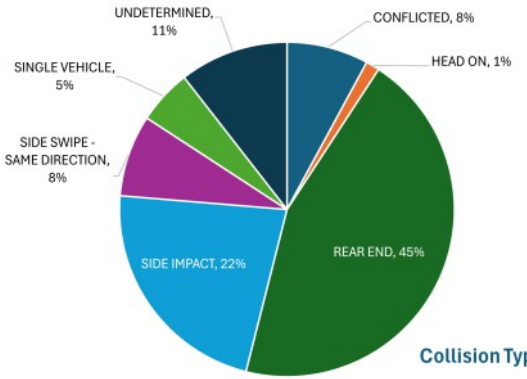
The table indicates that the most crashes are occurring during between 9AM -6PM which follows typical weekday peak traffic periods. As a result of the increase traffic demands and exposure, there is a risk of a high magnitude of crashes.

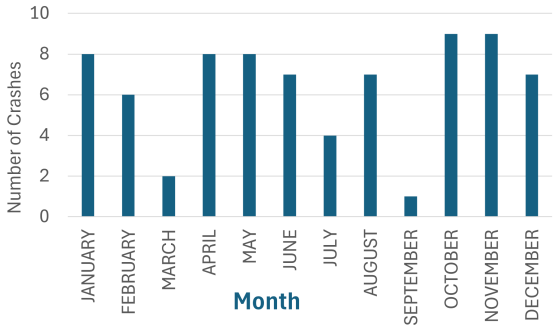
Exhibit 13.1 displays a summary of the crash history presented in this section.

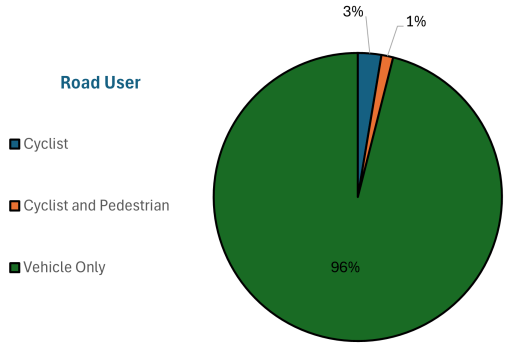
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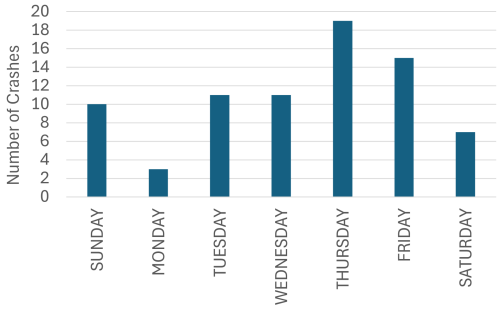


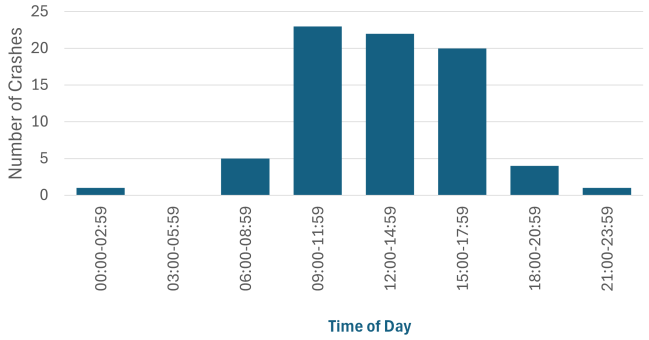
Collision Analysis (2019 - 2023): 76 Incidents











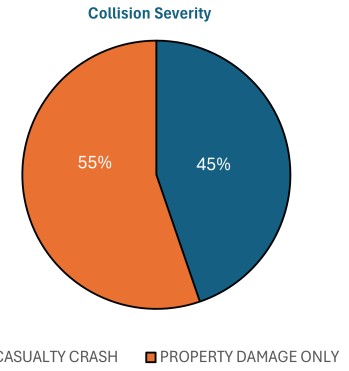


Exhibit 13.1

H12 - Highway 97 & 39th Avenue

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13.5.1 Collision Risk Assessment

The Collision Risk Assessment was completed to support the overall safety assessment of the Highway 97 & 39th Avenue Intersection and has been conducted by drawing upon the available data and information presented in the above sections. The details of how the collision risk is determined is outlined within **Section 17**. **Table 13.5** displays the assessment details and considerations for the intersection of Highway 97 & 39th Avenue.

Table 13.5: H12- Highway 97 & 39th Avenue Intersection Collision Risk Assessment

FREQUENCY RATING	SEVERITY RATING	COLLISION RISK
Frequent - 10 or more collisions per year 152 collisions / 10 years 15 collisions per year	**Extreme (Probable Fatal)** High number of collisions involved cyclists (3) and pedestrians (1) between 2019 - 2023. Although no specific heavy vehicle data was available for this intersection, given the nature of the other location along Highway 97 and the note that it is a dangerous good routes, indicates that it would be reasonable to expect a high percentage of heavy vehicles passing through this intersection.	**Highest Risk Level (F)**

13.6 Issue Identification

Based on the information presented in this section, the following issues have been identified:

- The long signal cycle length of over 100 seconds offers reduced Levels of Service to pedestrian and may cause additional delays. Note, there has been one pedestrian crash at this location in the last 5 years.
- Green bicycle conflict pavement markings are extremely faded at the intersection.
- There have been 3 cyclist-related crashes at this intersection in the last 5 years. Bicycle facilities are limited to on-street bicycle lanes. Note, the on-street bicycle markings are faded resulting in less conspicuity.
- There are no audible pedestrian signals or accessible pushbuttons installed at the intersection. Furthermore, cyclists have no way to actuate the signal from the bicycle lanes.

13.7 Recommended Mitigations

13.7.1 Intersection Warrants

No traffic signal warrant analysis was conducted as it is already fully signalized.

13.7.2 Recommendation

This signalized intersection faces some challenges with the high traffic volumes and vulnerable users. The following improvements are recommended for this intersection:

- Re-install the green conflict pavement markings close to the intersection to add awareness of cyclists for drivers.
- Provide dedicated bicycle detection for cyclists to activate the signal and corresponding pedestrian crossing phase. Detection could include push button activation or magnetic loops in the bicycle lane.
- Consider signal phasing to accommodate an advanced bicycle crossing interval and review the intersection cycle length.
- Consider upgrading the on-street bicycle lanes to off-street bicycle facilities in the future at this location to separate cyclists from vehicle traffic.

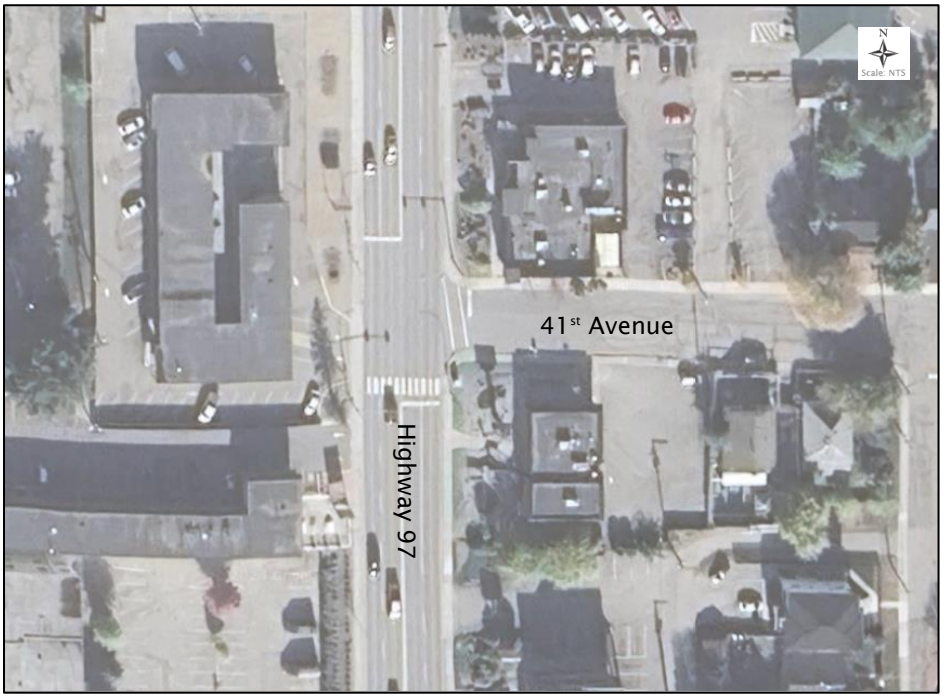
14. H13 - HIGHWAY 97 & 41ST AVENUE INTERSECTION

14.1 Intersection Description

The intersection of Highway 97 & 41st Avenue is controlled by a pedestrian signal, including a crossing facility, and is located towards the northern end of Vernon. Highway 97 provides two vehicle travel lanes in each direction at this intersection with no additional left and right turn auxiliary lanes. 41st Avenue provides a one lane, which is shared by left turns, through movements, and right turns. There are two driveway accesses on the west side of Highway 97 near the pedestrian signal. The Econo Lodge driveway intersects the intersection directly and forms the informal west approach of the intersection. There are pedestrian crossing facilities on the south (pedestrian signal controller) and east leg (stop-controlled). The posted speed limit at the intersection is 50km/hr for all approaches. In terms of pedestrian facilities, there are sidewalks installed along both sides of Highway 97 and 41st Avenue.

A plan view of the intersection is provided in **Figure 14.1**.

Figure 14.1: H13- Highway 97 & 41st Avenue Intersection



14.2 Site Visit Observations

Bunt undertook a site visit on September 26th, 2024, in the early afternoon to observe the intersection of Highway 97 & 32nd Street. The day was fine weather conditions. This section outlines the observation notes taken at the intersection.

Site Notes:

- A concrete pole base, fire hydrant, and BC Hydro pole were located in the roadway on 41st Avenue (**Figure 14.2**).
- There are no audible pedestrian signals or accessible pushbuttons installed at the intersection.

Figure 14.2: H13- 41st Avenue Concrete Base, Fire Hydrant, and BC Hydro Pole in Road





Source: Google

14.3 Traffic Volumes

Bunt collected traffic data on January 29th, 2025 to evaluate vehicle volumes on 41st Avenue and Highway 97 and to confirm the number of pedestrians crossing at this location. The findings are outlined in **Table 14.1** and full information presented in **Appendix A**.

Table 14.1: H13- Collected Traffic Data at Highway 97 & 41st Avenue Intersection

TRAFFIC VOLUMES	HIGHWAY 97						MOTEL			35TH AVENUE		TOTAL
	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBR	
AM Peak Hour (7:45AM – 8:45AM)	0	780	10	2	840	0	0	0	0	1	20	1,653
PM Peak Hour (4:00PM – 5:00PM)	1	1,240	10	10	1,040	0	0	1	1	0	30	2,333

During the AM peak hour, 17 pedestrians crossed the Highway, and in the PM peak hour, 5 pedestrians crossed. Additionally, based on the collected data, Bunt observed high pedestrian activity crossing the side streets in the peak hours.

From the traffic data collected as part of the study, Highway 97 at this location experiences heavy vehicle traffic, up to 8% of the daily traffic depending on the time of day and direction.

14.4 MOTT Signal Timing Plan

No STP was provided for this intersection. However, based on field observations, standard MOTT traffic signal timing appeared to be in operation.

14.5 Collision Data

Table 14.2 presents the total number of ICBC-reported crashes between 2019 and 2023 at the Highway 97 & 41st Avenue Intersection (full dataset in **Appendix B**). It is noted that no vulnerable road users (Pedestrians or cyclists) crashes were reported.

Table 14.2: H13- Highway 97 & 41st Avenue Intersection ICBC data – Severity

YEAR	CASUALTY CRASH	PROPERTY DAMAGE ONLY	TOTAL
2019	1	3	4
2020	1	2	3
2021	4	2	6
2022	1	4	5
2023	2	2	4
TOTAL	9	13	22

Source: ICBC Reported Crashes: https://public.tableau.com/app/profile/icbc/viz/ICBCReportedCrashes/ICBCReportedCrashes

Table 14.3 displays the crash types experienced at this intersection.

Table 14.3: H13- Highway 97 & 41st Avenue Intersection ICBC data, Crashes by Crash Type

YEAR	REAR END	SIDE IMPACT	TOTAL
2019	1	3	4
2020	1	1	2
2021	3	1	4
2022	3		3
2023	3		3
TOTAL	11	5	16

Note: Conflicted crashes (i.e. conflicting driver statements) and undetermined crashes have been removed.

The most common occurrence was rear end crashes. Generally rear end crashes occur due to the changing of traffic signals, where vehicles stop and the following vehicle does not realize or, is following too closely to stop before hitting the vehicle in front. This may also be a result of congested over-capacity traffic conditions where motorists travel with reduced headways and unexpected vehicle queues may be presented. The second most

frequent crash type is side impact crashes. Side impact crashes indicate that vehicles may be making inappropriate gap selection when making a left turn or failing to follow right of way as directed by the traffic signal.

Table 14.4 presents the time of day which the crashes occurred at the intersection.

Table 14.4: H13- Highway 97 & 41st Avenue Intersection ICBC data, By Time-of-Day Crashes

YEAR	12:00AM – 2:25AM	3:00AM – 5:59AM	6:00AM - 8:59AM	9:00AM – 11:59AM	12:00PM – 2:59PM	3:00PM – 5:59PM	6:00PM - 8:59PM	9:00PM - 11:59PM	TOTAL
2019					3			1	4
2020				1	1	1			3
2021			1	2	3				6
2022					1	4			5
2023				2	2				4
TOTAL			1	5	10	5		1	22

The table indicates that the most crashes occurred during at midday between 12PM-3PM.

Exhibit 14.1 showcases a summary of the crash history presented in this section.

14.5.1 Collision Risk Assessment

The collision assessment was completed to support the overall safety assessment of the Highway 97 & 41st Avenue Intersection and has been conducted by drawing upon the available data and information presented in the above sections. The details of how the collision risk is determined are outlined within **Section 17**. **Table 14.5** displays the assessment details and considerations for the intersection of Highway 97 & 41st Avenue.

Table 14.5: H13 - Highway 97 & 41st Avenue Intersection Collision Risk Assessment

FREQUENCY RATING	SEVERITY RATING	COLLISION RISK
Occasional - 1 to 9 collisions per year 40 collisions / 10 years 4 collisions per year	**Medium (Minor to Moderate Injury)** Casualty crashes are reported at this intersection, however less than that of property damage crashes. Additionally of the casualty crash types reported, these are generally those associated with minor injuries. Up to 8% of heavy vehicles recorded at this location.	**Medium Risk Level (D)**

14.6 Issue Identification

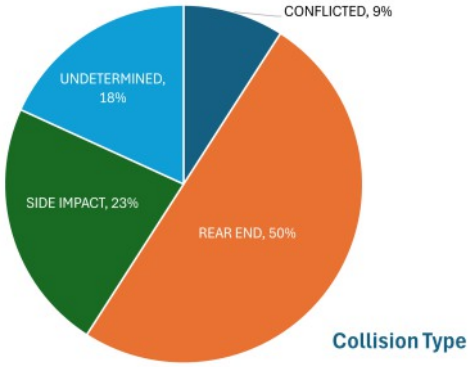
Based on the information presented in this section, the following issues have been identified:

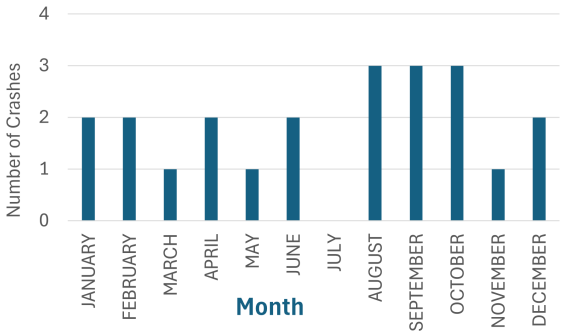
- The Hotel driveway access forming the west leg of the intersection is uncontrolled.
- 41st Avenue has a concrete block, fire hydrant and BC hydro pole installed within the paved road surface, which poses a hazard to vehicle travel.

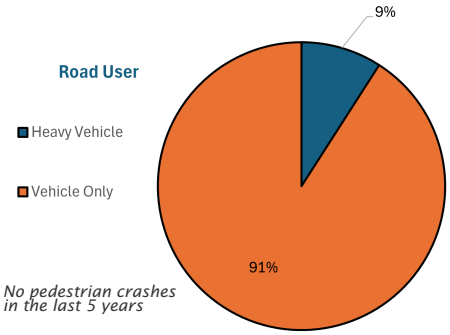
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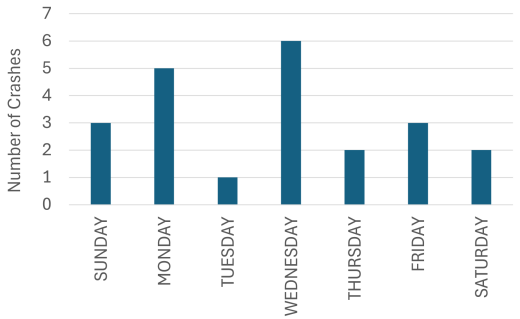


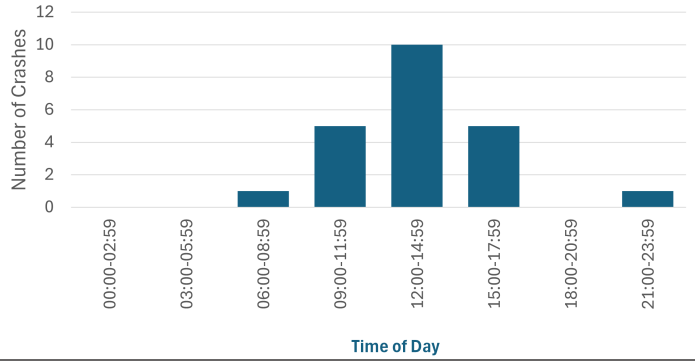
Collision Analysis (2019 - 2023): 22 Incidents











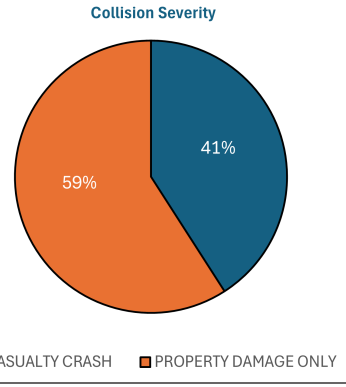


Exhibit 14.1

H13 - Highway 97 & 41st Avenue

City Of Vernon Traffic Modelling Services
07-24-0038 March 2025

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14.7 Recommended Mitigations

14.7.1 Intersection Warrants

Although this intersection is already a pedestrian signal, as part of the review process Bunt has reviewed the intersection to see if it warrants an upgrade to a full intersection. Bunt used the TAC Traffic Signal Warrant Analysis process to complete this warrant.

The Traffic Signal Warrant can be found in **Appendix C**. The outcome of this process was that a traffic signal is NOT Warranted at this location. Results of the Traffic Signal Warrant is presented in **Table 14.6**.

Table 14.6: H13- Traffic Signal Warrant Results at Highway 97 & 41st Avenue

VEHICLE SCORE	PEDESTRIAN SCORE	TOTAL SCORE	WARRANTED OR NOT WARRANTED
8	15	23	NOT WARRANTED

Note: Threshold total score is 100

14.7.2 Recommendations

- Close hotel driveway access into the intersection upon future redevelopment or with discussions with the property owner.
- Remove the concrete base and relocate the fire hydrant and BC Hydro poles out of the paved driving surface. Alternatively, provide curb extensions to remove these hazards from the paved driving surface.
- Provide an additional crosswalk on north leg of the intersection with supporting signal infrastructure (i.e., pushbutton, audible signals, pedestrian displays (walk/FDW/countdown). It is not anticipated to create any additional delays for vehicles and this would support pedestrian desire lines from the hotel to commercial area / restaurants.

15. H14 - HIGHWAY 97 & 43RD AVENUE INTERSECTION

15.1 Intersection Description

The intersection of Highway 97 & 43rd Avenue is a fully signalized intersection located in the north part of Vernon. Within approximately 60m – 70m east and west of the intersection are neighbouring intersections. Notably to the east there is an at-grade railway crossing with one track.

All roadway approaches provide two vehicle travel lanes and a separate auxiliary left turn lane. In the northbound direction the right turn movement forms a right turn channel with a zebra pedestrian crosswalk. There are sidewalks on all approaches to the intersection and the posted speed limit for Highway 97 and 43 Avenue is 50km/hr.

It is noted that sections of 43rd Avenue provide on-street bicycle facilities (refer to **Exhibit 1.2**). Bike lanes begin just west of the intersection. To the east of the intersection at 29th Street there is a north-south MUP connection, and further east, at 27th Street an on-street bicycle lane begins, travelling north-south and to the east.

A plan view of the intersection is provided in **Figure 15.1**.

Figure 15.1: H14- Highway 97 & 43rd Avenue Intersection



15.2 Site Visit Observations

Bunt undertook a site visit on January 30th, 2025, in the early evening to observe the intersection of Highway 97 & 43rd Avenue. The weather conditions were clear and overcast. This section displays the observation notes and pictures taken at the intersection (**Figure 15.2** and **Figure 15.3**).

Notes:

- Lane line, stop bars, and crosswalk markings were faded / worn in places.
- The westbound approach has a downward grade travelling towards the intersection.
- Sidewalk and pedestrian refuge island letdowns appear small and not accessible friendly.
- One tactile pad is present at the intersection on the northwest corner.
- There are no audible pedestrian signals or accessible pushbuttons installed at the intersection.
- An on-street marked bicycle lane is installed the west leg travelling westbound on 43rd Avenue

Figure 15.2: H14- Pedestrian Crossing Letdown



Figure 15.3: H14- Pedestrian Pushbutton



15.3 Traffic Volumes

Traffic volume data has been provided by MOTT through extraction of loop detector counts. Data was provided for the dates October 6th to 16th, 2024. When analyzing the provided traffic volumes for typical weekday scenarios (i.e. Tuesday – Thursday) Bunt found that Thursday had the largest volume of daily traffic. Traffic volumes from Thursday October 10th, 2024 are presented in **Table 15.1**.

Table 15.1: H14- Highway 97 & 43rd Avenue Intersection Traffic Volumes

TRAFFIC VOLUMES	NORTHBOUND APPROACH	SOUTHBOUND APPROACH	EASTBOUND APPORACH	WESTBOUND APPROACH	TOTAL
AM Peak Hour (8:00AM – 9:00AM)	940	710	630	420	2,700
PM Peak Hour (3:00PM – 4:00PM)	1,400	1,070	590	560	3,620
Daily Traffic Volumes	16,200	12,380	8,070	6,900	43,550

Note: Volumes have been rounded to the nearest 10 vehicles

15.4 MOTT Signal Timing Plan

The STP appears to follow standard MOTT traffic signal timing practice. The left turns movements at the intersection all operate with protected/permissive phasing. This intersection is coordinated with 39th Avenue and 41st Avenue on the highway. The signal timing plan was last updated in September of 2022. The cycle length of the intersection when coordinated is 120 seconds.

15.5 Collision Data

Table 15.2 presents the total number of ICBC reported crashes between 2019 – 2023 at the Highway 97 & 43rd Avenue Intersection (full dataset in **Appendix B**). It is noted that there were 5 vulnerable users involved in crashes during this period. Two pedestrian crashes (2021, 2022) and 3 cyclist crashes (2020 and two in 2021).

Table 15.2: H14- Highway 97 & 43rd Avenue Intersection ICBC data – Severity

YEAR	CASUALTY CRASH	PROPERTY DAMAGE ONLY	TOTAL
2019	10	14	24
2020	20	27	47
2021	19	34	53
2022	13	18	31
2023	7	27	34
TOTAL	**69**	**120**	**189**

Source: ICBC Reported Crashes: https://public.tableau.com/app/profile/icbc/viz/ICBCReportedCrashes/ICBCReportedCrashes

Out of all the study intersections, this intersection has the second most recorded collisions in the 5-year period from 2019 – 2023.

Table 15.3 displays the crash types experienced at this intersection.

Table 15.3: H14- Highway 97 & 43rd Avenue Intersection ICBC data, Crashes by Crash Type

YEAR	HEAD ON	REAR END	SIDE IMPACT	SIDE SWIPE OPPOSITE DIRECTION	SIDE SWIPE SAME DIRECTION	SINGLE VEHICLE	TOTAL
2019		13	5		2	1	21
2020		25	7	1	6		39
2021	1	25	10	1	5	2	44
2022	1	16	6		3	1	27
2023		13	6		7	1	27
TOTAL	2	92	34	2	23	5	158

Note: Conflicted crashes (i.e. conflicting driver statements) and undetermined crashes have been removed.

The most frequent crash type was rear end crashes. Rear end crashes typically occur due to the changing of traffic signals intervals, where vehicles stop and the following vehicle does not realize or, is following too closely to stop before hitting the vehicle in front or in over-capacity conditions where drivers accept lower headways, exhibit more aggressive driving behaviour, and there are constant vehicle queue spillback.

It should be noted that approximately 40% of the rear end crashes that are presented were recorded as a casualty crash.

Table 15.4 displays the time of day which the crashes occurred at the intersection.

Table 15.4: H14- Highway 97 & 43rd Avenue Intersection ICBC data, By Time-of-Day Crashes

YEAR	12:00AM – 2:25AM	3:00AM – 5:59AM	6:00AM - 8:59AM	9:00AM – 11:59AM	12:00PM – 2:59PM	3:00PM – 5:59PM	6:00PM - 8:59PM	9:00PM - 11:59PM	TOTAL
2019			2	4	6	9	2	1	24
2020			3	9	22	10	3		47
2021			7	15	11	13	7		53
2022			2	7	7	10	4	1	31
2023			1	9	6	15	2	1	34
TOTAL	0	0	15	44	52	57	18	3	189

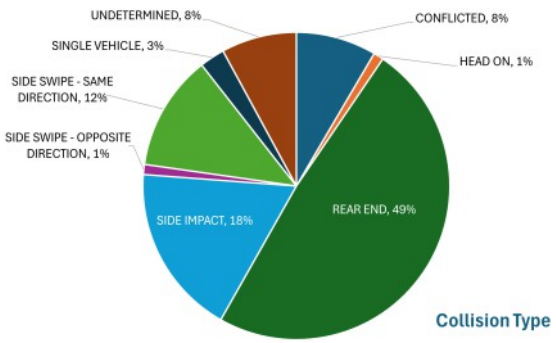
The table indicates that the most crashes are occurring during between 9AM-6PM aligning with standard workday hours.

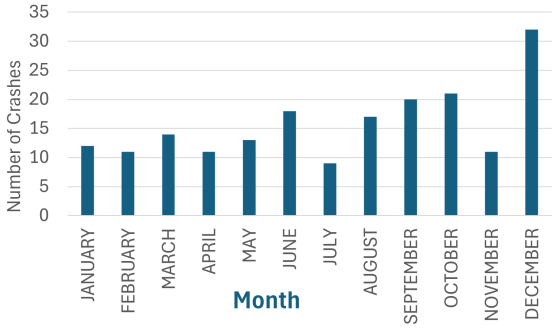
Exhibit 15.1 presents a summary of the crash history presented in this section.

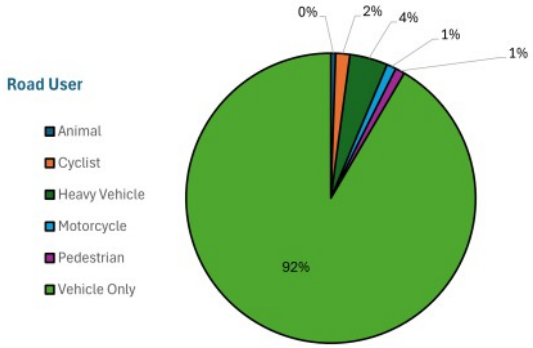
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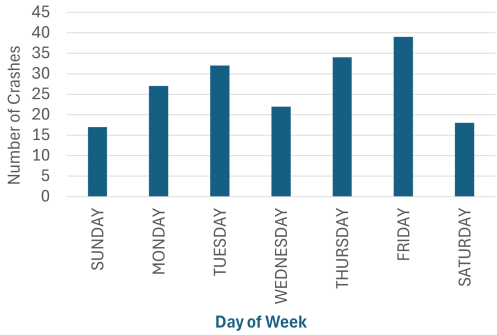


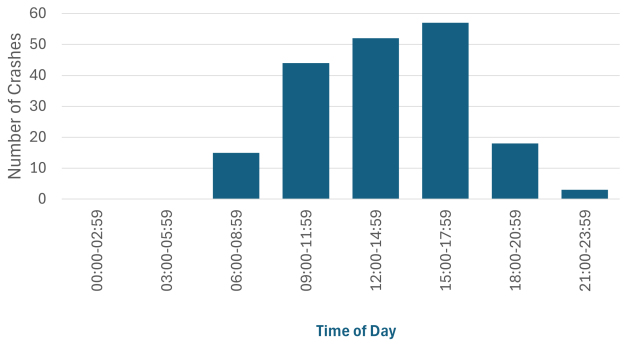
Collision Analysis (2019 - 2023): 189 Incidents











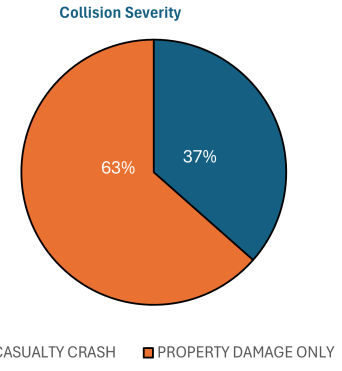


Exhibit 15.1

H14 - Highway 97 & 43rd Avenue

City Of Vernon Traffic Modelling Services
07-24-0038 March 2025

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15.5.1 Collision Risk Assessment

The Collision Risk Assessment was completed to support the overall safety assessment of the Highway 97 & 43rd Avenue Intersection and has been conducted by drawing upon the available data and information presented in the above sections. The details of how the collision risk is determined is outlined within **Section 17**. **Table 15.5** displays the assessment details and considerations for the intersection of Highway 97 & 43rd Avenue.

Table 15.5 : H14 - Highway 97 & 43rd Avenue Intersection Collision Risk Assessment

FREQUENCY RATING	SEVERITY RATING	COLLISION RISK
Frequent - 10 or more collisions per year 380 collisions / 10 years 38 collisions per year	**Extreme (Probable Fatal)** High number of collisions and high number involving cyclists (3) and pedestrians (2) between 2019 - 2023. Although no specific heavy vehicle data was available for this intersection, given the nature of the other location along Highway 97 and the note that it is a dangerous good routes, indicates that it would be reasonable to expect a high percentage of heavy vehicles passing through this intersection.	**Highest Risk level (F)**

15.6 Issue Identification

Based on the information presented in this section, the following issues have been identified:

- There have been five vulnerable user crashes recorded at this location between 2019 – 2023.
- Provisions for cyclists are limited to one on-street cycle lane on the west leg of 43rd Avenue westbound.
- The traffic signal cycle length is 120 seconds which could increase active traveller delay and result in impatient crossing decisions.
- There is a gap in the bicycle network connecting to the MUP to the east of the intersection.
- High frequency of vehicle crashes occurring.
- High number (40%) of rear end crashes are casualty crashes.

15.7 Recommended Mitigations

15.7.1 Intersection Warrants

Since the Intersection is already full signalized, no signal warrant analysis was conducted.

15.7.2 Recommendation

- Undertake an accessibility review to evaluate and upgrade pedestrian refuge islands at the intersection to ensure sufficient accessibility for all users.
- Install green pavement markings at the intersection to add awareness of potential conflict areas between cyclists and motorists.
- Provide bicycle facilities on 43 Avenue to connect the bicycle network (fill in gaps) to at 29th Street MUP.
- Review the signal timing for this intersection and prepare new optimized timing plans to help minimize vehicle queueing and delays.
- Install newer style accessible pedestrian pushbuttons to support travellers of all ages and abilities.

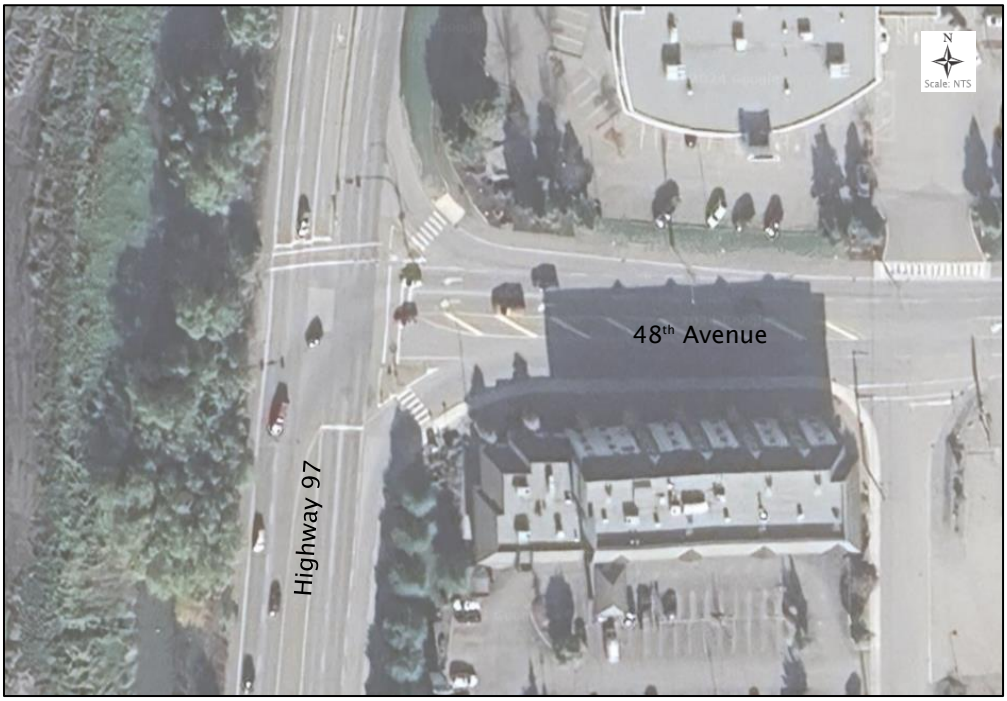
16. H15 - HIGHWAY 97 & 48TH AVENUE INTERSECTION

16.1 Intersection Description

The intersection of Highway 97 & 48th Avenue is a signalized 'T' intersection located in the northern area of Vernon. On Highway 97, there are two vehicle travel lanes in each direction with additional left and right turn auxiliary lanes. 48th Avenue provides a dual left turn lane and channelized right turn. There are crosswalks on the north and east legs and a zebra crossing on the northeast and southeast corners (across the channelized right turns). For pedestrians, there are sidewalks on both sides of 48th Avenue and on the east side of Highway 97. As the sidewalk facility on the east side of Highway 97 extends to the north, it transforms into an unpaved pathway set back from the edge of the roadway. Additionally, a paved MUP is installed on the north side of 48th Avenue. The posted speed limit at the intersection is 50 km/hr for Highway 97 and 48 Avenue. However, to the north, the Highway transitions to an 80km/ hr zone.

A plan view of the intersection is provided in **Figure 16.1**.

Figure 16.1: H15 - Highway 97 & 48th Avenue Intersection



16.2 Site Visit Observations

Bunt undertook a site visit on September 26th, 2024, in the early afternoon to observe the intersection of Highway 97 & 48th Avenue. The weather conditions were cloudy and overcast. This section outlines the observation notes and pictures taken at the intersection (**Figure 16.2** & **Figure 16.3**).

Notes:

- The curb letdowns and traffic islands are quite narrow and may prove challenging for limited mobility users.
- No pedestrian facilities are installed along the west side of the Highway.
- Left turn pavement marking arrows installed along Highway 97 are faded.
- There are no audible pedestrian signals or accessible pushbuttons installed at the intersection.
- A MUP facility is installed along the north side of 48th Avenue.

Figure 16.2: H15- Sidewalk and Crossing facing West



Figure 16.3: H15- Southbound approach



16.3 Traffic Volumes

Traffic volume data has been provided by MOTT for this intersection through the extraction of loop detector counts. Data was provided for October 6th to 16th, 2024. When analyzing the provided traffic volumes for typical weekday scenarios (i.e., Tuesday – Thursday) it was determined that Thursdays have the highest traffic demands. Traffic data for Thursday, October 10th, 2024 is presented in **Table 16.1**.

Table 16.1: H15- Highway 97 & 48th Avenue Intersection Traffic Volumes

TRAFFIC VOLUMES	NORTHBOUND	SOUTHBOUND	WESTBOUND	TOTAL
AM Peak Hour (8:00AM – 9:00AM)	890	580	370	1,840
PM Peak Hour (4:30PM – 5:30PM)	1,300	640	820	2,760
Daily Traffic Volumes	15,120	7,730	9,210	32,060

Note: Volumes have been rounded to the nearest 10 vehicles

16.4 MOTT Signal Timing Plan

The STP appears to follow standard MOTT traffic signal timing practice. The southbound left-turn movement is permissive, whilst the eastbound left-turn is a protected-only with dual left-turn lanes. This intersection is not coordinated with other Highway intersections along the corridor. The signal timing plan was last updated in December of 2022.

16.5 Collision Data

Table 16.2 presents the total number of ICBC-reported crashes between 2019 and 2023 at the Highway 97 & 48th Avenue Intersection (full dataset in **Appendix B**). It is noted that no vulnerable users (pedestrians or cyclists) were involved in the crash data.

Table 16.2: H15 - Highway 97 & 48th Avenue Intersection ICBC data – Severity

YEAR	CASUALTY CRASH	PROPERTY DAMAGE ONLY	TOTAL
2019	2	4	6
2020	5	4	9
2021	4	5	9
2022	4	6	10
2023	2	10	12
TOTAL	17	29	46

Source: ICBC Reported Crashes: https://public.tableau.com/app/profile/icbc/viz/ICBCReportedCrashes/ICBCReportedCrashes

Table 16.3 presents the crash types experienced at this intersection.

Table 16.3: H15 - Highway 97 & 48th Avenue Intersection ICBC data, Crashes by Crash Type

YEAR	REAR END	SIDE IMPACT	SIDE SWIPE SAME DIRECTION	SINGLE VEHICLE	TOTAL
2019	3		2		5
2020	5	2		1	8
2021	5	1			6
2022	5	2	1		8
2023	4	2	2	4	12
TOTAL	22	7	5	5	39

Note: Conflicted crashes (i.e. conflicting driver statements) and undetermined crashes have been removed.

The most frequent crash type was rear end crashes. Rear end crashes typically occur due to the changing of traffic signals, where vehicles stop and the following vehicle does not realize or, is following too closely to stop before hitting the vehicle in front or in over-capacity conditions where vehicle headways are less and unexpected vehicle queues may exist.

This intersection is a gateway signal for vehicles travelling southbound on Highway 97 originating north of Vernon. As such, drivers may not expect a traffic signal control on the Highway at this location. The next nearest signal on Highway 97 to the north is at Armstrong.

Table 16.4 displays the time of day which the crashes occurred at the intersection.

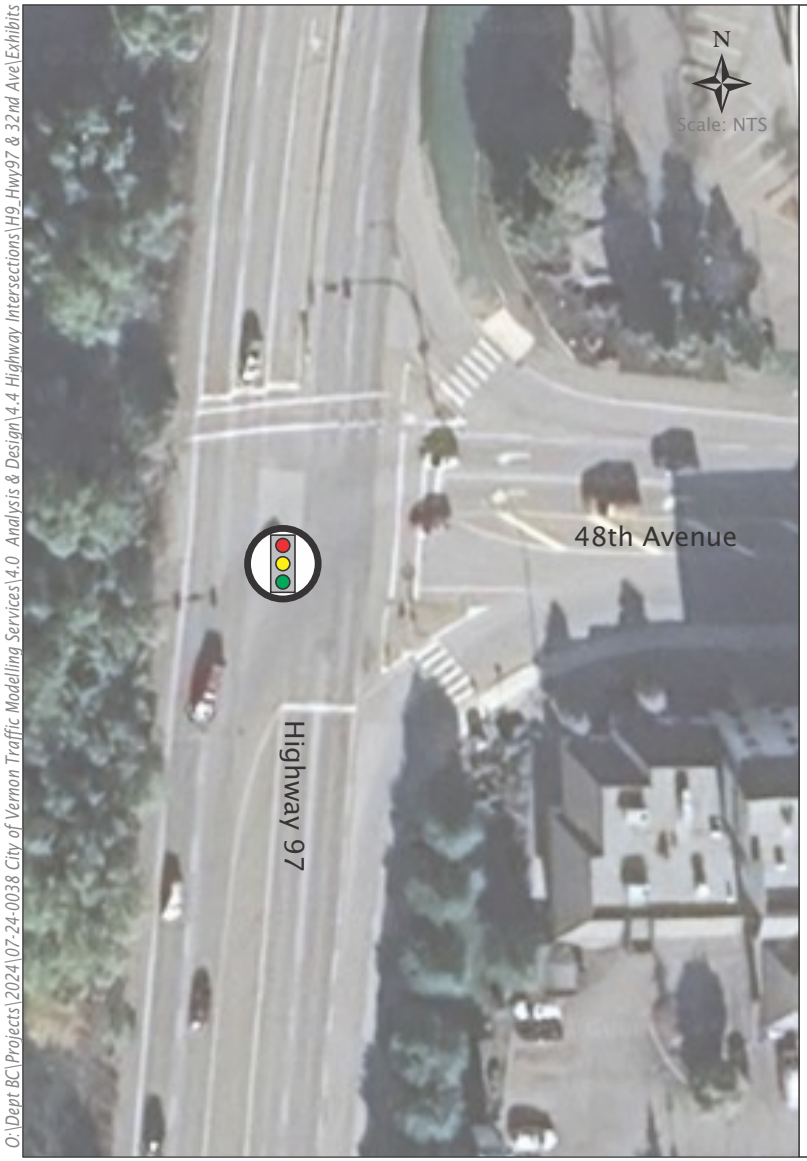
Table 16.4: H15 - Highway 97 & 48th Avenue Intersection ICBC data, By Time-of-Day Crashes

YEAR	12:00AM – 2:25AM	3:00AM – 5:59AM	6:00AM - 8:59AM	9:00AM – 11:59AM	12:00PM – 2:59PM	3:00PM – 5:59PM	6:00PM - 8:59PM	9:00PM - 11:59PM	TOTAL
2019				2	1	2	1		6
2020			1	2	4	1	1		9
2021				2	3	3	1		9
2022				1	3	5	1		10
2023		1	3	2	5	1			12
TOTAL		1	4	9	16	12	4		46

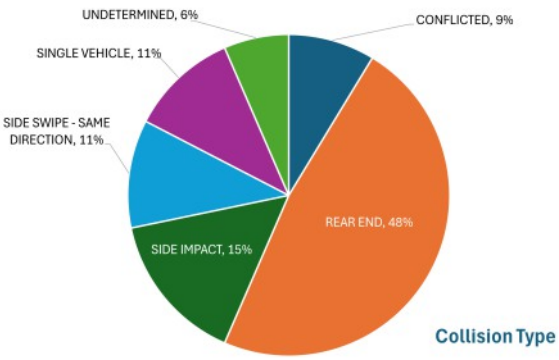
The table indicates that most crashes occur between 9AM and 6PM, aligning with typical weekday work hours.

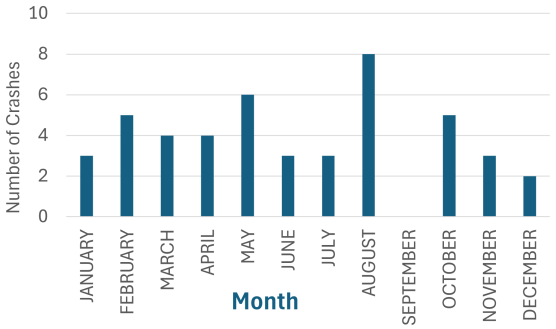
Exhibit 16.1 showcases a summary of the crash history presented in this section.

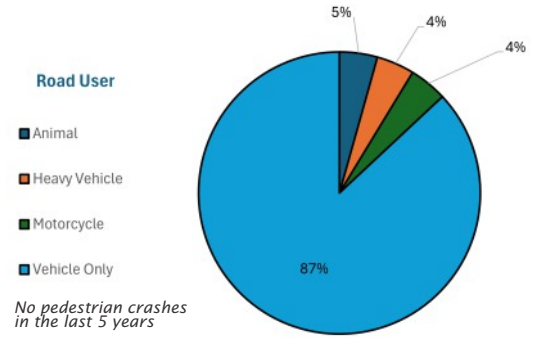
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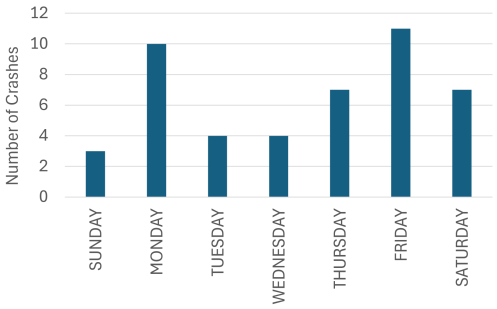
Collision Analysis (2019 - 2023): 46 Incidents

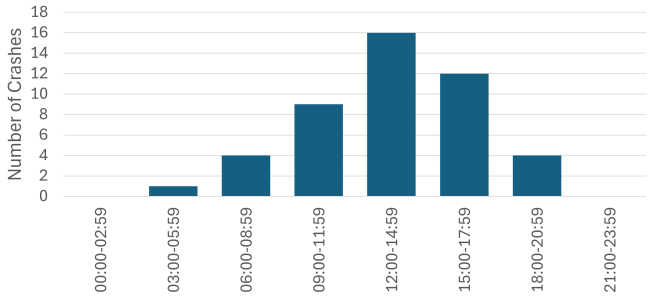






No pedestrian crashes in the last 5 years





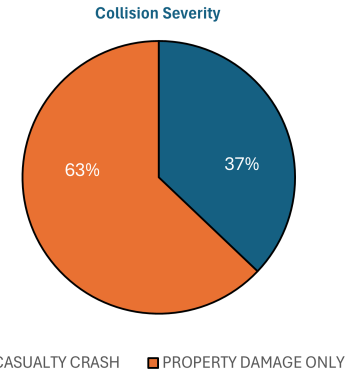


Exhibit 16.1

H15 - Highway 97 & 48th Avenue

City Of Vernon Traffic Modelling Services
07-24-0038 March 2025

bunt & associates

16.5.1 Collision Risk Assessment

The Collision Risk Assessment was completed to support the overall safety assessment of the Highway 97 & 48th Avenue Intersection and has been conducted by drawing upon the available data and information presented in the above sections. The details of how the collision risk is determined are outlined within **Section 17**. **Table 16.5** displays the assessment details and considerations for the intersection of Highway 97 & 48th Avenue.

Table 16.5 : H15- Highway 97 & 48th Avenue Intersection Collision Risk Assessment

FREQUENCY RATING	SEVERITY RATING	COLLISION RISK
Occasional - 1 to 9 collisions per year 92 collisions / 10 years 9 collisions per year	**Medium (Minor to Moderate Injury)** Casualty crashes are reported at this intersection, however less than that of property damage crashes. Additionally of the casualty crash types reported, the crash types such as head on and side impact that generally are associated with high severity was less than 35% of the casualty crashes. Although no specific heavy vehicle data was available for this intersection, given the nature of the other location along Highway 97 and the note that it is a dangerous good routes, indicates that it would be reasonable to expect a high percentage of heavy vehicles passing through this intersection.	**Medium Risk Level (D)**

16.6 Issue Identification

Based on the information presented in this section, the issues have been identified:

- Sign placement for the pedestrian crossing at the northeast corner appears to be in the middle of the unpaved pathway transition.
- Traffic islands and curb letdowns appear narrow and may not meet accessibility standards.
- Left turn pavement marking arrows are faded on the Highway 97 approaches.
- There are no audible pedestrian signals or accessible pushbuttons installed at the intersection.

16.7 Recommended Mitigations

16.7.1 Intersection Warrants

The intersection is already fully signalized. As such, no signal warrant analysis was conducted.

16.7.2 Recommendation

- Relocate the pedestrian crosswalk sign and sign post away from the MUP connection at the northeast corner.
- Provide wayfinding signage and clear distinction/definition of paths.

- Rep-install the Highway left turn symbol pavement markings.
- Undertake an accessibility review to evaluate the upgrade pedestrian refuge islands at the intersection and update curb letdowns median islands as required.
- Install newer style accessible pedestrian pushbuttons to support travellers of all ages and abilities.
- Install audible pedestrian signals.

17. COLLISION RISK ASSESSMENT

A Collision Risk Assessment was conducted based on the traffic characteristics, on-site field observations, and crash data from each study crossing to highlight high-risk intersections as detailed in **Sections 2** to **16.** The assessment follows the methodology outlined in the TAC Canadian Guide to In-Service Road Safety Reviews, which considers the anticipated frequency and likely severity of the collision. Note, the severity assessment is based on engineering judgement and considers crash history, existing traffic conditions, and in-field observations.

Bunt evaluated the existing frequency of collisions and severity of collision at each of the 15 identified intersections. The selected Frequency Rating is based on **Table 17.1**; the expected Severity Rating is based on **Table 17.2**. The combination of frequency rating and consequence produces a risk rating (See **Table 17.3**).

The results of the risk assessment are summarized in **Exhibit 17.1** for all the intersections. Details and assumptions for each intersection are provided in their respective section.

Table 17.1: Collision Risk - Frequency Rating

EXPECTED COLLISION FREQUENCY	FREQUENCY RATING
10 or more collisions per year	Frequent
1 to 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

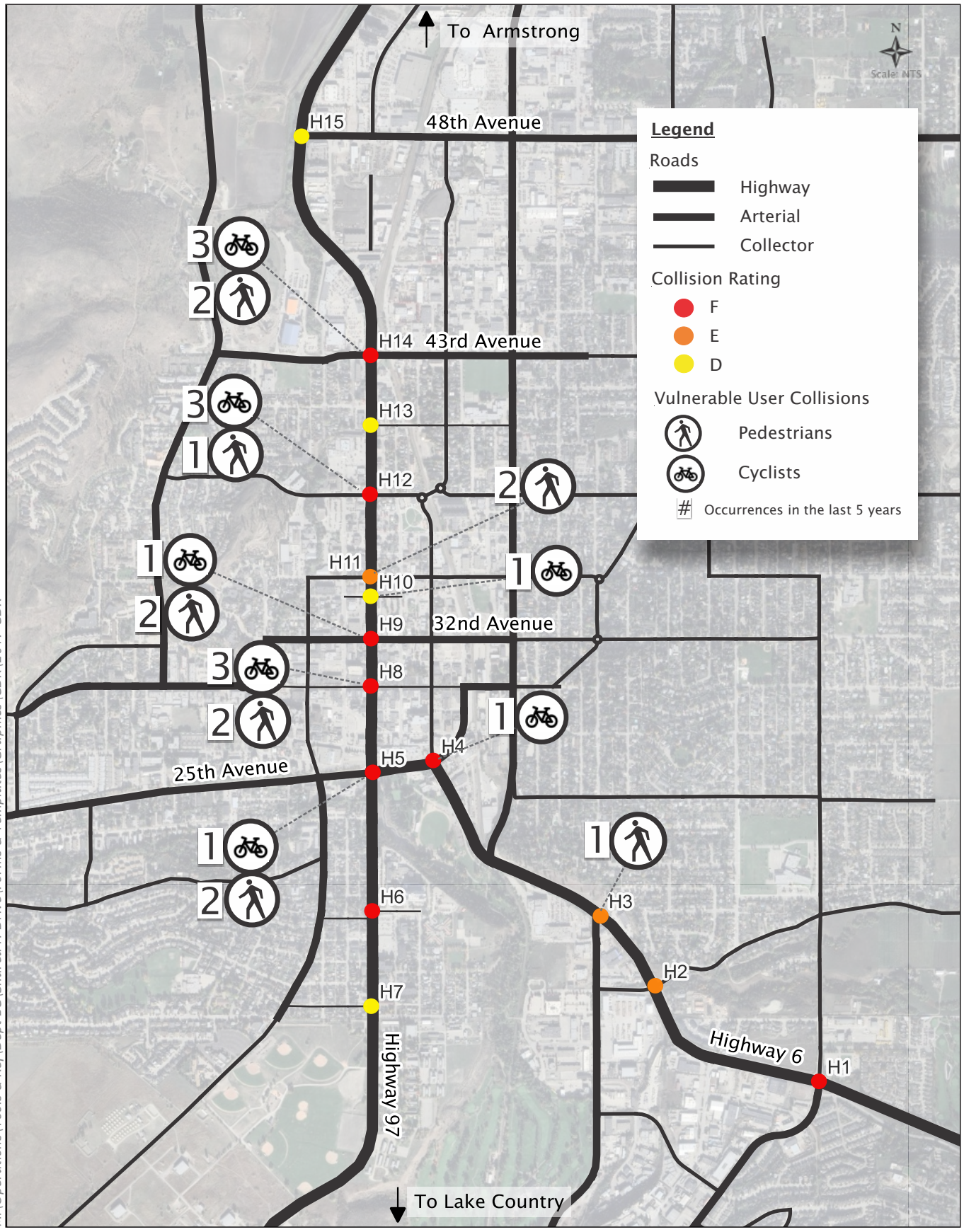
Table 17.2: Collision Risk - Severity Rating

EXPECTED COLLISION SEVERITY	SEVERITY RATING
Probable Fatality	Extreme
Moderate to Incapacitating Injury	High
Minor to Moderate Injury	Medium
Property Damage Only	Low

Table 17.3: Collision Risk Rating

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

Collision Risk Ratings: 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.



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Exhibit 17.1

Highway Intersections - Collision Overview

Vernon Traffic Modelling

07-24-0038 March 2025

bunt & associates

18. CONCLUSIONS & RECOMMENDATIONS

18.1 Study Purpose

Bunt completed a safety analysis of select Highway intersections in the City of Vernon as part of the Highway Crossing Safety Review to help inform the City's updates to their OCP and TP. The study intersections are located on both Highway 6 and Highway 97. The Highway 97 study intersections present a large challenge of balancing the need for a functional Highway while passing through an urban context. Highway 6 faces a similar challenge however to a lesser degree when compared to Highway 97.

18.2 Study Themes

Below, Bunt has summarized the key themes were present across many of the intersections within the study.

1. Traffic volumes along the Highway approaches of the intersection are high, which is to be expected. However, high traffic volumes increase the exposure and the possibility of collisions occurring.

2. There is a large presence of heavy vehicle traffic on both Highway 97 and Highway 6. This is to be expected on the highway and also due to the designated truck routes. Due to the nature of heavy vehicles, these can increase the severity of any crash incident with other road users, including pedestrians and cyclists.

3. The City of Vernon is developing a pedestrian and bicycle network which interfaces with many of the study intersections. Within the current environment, the highways can create a natural barrier for the active mode network.

4. Across the study intersections, pedestrian and cycling provisions require several upgrades or improvements to meet current accessibility standards and help improve safety for users of all ages and abilities.

5. There are a high number of crashes occurring at the study intersections.

18.3 Intersection Issues and Mitigation Measures

Table 18.1 outlines a summary of the identified problems and recommended mitigations for each intersection.

Table 18.1: Intersection Conclusions & Recommendations

LOCATION	ISSUES IDENTIFIED	RECOMMENDED MITIGATIONS	JURISDICTION
H1 – Highway 6 & Middleton Way & 15th Street	• There is a lack of sidewalk facilities connecting to the intersection. The south leg of the intersection on the east side provides some flexible bollards, painted crossing over Sarson Road and concrete barriers. However, there are no permanent pedestrian sidewalk facilities. • Accessibility provisions onto the median islands are limited and restrictive. The curb letdowns are quite small and narrow, and surfaces are in some places uneven. • Older versions of pedestrian push buttons, Flashing Don't Walk displays, and pedestrian signals are present. • The intersection has visibility limitations in the north / southbound direction due to the vertical curvature along 15 Street, which crests near the northern edge of the intersection restricting sight lines. • There are a high number of crashes that have occurred at the intersection in the last five years with a significant number resulting in casualty crashes (48%). Many of these crashes are rear-end crashes.	Provide a separate raised sidewalk facility which connects to the crosswalk facilities on the east side of 15th Street and Middleton Way at a minimum. Undertake an accessibility review and upgrade pedestrian refuge islands at the intersection, ensuring sufficient accessibility provisions, including curb letdown requirements. Regrade the centre of the intersection and the northbound and southbound approaches to provide a flatter continuous road surface to help improve visibility. Alternatively, consider implementing a northbound left-turn protected signal phase to help mitigate the issue and provide time separation between conflicting movements. Provide advanced flasher warning facing eastbound traffic on the southside of Highway 6. Even though the warrant analysis indicated it is not warranted, Bunt suggests that this still be considered based on the changing speed environment and help to prevent/reduce rear-end crashes occurring in the future. Review traffic signal infrastructure for pedestrians and install countdown timers, audible pedestrian signals, and accessible pedestrian push buttons.	(City) (MOTT) (City and MOTT) (MOTT) (MOTT)

LOCATION	ISSUES IDENTIFIED	RECOMMENDED MITIGATIONS	JURISDICTION
H2 – Highway 6 & Pottery Road	• There are no side walks connecting the residents to the north to the southern commercial/industrial area. • There are no crossing facilities at this location or sidewalks to connect pedestrians to a crossing facility. • 68% of recorded crashes between 2019 – 2023 have been casualty crashes.	1. Upgrade the Highway 6 & Pottery Road intersection to a full traffic signal control, following the TAC warrant analysis and guidance. 2. Implement coordinated signal timing plans for the new signal and the signal at Kalamalka Lake Road & Highway 6 to help maintain Highway traffic progression. 3. Undertake an accessibility review and upgrade pedestrian refuge islands at the intersection to ensure sufficient accessibility provisions, including curb letdown requirements. 4. Extend the sidewalk from the NE approach (northside) to the World Health & Fitness driveway access, along the north side of Highway 6. 5. Provide a sidewalk facility on Pottery Road west of Highway 6.	(MOTT) (MOTT) (MOTT) (MOTT) (City)

LOCATION	ISSUES IDENTIFIED	RECOMMENDED MITIGATIONS	JURISDICTION
H3 – Highway 6 & Kalamalka Lake Road	• One pedestrian crash occurred at this intersection in 2020. • The sidewalk connection at the northeast corner of the intersection does not connect to the pedestrian pushbutton on the north side. • Pedestrian curb letdowns are small with surfaces uneven in places. • 23% of crashes recorded at this intersection are side impact crashes, and 34% are rear-end. • Review traffic signal infrastructure for pedestrians and install countdown timers, audible pedestrian signals, and accessible pedestrian push buttons.	1. Undertake an accessibility review to assess pedestrian refuge islands at the intersection to ensure sufficient accessibility provisions, including curb letdown requirements. 2. Provide a clear and protected path or sidewalk to the pedestrian push button at the northeast corner of the intersection. 3. Review the signal clearance parameters and signal timing to ensure adequate clearances are provided. 4. Review traffic signal infrastructure for pedestrians and install audible pedestrian signals and accessible pedestrian push buttons.	(MOTT) (MOTT) (MOTT) (MOTT)

LOCATION	ISSUES IDENTIFIED	RECOMMENDED MITIGATIONS	JURISDICTION
H4- Highway 6 / 30th Street & 25th Avenue	• Awareness of vehicles of vulnerable road users. The site is currently missing pedestrian signage on the channelized right turns and has faded cycle lane paint. In a high trafficked intersection highlighting crossing points and areas where vulnerable users could be present is important to make vehicles aware. • Pedestrian amenities at the crossings are missing audible pedestrian signals, accessible pushbuttons, and tactile pads. • The on-street bicycle lane present on the eastbound leg is mixed with a road which supports a high volume of vehicles including large transport vehicles and trucks. An environment like this creates high risk for cyclists using the bicycle lane. • Sightlines for the southbound left movement are restricted due to the offset of the opposing left turn lane and resulting vehicle shadowing.	1. Undertake an accessibility review and upgrade the pedestrian refuge islands at the intersection to ensuring sufficient accessibility provisions, including let down requirements. 2. Review signal phasing and consider implementing a split phase signal operation to help mitigate sightline challenges. 3. Upon redevelopment of either north corner parcels adjacent to the intersection, acquire land to provide a left turn bay for southbound traffic to help mitigate the sightline limitation. 4. Increase wayfinding signage to the MUP to encourage cyclists to use the off-street facility to help reduce potential conflicts given the high volume of traffic and heavy vehicles. 5. Upgrade the existing marked bicycle lanes on Highway 6 to a facility with higher protection (i.e., buffered bicycle lane, protected bicycle lane, off-street path, etc.) to help reduce potential conflicts between modes. 6. Consider installing a smart-channel right turn for the eastbound channelized right turn (similar to the Highway 97 & 25th Avenue intersection) to reduce the speed of vehicles and help support a safer environment for pedestrians crossing the intersection. 7. Review traffic signal infrastructure for pedestrians and install countdown timers, audible pedestrian signals, and accessible pedestrian push buttons.	(MOTT) (MOTT) (City and MOTT) (City) (MOTT) (MOTT) (MOTT)

LOCATION	ISSUES IDENTIFIED	RECOMMENDED MITIGATIONS	JURISDICTION
H5 - Highway 6 / 25th Avenue & Highway 97 / 32nd Street	• The high volume of traffic at this intersection presents a high risk for vulnerable users. This is shown in the reported crash data, with 3 vulnerable user crashes having occurred in the last 5 years. • 25th Avenue and Highway 6 are truck routes (and have high traffic volumes). However, bicycle lanes are present on-street and result in a lack of protection and high risk to cyclists. • Pedestrian facilities at the crossings are lacking and missing audible signals, tactile pads, accessible pedestrian pushbuttons, and faded paint on crosswalks/bicycle lanes, etc. • It is unclear where the MUP starts after going through the intersection on the southeast corner of the intersection.	1. Undertake an accessibility review to look at the upgrade of pedestrian refuge islands at the intersection to ensure sufficient accessibility provisions, including let-down requirements and audible signals. 2. Repaint on street bicycle lanes and pedestrian crosswalks. 3. Consider redirecting all cyclists off Highway 6 and 25th Avenue to reduce the risk of conflict with vehicles and cyclists. 4. Provide wayfinding for active modes at the end and beginning of the shared paths connecting to the intersection.	(MOTT) (MOTT) (City and MOTT) (City)

LOCATION	ISSUES IDENTIFIED	RECOMMENDED MITIGATIONS	JURISDICTION
H6 - Highway 97 & 21st Avenue (Vernon Jubilee Hospital)	• The signed and marked pedestrian crossing control type appears inadequate for the Highway environment with high vehicle speeds, high heavy vehicle volumes, and a large crossing distance. • The wide cross-section of Highway 97 creates difficulty for pedestrians to cross in one instance. As a result, pedestrians may be left stranded on the median island. • There is limited advance warning of the pedestrian crosswalk to alert vehicles of crossing pedestrians. Rear-end crashes occur likely because the following vehicle cannot anticipate that the front vehicle is stopping for a pedestrian to cross.	1. Upgrade this location to a full traffic signal to support both vehicle and pedestrian movements. At a minimum, upgrade the intersection to a pedestrian-actuated traffic signal with pedestrian pushbuttons to augment the crossing control and help improve safety. 2. Undertake an accessibility review and upgrade the pedestrian refuge islands at the intersection, ensuring sufficient accessibility provisions, including curb letdown requirements and audible signals. 3. When funding is available, upgrade the pedestrian crossing to a full grade-separated crossing, i.e., pedestrian underpass or overpass, ensuring accessibility for all mobility users.	(MOTT) (City) (City and MOTT)

LOCATION	ISSUES IDENTIFIED	RECOMMENDED MITIGATIONS	JURISDICTION
H7 – Highway 97 & 16th Avenue Intersection	• There is no sidewalk connection on the south side of 16th Avenue to the bus stop. • The Tel-A-Friend Motel driveway forms the east legs of the intersection, creating additional conflict points for vehicle and pedestrian traffic. Additionally, this driveway is an uncontrolled access to the intersection. • There are no audible pedestrian signals or accessible pushbuttons installed at the intersection. • Sightlines from 16th Avenue are limited. • The shared through and left laning configuration northbound and southbound on the Highway may create hazardous situations where visibility is limited.	1. Provide crosswalk markings on 16th Avenue. 2. Provide sidewalk facilities on the south side of 16th Avenue for pedestrians to access the bus stop. 3. Provide a stop sign and stop line on the Tel-A-Friend Motel access to help control traffic. Upon redevelopment of this site, close the driveway access from the Highway to this property. 4. Trim and maintain foliage along Highway 97 to ensure appropriate sightlines from 16th Avenue.	(MOTT) (City) (City and MOTT) (City and MOTT)

LOCATION	ISSUES IDENTIFIED	RECOMMENDED MITIGATIONS	JURISDICTION
H8 - Highway 97 & 30th Avenue Intersection	• A high number of active transportation-related crashes were reported, including two pedestrian and three cyclist incidents. • Highway 97 operates near capacity during peak hours with congested traffic conditions and vehicle queues. This results in augmented aggressive driving behaviour, including smaller vehicle headways, yellow and red light running, and reduced yielding behaviour. • The mix of heavy vehicle traffic along Highway 97, intersecting the urban pedestrian high street environment on 30th Avenue. • The conflict between pedestrians utilizing the crosswalks and right-turning vehicles from 30th Avenue. • The coordinated signal cycle length is 120 seconds which is near the upper threshold of typical MOTT signal timing standards and can result in long pedestrian delays waiting to use the crosswalks. • Older style pedestrian pushbuttons not meeting the latest accessibility standards are present.	**Traffic Signal Modifications:** 1. **Option 1:** Prohibit Right Turn on Red for east-west movements onto Highway 97 from 30th Avenue. This should be supported with signage right turn traffic control signals. 2. **Option 2:** Prohibit Right Turn on Red for east-west movements onto Highway 97 from 30th Avenue and install a right turn signal control. 3. **Option 3:** Install Leading Pedestrian Interval for the east-west pedestrian crossings on 30th Avenue. **Signage, Infrastructure, and Maintenance:** 1. Install Additional Signage for Vehicles to 'Watch for Pedestrians'. 2. Trim and maintain foliage on the corners of the intersection to help improve visibility for right-turn vehicle movements onto Highway 97. 3. Install newer-style accessible pedestrian pushbuttons to support travellers of all ages and abilities.	(City and MOTT) (MOTT) (MOTT) (City and MOTT) (City) (MOTT)

LOCATION	ISSUES IDENTIFIED	RECOMMENDED MITIGATIONS	JURISDICTION
H9 - Highway 97 & 32nd Avenue Intersection	• Left-turn movements are very challenging to complete with large Highway 97 through traffic volumes. • There may be limited visibility for left turn movements due to the shared through and left turn lane configuration resulting in vehicle shadowing of opposing left turn movements. • The intersection has experienced one pedestrian and two cyclist crashes in the last 5 years.	1. Prohibit Right Turn on Red for east-west movements onto Highway 97 from 32nd Avenue. Additionally, consideration for installing a dedicated right-turn phase should be made. 2. Install additional Signage for vehicles to 'Watch for Pedestrians'. 3. Consider installing left-turn lanes on Highway 97 and adjust signal operation at a future time upon the redevelopment of surrounding properties. 4. Consider extending the northbound and southbound left turn prohibition to 24/7 to avoid potentially hazardous left turn movements with limited visibility of oncoming traffic. 5. Install newer-style accessible pedestrian pushbuttons to support travellers of all ages and abilities.	(City and MOTT) (City and MOTT) (MOTT) (MOTT) (MOTT)
H10 - Highway 97 & 34th Avenue Intersection	• No pedestrian crossing facilities are provided at this location. • Physical obstructions exist within the existing sidewalk on 34th Avenue. • It is challenging and potentially hazardous to make left turns onto or off of the highway. Additionally, there are no left turn bays present. • The paved road surface on Highway 97 appears narrow, and 5 side swipe collisions were recorded in the same direction at this intersection in the last 5 years.	1. Monitor the intersection and consider additional pedestrian crossing upgrades in the future. The City of Vernon should collect and review traffic movement data at this location and analyze the volumes of the left turning movements. 2. Consider prohibiting the left turn movements from 34th Avenue in the future if they continue to operate in a challenging and potentially hazardous manner.	(City) (City and MOTT)

LOCATION	ISSUES IDENTIFIED	RECOMMENDED MITIGATIONS	JURISDICTION
H11 - Highway 97 & 35th Avenue Intersection	• A high number of side impact crashes occurred, which may be attributed to difficulty when making left turns from 35th Avenue onto Highway 97 and, as a result, smaller gap acceptance from motorists. • Pedestrian crossing demand was observed at this location despite no provision of a formal crossing facility. • 2 pedestrian crashes were recorded between 2019-2023.	1. Continue monitoring vehicle volumes and active transportation demands in the area and reevaluate requirements for a crossing facility regularly. From a network standpoint, a crossing facility at this location may help connect the City's active transportation systems.	(City and MOTT)

LOCATION	ISSUES IDENTIFIED	RECOMMENDED MITIGATIONS	JURISDICTION
H12 - Highway 97 & 39th Avenue Intersection	• The long signal cycle length of over 100 seconds offers reduced Levels of Service to pedestrian and may cause additional delays. Note, there has been one pedestrian crash at this location in the last 5 years. • Green bicycle conflict pavement markings are extremely faded at the intersection. • There have been 3 cyclist related crashes at this intersection in the last 5 years. Bicycle facilities are limited to on-street bicycle lanes. Note, the on-street bicycle markings are faded resulting in less conspicuity. • There are no audible pedestrian signals or accessible pushbuttons installed at the intersection. Furthermore, cyclists have no way to actuate the signal from the bicycle lanes.	1. Reinstall the green conflict pavement markings close to the intersection to add awareness of cyclists for drivers. 2. Provide dedicated bicycle detection for cyclists to activate the signal and corresponding pedestrian crossing phase. Detection could include push buttons activation or magnetic loops in the bicycle lane. 3. Consider signal phasing to accommodate an advanced bicycle crossing interval and review the intersection cycle length. 4. Consider upgrading the on-street bicycle lanes to off-street bicycle facilities in the future at this location to separate cyclists from vehicle traffic.	(City) (MOTT) (MOTT) (City)

LOCATION	ISSUES IDENTIFIED	RECOMMENDED MITIGATIONS	JURISDICTION
H13 - Highway 97 & 41st Avenue Intersection	• The Hotel driveway access forming the west leg of the intersection is uncontrolled. • 41st Avenue has a concrete block, fire hydrant and BC hydro pole installed within the paved road surface, which poses a hazard to vehicle travel.	1. Close hotel driveway access into the intersection upon future redevelopment or with discussions with the property owner. 2. Remove the concrete base and relocate the fire hydrant and BC Hydro poles out of the paved driving surface. Alternatively, provide curb extensions to remove these hazards from the paved driving surface. 3. Provide an additional crosswalk on the north leg of the intersection with supporting signal infrastructure (i.e., pushbutton, audible signals, and pedestrian displays (walk/FDW/countdown). It is not anticipated to create any additional delays for vehicles, and this would support pedestrian desire lines from the hotel to commercial areas/restaurants.	(City and MOTT) (City) (MOTT)
H14 - Highway 97 & 43rd Avenue Intersection	• There have been five vulnerable user crashes recorded at this location between 2019 – 2023. • Provisions for cyclists are limited to one on-street cycle lane on the west leg of 43rd Avenue westbound. • The traffic signal cycle length is 120 seconds which could increase active traveller delay and result in impatient crossing decisions. • There is a gap in the bicycle network connecting to the MUP to the east of the intersection. • High frequency of vehicle crashes occurring. • High number (40%) of rear-end crashes are casualty crashes.	1. Undertake an accessibility review to evaluate and upgrade pedestrian refuge islands at the intersection to ensure sufficient accessibility for all users. 2. Install green pavement markings at the intersection to add awareness of potential conflict areas between cyclists and motorists. 3. Provide bicycle facilities on 43 Avenue to connect the bicycle network (fill in gaps) to 29th Street MUP. 4. Review the signal timing for this intersection and prepare new optimized timing plans to help minimize vehicle queueing and delays. 5. Install newer-style accessible pedestrian pushbuttons to support travellers of all ages and abilities.	(MOTT) (City) (City) (MOTT) (MOTT)

LOCATION	ISSUES IDENTIFIED	RECOMMENDED MITIGATIONS	JURISDICTION
H15 - Highway 97 & 48th Avenue Intersection	• Sign placement for the pedestrian crossing at the northeast corner appears to be in the middle of the unpaved pathway transition. • Traffic islands and curb letdowns appear narrow and may not meet accessibility standards. • Left-turn pavement marking arrows are faded on the Highway 97 approaches. • There are no audible pedestrian signals or accessible pushbuttons installed at the intersection.	1. Relocate the pedestrian crosswalk sign and sign post away from the MUP connection at the northeast corner. 2. Provide wayfinding signage and clear distinction/definition of paths. 3. Reinstall the Highway left turn symbol pavement markings. 4. Undertake an accessibility review to evaluate the upgrade pedestrian refuge islands at the intersection and update curb letdowns median islands as required. 5. Install newer style accessible pedestrian pushbuttons to support travellers of all ages and abilities. 6. Install audible pedestrian signals.	(MOTT) (City) (MOTT) (MOTT) (MOTT) (MOTT)

18.4 Collisions Risk Assessment

- An assessment was undertaken to evaluate and determine the study intersections Collision Risk Assessment rating utilizing guidance from TAC.
- The Collision Risk Ratings are based on the following parameters:
    - Historical collision frequency
    - Historical collision severity (property damage only, casualty, fatality)
    - Collisions involving active transportation travellers
    - Interaction of modes (i.e., heavy vehicles with cyclists)
    - On-site field observations
    - Engineering judgement
- A summary of the Collision Risk Ratings for the study intersections is presented in Table 18.2.

Table 18.2: Collision Risk Ratings

COLLISION RISK RATING	STUDY INTERSECTIONS	STUDY INT ID
Level D	Highway 97 & 16 Avenue	H7
	Highway 97 & 34 Avenue	H10
	Highway 97 & 41 Avenue	H13
	Highway 97 & 48 Avenue	H15
Level E	Highway 6 & Pottery Road	H2
	Highway 6 & Kalamalka Lake Road	H3
	Highway 97 & 35 Avenue	H11
Level F	Highway 6 & Middleton Street / 15 Street	H1
	Highway 6 & 25 Avenue	H4
	Highway 97 & 21 Avenue (VJH)	H6
	Highway 97 & 25 Avenue	H5
	Highway 97 & 30 Avenue	H8
	Highway 97 & 32 Avenue	H9
	Highway 97 & 39 Avenue	H12
	Highway 97 & 43 Avenue	H14

APPENDIX A

Traffic Data

The attached information is provided to support the agency's review process and shall not be distributed to other parties without written consent from Bunt & Associates Engineering Ltd.

APPENDIX B

ICBC Data

The attached information is provided to support the agency's review process and shall not be distributed to other parties without written consent from Bunt & Associates Engineering Ltd.

APPENDIX C

Traffic Analysis Warrants