DILLON CONSULTING

Corporation of the City of Burlington

Community Risk Assessment

Final Report

March 2022 – 19-9811

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1.0 Introduction

This Community Risk Assessment (CRA) has been developed for the City of Burlington to comply with **Ontario Regulation 378/18: Community Risk Assessments (O. Reg. 378/18)**. **O. Reg. 378/18** came into force July 1, 2019 under the authority of the Fire Protection and Prevention Act, 1997 (FPPA). It requires all municipalities in Ontario to develop a CRA prior to July 1, 2024. This regulation also requires municipalities to **"use its community risk assessment to inform decisions about the provisions of fire protection services"[1].**

At this time, the CRA is a standalone report which is a companion document to the City's proposed Master Fire Plan (MFP). Under **O. Reg. 378/18**, the City is required to complete a CRA every five years, to review it on a regular basis, and at least once annually. This CRA is in alignment with the 2016 Standards of Cover recommendation to conduct a CRA every five years, whereby a CRA was completed as part of that process.

In addition to this CRA, the FPPA requires that municipalities provide fire protection programs that "**must include public education with respect to fire safety and certain components of fire prevention, and provide such other fire protection services as it determines may be necessary in accordance with its needs and circumstances"[2]**. **O. Reg. 378/18** is now a core component of developing an in-depth analysis of a community's fire related risks through a comprehensive analysis of nine mandatory profiles.

The Office of the Fire Marshal and Emergency Management (OFMEM) has developed Technical Guideline-02-2019 (OFMEM TG-02-2019) to assist municipalities and fire departments in developing a CRA to inform the municipality's decisions with regard to the provision of fire protection services.

1 Ontario Regulation 378/18: Community risk Assessments, Mandatory Use, Section 1 (b).
2 Fire Protection and Prevention Act, 1997 Part II Responsibility for Fire Protection Services, Section 2.1 (a) (b).

The methodology and analysis utilized to develop this CRA has been directly informed by OFMEM TG-02-2019 that recognizes the value of understanding the fire risk within a community, and the importance of developing fire risk reduction and mitigation strategies in addition to providing fire suppression services.

The primary purpose of this CRA is twofold:

1. To develop a Community Risk Assessment for the City of Burlington to identify the fire related risks within the community and comply with **O. Reg. 378/18.**
2. To utilize the risk conclusions of the Community Risk Assessment to inform comprehensive analyses of the existing, and future fire protection needs of the City of Burlington through the development of an MFP.

1.1 Methodology

In addition to OFMEM TG-02-2019, the methodology applied to develop this CRA has been informed by other current industry standards and best practices. These include:

1. OFMEM Comprehensive Fire Safety Effectiveness Model: Fire Risk Sub-Model
2. OFMEM Public Fire Safety Guideline (PFSG) 04-40A-03: Simplified Risk Assessment
3. National Fire Protection Association (NFPA) 1300 - Standard on Community Risk Assessment and Community Risk Reduction Plan Development (2020 Edition)
4. NFPA 1730 - Standard on Organization and Deployment of Fire Prevention Inspection and Code Enforcement, Plan Review, Investigation, and Public Education Operations (2019 Edition)
5. Vision 20/20 Community Risk Assessment: A Guide for Conducting a Community Risk Assessment[3] (Version 1.5, 2016)
6. Vision 20/20 Community Risk Reduction Planning: A Guide for Developing a Community Risk Reduction Plan[4]

3 John A. Stouffer, Community Risk Assessment: A Guide for Conducting a Community Risk Assessment, Vision 20/20, ESRI, 2016.
4 John A. Stouffer, Community Risk Assessment: A Guide for Conducting a Community Risk Reduction P, Vision 20/20, ESRI, 2016.

In Dillon's view, these documents collectively represent the most current industry best practices related to the applicable methodology and process to develop a CRA for the City of Burlington as required by **O. Reg. 378/18**. The information presented within these documents is often, complementary, having been built upon each other.

The methodology presented within this CRA has also been reviewed by the OFMEM and the NFPA Risk Analysis Sub-Committee as part of other projects completed by Dillon Consulting Limited. This includes the Corporation of the City of Mississauga Comprehensive Community Risk Assessment.[5]

As required by **O. Reg. 378/18**, this CRA includes a comprehensive analysis of the nine mandatory profiles including:

1. Geographic Profile
2. Building Stock Profile
3. Critical Infrastructure Profile
4. Demographic Profile
5. Public Safety and Response Profile
6. Community Services Profile
7. Hazard Profile
8. Economic Profile
9. Past Loss and Event History Profile

Within each of the nine profiles, there are a number of sub-topics examined. These profiles are based on an analysis of several sources of information, including data provided by the City of Burlington, Burlington Fire Department (BFD), Statistics Canada, the OFMEM, and desktop research.

The mandatory profile analyses result in a series of risk related conclusions that will be used to inform service levels or other strategies in alignment with the three lines of defense through a risk treatment process. Throughout this document, these risk related conclusions are referred to as a '**key finding**' or an '**identified risk**'. Those findings

5 O.F.M.E.M. T.G.-02-2019 End Notes (2)

referred to as an 'identified risk' are taken through a risk assignment process to assist with risk prioritization as referred to within OFMEM TG-02-2019.

In specific circumstances a risk-related conclusion is referred to as a **Special Consideration** due to local or legislative considerations. All risk-related conclusions will be taken through a risk treatment process and aligned with the "three lines of defense" in order to inform the analysis and recommendations within the Master Fire Plan.

More information on how the findings and identified risks will be used to inform the MFP can be found in **Section 11.0 – Applying Key Findings and Identified Risks**.

The analysis presented within this CRA has been informed by a wide range of data sources. Where applicable, all numerical data has been rounded to the nearest 1/100 (hundredths) decimal point to provide consistency in the analysis. As a result, the numerical totals presented within each analysis although presented as reflecting 100% may actually reflect a minor variance based on the use of only the nearest 1/100 (hundredths) decimal points.

2.0 Geographic Profile

As referenced in **O. Reg. 378/18**, the geographic profile assessment includes analysis of the physical features of the community, including the nature and placement of features such as highways, waterways, railways, canyons, bridges, landforms and wildland-urban interfaces. These physical features may present inherent risks or potentially have an impact on fire department access or emergency response time. The following sections consider these geographic characteristics within the City of Burlington.

2.1 Geographical Snapshot of Burlington

The geographical area of the City of Burlington represents a land area of approximately 185.66 square kilometres[6]. Burlington is situated on the western shore of Lake Ontario and bordered by the City of Hamilton to the south, the Town of Milton to the north and the Town of Oakville to the east. The City is bisected by Highway 403, Highway 407 and multiple rail lines, which include mixed-use corridors and mobility hubs. The City is also connected by the Burlington Skyway Bridge which spans the Hamilton Harbour and connects the Queen Elizabeth Way to Highway 403. A portion of the Niagara Escarpment, a United Nations Educational, Scientific and Cultural Organisation World Biosphere region, traverses the City in the northern rural area and offers a range of recreational activities to residents and tourists. Burlington is home to Mount Nemo Conservation Area, various waterfront parks and trails, and the Royal Botanical Gardens. As shown in **Figure 1**, the northwestern geographical area of the City includes lands designated as “Rural Area” while **Figure 2** shows the southeastern portion of the City’s “Urban Area”.

[6] Statistics Canada. 2017. Burlington, CY [Census subdivision], Ontario and Ontario [Province] (table). Census Profile. 2016 Census. Statistics Canada Catalogue no. 98-316-X2016001. Ottawa. Released November 29, 2017.
Visit Statistics Canada Website for 2016 Census

Figure 1: City of Burlington Land Use – Rural Area

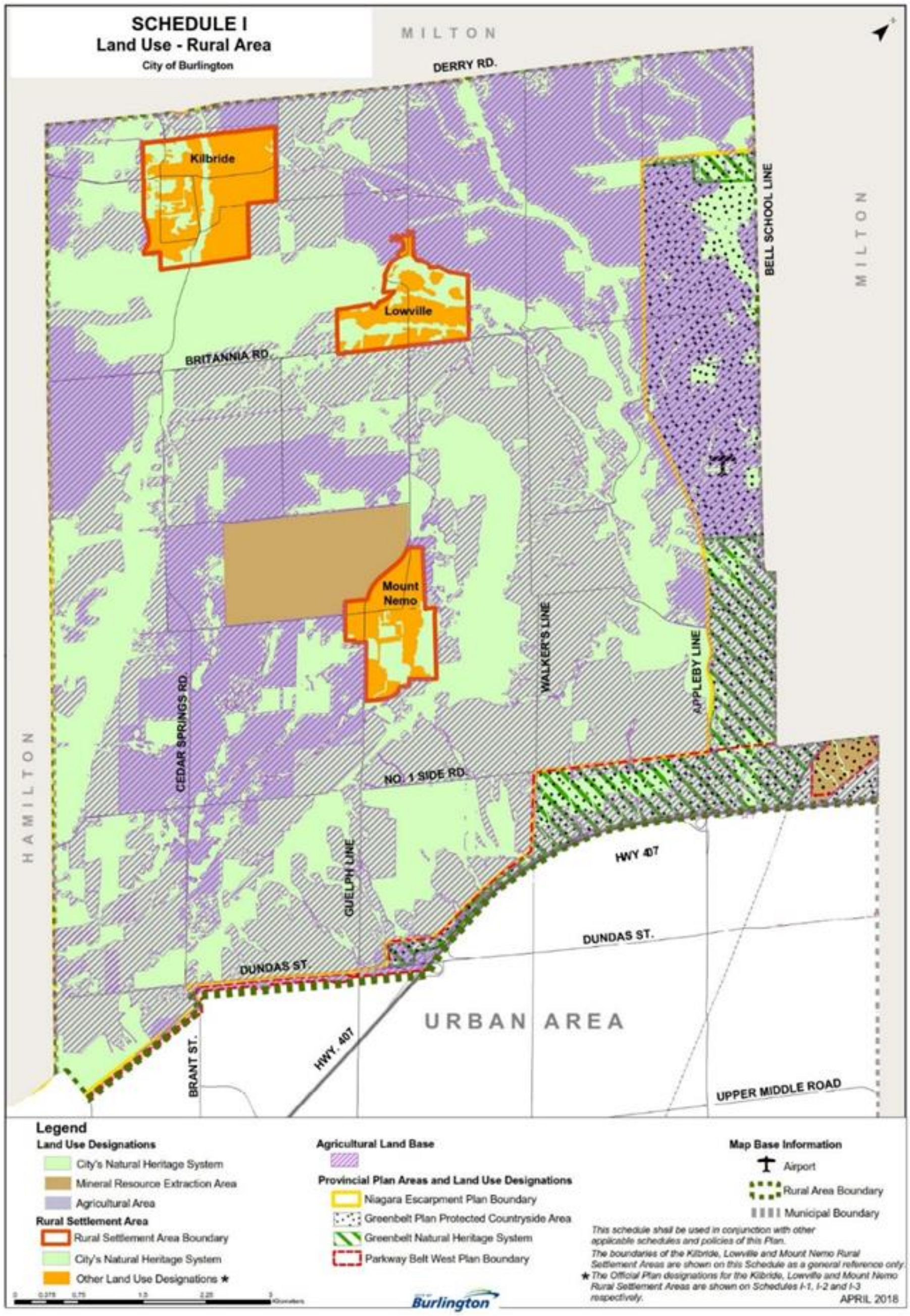


Figure Source: City of Burlington Official Plan, Schedule I, 2018.

Figure 2: City of Burlington Land Use – Urban Area

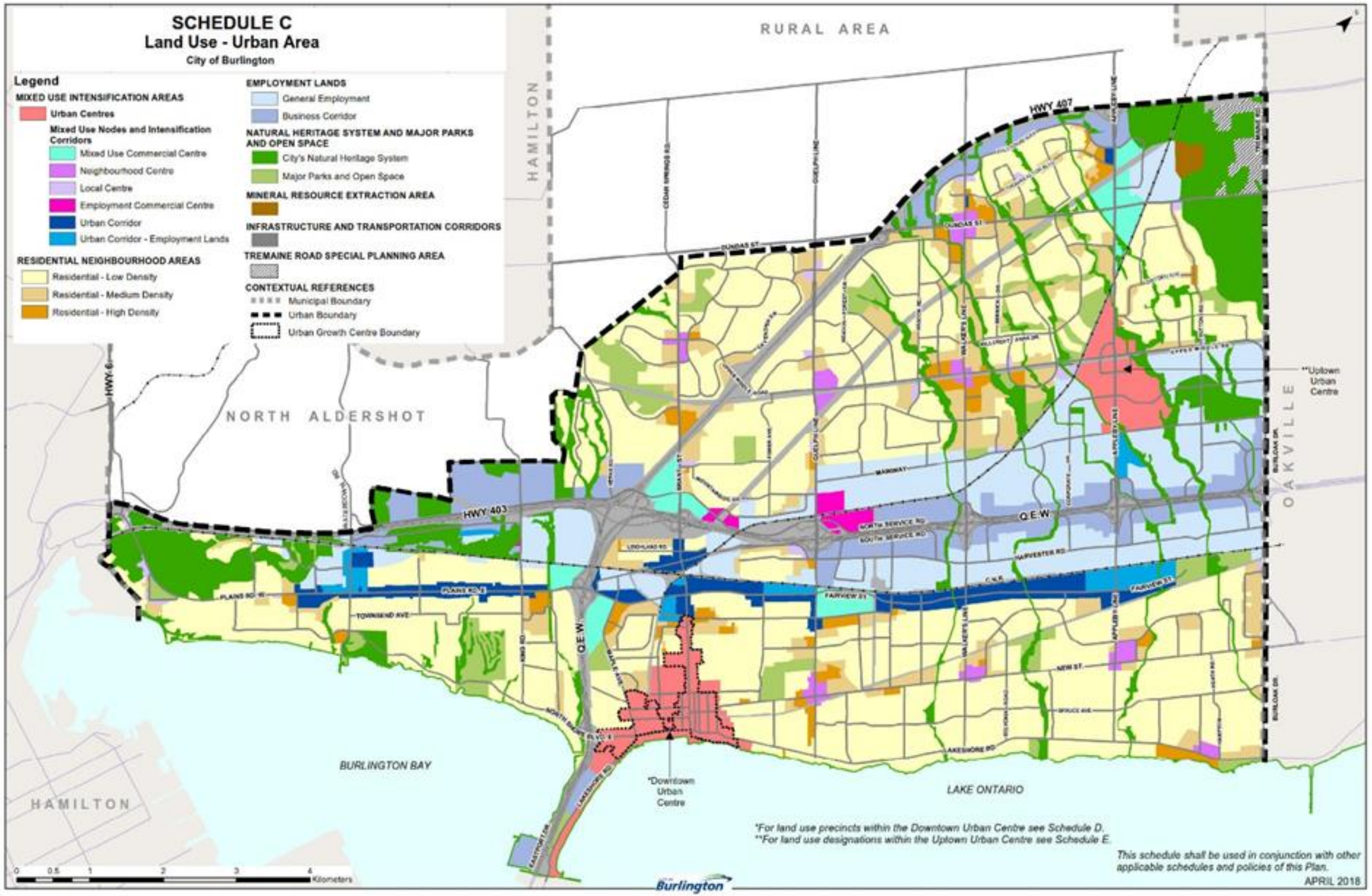


Figure Source: City of Burlington, Official Plan, Schedule C, 2018.

2.2 Roads, Transit, Bridges and Rail

2.2.1 Road Network

Road networks and transportation systems provide fire services with access throughout a community when responding to emergency calls. The road network is how fire apparatus travel through a municipality; and therefore, it is valuable to consider where there may be a lack of connectivity due to road network design as well as other natural (e.g. rivers, lakes, etc.) or human-made barriers (e.g. rail lines, traffic calming measures, etc.). Road networks can also contribute to vehicle congestion causing delays in emergency response travel times. Where possible, the City's transportation planning processes should include the BFD as a stakeholder to provide consideration to emergency service needs and challenges relating to the road network, traffic congestion, traffic calming and related topics.

Roads are also important from a risk and emergency response perspective because motor vehicle-related incidents often account for a large portion of a fire department's call volume. As described in **Section 10.2.2.3 – Spatial Modelling - Rescue Incidents** of this CRA, 2,946 calls were motor-vehicle related incidents (vehicle collisions and vehicle extrication combined), accounting for approximately 89.14% of all rescue calls responded to by the Burlington Fire Department during a five year period (2016-2020).

Located at the western end of Lake Ontario, Burlington is intersected by a number of provincial highways and freeways that act as gateways to other urbanized parts of Ontario. These highways and freeways include Highway 407, Highway 403/Queen Elizabeth Way (QEW) towards Toronto and Niagara, and Provincial Highway 6.

Road networks can also contribute to vehicle congestion causing delays in emergency response travel times. The major freeway junction of the of QEW, Highway 403 and Highway 407 experiences high traffic volumes, which increase during peak commute hours and are a source of congestion.[7] Major highway routes and high traffic volumes provides an increased risk of motor vehicle collisions, and the potential for a transport incident involving dangerous good.

[7] Freeman Interchange. WSP. 2020. Retrieved August 7, 2020 from https://qew403freeman.ca/

Public transit in Burlington is provided by Burlington Transit and GO Transit. Burlington transit offers a conventional and accessible bus services. GO Transit provides bus service from multiple locations along Highway 403.

The road hierarchy in Burlington is presented in **Figure 3**.

Figure 3: City of Burlington Road Hierarchy

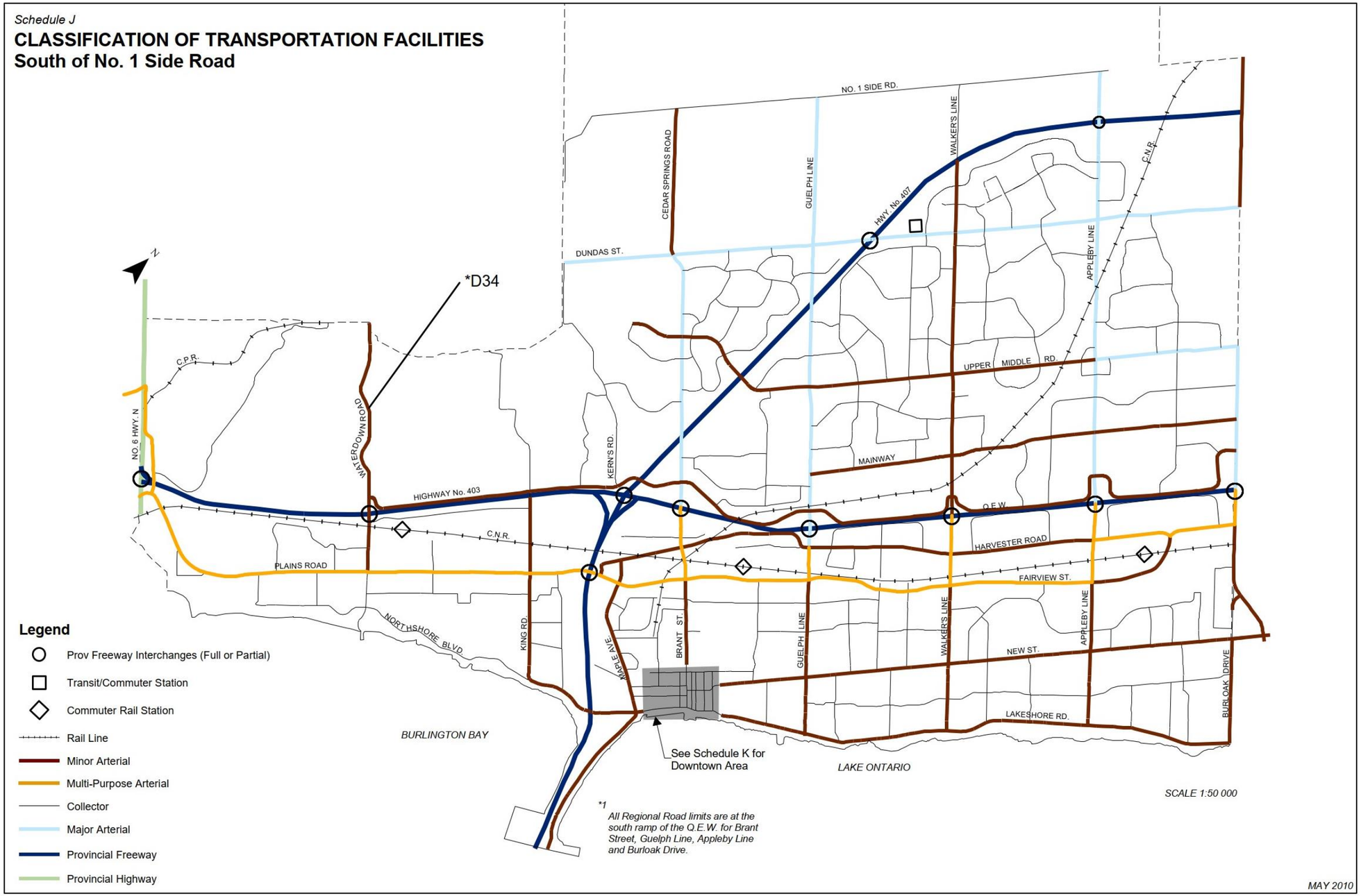


Figure Source: City of Burlington Official Plan, Schedule J, 2010.

Identified Risk: Increasing traffic congestion and other natural and human-made barriers on the existing road network presents the potential for a delay in emergency response times.

Identified Risk: Motor vehicle-related incidents on the existing road network represent 89.14% (2,946) of all rescue responses of the Burlington Fire Department.

2.2.2 Bridges

Bridges are considered within a CRA for two main reasons: the potential for crossing restrictions on fire apparatus due to weight; and potential for impact on network connectivity if a bridge were to be out of service. As an example; there are several bridges in Burlington that overpass Bronte Creek which flows to Lake Ontario and through to the Bronte Creek Provincial Park in Oakville.

These bridge overpasses are located on the following roadways:

- Dundas Street south of Tremaine Road
- Highway 407 northeast of Appleby Line
- Appleby Line northwest of Highway 407
- Side Road 2 south of Appleby Line
- Side Road 4 south of Appleby Line
- Britannia Road north of Walkers Line
- Walkers Line northwest of Britannia Road
- Guelph Line north of Britannia Road
- Cedar Springs Road north of Britannia Road

Other examples include bridges over major highways and railway tracks. If one of these bridges were to be out of service it could impact network connectivity within the City.

The Hamilton Harbour James N. Allan Skyway (commonly known as the Burlington Skyway) is a bridge that spans the Hamilton Harbour in the southwestern section of Lake Ontario connecting the QEW in the City of Hamilton's north end to Highway 403 in Burlington. The Skyway Bridge is discussed further in **Section 4.1 – Critical Infrastructure in Burlington**. A 2014 incident involving a dump truck resulted in the bridge being closed for four days, causing significant traffic delays and other concerns.

Through consultation with the BFD, it was identified that there are existing load restrictions to private residences located in the Cedar Springs area as well as in the 6200 block of Guelph Line. BFD pre-fire plans for these properties include use of a reverse lay, which requires water supply to be pumped to the address as the bridge would not support the weight of an apparatus loaded with water.

Key Finding: Bridges, with restrictions or closures, have the potential to reduce the connectivity of the City's road network resulting in the potential for delays in emergency response times.

2.2.3 Rail

Rail lines are considered in this CRA for a few key reasons related to emergency services: firstly, the potential for a rail-based transport incident is a major consideration as a derailment or accident involving the goods being transported (hazardous materials) could occur, requiring hazardous materials response; and secondly, the physical barrier created by the rail infrastructure itself, such as a rail yard or the placement of rail infrastructure within and throughout a municipality can slow down emergency travel and overall response times.

The City of Burlington has two prominent rail lines; one located south of Highway 403/QEW and the other, branches off of the east west line up through the northeastern corridor of the City. The Canadian National Railway Company (C.N.) operates switching and shunting facilities out of Aldershot Station on the C.N. Oakville Subdivision. C.N.'s main rail line runs east/west between Toronto and Hamilton, feeding into the C.N. Grimsby Subdivision to the east, and C.N. Dundas Subdivision to the west.

Passenger Rail service is provided by VIA Rail Canada and Go Transit on the rail line south of Highway 403. Passengers can connect via three stations, namely: Aldershot Station, Burlington Station, and Appleby Station.

Part of the City's commitment to adopting a new level of transit service includes establishing Major Transit Station Areas (MTSA) around the City's three existing GO Stations. According to the City's website, these transit-oriented hubs offer multiple transportation options to mixed use concentration points for transit, employment, housing and recreation. The MTSA Area-Specific Planning Project process is currently being re-initiated by the City but the areas are expected to include a variety of building

types, from low density to high density in order to meet overall density targets and to include a variety of transportation options.[8] These components may contribute to a change in risk profile and to an increased risk in these areas due to population and high-rise development, which could impact the demand for specific emergency services.

Where possible, the City's Major Transit Station Area planning processes should include the Burlington Fire Department as a stakeholder to provide consideration to emergency services demands and changes in service levels. In addition, Station 3 is currently located within the Aldershot GO MTSA and Station 4 is currently located within the Appleby GO MTSA as identified by the Halton Region Official Plan Amendment 48. Station 1 is adjacent to the Burlington GO MTSA This will be explored further within the Fire Master Plan.

At-grade rail crossings (an intersection at which a road crosses a rail line at the same level) can create delays in emergency response by inhibiting emergency response vehicles and apparatus from accessing a road. Desktop research indicates there are three at-grade rail crossings within City boundaries:

- Mainway Drive, north of the Q.E.W
- No.1 Side Road, north of Highway 407
- Burloak Drive, west of Appleby Line

Most of the rail crossings throughout the City are grade separated and do not have an impact on emergency response travel times.

Key Finding: Grade level rail crossings could create a physical barrier to the connectivity of the City's road network that can potentially result in delays in emergency response times.

[8] City of Burlington https://www.burlington.ca/en/services-for-you/burlington-go-mobility-hub-study.asp Accessed July 29, 2021

2.3 Waterways and Conservation Areas

2.3.1 Waterways

The City of Burlington is located on the western side of Lake Ontario with a shoreline that supports residential dwellings, golf courses, boating clubs, marinas, and popular parks including Spencer Smith Park, and Paletta Lakefront Park.

The Halton Conservation Authority (H.V.C.A.) is responsible for the Bronte Creek, extending into northern Burlington. Waterways are important from a risk perspective, in part, due to the recreational activities that take place in these settings and the natural hazards that they present, which could require specialized technical rescue emergency responses. There may also be natural hazards, such as flooding, associated with waterways.

The City of Burlington recognizes the negative impacts flooding and water-related incidents can have on the City. After a major flooding event in 2014, the City of Burlington completed various studies to analyze previous storms and the impacts they have on Burlington's stormwater management system.

The findings from these studies led Burlington City Council to approve an additional $20.4 million in funds to upgrade existing stormwater infrastructure.[9]

Identified Risk: The presence of waterways within the City of Burlington creates a potential need for specialized technical ice and water rescue services.

2.3.1.1 Marinas

Marinas present unique and complex fire safety risks and challenges to any fire department. Fires can result from the malfunction of electrical devices on board or due to incidents occurring during the dispensing of fuel where marinas offer on-site fueling. Some marinas may allow boat owners and passengers to occupy their vessel overnight which can present additional life safety risks for occupants. NFPA 303 Standard for Marinas and Boatyards includes a number of important topics related to creating a safe

[9] Flood Recovery, City of Burlington, (n.d.), https://www.burlington.ca/en/services-for-you/Flood-Recovery.asp

marine environment and is intended to provide a minimum level of safety from fire as well as electrical safety at marinas and boatyards.

LaSalle Park Community Marina is the City's only marina. The Marina has 219 docking spaces and is protected by a floating wave break, which was completed in spring of 2020. The Burlington Sailing and Boating Club, and multiple other sailing schools operate out of the LaSalle Marina, contributing to an increase in the number of recreational vessels on the Lake. The closest diesel fueling station is located at the Hamilton Harbour Commission Dock across the Hamilton Harbour, in Hamilton.

2.3.2 Conservation Areas

There is one conservation area within the City. The Mount Nemo Conservation Area is owned and operated by Conservation Halton. Mount Nemo is an example of several cliff ecosystems that comprise Ontario's Niagara escarpment making it a popular destination for rock climbing and hiking. Due to the area's natural setting and elevation, there is potential for injury as a result of the activities taking place along the cliffs. There have been several incidents in recent years requiring high angle rope rescue from the Burlington Fire Department.

The Royal Botanical Gardens are located on the border of Burlington and Hamilton. The Gardens have been designated as a National Heritage Site, consisting of a large natural area with water features and trails throughout. This site does have its own Emergency Response Plan policy intended to ensure that all RBG employees and volunteers understand their roles and responsibilities in the event of an emergency. This area has the potential for emergency incidents requiring specialized rescue services.

Identified Risk: Mount Nemo Conservation Area presents a risk associated with residents and visitors participating in activities that may require specialized rescue services.

2.4 Wildland-Urban Interface

NFPA 1730 - Standard on Organization and Deployment of Fire Prevention Inspection and Code Enforcement, Plan Review, Investigation, and Public Education Operations (2019 Edition) identifies wildland-urban interface as geography-based risk for consideration. This interface refers to the area of transition between unoccupied land

and human development. This transition area can be comprised of a mix of woodlots, bush or grass.

There are residential neighbourhoods in Burlington located adjacent to wildland areas, primarily in the rural area of the City.

Based on review of fire loss data for the City for the period of January 1, 2015 to December 31, 2019, there were 41 outdoor fires. There does not appear to be a high risk of wildfire in the City of Burlington.

3.0 Building Stock Profile

As referenced in **O. Reg. 378/18**, the building stock profile assessment includes analysis of the types and uses of the building stock within the municipality. Important considerations include the number of buildings of each type, the number of buildings of each use and any building-related risks known to the fire service. There are potential fire risks associated with different types or uses of buildings given the presence or absence of fire safety systems and equipment at the time of construction and maintenance thereafter. This section considers these building characteristics within the City of Burlington.

3.1 Ontario Building Code Occupancy Classifications

OFMEM TG-02-2019 encourages fire departments to consider the potential fire related risks associated with different building occupancy types and building uses. This includes consideration of each occupancy classification's prevalence within a community and the presence of fire and life safety systems and equipment. The Ontario Building Code (OBC) categorizes buildings by major occupancy classification. Utilizing the OBC major building occupancy classifications is consistent with the intent of TG-02-2019 to provide a recognized definition and baseline for developing a community risk assessment.

The OBC is divided into six major building occupancy classifications (groups). Within each group the occupancies are further defined by division. The OBC major classification groups and divisions are presented in **Table 1**.

Table 1: OBC Major Occupancy Classifications

Group	Division	Description of Major Occupancies
Group A	1	Assembly occupancies intended for the production and viewing of the performing arts
Group A	2	Assembly occupancies not elsewhere classified in Group A
Group A	3	Assembly occupancies of the arena type
Group A	4	Assembly occupancies in which occupants are gathered in the open air
Group B	1	Detention occupancies
Group B	2	Care and treatment occupancies
Group B	3	Care occupancies
Group C	All divisions	Residential occupancies
Group D	All divisions	Business and personal services occupancies
Group E	All divisions	Mercantile occupancies
Group F	1	High-hazard industrial occupancies
Group F	2	Medium-hazard industrial occupancies
Group F	3	Low-hazard industrial occupancies

Source: Ontario Building Code[10]

3.2 OFMEM Fire Risk Sub-Model Occupancy Classifications

The Fire Risk Sub-model developed by the OFMEM utilizes the major group classifications (i.e. Group A, B, C, D, E, F), but does not use the detailed division classifications as included in the OBC This strategy provides the ability to assess buildings within a community comparatively by major occupancy groups, thus providing a consistent and recognized definition for each major occupancy type. This strategy

[10] Ontario Regulation 332/12: Building Code, Part III Fire Protection, Occupant Safety and Accessibility, Section 3.1.2.1.

provides the opportunity for further analysis of a specific occupancy group. Subject to any site specific hazards or concerns, occupancies within this group can be assessed individually and then included where required within the scope of the broader Community Risk Assessment. The OFMEM Fire Risk Sub-Model OBC classifications, definitions and associated fire related risks are presented in **Table 2** along with potential proactive measures to reduce risk within these occupancy types.

Table 2: OFMEM Fire Risk Sub-Model Major Building Classifications

OBC Occupancy Classification	OFMEM: Fire Risk Sub-Model Major Building Classifications	OFMEM Definitions	OFMEM Fire Related Risks	Proactive Measures for Reducing Risk
Group A	Assembly Occupancies	An assembly occupancy is defined as one that is used by a gathering of persons for civic, political, travel, religious, social, educational, recreational or like purposes or for the consumption of food or drink.	Assembly buildings are often occupied by a large number of people and may contain high quantities of combustible furnishings and decorations. Occupants are generally unfamiliar with the building's exit locations and may not know how to react in the event of an emergency. Low light conditions are inherent to some of these occupancies and can contribute to occupant confusion during an evacuation. Numerous examples exist of disastrous events that have occurred throughout the world, resulting in multiple fire fatalities in these occupancies. Therefore, these facilities warrant special attention. Accordingly, it is paramount to ensure that maximum occupant load limits are not exceeded, detection is available, an approved fire safety plan is in place and adequate unobstructed exits/means of egress are readily available.	• Regular fire prevention inspection cycles • Automatic fire detection and monitoring systems • Approved fire safety plan and staff training • Pre-planning by fire suppression staff
Group B	Care or Detention Occupancies	A care or detention occupancy means the occupancy or use of a building or part thereof by persons who: Are dependent on others to release security devices to permit egress; Receive special care and treatment; or Receive supervisory care.	In addition to the presence of vulnerable occupants, these occupancies may contain quantities of various flammable/combustible liquids and gases, oxidizers and combustible furnishings that will impact the intensity of the fire if one should occur. The evacuation or relocation of patients, residents or inmates to an area of refuge during an emergency poses additional challenges in these facilities. It is essential to ensure that properly trained staff is available and prepared to quickly respond according to the facility's approved fire safety plan.	• Regular fire prevention inspection cycles • Automatic fire detection and monitoring systems • Approved Fire Safety Plan and staff training • Pre-planning by fire suppression staff

OBC Occupancy Classification	OFMEM: Fire Risk Sub-Model Major Building Classifications	OFMEM Definitions	OFMEM Fire Related Risks	Proactive Measures for Reducing Risk
Group C	Residential Occupancies	A residential occupancy is defined as one that is used by persons for whom sleeping accommodation is provided but who are not harboured or detained to receive medical care or treatment or are not involuntarily detained.	In Ontario, residential occupancies account for 70% of all structural fires and 90% of all fire deaths. Residential units that are located in multi-unit buildings, including secondary units in a house, pose additional risks due to egress and firefighting accessibility challenges.	• Home smoke alarm programs • Public education programming including home escape planning • Retro-fit and compliance inspection cycles for OFC compliance • Pre-planning by fire suppression staff • Fire Drills as required by the OFC
Group D	Business & Personal Services	A business and personal services occupancy is defined as one that is used for the transaction of business or the rendering or receiving of professional or personal services.	Many office buildings are occupied by a large number of people during business hours and contain high combustible content in the form of furnishings, paper, books, computers and other office equipment/supplies. Those that are located in a high-rise building pose additional risks due to egress and firefighting challenges.	• Regular fire prevention inspection cycles to maintain OFC compliance • Staff training in fire prevention and evacuation procedures • Public education programs • Pre-planning by fire suppression staff
Group E	Mercantile	A mercantile occupancy is defined as one that is used for the displaying or selling of retail goods, wares or merchandise.	Larger mercantile occupancies such as department stores are generally occupied by a large number of people and contain high quantities of combustibles in the form of merchandise, furnishings and decorations. Customers may be unfamiliar with the building's exit locations and not know how to react in the event of an emergency. Additional hazards will be present in "big box" type stores that sell and store large volumes of combustible materials in bulk. These stores generally have similar properties to industrial warehouses with the additional hazard of higher number of occupants.	• Regular fire prevention inspection cycles • Automatic fire detection and monitoring systems • Approved Fire Safety Plan and staff training • Pre-planning by fire suppression staff

OBC Occupancy Classification	OFMEM: Fire Risk Sub-Model Major Building Classifications	OFMEM Definitions	OFMEM Fire Related Risks	Proactive Measures for Reducing Risk
Group F	High/Medium/Low Hazard Industrial	An industrial occupancy is defined as one for the assembling, fabricating, manufacturing, processing, repairing or storing of goods and materials. This category is divided into low hazard (F3), medium hazard (F2) and high hazard (F1) based on its combustible content and the potential for rapid fire growth.	These occupancies constitute a special fire hazard due to high levels of combustible, flammable or explosive content and the possible presence of oxidizing chemicals and gases. Processing and other activities that involve various ignition sources often occur in these occupancies. The lack of security during non-operational hours also makes them susceptible to incendiary type fires. Industrial fires generally involve large quantities of combustible materials and potentially result in large financial losses (e.g. building, contents) and significant damage to the community's environment and economic well-being (e.g. loss of jobs).	• Regular fire prevention inspection cycles • Staff training in fire prevention and evacuation • Public education • Pre-planning by fire suppression staff • Installation of early detection systems (e.g., fire alarm systems, heat detectors) • Installation of automatic sprinkler systems • Approved Fire Safety Plans • Fire extinguisher training

Source: OFMEM Fire Risk Sub-Model[11]

[11] Office of the Fire Marshall and Emergency Management. (2016, February). Comprehensive Fire Safety Effectiveness Model: Fire Risk Sub-Model. Retrieved from Ministry of the Solicitor General Website

3.2.1 City of Burlington Existing Major Building Classification Summary

Analysis of the City of Burlington's existing major building occupancy types was conducted through a review of the Municipal Property Assessment Corporation (MPAC) property data, as provided by the City of Burlington. **Table 3** summarizes the City's existing major building occupancy classifications.

As presented in **Table 3**, the majority of the City's existing property stock is comprised of Group C - Residential Occupancies (93.53%) representing 62,438 residential property parcels. The second largest occupancy type within the City is Group F –Industrial Occupancies (combined Low, Medium and High Hazard) accounting for 1.73% of the City's property stock. There are a small number of Group A – Assembly Occupancies (243), Group E – Mercantile (351), Group D – Business (228), Group E/D (391) and Group C/E/D (45) property parcels.

There are also ten parcels that are classified as farms under the National Farm Building code and 1,842 that are vacant or open space.

There are 49 Group B – Care or Detention Occupancies in the City of Burlington based on property parcel data. It should be noted that some Vulnerable Occupancies (VOs) are considered Group C - Residential Occupancies according to MPAC data. In addition, not all registered City of Burlington VOs are Group B - Care or Detention Occupancies. Registered vulnerable occupancies are discussed further in **Section 3.2.1 – Vulnerable Occupancies.**

There are nine properties that are classified as Group C/D/E/F mixed use. Additional analysis indicates that these are farm properties that include a home and a commercial enterprise.

Table 3: City of Burlington Existing Property Stock

OBC Occupancy Classification	OFMEM Fire Risk Sub-Model Major Building Classifications	Number of Occupancies	Percentage of Occupancies
Group A	Assembly Occupancies	243	0.36%
Group B	Care or Detention Occupancies	49	0.07%
Group C	Residential Occupancies	62,438	93.53%
Group D	Business	228	0.34%
Group E	Mercantile	351	0.53%
Group F Division 3	Low-Hazard Industrial	93	0.14%
Group F Division 2	Medium-Hazard Industrial	1,059	1.59%
Group F Division 1	High-Hazard Industrial	1	0.001%
Group F (all Divisions combined)	Industrial Occupancies	1,153	1.73%
Group C/D/E/F	Mixed Use C/D/E/F	9	0.01%
Group C/E/D	Mixed Use C/E/D	45	0.07%
Group E/D	Mixed Use E/D	391	0.59%
Farm	Classed under National Farm Building Code	10	0.01%
Open Space/Vacant	Vacant	1,842	2.76%
Total Occupancy Classification	Total Building Classifications	66,759	100.00%

Source: City of Burlington, Municipal Property Assessment Corporation Data

Group C - Residential Occupancies represent the most prominent type of building occupancy type within the City of Burlington, which is consistent with most municipalities across Canada. Within Ontario, information provided by the OFMEM (as described in **Section 10.0** – **Past Loss and Event History Profile**) indicates that the majority of structure fires over the five year period from January 1, 2015 to December 31, 2019, occurred within Group C - Residential Occupancies (72.24%).

Identified Risk: Group C - Residential Occupancies represent 93.53% of the City's existing property stock, and over the five year period from January 1, 2015 to December 31, 2019 were associated with 72.24% of the structure fires within the City.

Table 4 illustrates a comparison of the City's existing Group C - Residential building stock with that of the Province based on the 2016 Statistics Canada Census.

Table 4: Group C - Residential Building Stock Comparison

Structural Dwelling Type	Burlington Total Number of Dwellings	Burlington Total Percentage of Dwellings	Ontario Total Number of Dwellings	Ontario Total Percentage of Dwellings
Single-detached house	36,745	51.49%	2,807,380	54.31%
Apartment in a building that has five or more storeys	11,570	16.21%	886,705	17.15%
Movable dwelling	60	0.08%	14,890	0.29%
Other attached dwellings[12]	22,995	32.22%	1,460,200	28.25%
Semi-detached house	3,110	4.36%	289,975	5.61%
Row house	13,310	18.65%	460,425	8.91%
Apartment or flat in a duplex	780	1.09%	176,080	3.41%
Apartment in a building that has fewer than five storeys	5,690	7.97%	522,810	10.11%
Other single-attached house	105	0.15%	10,910	0.21%
Total	**71,370**	**100.00%**	**5,169,175**	**100.00%**

[12] The category 'Other attached-dwelling' is a subtotal of the following categories: semi-detached house, row house, apartment or flat in a duplex, apartment in a building that has fewer than five storeys and other single-attached house.

Table Source: 2016 Census, Statistics Canada[13]

This analysis highlights that the existing residential building stock within the City is similar to that of the Province overall. The City has a lower percentage of single detached – houses of 51.49% compared to the Province of 54.31%.

The City also has a lower number of apartments in buildings of five storeys or more of 16.21% compared to the Province of 17.15%.

The City has a higher percentage of other attached dwellings of 32.22% compared to that of the Province of 28.25%. Within the other attached dwellings category, 18.65% of the City's building stock is comprised of row housing, this is 9.74% higher than the Province (where 8.91% of provincial building stock is row housing). Refer to **Section 3.0 – Building Density and Exposure** for more information.

3.3 Building Density and Exposure

NFPA 1730 - Standard on Organization and Deployment of Fire Prevention Inspection and Code Enforcement, Plan Review, Investigation, and Public Education Operations (2019 Edition) lists building density as a key factor for understanding potential fire risk with particular consideration given to core areas (downtown). Closely spaced buildings, typical of historic downtown core areas and newer infill construction, may have a higher risk of a fire spreading to an adjacent exposed building. In a built up area with minimal building setbacks, a fire originating in one building could extend to a neighbouring structure due to the close proximity.

The close proximity of buildings can also impede firefighting operations due to the limited access for firefighters and equipment.

As shown in **Table 4**, the City has a higher percentage of other attached dwellings of 32.22% compared to that of the Province of 28.25%. The table also shows that 18.65%

[13] Statistics Canada. 2017. Burlington, CY [Census subdivision], Ontario and Ontario [Province] (table). Census Profile. 2016 Census. Statistics Canada Catalogue no. 98-316-X2016001. Ottawa. Released November 29, 2017.
Statistics Canada Website, 2016 Census (accessed November 26, 2019)

of the City's building stock is comprised of row housing, this is 9.74% higher than the Province (where 8.91% of provincial building stock is row housing).

The City has a number of existing areas where the presence of building density and potential exposure as a result of minimal setbacks should be highlighted.

These include the downtown core that contains mixed use occupancies, including some Group C- Residential and commercial uses. These areas may be further impacted by infill construction and intensification. Existing residential areas that include other attached dwellings such as townhouses, row houses and apartments with less than five storeys should be highlighted for potential exposure risks.

Key Finding: The City includes areas of building stock that have higher density and, as such, greater potential for exposure in the event of a fire. Statistics Canada 2016 census data indicates that 18.65% of the City's building stock is comprised of row housing, this is 9.74% higher than the Province (where 8.91% of provincial building stock is row housing).

3.4 Building Age and Construction

The OBC was adopted in 1975, and the Ontario Fire Code (OFC) was adopted in 1981. Together, these two codes have provided the foundation for eliminating many of the inconsistencies in building construction and maintenance that were present before adoption.

The OBC and the OFC were developed to ensure that uniform building construction and maintenance standards are applied for all new building construction. The codes also provide for specific fire and life safety measures depending on the use of the building.

Examples of the fire and life safety issues that are addressed include:

- Occupancy
- exits/means of egress including signs and lighting
- fire alarm and detection equipment
- fire department access
- inspection, testing, and maintenance

In many situations the age and construction of a building can be directly associated with whether the building was constructed prior to, or after the introduction of these codes. For example, during the late 19th century and early 20th century, balloon frame construction was a common wood framing technique that was used in both residential and small commercial construction.

This technique allowed for exterior walls to be continuous from the main floor to the roof in some cases extending multiple stories through a building. The result was the potential for fire and smoke to spread unobstructed from the basement to the roof of a building. In many cases, the result was a fire that started in the basement spreading to the roof very quickly and without the knowledge of building occupants or fire service personnel. The OBC implemented requirements to change this construction method and introduce additional requirements to mitigate the potential of fire spread through wall cavities.

Similarly, the new codes have recognized new construction techniques such as light weight wood frame construction. This includes the use of wood trusses to replace conventional wood frame roofing techniques and new construction materials including Laminated Veneer Lumber (LVL) that is a high strength engineered wood product now used commonly in residential and commercial buildings. Although these techniques and materials have enhanced the efficiency and cost of construction, this construction presents very different challenges to firefighters from those of historical construction methods. For example, the light weight wood frame construction used in an engineered wood truss roof system relies on all of the structural components to work together. In the event one of the components fails due to exposure to high heat or fire, the result is the potential for the entire roof system to fail.

In addition to building construction, fire growth rate depends on the flammability of the materials and contents within the building which introduces variances into the growth rates presented above.

The impact of increasing fire growth rates is directly related to the time lapse from ignition to flashover when the combustible items within a given space reach a temperature that is sufficiently high for them to auto-ignite.

Listed in **Table 5**, are fire growth rates measured by the time it takes for a fire to reach a one megawatt (M.W.) fire. Fire growth rate depends on the flammability of the

materials and contents within the building which introduces variances into the growth rates presented below.

Table 5: Time to Reach 1 M.W. Fire Growth Rates in the Absence of Fire Suppression

Fire Growth Rate	Time in Seconds to Reach 1 M.W.	Time in Seconds to Reach 2 M.W.
Slow	600 seconds	848 seconds
Medium	300 seconds	424 seconds
Fast	150 seconds	212 seconds

Source: O.F.M.E.M, Operational Planning: An Official Guide to Matching Resource Deployment and Risk Workbook.[14]

In addition to building construction, fire growth rate depends on the flammability of the materials and contents within the building which introduces variances into the growth rates presented above. The impact of increasing fire growth rates is directly related to the time lapse from ignition to flashover when the combustible items within a given space reach a temperature that is sufficient high for them to auto-ignite. The graph in **Figure 4** (below) highlights the exponential increase in fire temperature and the potential for loss of property/loss of life with the progression of time.

[14] Office of the Fire Marshal and Emergency Management. (2017, May). Operational Planning: An Official Guide to Matching Resource Deployment and Risk Workbook. Retrieved from http://www.mcscs.jus.gov.on.ca/english/FireMarshal/FireServiceResources/PublicFireSafetyGuidelines/04-08-10at1.html

Figure 4: Fire Propagation Curve

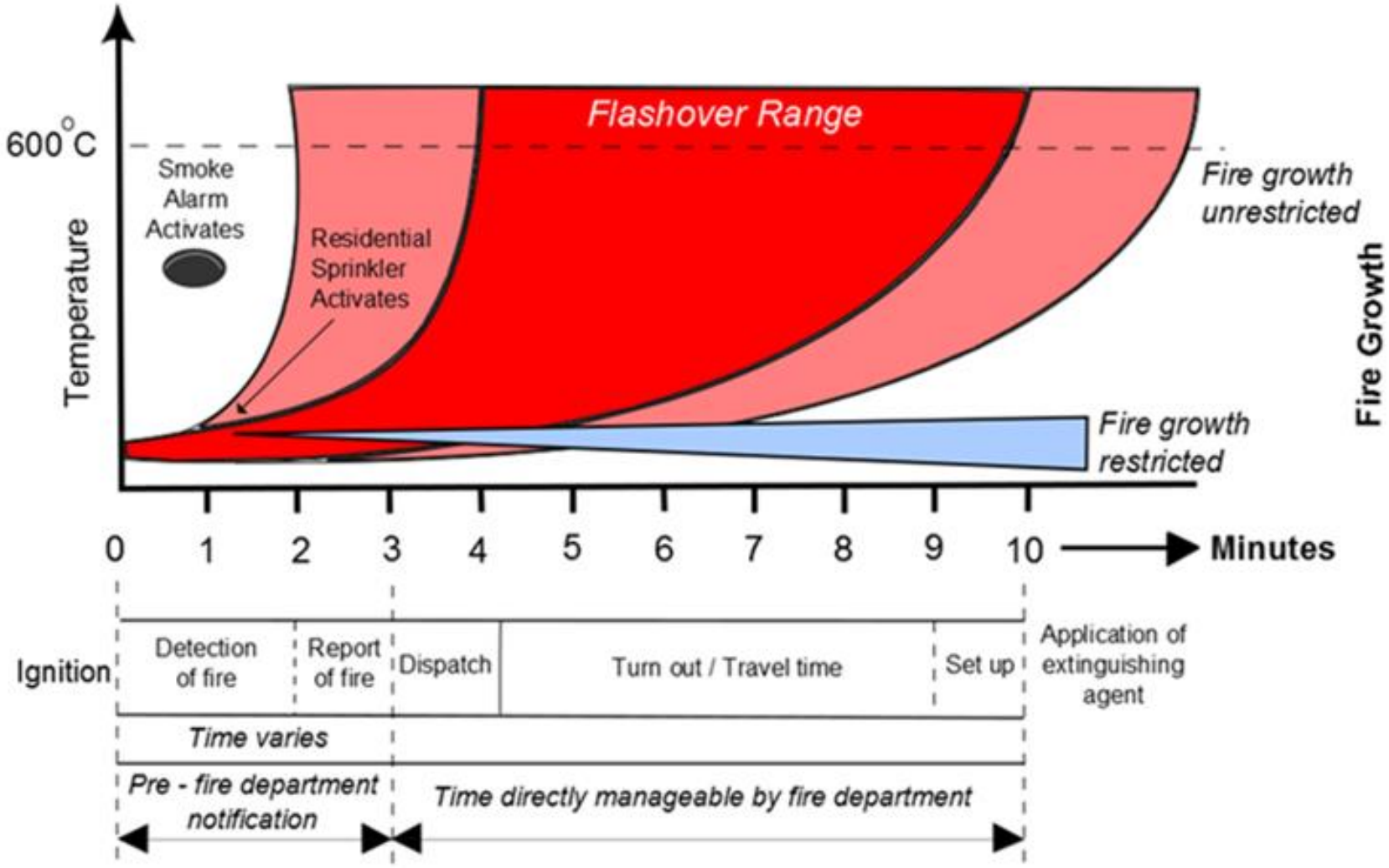


Figure Source: Fire Underwriters Survey "Alternative Water Supplies for Public Fire Protection: An informative Reference Guide for Use in Fire Insurance Grading" (May 2009) and NFPA "Fire Protection Handbook" (2001)

Understanding building construction and building materials is a critical component for firefighters in determining the appropriate type of fire attack and safety measures that need to be in place. As such, having knowledge of the age of a building may be directly related to the type of construction methods and materials used to build it, making building age and construction an essential component of this Community Risk Assessment.

Table 6 and **Figure 5** illustrate the age of residential buildings (2016 Census Data) within the City prior to the new codes. This analysis indicates that 49.51% of the City's residential building stock was built prior to 1981, preceding the adoption of the 1981 Ontario Fire Code. This represents a fire risk within the community.

Table 6: Period of Construction of Residential Dwellings – Burlington and Ontario

Period of Construction	Burlington Total Number of Dwellings	Burlington Total Percentage of Dwellings
Prior to 1960	10,805	15.14%
1961 to 1980	24,530	34.37%
1981 to 1990	9,755	13.67%
1991 to 2000	10,020	14.04%
2001 to 2005	6,995	9.80%
2006 to 2010	5,560	7.79%
2011 to 2016	3,700	5.18%
Total	**71,375**	**100.00%**

Source: 2016 Census, Statistics Canada[15]

[15] Statistics Canada. 2017. Burlington, CY [Census subdivision], Ontario and Ontario [Province] (table). Census Profile. 2016 Census. Statistics Canada Catalogue no. 98-316-X2016001. Ottawa. Released November 29, 2017. https://www12.statcan.gc.ca/census-recensement/2016/dp-pd/prof/index.cfm?Lang=E (accessed November 26, 2019)

Figure 5: Period of Construction of Residential Dwellings – Burlington

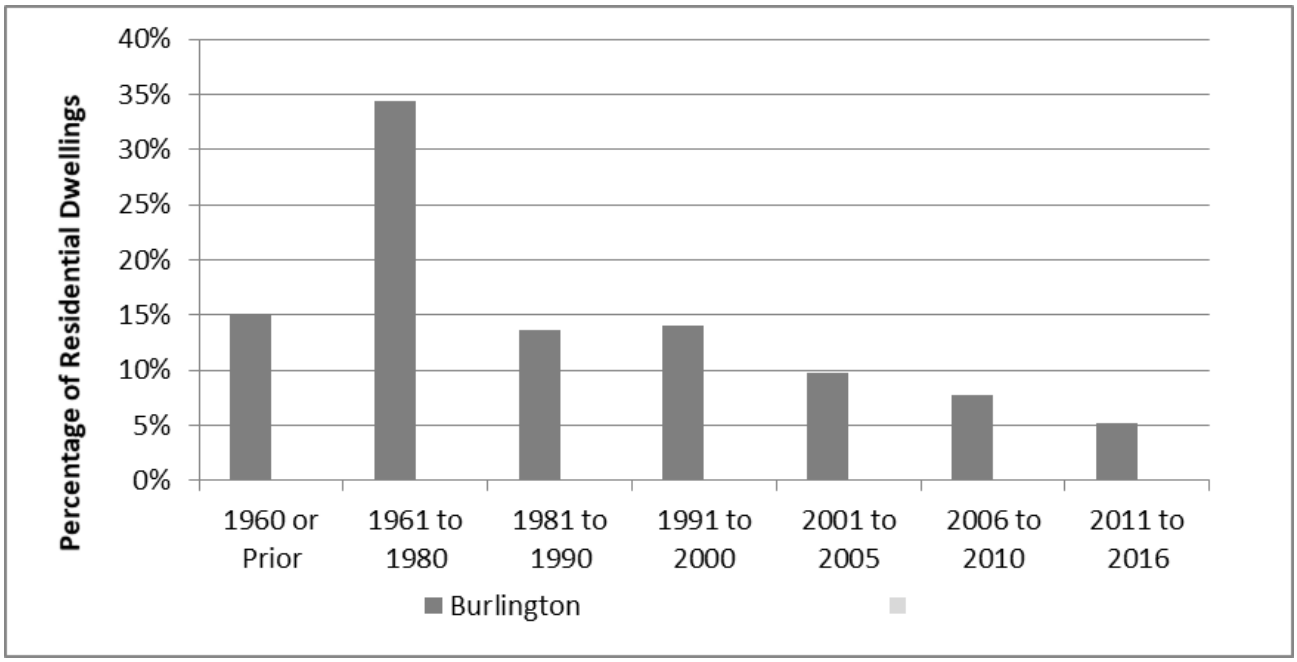


Figure Source: 2016, Census, Statistics Canada[16]

Identified Risk: The 2016 Census data indicates that 49.51% of the City's Group C-Residential building stock was built prior to the introduction of the 1981 Ontario Fire Code.

3.5 Building Height and Area

Buildings that are taller in height, or contain a large amount of square footage (building footprint) can have a greater fire loss risk and life safety concern. One of the unique characteristics and risks of tall / multi-storey buildings is known as the "stack effect". This is characterized as vertical air movement occurring throughout the building, caused by air flowing into and out of the building, typically through open doors and windows. The resulting buoyancy caused by the differences between the indoor/outdoor temperature and elevation differences causes smoke and heat to rise within the building.

[16] Ibid.

This can have a dramatic effect on smoke permeation throughout the common areas and individual units within the building.

This can be directly related to the high percentage of deaths that occur in high-rise buildings as a result of smoke inhalation. The nature of taller buildings also brings the presence of higher occupant loads and higher fuel loads due to the quantity of furnishings and building materials.

Efficient evacuation can also be a challenging process due to a lack of direction, signage, knowledge, or familiarity of the occupants which may result in overcrowding of stairways and exit routes.

Ensuring all required fire and life safety systems are in place and functioning is a priority for these occupancies. Taller buildings can experience extended rescue / fire suppression response times for firefighters to ascend to the upper levels. This is commonly referred to as "vertical response" representing the time it takes for firefighters to gain entry into the building and ascent to the upper floors by the stairwells. Options such as "shelter-in-place" whereby occupants are directed by the fire department to stay within their units can be an effective life safety strategy. However, ensuring internal building communications systems are in place and functioning is critical to the success of this strategy. Targeted public education campaigns addressing strategies like shelter-in-place are also critical to educating building occupants.

Building area can cause comparable challenges as those present in taller buildings. Horizontal travel distances rather than vertical can mean extended response times by firefighters attempting rescue or fire suppression activities in buildings with a very large footprint.

3.5.1 Building Height

3.5.1.1 Defining High-Rise Buildings

It is important to note that there are a variety of metrics associated with the terms "high rise", "tall buildings" and "high buildings." Some key definitions are outlined in **Table 7**.

Table 7: Summary of High-Rise Building Height Metrics

Source	Simplified Definition
Ontario Building Code/Ontario Fire Code	A building with its floor level 18 metres (59 feet) above grade, or 6 storeys
NFPA 1710: Standard for the Organization and Deployment of Fire Suppression Operations	Building height greater than 75 feet (23 metres), or 7 storeys
Statistics Canada*	Buildings with 5 or more storeys

*Statistic Canada's references to building height are not focused on a strict definition of building height consideration but to provide insight as to the overall built form of housing within a community.

The variance in these definitions is directly related to the different applications required by these organizations. For example, the OBC has detailed considerations to define a high-rise building based on the occupancy classification, floor area and occupant load. Within all occupancy classifications, additional OBC requirements apply when a building is or exceeds 18 meters in height.

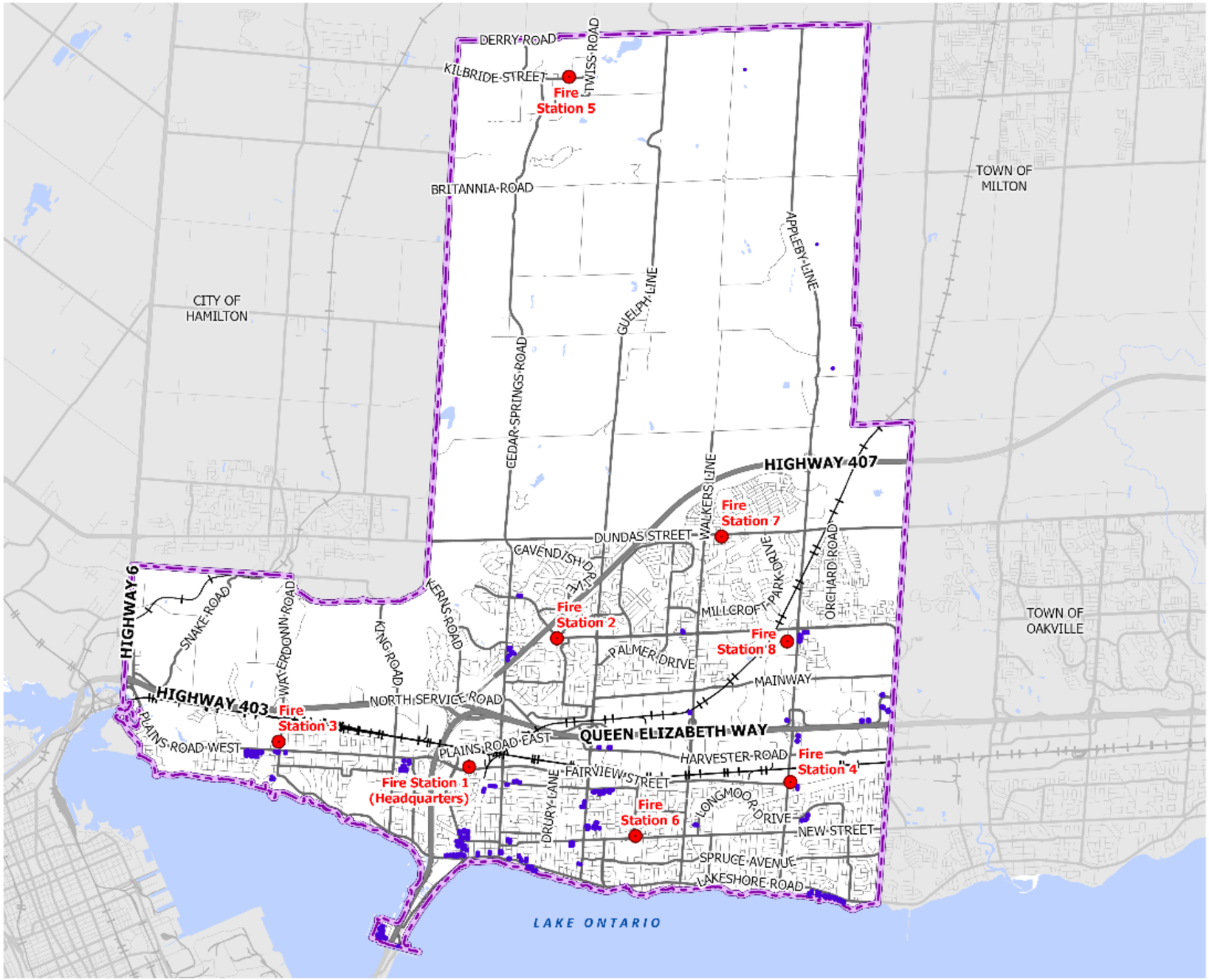
Within the data collection process to prepare this CRA the application of these different definitions was confirmed by the BFD. The BFD utilizes the definition of the Ontario Building Code / Ontario Fire Code to define high-rise buildings.

For the purposes of developing this CRA, the OBC /OFC definition has been used to analyze building height within the City.

3.5.1.2 Mapping Building Height

As part of the data provided for this CRA, the City provided building height data from which buildings with a height greater than 18 metres were identified, reflecting a high-rise occupancy as per Section 3.2.6 of the OBC. For the purposes of this analysis, it has been assumed that buildings under 18 metres (roughly five storeys or less) are not considered high-rise. Buildings identified with a height at or in excess of 18 metres are illustrated in **Figure 6**.

Figure 6: Building Height



CITY OF BURLINGTON

BUILDING HEIGHTS

- Fire Station
- Identified High-Rise Occupancy

Base Data

- City of Burlington Boundary
- Railway
- Expressway / Highway / Freeway
- Collector / Arterial Road
- Local Road / Ramp
- Waterbody

Note: Identified high-rise occupancies were classified as buildings with a height equal to or greater than 18m.

1:75,000

0 0.75 1.5 3 km

MAP DRAWING INFORMATION:
BASE DATA PROVIDED BY MNRF, CITY OF BURLINGTON

MAP CREATED BY: LK
MAP CHECKED BY: CB/AN
MAP PROJECTION: NAD 1983 UTM Zone 17N

DILLON CONSULTING

PROJECT: 19981
STATUS: DRAFT
DATE: 2021-07-19

In total, 105 buildings as defined by the OBC were identified as high-rise buildings. As shown, the buildings identified as high-rise are distributed throughout the urban area of the City, primarily south of Highway 403 and Highway 407. There is a notable cluster of high-rise buildings located near the lakeshore area east of the Skyway Bridge.

Identified Risk: The City currently has 105 buildings defined by the OBC as high-rise buildings with a floor level 18 metres (59 feet) above grade, or 6 storeys. These buildings are distributed throughout the urban area.

3.5.2 Building Area

Building area can cause comparable challenges as those present in taller buildings. Horizontal travel distances rather than vertical can mean extended response times by firefighters attempting rescue or fire suppression activities. Large buildings, such as industrial plants and warehouses, department stores, and big box stores, can also contain large volumes of combustible materials. In many of these occupancies the use of high rack storage is also present. Fires within this type of storage system can be difficult to access and may cause additional risk to firefighter safety, due to collapse-related risks.

As part of the data collection process, City staff were able to provide building footprint data for the City of Burlington. The information presented in **Table 8** indicates that the majority of building stock (81.7 %) has a total building area (footprint) of 2,500 square feet or less. This summary also indicates that 0.5% (225) buildings have an area greater than 50,000 square feet or approximately 4,655 square metres.

Table 8: Building Area

Building Size (Square Feet)	# of Buildings	% of all Buildings
0-2,500	40,294	81.7%
2,500-5,000	5,681	11.5%
5,000-10,000	2,094	4.2%
10,000-20,000	595	1.2%
20,000-50,000	444	0.9%
>50,000	225	0.5%
Total	**49,333**	**100.0%**

Source: City of Burlington

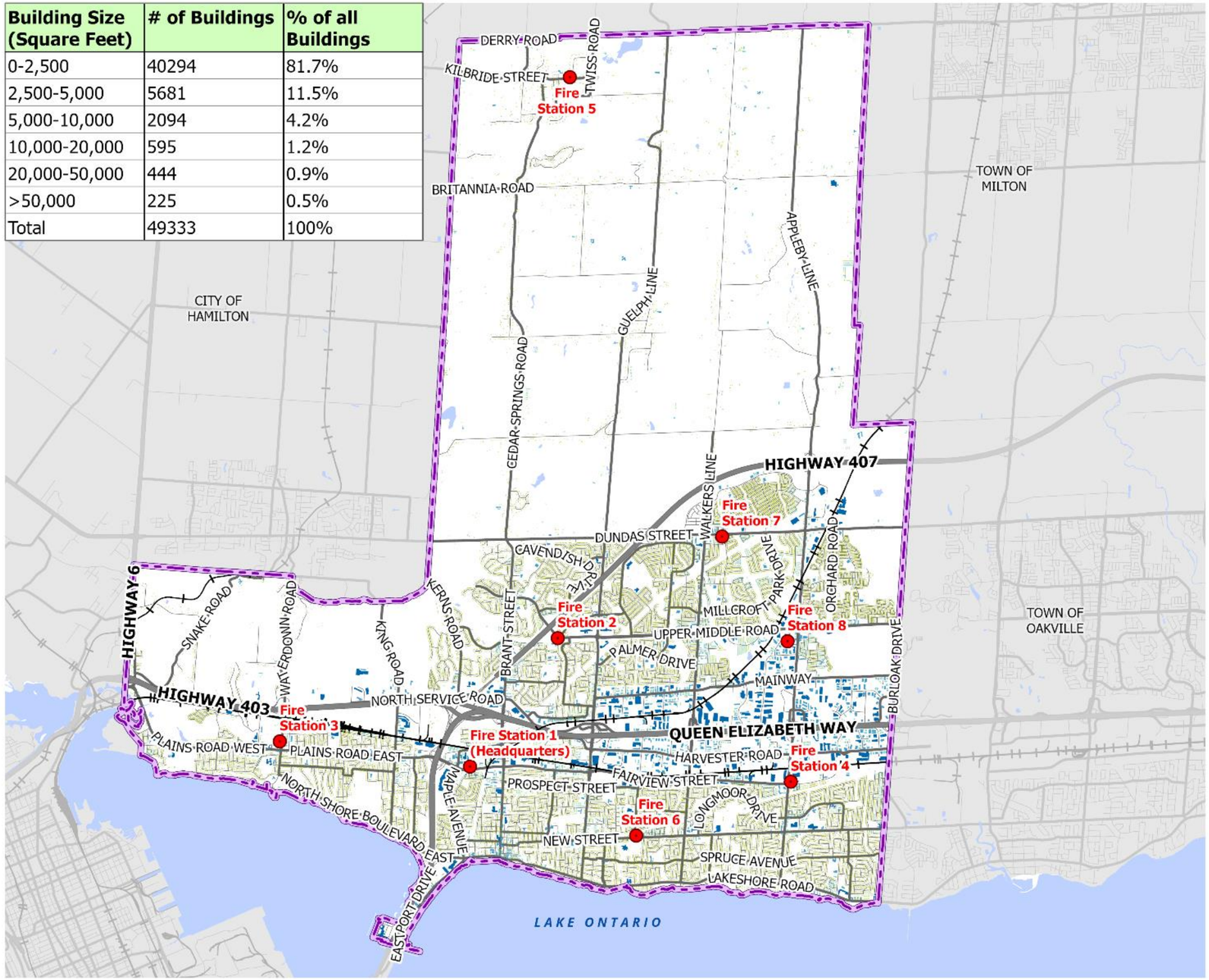
3.5.2.1 Mapping Building Area

Figure 7 illustrates that the buildings with a larger footprint are dispersed mainly throughout the urban area of the City. In comparison to the land use areas in **Figures 1** and **2** of **Section 2.1 – Geographical Snapshot of Burlington,** the buildings with a footprint of 2,500 square feet or less align with the City's residential area while buildings with a footprint of 50,000 square feet or more align with the general employment and business corridor along either side (north and south) of the QEW

Identified Risk: The City has 225 buildings with a total building area (footprint) that exceed 50,000 square feet (4,655 square metres). These buildings are predominantly located in the general employment and business corridor along the Q.E.W

Figure 7: Building Area Locations

Building Size (Square Feet)	# of Buildings	% of all Buildings
0-2,500	40294	81.7%
2,500-5,000	5681	11.5%
5,000-10,000	2094	4.2%
10,000-20,000	595	1.2%
20,000-50,000	444	0.9%
>50,000	225	0.5%
Total	49333	100%



CITY OF BURLINGTON

BUILDING AREA

- Fire Station

Building Area ft²

- < 2500
- 2500 - 5000
- 5000 - 10000
- 10000 - 20000
- 20000 - 50000
- > 50000

Base Data

- City of Burlington Boundary
- Railway
- Expressway / Highway / Freeway
- Collector / Arterial Road
- Local Road / Ramp
- Waterbody

1:75,000

0 0.75 1.5 3 km

MAP DRAWING INFORMATION:
BASE DATA PROVIDED BY MNRF, CITY OF BURLINGTON

MAP CREATED BY: LK
MAP CHECKED BY: CB/AN
MAP PROJECTION: NAD 1983 UTM Zone 17N

DILLON CONSULTING

PROJECT: 199811
STATUS: DRAFT
DATE: 2021-07-19

3.6 Potential High-Fire Risk Occupancies

Potential high-fire risk occupancy is another factor for consideration within a City's building stock. High fire risk can be linked to a combination of factors such as building density (exposures), building age, and construction. Fuel load typically refers to the amount and nature of combustible content and materials within a building. This can include combustible contents, interior finishes as well as structural materials. Combustible content tends to create the greatest potential fire loss risk. Higher fuel loads results in increased fire loss risk due to increased opportunity for ignition and increased fire severity. In many communities, large amounts of fuel load can be contained within a single occupancy, such as a building supply business, within a large multi-unit residential building, or within a historic downtown core. This section of the CRA will focus primarily on fuel load for industrial occupancies.

Buildings with potential fuel load concerns as identified by BFD are presented in **Table 9.** BFD identified several occupancies with fuel load concerns as housing materials such as oxidizers and flammable and combustible liquids and chemicals (not an all-inclusive list).

Table 9: Potential High-Fire Risk Occupancies

Risk Description
A variety of manual and automated processes involving oxidizers and flammable and combustible liquids
Industrial dry cleaning. Hazards are spontaneous combustion in relation to drying processes, dryers and combustible linens, fuel load and significant health and safety concerns for first responders (chain hung linen, product bags being a crushing concern during fire incidents, etc.).
Closed and in-rack industrial storage of flammable and combustible liquids, assembly line like process involving aerosols.
Significant fuel load, size of buildings in excess of 1,000,000 ft^2. Licensed storage and distribution of cannabis and cannabis products.
Environmental hazards; asphyxiates etc.
A variety of chemicals being processed on-site.

Source: BFD

Through internal stakeholder engagement it was learned the City has recently become home to a number of cannabis retail locations. As the only jurisdiction within Halton Region to opt for allowing cannabis retail locations, City staff believes there is a high number of stores selling recreational marijuana within Burlington. Alcohol and Gaming Commission licencing requires increased security features within these facilities which may lead to inhibited evacuation options for employee and patrons, increasing the need for inspection and enforcement efforts by the BFD to ensure compliance with the OFC

In addition to ensuring compliance to the requirements of the OBC and the OFC, there are operational strategies that a fire service can implement to address fuel load concerns. These include regular fire inspection cycles and pre-planning of buildings of this nature to provide an operational advantage in the event of fire.

Key Finding: BFD identified several properties within Burlington as having an increased potential for high fire risk in regards to fuel load.

3.7 Occupancies with Potential High Fire Life-Safety Risk

Fire risk does not affect all people equally. Those who are at an increased risk of fire injury or fatality are known as vulnerable individuals. In the event of a fire, these individuals may be unable to self-evacuate and/or require assistance in their evacuation efforts. Identifying the location and number of vulnerable individuals or occupancies within the community provides insight into the magnitude of this particular demographic within a community.

From an occupancy perspective, vulnerable occupancies contain vulnerable individuals who may require assistance to evacuate in the event of an emergency due to cognitive or physical limitations, representing a potential high-life safety risk. As part of its registry of vulnerable occupancies, the OFMEM defines vulnerable occupancy as any care occupancy, care and treatment occupancy, or retirement home regulated under the Retirement Homes Act.

These occupancies house individuals such as seniors or people requiring specialized care. It is important to note, however, that **not all vulnerable individuals live in vulnerable occupancies**; for example, some seniors who are vulnerable due to physical limitation can live on their own or in subsidized housing, making them a key demographic to reach.

3.7.1 Registered Vulnerable Occupancies

Ontario Regulation 150/13: Fire Code, which amends **Ontario Regulation 213/07: Fire Code**, identifies vulnerable occupancies as care, care and treatment and retirement homes. This includes hospitals, certain group homes and seniors' residences and long term care facilities. The regulation requires fire departments to perform annual inspection, approve and witness fire drill scenarios and file certain information regarding the occupancy with the Fire Marshal's office. As indicated by the BFD, there are 43 vulnerable occupancies in the City of Burlington.

Identified Risk: The City of Burlington currently has forty-three (43) registered vulnerable occupancies.

3.7.2 Other High Fire Life Safety Risk Occupancies

From the perspective of risk, and for the purposes of the services provided by the fire department, including enhanced and targeted fire inspections and public education programming, it can be valuable for a fire department to identify additional potential high fire life-safety risk considerations, including day care facilities and schools, where due to their age, children may have cognitive or physical limitations to preventing or delaying self-evacuation in the event of an emergency. For the purposes of this CRA, potential high life-safety risk occupancy considerations include schools and licenced day care facilities. Analysis of data provided by the BFD identified that there are 63 schools (elementary and secondary combined) and 46 daycares.

It would be beneficial for BFD to conduct pre-planning activities for all occupancies with vulnerable occupants. Pre-planning activities increase fire department personnel familiarity with buildings of special interest. A fire department can help reduce the risk faced by vulnerable individuals or vulnerable occupancies by performing regularly scheduled fire safety inspections; approving and witnessing fire drill scenarios; enforcing the OFC; providing public education on fire safety issues; conducting pre-planning exercises to increase fire department personnel's familiarity with the facility; reviewing fire safety plans for accuracy and encouraging facility owners to update facilities as needed; providing staff training; and encouraging fire drills.

(Some of these activities are now legislated responsibilities under **O. Reg. 150/13: Fire Code** for those facilities classified as vulnerable occupancies.)

Key Finding: In addition to registered vulnerable occupancies, the City has 63 schools and 46 identified daycare centres, representing higher fire life-safety risks due to the number of children attending these facilities.

3.8 Historic or Culturally Significant Buildings

An understanding of the location of historic or culturally significant buildings or facilities is an important consideration within the building stock profile of a Community Risk Assessment. Such buildings or facilities may be keystone features to the community that provide a sense of heritage, place, and pride and act as tourism destinations which could result in an economic impact. Historic areas can present a high fire risk due to age, the materials used to construct the buildings, exposure to other buildings, and importance to the community. Regular fire inspection cycles and strategies to enforce continued compliance with the OFC are considered as best practices to achieving the legislative responsibilities of the municipality and providing an effective fire protection program to address fuel load risks.

The City of Burlington regulates a number of heritage homes and properties through the municipal register under the Ontario Heritage Act. The register of designated heritage properties includes 76 properties of historical significance.[17]

One of the City's most notable heritage properties include the Ireland House at Oakland Farm, home to one of Burlington's earliest settlers Joseph Ireland. Pre-fire planning activities increase fire department personnel familiarity with buildings of special interest. A fire department can help reduce the risk of fire within heritage properties through regularly scheduled fire safety inspections, enforcement of the Ontario Fire Code, regular review of fire safety plans for accuracy and encouraging facility owners to upgrade facilities as needed.

Key Finding: There are a number of identified heritage buildings within Burlington, many of which were constructed prior to the introduction of the Ontario Fire Code.

[17] Register of Designate Heritage Properties. (Last updated July 18, 2019). City of Burlington Municipal Register of cultural Heritage Resources. Retrieved from https://www.burlington.ca/en/services-for-you/resources/Planning_and_Development/Heritage_Conservation/Heritage-Register/Heritage-Register---Section-1-2019-07-17.pdf

4.0 Critical Infrastructure Profile

As referenced in **O. Reg. 378/18**, the critical infrastructure profile assessment includes analysis of the capabilities and limitations of critical infrastructure, including electrical distribution, water distribution, telecommunications, hospitals and airports. The following section considers these critical infrastructure characteristics within the City of Burlington.

4.1 Critical Infrastructure in Burlington

Ontario's Critical Infrastructure Assurance Program defines critical infrastructure (C.I.) as "interdependent, interactive, interconnected networks of institutions, services, systems and processes that meet vital human needs, sustain the economy, protect public health, safety and security, and maintain continuity of and confidence in government."[18] The program also sets out nine critical infrastructure sectors, namely: continuity of government, electricity, financial institutions, food and water, health, oil and natural gas, public safety and security, telecommunications and transportation networks. Infrastructure is a complex system of interconnected elements whereby failure of one could lead to the failure of others. The vulnerability of infrastructure is often connected to the degree to which one infrastructure component depends upon another. Therefore, it is critical that these elements be viewed in relation to one another and not in isolation.

An extensive list of the City's C.I. for each sector was provided by the City of Burlington. For the purposes of this CRA, general considerations and concerns related to each C.I. sector as it pertains to the provision of fire protection services for each asset included within the City's C.I. list are included in **Table 10**. Burlington specific C.I. concerns are described in greater detail within the text.

[18] Ministry of the Solicitor General. (2017). Critical Infrastructure. Retrieved from Emergency Management Ontario website

Table 10: Critical Infrastructure Considerations

C.I. Sector	Fire Related Issues/Concerns
Energy and Utilities	Within the City of Burlington, Burlington Hydro Inc. (owned by the City of Burlington) is the electricity provider, maintaining the King Road distribution centre and 32 substations and distribution lines across the City. Natural Gas is provided by Enbridge Gas. Energy and utility infrastructure are significant from the perspective of fire protection services for the following reasons: • The oil and natural gas subsector present operational hazards to first responders, including spills and personal injury, firefighter exposure to toxic or hazardous materials via inhalation, skin contact, and/or ingestion • There is potential for explosion and/or fire • Gas and oil supply could be limited across the City in the event of an emergency incident • Firefighter safety considerations when responding to a fire at an electrical substation (e.g. high voltage electrical hazards and the presence of chemical hazards that are used to cool electrical conductors) • Disruption to the electrical distribution system could disrupt emergency communication systems, or municipal power supply leading to a wide range of public health and safety concerns, requiring fire department assistance
Finance	Financial infrastructure can include institutions such as banks or credit unions or ATMs. In the event of a significant emergency, residents may not have access to their financial institutions and banking services.

C.I. Sector	Fire Related Issues/Concerns
Food	Food related infrastructure can include agriculture, major distribution centres or grocery stores, for example. Grocery stores and food distribution centres typically contain large amounts of ammonia used as a component of refrigeration systems. Fire responders should be aware of dangers related to an ammonia release and response protocols.
Government	Municipal services are often interconnected, therefore the failure of one may lead to the failure or damage to other services or loss of continuity of operations.
Health	There is one major hospital in the City of Burlington – the Joseph Brant Hospital. A fire at Joseph Brant Hospital in Burlington would require complex evacuation procedures for a large number of immobile and medical device dependant individuals. Health care infrastructure is also significant from the perspective of fire protection services because a health-related emergency can increase demand for health care services, specifically ambulance services and medical response (e.g. tiered response).
Information and Communication Technology	There are several radio communication towers within Burlington. If wires or towers are compromised, the ability to communicate with emergency personnel could be extended, possibly leading to extended emergency response times.
Manufacturing	According to the 2016 Statistics Canada Census, manufacturing is the third largest economic industry in the City of Burlington accounting for 9.91% of local industry (see **Section 9.1 - Economic Sectors and Employers in Burlington**). Processing and other activities that involve various ignition sources often occur in these occupancies. Manufacturing facilities constitute a special fire hazard due to high levels of combustible, flammable or explosive content and the possible presence of oxidizing chemicals and gases.
Safety	There are eight fire stations in Burlington. Frequent or extreme emergency events could increase demand for emergency response services affecting the response capacity of the fire department.

C.I. Sector	Fire Related Issues/Concerns
Transportation	**Rail** The City of Burlington has two prominent rail lines; one located south of Highway 403/QEW and the other, branches off of the east west line up through the northeastern corridor of the City. Rail lines and operations are of concern from the perspective of fire protection services due to the following factors: • Accidents involving transportation of hazardous cargo could result in release hazardous material requiring hazardous materials response • Potential for explosions, fires and destabilization of surrounding structures • For passenger train derailments or collisions, passenger and rail employee extrication and technical rescue may be required • Difficulty accessing scene • Major incidents resulting in long term recovery could delay daily shipment of goods and services, with potential negative affects to local economy

C.I. Sector	Fire Related Issues/Concerns
Transportation	**Roads and Highways** Burlington is intersected by a number of provincial highways and freeways including Highway 407, Highway 403/Queen Elizabeth Way (QEW) towards Toronto and Niagara, and Provincial Highway 6. Major highways are of concern from the perspective of fire protection services due to the following factors: • Incidents involving hazardous materials transport • Motor vehicle collisions driving fire department and ambulance call volume • Multi-lane and vehicle collisions can obstruct lane access for responding apparatus • Traffic hazards (distracted drivers, high speed movement) present safety considerations for responding crews
Transportation	**Air** Airports also present unique hazards related to aircraft and supporting infrastructure. In addition to those using this type of transportation these hazards can include the use of aircraft fuel and the transportation of dangerous goods. There is one aircraft facility located off of Bell School Line in the City's rural area - the Burlington Executive Airport.
Water	Halton Region is responsible for water purification and distribution, and wastewater treatment and collection in the City of Burlington. Water infrastructure is comprised of various components such as water treatment, water storage, and distribution stations. Water supply is an essential component of firefighting and is accessible to the fire department through hydrant systems. A water supply shortage or damage to the distribution system could impede the fire department's ability or use of these systems. There are fire department considerations to areas without adequate water flow and supply (hydrants). These are discussed further in **Section 4.1.3 – Hydrants** below.

4.1.1 Transportation Infrastructure – Hamilton Harbour James N. Allan Skyway Bridge

As discussed in **Section 2- Geographic Profile**, the Hamilton Harbour James N. Allan Skyway (commonly known as the Burlington Skyway) is a bridge that spans the Hamilton Harbour in the southwestern section of Lake Ontario. It connects the QEW in the City of Hamilton's north end to Highway 403 in Burlington. In addition to QEW traffic, there are lanes connecting Lakeshore Road in Burlington to Eastport Drive and Beach Boulevard in Hamilton which cross the Burlington Canal Lift Bridge of the Burlington Skyway. The lift bridge provides access to thousands of commercial and pleasure craft vessels each year and is the only crossing over the harbour for pedestrians and cyclists. The lift operates on an on-demand basis for large vessels and every half hour to accommodate pleasure craft. Information about upcoming road closures and lane reductions is accessible through the Government of Canada, Public Services and Procurement Canada website.

An emergency incident on the Skyway Bridge could potentially impact the road network connectivity if the bridge were to be out of service. Due to the high volume of traffic along the bridge, there is also potential for motor vehicle collisions, and incidents involving hazardous materials transport increasing fire department call volume.

4.1.2 Health – Joseph Brant Hospital

The Joseph Brant Hospital was opened adjacent to Lake Ontario at 1245 Lakeshore Road and provides health care services to Burlington and the Regional Municipality of Halton. A wide range of health care services are offered year-round, including ambulatory care clinics, maternal and child programs, surgery, palliative care, intensive care unit (ICU) services, emergency services, and more. With over 175,000 patients each year, including over 45,000 emergency department visits, the hospital employs 1800 employees.[19]

Beginning in 2012, the hospital underwent an extensive revitalization project to expand, modernize, and meet the needs of an aging population. This includes a full renovation to the existing hospital, and the addition of an emergency department, the Halton McMaster Family Health Centre, the seven storey Michael Lee-Chin & Family Patient

[19] Who We Are, Joseph Brant Hospital Website, (n.d.), Retrieved July 21 from Joseph Brant Hospital Website, About Us

Tower, and a four storey parking garage.[20] The revitalization project expanded the capacity of the hospital and many of the services provided including medical, surgical, and outpatient services.

The hospital has experienced impacts from flooding in the past. In 2014, a storm resulted in 45 centimetres of water seeping into the hospital basement, causing a sewage backup, leading to the cancellation of some surgeries and testing.

Flooding of facilities (basement) is a concern as well as the potential of flooding of road network preventing access to the hospital.[21] Flooding can result from Lake water levels rising and overtopping the shoreline or from the inability of the City's stormwater systems to handle the surge of water caused by intense rainfall.

Depending on the severity of the flooding, access to various sections of the road network could limit fire department response, delaying emergency response times.

4.1.3 Water Infrastructure – Hydrants

Burlington has a water supply system consisting of water treatment, water storage, and distribution stations, as well as numerous fire hydrants mostly in the urban area of the City. Halton Region is responsible for water purification and distribution, and wastewater treatment and collection in Oakville, Burlington, Milton and Halton Hills.

Water supply is essential for firefighting, accessible to the fire department through municipal water delivery systems, or the fire department itself (tanker shuttles). Equally important to the presence of water supply is the quantity of water available for fire protection purposes, referred to as fire flow. As described in the NFPA Glossary of Terms (2019 Edition), fire flow is "the flow rate of water supply measured at 20psi (137.9 kPa) residual pressure, that is available for firefighting." The control of structure fires in urban areas are typically delivered by hose lines supplied by a local water delivery system via hydrants.

[20] Our New Hospital, Joseph Brant Hospital Website, (n.d.), Retrieved July 21 from Joseph Brant Hospital Website

[21] Micheal Miles, Jo Brant Hospital cleaning up sewage from Burlington flooding, CHCH news, August 7, 2014, Retrieved July 21 from CHCH News Website

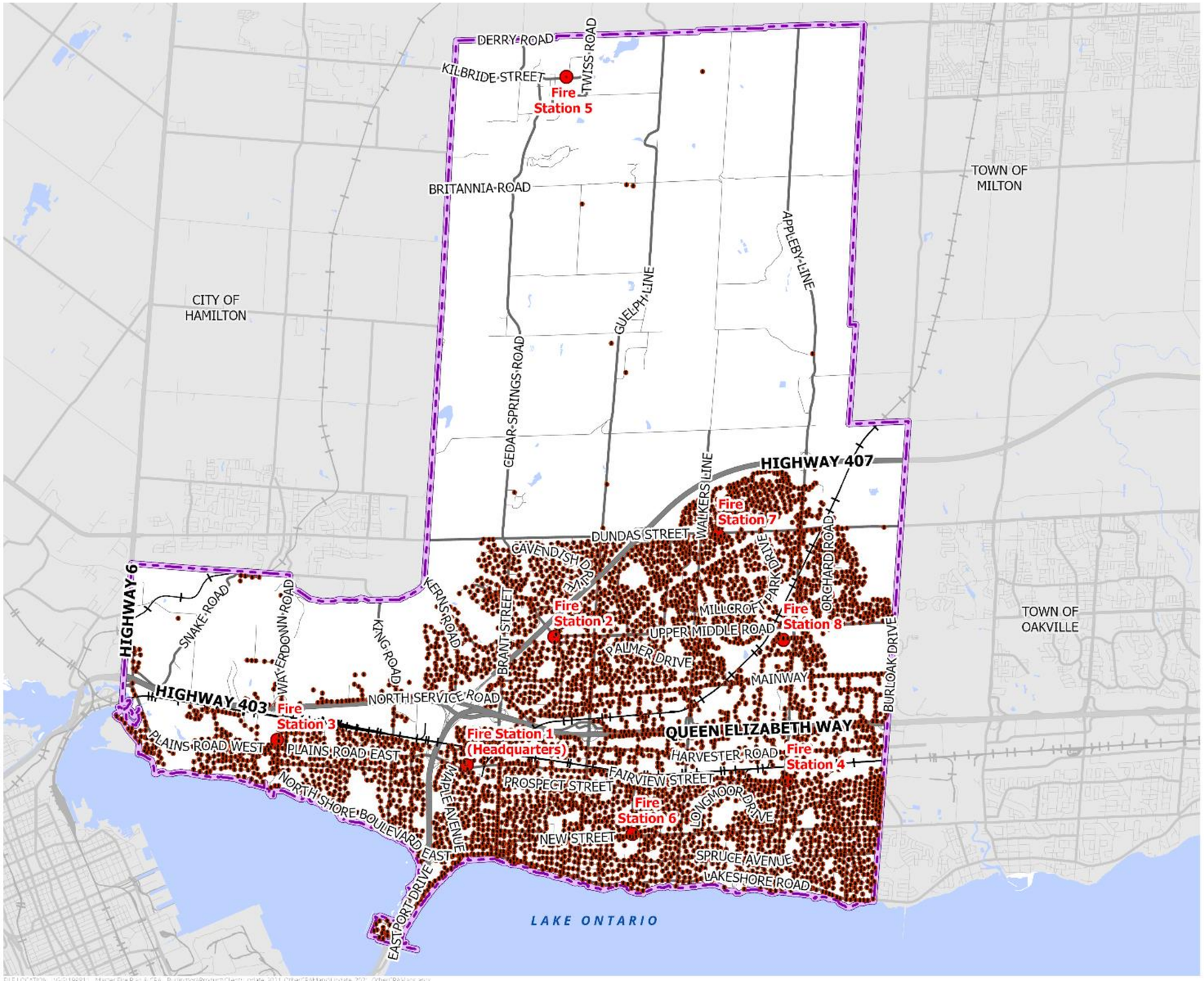
A water supply shortage or water system disruption could impede the flow rate of water delivered to hydranted areas resulting in inadequate water supply and distribution needed for the delivery of fire protection services.

Where no municipal water systems exist, supplementary water supply sources are considered. It is a common occurrence for rural and undeveloped areas, not to have pressurized hydranted water supply systems.

Figure 8 illustrates the location of fire hydrants throughout Burlington and as shown, they are found primarily in the urban area of the City. Alternatively, water for firefighting purposes may be provided by tanker shuttle and the use of reliable and accessible local water supplies (e.g. reservoirs, swimming pools, ponds, rivers, etc).. According to the Fire Underwriter's Survey, an Accredited Superior Tanker Shuttle Service is a recognized equivalency to hydrant protection if it meets all the requirements for accreditation. In areas without municipal water supply, a fire department should consider a water servicing strategy or formal plan for those areas requiring water flow for firefighting.

Fire hydranted areas are discussed further in the Master Fire Plan Report.

Figure 8: Hydrants



CITY OF BURLINGTON

FIRE HYDRANTS

- Fire Station
- Fire Hydrant

Base Data

- City of Burlington Boundary
- Railway
- Expressway / Highway / Freeway
- Collector / Arterial Road
- Local Road / Ramp
- Waterbody

1:75,000

0 0.75 1.5 3 km

MAP DRAWING INFORMATION:
BASE DATA PROVIDED BY MNRF, CITY OF BURLINGTON

MAP CREATED BY: LK
MAP CHECKED BY: CB/AN
MAP PROJECTION: NAD 1983 UTM Zone 17N

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PROJECT: 199811
STATUS: DRAFT
DATE: 2021-07-19

4.1.4 Transportation Infrastructure – Burlington Executive Airport

Airports and airlines facilitate the movement of material goods and people, serving as gateways of connectivity to other municipalities and regions that can contribute to the economic growth and development of the City. They play an essential role in trade, commerce and product distribution and provide a major mechanism through which people travel. Airports also present unique hazards related to aircraft and supporting infrastructure. In addition to those using this type of transportation these hazards can include the use of aircraft fuel and the transportation of dangerous goods.

There is one aircraft facility located off of Bell School Line in the City's rural area. The Burlington Executive Airport is a privately operated airport that offers flight training, aircraft maintenance, charter flights and aircraft hangar sale and leasing.

In the event of an emergency incident occurring at the airport, Burlington Fire Station 5 is the closest fire hall to provide fire protection services.

Special Consideration: The Burlington Executive Airport presents a number of unique fire related risks associated with aircraft, supporting infrastructure and the potential transportation of dangerous goods requiring specialized fire protection services.

5.0 Demographic Profile

As referenced in **O. Reg. 378/18**, the demographic profile assessment includes analysis of the composition of the community's population, respecting matters relevant to the community such as population size and dispersion, age, gender, cultural background, level of education, socioeconomic make-up and transient population. The following sections consider these demographic characteristics within the City of Burlington.

5.1 Population and Dispersion

Over a fifteen year period (2001-2016), the City of Burlington's population has steadily increased. Simultaneously, the number of total private dwellings has increased from 2001 to 2016. **Table 11** shows that the rate of increase for both the population and total private dwellings has slowed down over the years with a 4.28% increase in total population between 2011 and 2016.

Table 11: Historic Growth in Population and Households - Burlington

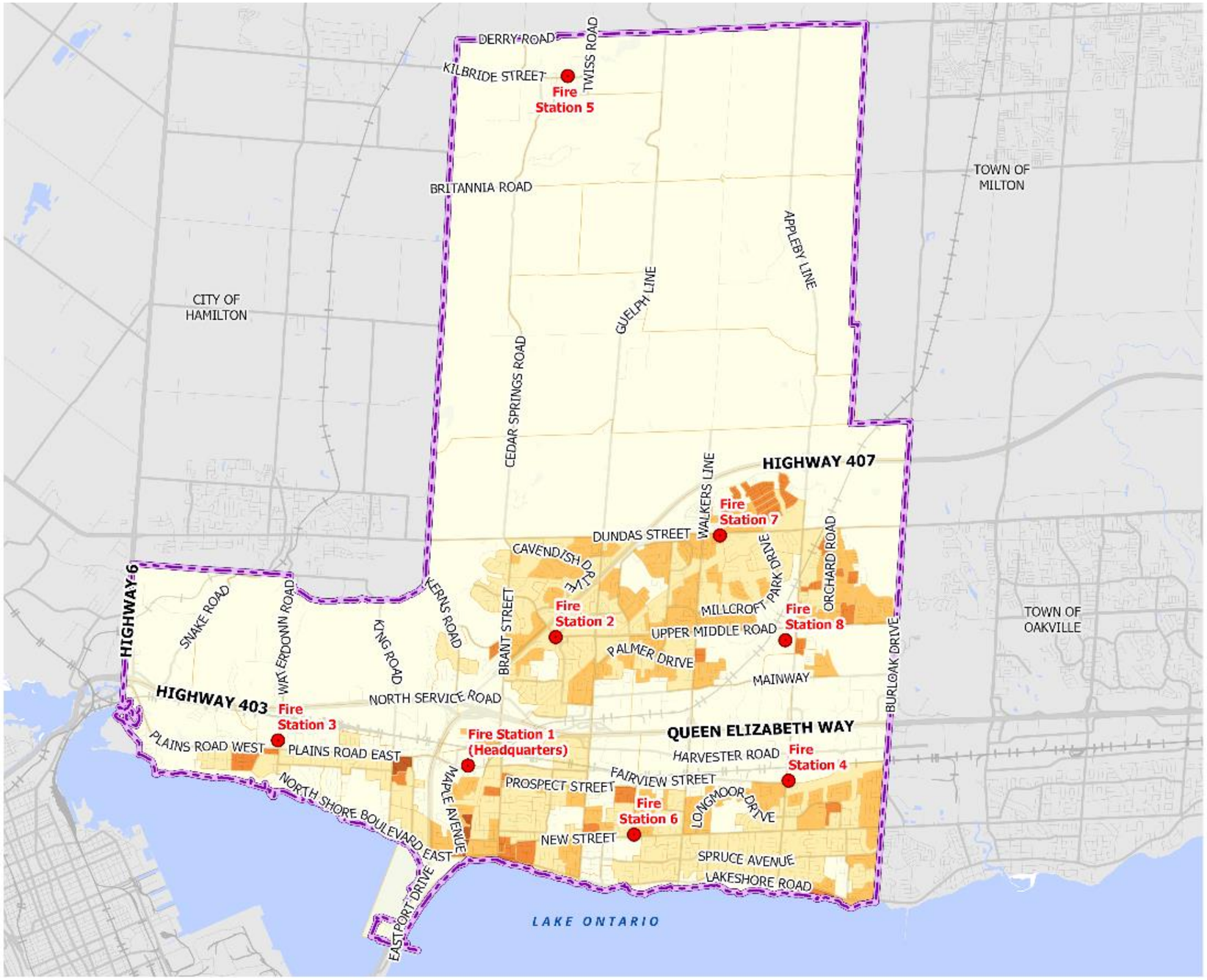
Year	Population	% Change	Total Private Dwellings	% Change
2001	150,836	No Data	59,020	No Data
2006	164,415	9.00%	65,340	10.70%
2011	175,779	6.91%	69,813	6.84%
2016	183,314	4.28%	72,535	3.89%

Source: 2016, 2011, 2006, 2001 Census, Statistics Canada

5.1.1 Mapping Population Dispersion

The dispersion of the population is presented in **Figure 9**. Areas of Burlington most densely populated are found within the City's urban area, generally south of Highway 407 and along the lakeshore areas below the Queen Elizabeth Highway. More specifically, areas of the City with the highest densities include the areas northeast of the intersection at Walkers Line and Dundas Street, east of the intersection of Plains Road and King Road and the areas directly east of Eastport Drive near the waterfront.

Figure 9: Population Density – City of Burlington



CITY OF BURLINGTON

POPULATION DENSITY

- Fire Station

People per Square Kilometre

- 0 - 1630
- 1630 - 3364
- 3364 - 6073
- 6073 - 9894
- 9894 - 22500
- 22500 - 87870

Base Data

- City of Burlington Boundary
- Railway
- Expressway / Highway / Freeway
- Collector / Arterial Road
- Local Road / Ramp
- Waterbody

1:75,000

0 0.75 1.5 3 km

MAP DRAWING INFORMATION:
BASE DATA PROVIDED BY MNRF, CITY OF BURLINGTON

MAP CREATED BY: LK
MAP CHECKED BY: CB/AN
MAP PROJECTION: NAD 1983 UTM Zone 17N

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5.2 Population Age

A community's population by age is an important factor in identifying specific measures to mitigate risks associated with a specific age group, such as seniors. Canada's aging population has been recognized as one of the most significant demographic trends. According to Statistics Canada, from 2011 to 2016 Canada experienced "the largest increase in the proportion of seniors since Confederation" due to the baby boomer generation reaching the age of 65. There are now more Canadians over the age of 65 (16.9% of the population) than there are children aged 14 years and younger (16.6%).[22]

Seniors (those 65 years and over) are considered to represent one of the highest fire risk groups across the province based on residential fire death rate (fire deaths per million of population). **Figure 10** illustrates the results of an analysis revised by the OFMEM's Fire Statistics in November 2018. Through this analysis, seniors are identified at an increased risk of fatality in residential occupancies when compared to other age groups. However, the fire death rate for seniors has been decreasing since 1997 according to Ontario residential fatal fires reporting.

[22] Statistics Canada. (2017, May). The Daily: Age and sex, and type of dwelling data: key results from the 2016 Census. Retrieved from http://www.statcan.gc.ca/daily-quotidien/170503/dq170503a-eng.htm?HPA=1

Figure 10: 2007-2018 Residential Fire Death Rate by Age of Victim

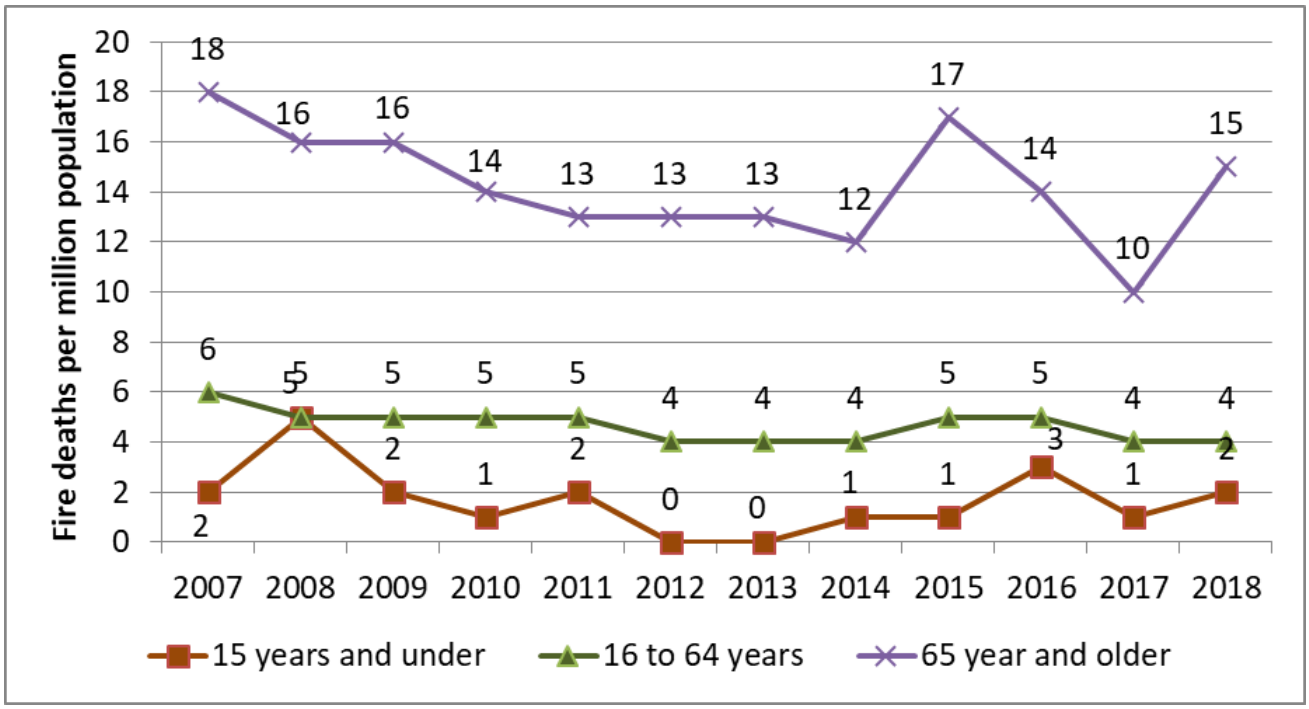

Figure Source: Adapted based on OFMEM reported residential fatal fires.[23]

Identifying a community's population by age category is a core component of developing the CRA and identifying specific measures to mitigate risks associated with a specific age group, such as seniors. The 2016 Census identifies a total population of 183,315 for the City of Burlington. The age distributions of the City's population and Ontario's population are summarized and compared in **Table 12** and further illustrated in **Figure 11.**

[23] Office of the Fire Marshal and Emergency Management. (Revised 2018, November). Ontario Residential Fatal Fires. Retrieved from Ministry of the Solicitor General Website

Table 12: Population by Age Group – Burlington and Ontario

Age	Burlington Population	Burlington Percentage of Population	Ontario Population	Ontario Percentage of Population
0 to 4 years	9,275	5.06%	697,360	5.19%
5 to 9 years	10,475	5.71%	756,085	5.62%
10 to 14 years	10,915	5.95%	754,530	5.61%
15 to 19 years	10,730	5.85%	811,670	6.04%
20 to 24 years	10,175	5.55%	894,390	6.65%
25 to 44 years	44,715	24.39%	3,453,475	25.68%
45 to 54 years	27,845	15.19%	1,993,730	14.82%
55 to 64 years	23,865	13.02%	1,835,605	13.65%
65 to 74 years	18,475	10.08%	1,266,390	9.42%
75 to 84 years	11,420	6.23%	684,195	5.09%
85 + years	5,425	2.96%	301,075	2.24%
Total	**183,315**[24]	**100.00%**	**13,448,505**	**100.00%**
Median Age of the Population	43	Not Applicable	41	Not Applicable
Population aged 14 and under	30,665	16.73%	**2,207,975**	**16.42%**
Population aged 65 and over	35,320	19.27%	**2,251,660**	**16.74%**

Source: 2016 Census, Statistics Canada[25]

[24] For the purposes of this CRA, the total population counts provided are a sum of the values provided by Statistics Canada. Of note, these totals may be different from the totals provided by Statistics Canada because of the following "Statistics Canada is committed to protect the privacy of all Canadians and the confidentiality of the data they provide to us. As part of this commitment, some population counts of geographic areas are adjusted in order to ensure confidentiality. The adjustment to counts of the total population for any dissemination block is controlled to ensure that the population counts for dissemination areas will always be within 5 of the actual values. The adjustment has no impact on the population counts of census divisions and large census subdivisions."

[25] Statistics Canada. 2017. Burlington, CY [Census subdivision], Ontario and Ontario [Province] (table). Census Profile. 2016 Census. Statistics Canada Catalogue no. 98-316-X2016001. Ottawa. Released November 29, 2017.

The youngest demographic (those 14 years of age and under) represents 16.73% of the City's total population, similar in comparison to the Province (16.42%). While at a lower risk of fatality in residential occupancies overall when compared to seniors or adults, youth (aged 14 years and under) represent an important demographic for the purposes of public education. As a result, there is value in targeting public education and prevention programs to this demographic. Structured education programs consistently provided to children and youth can help to engrain fire and life safety awareness and knowledge into future generations.

The percentage of the population aged 65 years and older in Burlington represents 19.27% of the total population, higher when compared to the Province (16.74%) by 2.53%. An additional 13.02% of the City's population falls between the age group of 55 and 64, who are aging towards the senior's demographic of 65 years of age and older. Based on historic residential fire fatality data, this population will become seniors who will be at greater risk. These demographic trends are important considerations for the development of informed targeted public education programs and risk reduction strategies within the community.

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https://www12.statcan.gc.ca/census-recensement/2016/dp-pd/prof/index.cfm?Lang=E (accessed February 13, 2020).

Figure 11: Population Distribution – Burlington and Ontario

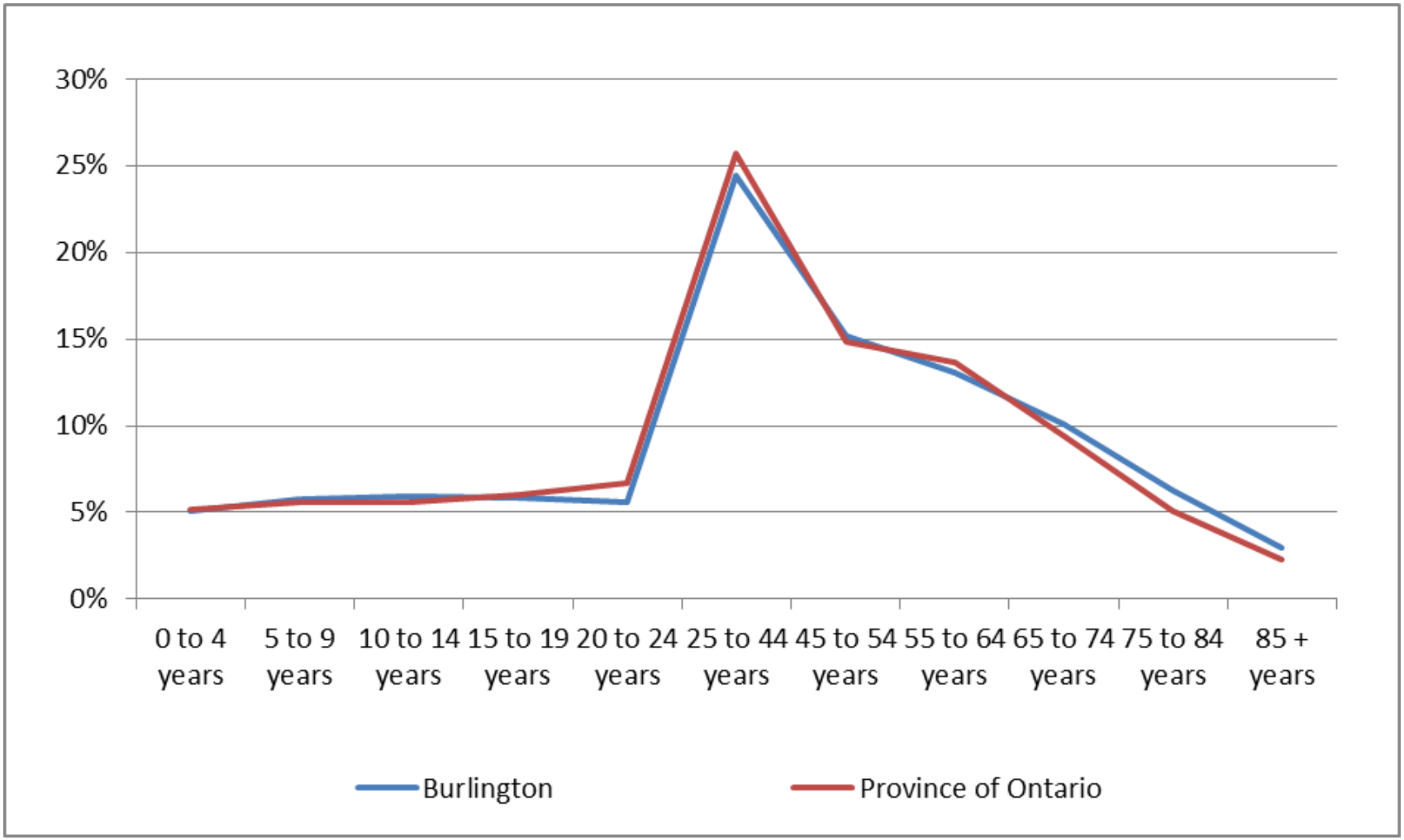


Figure Source: 2016 Census, Statistics Canada[26]

[26] Ibid.

Key Finding: The 2016 Census data indicates that children aged 14 and under represent 16.73% of the City's total population.

Identified Risk: Seniors (those 65 years and over) are considered to represent one of the highest fire risk groups across the Province based on residential fire death rate. According to the 2016 Census, seniors represent 19.27% of the City's total population.

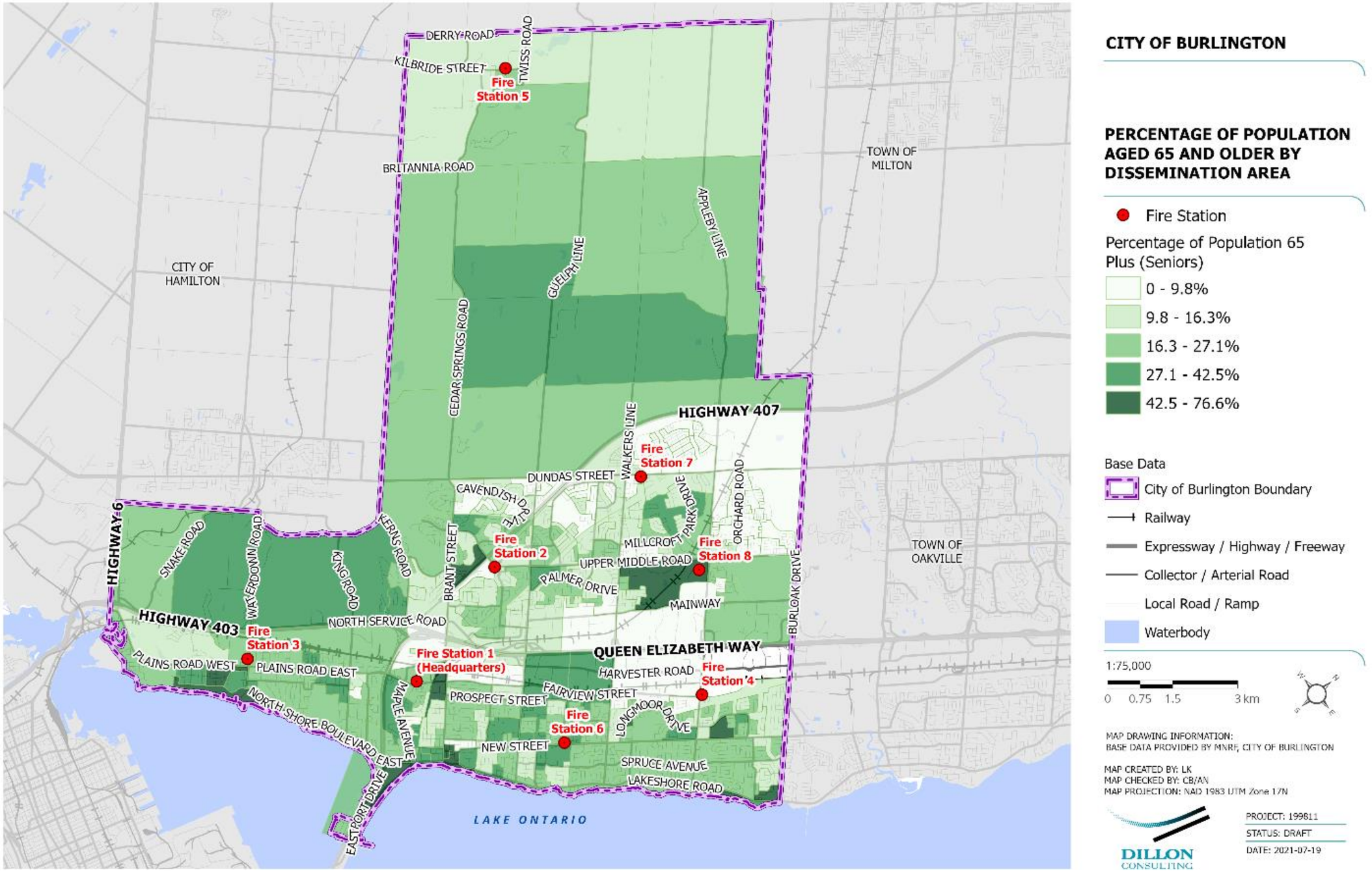
Key Finding: Of the City's total population, 13.02% fall into the age range of 55 to 64, representing a cohort aging towards the seniors demographic of 65 years or older.

5.2.1 Mapping Population Age

To understand the spatial distribution of population by age across the City, 2016 Census data was mapped by dissemination area. **Figure 12** presents the distribution of the senior population (65 and older) and **Figure 13** shows the distribution of youth (0 to 14 years). **Figure 12** shows that a higher percentage of the population 65 years and older reside in the downtown area with notable clusters along Eastport Drive and Lakeshore Road West. There is also a higher concentration of seniors living southwest of Fire Station 8, southeast of Fire Station 4 along New Street, south of Upper Middle Road, east of Fire Station 1 and south of Plains Road/Fire Station 3.

Figure 13 shows a higher proportion of youth (0-14 years) concentrated south of Highway 407 and east of Fire Station 7 as well as west of Guelph Line south of the Queen Elizabeth Way. There is also a notable cluster east of Fire Station 1. There are several schools in this area that the BFD could partner with for the delivery of public fire and life safety education.

Figure 12: Percentage of Population Aged 65 and Older by Dissemination Area



CITY OF BURLINGTON

PERCENTAGE OF POPULATION AGED 65 AND OLDER BY DISSEMINATION AREA

- Fire Station

Percentage of Population 65 Plus (Seniors)

- 0 - 9.8%
- 9.8 - 16.3%
- 16.3 - 27.1%
- 27.1 - 42.5%
- 42.5 - 76.6%

Base Data

- City of Burlington Boundary
- Railway
- Expressway / Highway / Freeway
- Collector / Arterial Road
- Local Road / Ramp
- Waterbody

1:75,000

0 0.75 1.5 3 km

MAP DRAWING INFORMATION:
BASE DATA PROVIDED BY MNRF, CITY OF BURLINGTON

MAP CREATED BY: LK
MAP CHECKED BY: CB/AN
MAP PROJECTION: NAD 1983 UTM Zone 17N

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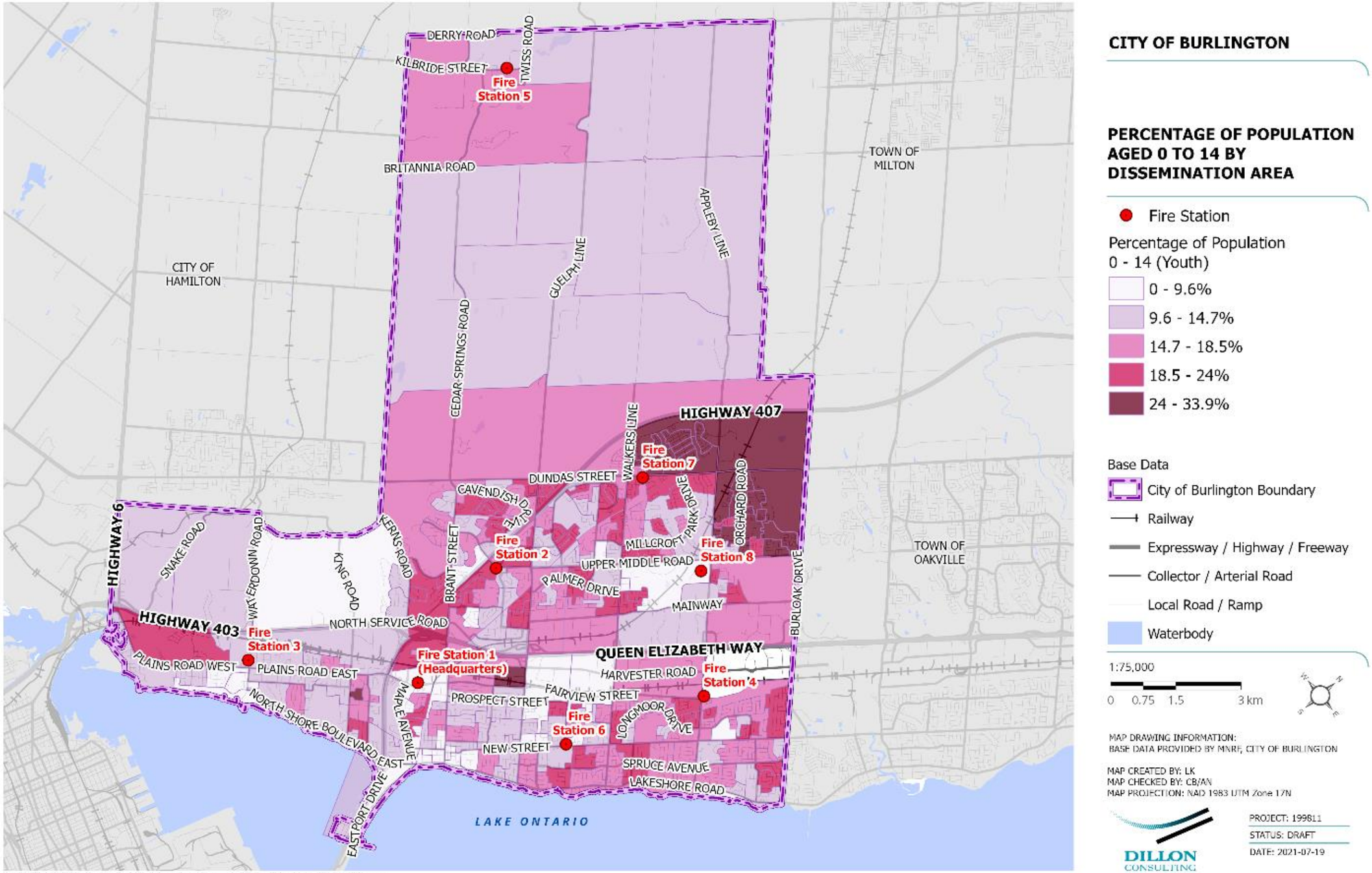
Figure 13: Percentage of Population Age 0-14 Years Old by Dissemination Area



5.3 Sex

NFPA 1730 - Standard on Organization and Deployment of Fire Prevention Inspection and Code Enforcement, Plan Review, Investigation, and Public Education Operations (2019 Edition) considers sex as part of a Community Risk Assessment due to the finding that, based on historic data, males are more likely to be injured or die in a fire. **Table 13** displays the distribution of both sexes by age for the City of Burlington. The proportion of males versus females is fairly even at 47.98% male and 52.02% female, as would be expected. When specific age groups are reviewed, there are minor variations. One of the greater differences is the proportion of males (36.16%) compared to females (63.84%) for the 85 years and over age group. Based on these statistics, it is not anticipated that public education programming would be refined based on sex. The impact of sex ratio on public education programming would be more notable in a community with unique demographics such as those that have transient populations due to employment, for example.

Table 13: Sex Distribution by Age Group – Burlington

Age Group	Total Population	Male	%	Female	%
0 to 4 years	9,275	4,750	51.21%	4,525	48.79%
5 to 9 years	10,480	5,420	51.72%	5,060	48.28%
10 to 14 years	10,910	5,640	51.70%	5,270	48.30%
15 to 19 years	10,730	5,500	51.26%	5,230	48.74%
20 to 24 years	10,175	5,270	51.79%	4,905	48.21%
25 to 44 years	44,715	21,430	47.93%	23,285	52.07%
45 to 54 years	27,840	13,385	48.08%	14,455	51.92%
55 to 64 years	23,870	11,290	47.30%	12,580	52.70%
65 to 74 years	18,475	8,360	45.25%	10,115	54.75%
75 to 84 years	11,420	4,955	43.39%	6,465	56.61%
85 + years	5,420	1960	36.16%	3460	63.84%
Total	**183,310**	**87,960**	**47.98%**	**95,350**	**52.02%**

Source: 2016 Census, Statistics Canada[27]

5.4 Socioeconomic Circumstances

Socioeconomic circumstances of a community are known to have a significant impact on fire risk. Socioeconomic status is reflected in an individual's economic and social standing and is measured in a variety of ways. These factors can be reflected in the analysis of socioeconomic indicators such as labour force status, educational attainment and income as well as household tenure, occupancy, suitability, and cost.

Socioeconomic factors intersect in a number of ways and have direct and indirect impacts on fire risk. One such example is outlined in the OFMEM's Fire Risk Sub-Model.[28] The Sub-Model makes reference to the relationship between income and fire risk. As one consideration, households with less disposable income may be less likely to purchase fire safety products (e.g., smoke alarms, fire extinguishers, etc.), which puts them at higher risk of experiencing consequences from a fire. Another consideration is that households living below the poverty line may have a higher number of persons per bedroom in a household and/or children who are more likely to be at home alone. These circumstances would impact both the probability and consequence of a fire. While these complex relationships between socioeconomic circumstances and the probability / consequence of a fire are not well understood, this CRA seeks to explore these factors.

The factors reviewed at a high level have been selected based on the data available from Statistics Canada. Socioeconomic factors such as income decile group and median household income have been displayed spatially throughout this section.

Factors that are highlighted in this section include:

- Labour force status
- Immigrant status
- Educational attainment
- Household tenure, occupancy, suitability, and cost

[27] Ibid.
[28] Minister of the Solicitor General. (Modified 2016, February). Comprehensive Fire Safety Effectiveness Model: Fire Risk Sub-Model. Retrieved from Ministry of the Solicitor General Website

5.4.1 Labour Force Status

Those who are economically disadvantaged, including low-income families, the homeless and perhaps those living alone, may experience a higher fire risk. The OFMEM's Fire Risk Sub-Model references a number of reports that suggest there is a correlation between income levels and fire risk. The reports identify the following factors:

- The higher number of vacant buildings found in low-income neighborhoods attract the homeless. This introduces risks such as careless smoking, drinking and unsafe heating practices.
- Building owners are less likely to repair building systems (electrical, mechanical, suppression) due to affordability, increasing fire risk from improper maintenance.
- Households with lower disposable income are less likely to purchase fire safety products (i.e. smoke alarms, extinguishers, cigarette ignition resistant furniture, etc.) due to affordability.
- Households with lower disposable income are more likely to have utilities shut off due to non-payment, leading to increased risks related to unsafe heating, lighting and cooking practices.
- The 1981 report, "Fire-Cause Patterns for Different Socioeconomic Neighborhoods in Toledo, Ohio" determined that the incendiary fire rate in low-income neighbourhoods is 14.4 times higher compared to areas with the highest median income. Further, fires caused by smoking and children playing occurred at rates 8.5 and 14.2 times higher, respectively.
- Single parent families are more economically challenged due to the fact that there is only one income. These households also have fewer resources to arrange childcare, increasing the likelihood of fires caused by unsupervised children.
- Studies have shown that cigarette smoking is inversely related to income. In Canada, findings by the Centre for Chronic Disease Prevention and Control through the National Population Health Survey established that there were nearly twice as many smokers in the lowest income group when compared against the highest (38% vs. 21% respectively).

- Those with low education and literacy levels are inhibited in their ability to read instruction manuals and warning labels and less likely to grasp fire safety messages.[29]

Labour force status is a possible indicator of income levels which directly influence fire risk (e.g. lower income, increased fire risk). The participation rate (i.e. the proportion of residents in the labour force) can also be an indicator of income and can be considered alongside unemployment rates (e.g. lower participation rate and higher unemployment could mean lower income, higher fire risk).

Labour force status, shown in **Table 14** below, shows that the City of Burlington has a higher participation rate than the Province of Ontario (68.00% versus 64.70%). This would suggest that the City faces a lower fire risk in comparison to the Province from the perspective of labour force.

Table 14: Labour Force Status – Burlington and Ontario

Status	Burlington Population	Burlington %	Ontario Population	Ontario %
In the Labour Force[30]	101,655	68.00%	7,141,675	64.70%
Employed	95,975	64.20%	6,612,150	59.90%
Unemployed	5,680	3.80%	529,525	4.80%
Not in the Labour Force	47,845	32.00%	3,896,765	35.30%
Total	**149,500**	**100.00%**	**11,038,440**	**100.00%**

Source: 2016 Census, Statistics Canada[31]

[29] Ibid.
[30] The category 'In the Labour Force' is a subtotal of the following categories: employed and unemployed.
[31] Statistics Canada. 2017. Burlington, CY [Census subdivision], Ontario and Ontario [Province] (table). Census Profile. 2016 Census. Statistics Canada Catalogue no. 98-316-X2016001. Ottawa. Released November 29, 2017. https://www12.statcan.gc.ca/census-recensement/2016/dp-pd/prof/index.cfm?Lang=E (accessed February 13, 2020).

5.4.2 Educational Attainment

The relationship between educational attainment and income is complex. An analysis conducted by Statistics Canada has found that high-income Canadians are generally more likely to be highly educated. Over two thirds (67.1%) of the top 1% had attained a university degree compared to 20.9% of all Canadians aged 15 and over.[32] Based on this national trend and for the purposes of this Community Risk Assessment it is assumed that a higher education leads to more disposable income and a lower fire risk. It is also assumed that households with more disposable income are more likely to invest in fire life safety products such as fire extinguishers and smoke alarms reducing the fire risk.

Table 15 displays educational attainment for the City of Burlington and the Province of Ontario.

Table 15: Educational Attainment – Burlington and Ontario

Educational Attainment	Burlington Population	Burlington %	Ontario Population	Ontario %
No Certificate/Diploma/Degree	18,150	12.14%	1,935,355	17.53%
High School Diploma or Equivalent	38,910	26.03%	3,026,100	27.41%
Postsecondary Certificate; Diploma or Degree	92,430	61.83%	6,076,985	55.05%
Total	**149,490**	**100.00%**	**11,038,440**	**100.00%**

Source: 2016 Census, Statistics Canada[33]

[32] Statistics Canada. (Modified 2018, July). Education and occupation of high-income Canadians. Retrieved from Statistics Canada Website

[33] Statistics Canada. 2017. Burlington, CY [Census subdivision], Ontario and Ontario [Province] (table). Census Profile. 2016 Census. Statistics Canada Catalogue no. 98-316-X2016001. Ottawa. Released November 29, 2017. https://www12.statcan.gc.ca/census-recensement/2016/dp-pd/prof/index.cfm?Lang=E (accessed February 13, 2020).

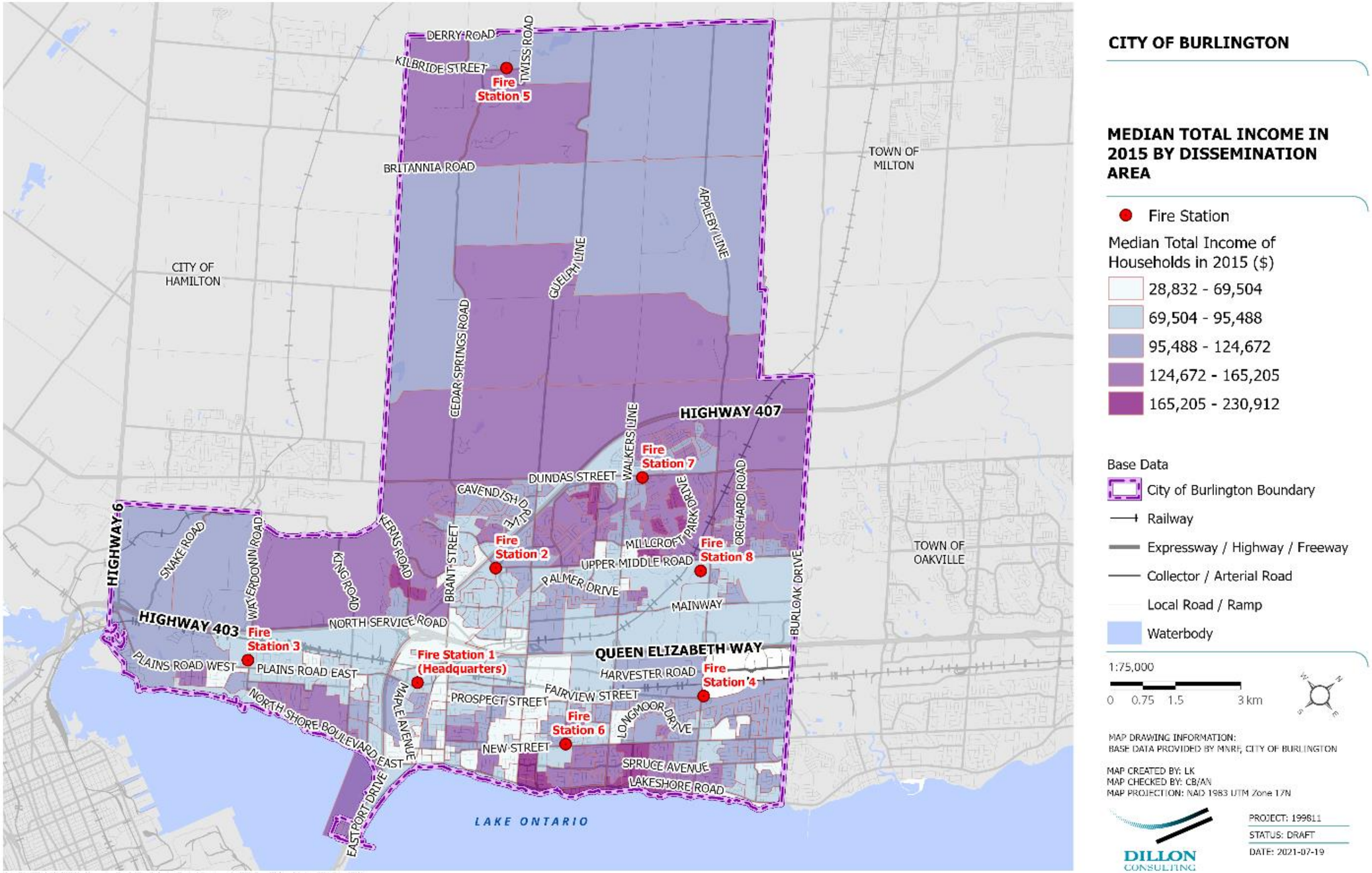
According to the 2016 Census, 61.83% of residents in Burlington have a postsecondary Certificate, Diploma or Degree, which is approximately 6.78% higher than the Province. This level of educational attainment could be linked to the median household incomes found in the City.

According to the 2016 Census, the median total income of households for Burlington in 2015 was $93,588.00, higher than the Provincial median total income per household of $74,287.00.

5.4.2.1 Mapping Income

Median household income across the City is displayed in **Figure 14**, indicating that households with a lower median income are found primarily in the areas south of the Queen Elizabeth Way and west of Walkers Line as well as north of Fire Station 1.

Figure 14: Median Total Income of Households in 2015 by Dissemination Area



CITY OF BURLINGTON

MEDIAN TOTAL INCOME IN 2015 BY DISSEMINATION AREA

- Fire Station

Median Total Income of Households in 2015 ($)

- 28,832 - 69,504
- 69,504 - 95,488
- 95,488 - 124,672
- 124,672 - 165,205
- 165,205 - 230,912

Base Data

- City of Burlington Boundary
- Railway
- Expressway / Highway / Freeway
- Collector / Arterial Road
- Local Road / Ramp
- Waterbody

1:75,000

0 0.75 1.5 3 km

MAP DRAWING INFORMATION:
BASE DATA PROVIDED BY MNRF, CITY OF BURLINGTON

MAP CREATED BY: LK
MAP CHECKED BY: CB/AN
MAP PROJECTION: NAD 1983 UTM Zone 17N

DILLON CONSULTING

PROJECT: 19811
STATUS: DRAFT
DATE: 2021-07-19

5.4.3 Income Decile Groups

Income can also be viewed through the lens of income decile groups. As stated by Statistics Canada, a "decile group provides a rough ranking of the economic situation of a person based on his or her relative position in the Canadian distribution of the adjusted after-tax income of economic families".[34] Economic family income decile group for the population in private households in Burlington is presented in **Table 16** illustrating that a higher portion of the population within the City falls within the top distribution of income decile groups when compared to the overall population of the Province. These statistics may be suggestive of a lower fire risk within the City from the perspective of income.

Table 16: Economic Family Income Decile Group for the Population in Private Households – Burlington and Ontario

Decile Group	Burlington Population	Burlington %	Ontario Population	Ontario %
In the bottom half of the distribution	59,355	32.95%	6,335,170	47.84%
In the top half of the distribution	120,780	67.05%	6,906,990	52.16%
Total	180,135	100.00%	**13,242,160**	**100.00%**

Source: 2016 Census, Statistics Canada[35]

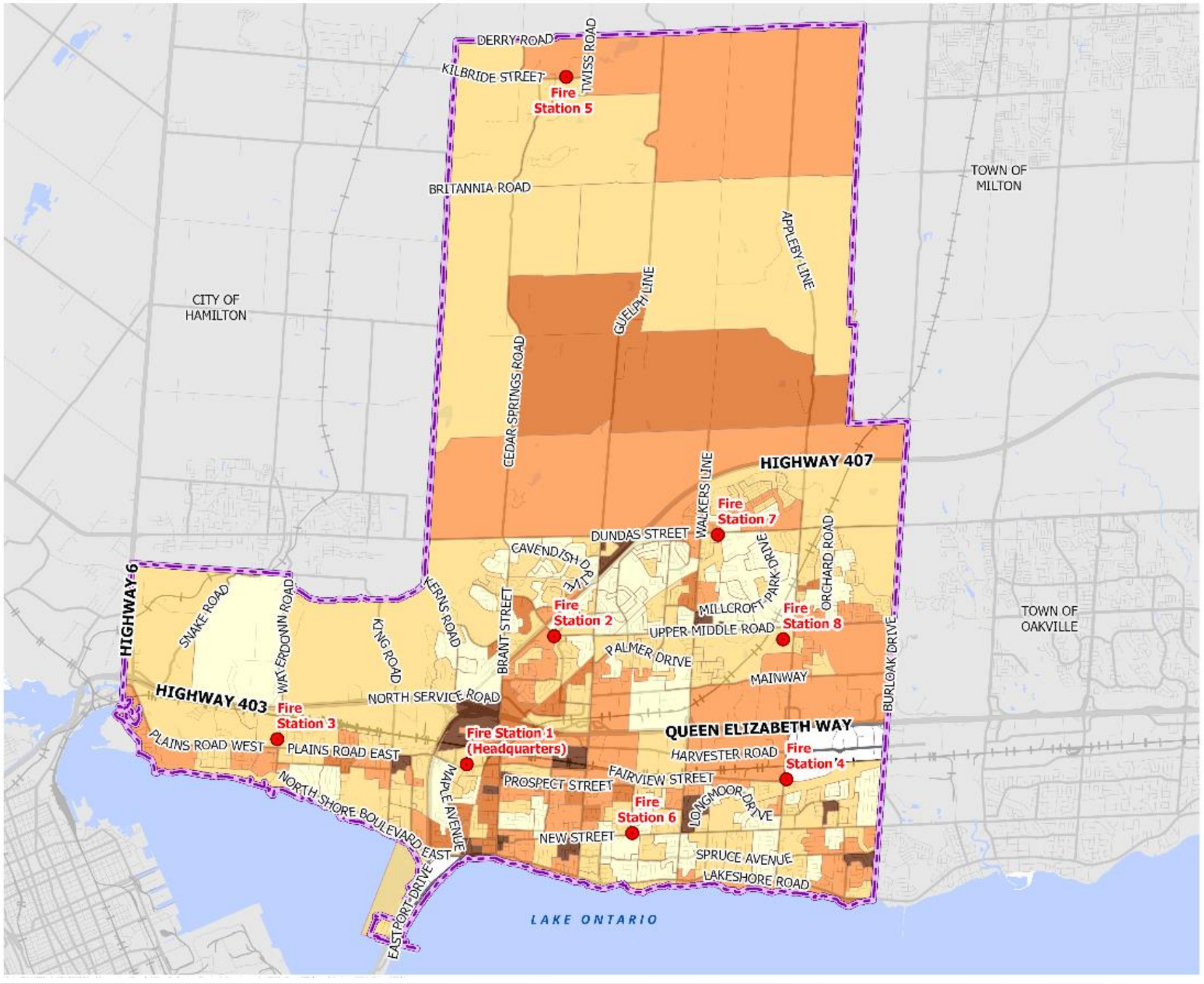
[34] Statistics Canada. (Updated 2016). Income Decile Group. Retrieved from Statistics Canada Website
[35] Statistics Canada. 2017. Burlington, CY [Census subdivision], Ontario and Ontario [Province] (table). Census Profile. 2016 Census. Statistics Canada Catalogue no. 98-316-X2016001. Ottawa. Released November 29, 2017. https://www12.statcan.gc.ca/census-recensement/2016/dp-pd/prof/index.cfm?Lang=E (accessed February 13, 2020).

5.4.3.1 Mapping Income Distribution

To understand the spatial distribution of income decile groups, **Figure 15** and **Figure 16** display the percentages of the population in the bottom and top income distribution groups by dissemination area.[36] **Figure 15** shows that there are dissemination areas with a high percentage of the population in the bottom half of income distribution in the downtown area, in various locations around Fire Station 1 and there are clusters south of the Queen Elizabeth Way. There are also notable clusters at the intersection of Walkers Line and Upper Middle Road as well as near Dundas Street and Highway 407. **Figure 16** shows there are dissemination areas with a high percentage of the population in the top distribution of income in the neighbourhoods along Lakeshore Road as well as east of Waterdown Road and north of Highway 407.

[36] Data obtained from Statistics Canada was used in the creation of both income decile maps. Some areas of the City are not included within the income decile group maps. According to the dataset obtained through Statistics Canada and viewed in the Beyond 20/20 data viewer, these areas were suppressed to meet the confidentiality requirements of the Statistics Act.

Figure 15: Percentage of Bottom Income Decile by Dissemination Area



CITY OF BURLINGTON

PERCENTAGE OF POPULATION IN BOTTOM INCOME DECILE

- Fire Station

Percentage of Population in Bottom Income Decile by Dissemination Area

- 0 - 2.7%
- 2.7 - 4.9%
- 4.9 - 7.5%
- 7.5 - 11.6%
- 11.6 - 18.5%

Base Data

- City of Burlington Boundary
- Railway
- Expressway / Highway / Freeway
- Collector / Arterial Road
- Local Road / Ramp
- Waterbody

1:75,000

0 0.75 1.5 3 km

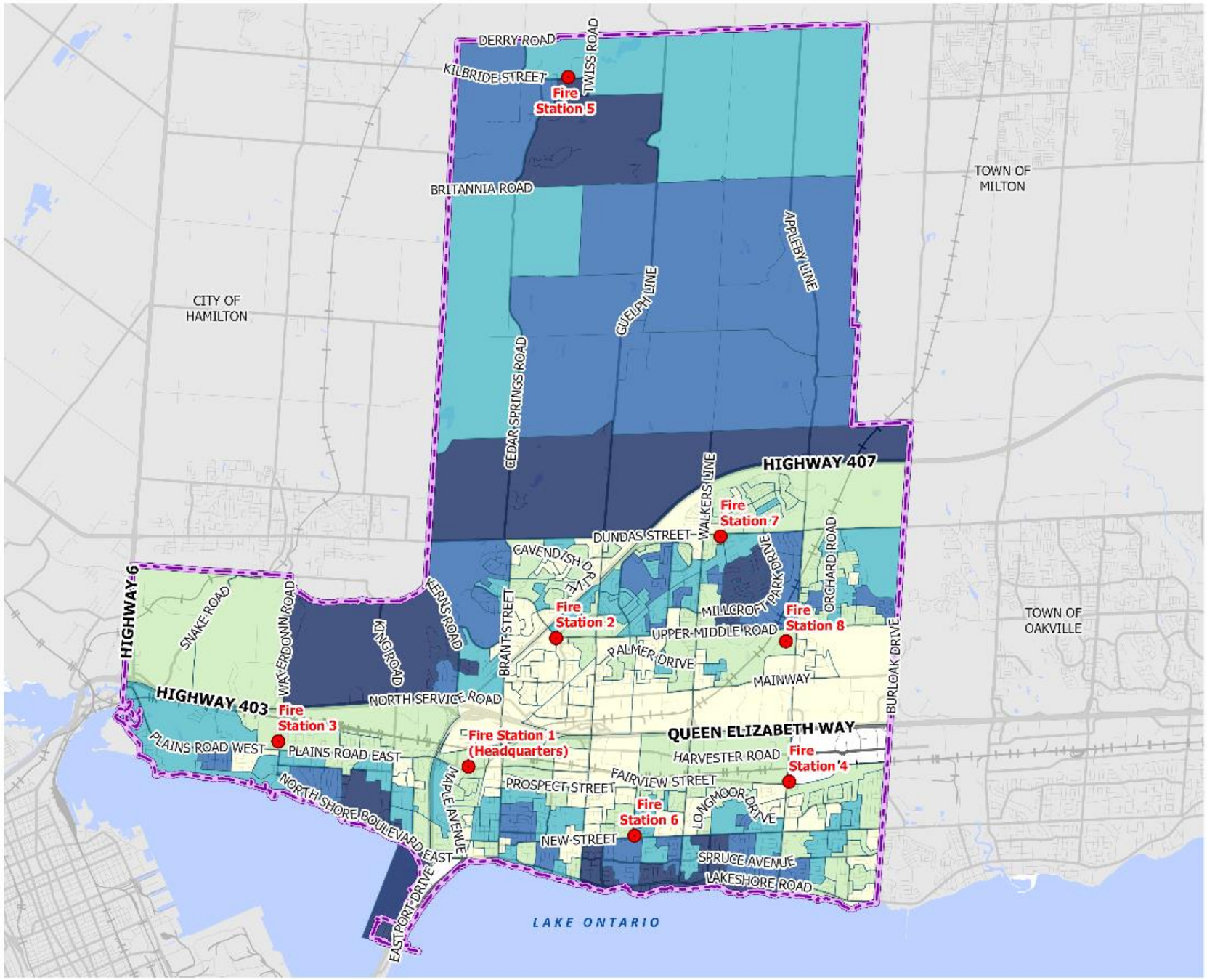
MAP DRAWING INFORMATION:
BASE DATA PROVIDED BY MNRF, CITY OF BURLINGTON

MAP CREATED BY: LK
MAP CHECKED BY: CB/AN
MAP PROJECTION: NAD 1983 UTM Zone 17N

DILLON CONSULTING

PROJECT: 19981
STATUS: DRAFT
DATE: 2021-07-19

Figure 16: Percentage of Top Income Decile by Dissemination Area



5.4.4 Household Tenure, Occupancy, Suitability and Costs

Table 17 through to **Table 25** summarizes household statistics for the City of Burlington and the Province, including tenure, occupancy, suitability and costs.

5.4.4.1 Housing Tenure

Housing tenure reflects socioeconomic status whereby a low home ownership rate may reflect lower incomes in the community and a higher overall fire risk. The City has a higher proportion of dwellings that are owned versus rented when compared to the Province (76.41% owned in Burlington versus 69.78% in the Province).

5.4.4.2 Occupancy

A higher proportion of multiple persons per household can result in increased fire loss (consequence) resulting in a higher risk. There are 490 households (0.69% of total households) that have more than one person per room in Burlington. This reflects a lower percentage compared to the Province where 2.37% of households have more than one person per room.

5.4.4.3 Suitability

The 2016 Census reports on housing suitability which, according to Statistics Canada, refers to whether a private household is a suitable accommodation according to the National Occupancy Standard. Suitable accommodations are defined by whether the dwelling has enough bedrooms based on the ages and relationships among household members. Based on this measure, 2.91% (or 2,075 households) are classified as “not suitable” within the City, compared to 6.02% for the Province as a whole. From the perspective of housing suitability, the City has a potentially lower fire risk.

5.4.4.4 Housing Costs

The cost of shelter may also be indicative of the amount of disposable income within a household. Households with less disposable income have fewer funds to purchase household fire life safety items resulting in a higher risk. In Burlington, 23.56% of households spend 30% or more of the household total income on shelter costs. This is

approximately 4.09% less than the Province, where 27.65% of households spend 30% or more of income on shelter costs.

Looking closer at shelter costs, the median value of dwellings in Burlington is $589,996 ($189,500 higher than the provincial median). The City also has higher median monthly shelter costs for owned and rented dwellings than the Province.

Table 17: Household Tenure – Burlington and Ontario

Household Tenure	Burlington	%	Ontario	%
Owner	54,540	76.41%	3,601,825	69.78%
Renter	16,835	23.59%	1,559,720	30.22%
Total Households	**71,375**	**100.00%**	**5,161,545**	**100.00%**

Table 18: Household Occupancy – Burlington and Ontario

Household Occupancy	Burlington	%	Ontario	%
One person or fewer per room	70,880	99.31%	5,046,810	97.63%
More than one person per room	490	0.69%	122,360	2.37%
Total Households	**71,370**	**100.00%**	**5,169,170**	**100.00%**

Table 19: Household Tenure – Burlington and Ontario

Housing Tenure	Burlington	%	Ontario	%
Suitable	69,295	97.09%	4,858,170	93.98%
Not suitable	2,075	2.91%	311,005	6.02%
Total Households	**71,370**	**100.00%**	**5,169,175**	**100.00%**

Table 20: Shelter Costs – Burlington and Ontario

Shelter Costs	Burlington	%	Ontario	%
Spending less than 30% of household total income on shelter costs	54,485	76.44%	3,694,385	72.35%
Spending 30% or more of household total income on shelter costs	16,795	23.56%	1,411,900	27.65%
Total Households	**71,280**	**100.00%**	**5,106,285**	**100.00%**

Table 21: Median Costs – Burlington and Ontario

Median Costs	Burlington	Ontario
Median value of dwellings	$589,996	$400,496
Median monthly shelter costs for owned dwellings	$1,512	$1,299
Median monthly shelter costs for rented dwellings	$1,302	$1,045

Source: 2016 Census, Statistics Canada[37]

5.5 Cultural Background and Language Considerations

Cultural background and language considerations can be factors for fire service providers to consider in developing and delivering programs related to fire prevention and public education. Communication barriers, in terms of language and the ability to read written material, may have an impact on the success of these programs. There may also be familiarity challenges related to fire safety standards within newcomer populations. A high proportion of immigrants could demonstrate a large population that has a potential for unfamiliarity with local fire life safety practices and/or may experience possible language barriers. **Table 22** summarizes the immigration status of Burlington's population. The City has a lower proportion of newcomers (23.58%) when compared to Ontario (29.09%). This population should be monitored as new Census

[37] Ibid.

data becomes available for consideration when planning public education programs and materials.

Table 22: Immigration Status – Burlington and Ontario

Immigration Status	Burlington Population	Burlington %	Ontario Population	Ontario %
Non-immigrants	136,680	75.88%	9,188,815	69.39%
Immigrants	42,470	23.58%	3,852,150	29.09%
Before 1981	17,180	9.54%	1,077,745	8.14%
1981 to 1990	4,965	2.76%	513,995	3.88%
1991 to 2000	6,830	3.79%	834,510	6.30%
2001 to 2005	4,725	2.62%	490,560	3.70%
2006 to 2010	4,640	2.58%	463,170	3.50%
2011 to 2016	4,130	2.29%	472,170	3.57%
Non-permanent residents	980	0.54%	201,200	1.52%
Total	**180,130**	**100.00%**	**13,242,165**	**100.00%**

Source: 2016 Census, Statistics Canada[38]

Knowledge of official languages based on the 2016 Census is included in **Table 23** for the City of Burlington and Province of Ontario.

As shown, 90.21% of the population in the City have knowledge of English only, 8.92% possess knowledge of both English and French, 0.83% have no knowledge of English or French, and 95 people speak French only. Additional research into language by "mother tongue"[39] indicates that some of the top languages spoken in Burlington include Arabic, Polish and Spanish. The potential for communication barriers should be considered and monitored, especially as the City continues to grow in the future.

[38] Ibid.
[39] Ibid.

Table 23: Knowledge of Official Language – Burlington and Ontario

Language	Burlington Total	Burlington %	Ontario Total	Ontario %
English Only	163,410	90.21%	11,455,500	86.05%
French Only	95	0.05%	40,040	0.30%
English and French	16,150	8.92%	1,490,390	11.20%
Neither English nor French	1,495	0.83%	326,935	2.46%
Total population (non-institutional)	**181,150**	**100.00%**	**13,312,865**	**100.00%**

Source: 2016 Census, Statistics Canada[40]

5.6 Transient Populations

Ontario Regulation 378/18 requires the consideration of "transient populations". This refers to the concept of population shift where the population within a community can shift at various times during the day or week or throughout the year. Population shift can be a result of a number of factors including employment, tourism, and education. In some municipalities, residents regularly leave the community for employment. This can contribute to increased traffic resulting in an increase in the number of motor vehicle collision calls. Other communities may be major tourist and vacation destinations resulting in large population shifts related to seasonal availability of tourism activities. This can result in an increased risk due to overnight tourism accommodation (sleeping) which can impact the demand for fire protection services. Educational institutions can attract a transient student population who commute to school daily or reside in dormitories or student housing on a seasonal basis.

Student accommodations and short term rental units present unique fire safety issues that may be attributed to the conversion of houses into boarding houses or rooming house type accommodations that do not conform to the OFC or OBC These properties

[40] Ibid.

are not always known to the fire department, posing a challenge for fire prevention division staff responsible for fire code enforcement.

5.6.1 Tourism

An increase in tourism can result in an increased risk due to overnight tourism accommodation which can impact the demand for fire protection services. There are several City-hosted events each year and attractions that draw residents and non-residents to the City of Burlington. Annual festivals and events include, but are not limited to:

- Canada Day
- Children's Festival
- Concerts at Central Park Band Shell (throughout the summer months)
- Kite Festival
- Santa Claus Parade
- Movies Under the Stars

In addition to the City-run events, there are more than 200 community organized events each year.[41]

5.6.2 Education

Educational institutions are a key source for population shift in larger communities as they attract people from outside of the typical community. They are important to consider since they may have school-based residences, or contribute to a population that is not captured through the census. There are no major post-secondary institutions within Burlington, however, there are several universities and colleges in neighbouring municipalities within an attractive commuting distance.

Post-secondary education institutions in neighbouring municipalities include McMaster University in Hamilton, Mohawk College in Hamilton, Sheridan College in Oakville and University of Toronto (Mississauga).

[41] Festivals and Events (n.d.). City of Burlington. Retrieved February 13, 2020 from https://www.burlington.ca/en/live-and-play/Festivals-and-Events.asp

5.6.3 Employment

Commuter populations represent a significant portion of Burlington's labour force. **Table 24** shows the commuting destination trends for the residents of Burlington based on 2016 Census data. It appears that a portion of the City's labour force (13,785) commutes to a different census subdivision within the census division of residence. An additional 31,570 commute to a different census division within the province.

A shift in commuter population may impact the demand for fire protection services. These figures are important from a fire suppression standpoint as large numbers of people commuting in and out of the City could increase the number of vehicle collision calls to which the fire service responds.

Table 24: Commuting Destinations – City of Burlington

Commuting Destination*	Population
Commute within census subdivision of residence	33,060
Commute to a different census subdivision within census division of residence	13,785
Commute to a different census subdivision and census division within province or territory of residence	31,570
Commute to a different province or territory	225
Total	**78,640**

Source: 2016 Census, Statistics Canada[42]

*Commuting destination for the employed labour force aged 15 years and over in private households with a usual place of work - 25% sample data.

[42] Ibid.

Another way to measure this population shift is based on traffic counts. The Transportation Tomorrow Survey (TTS) is a comprehensive travel survey conducted every five years, providing insight into the travel habits of residents in the Greater Toronto, Hamilton and surrounding areas, including the City of Burlington.

The most recent TTS reporting year (2016) indicates that in a 24 hour period, 400,700 trips are made by the residents of Burlington, with the majority made by vehicle drivers as the main mode of travel. Similarly, 406,100 trips are made to Burlington by residents of the TTS Area in a 24 hour period.[43]

High commuter volumes (due to an individual's journey to work or school) can have a significant impact on transit and traffic, increasing the likelihood of vehicle collisions with the possibility of higher call volumes during peak commuting times in the morning and late afternoon. This could potentially impact emergency response times within the City.

Identified Risk: The City's commuter population presents a factor that may impact traffic congestion, and the potential occurrence of motor vehicle accidents within the City.

[43] Data Management Group, University of Toronto. (2018, March). Transportation Tomorrow Survey 2016 (PDF File). Retrieved from University of Toronto Website, Data Management Group

6.0 Hazard Profile

As referenced in the **O. Reg. 378/18**, the hazard profile assessment includes analysis of the hazards within the community, including natural hazards, hazards caused by humans, and technological hazards to which fire departments may be expected to respond to. Hazardous incidents may have significant impact within the community. This section considers such hazards within the City of Burlington.

6.1 Hazard Identification and Risk Assessment in Ontario (HIRA)

A hazard is defined as a phenomenon, substance, human activity or condition that may cause loss of life, injury or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage. Hazards can be natural, human-caused or technological. It is important to identify and consider these hazards from a fire risk, emergency response, and overall public safety perspective in order to assist local governments and emergency management personnel plan for the risks within their communities and take the appropriate action to reduce future losses.

Under the Emergency Management and Civil Protection Act (EMCPA), municipalities are required to 'identify and assess the various hazards and risks to public safety that could give rise to emergencies and identify the facilities and other elements of the infrastructure that are at risk of being affected by emergencies'. 2002, c. 14, s. 4. The OFMEM recently released methodology guidelines outlining a process for the development of a HIRA program, to assist municipalities in assessing their local hazards and potential risks. Current legislation requires an annual review and update of the municipally developed HIRA.

6.1.1 HIRA and the CRA

The OFMEM TG-02-2019 and OFMEM "Question and Answers" provide guidance with respect to developing a community HIRA in the context of a Community Risk Assessment. The guidelines acknowledge that these processes are separate, but complementary. The OFMEM "Question and Answers" states that the CRA process "may result in decisions about fire department responses to various types of emergencies identified in a completed HIRA".

A HIRA is a comprehensive process to identify the hazards to a community as a whole. A CRA provides an opportunity to examine the impact that these hazards would have on the services provided by a fire department. For the purposes of this CRA, a "fire protection services" lens will be applied to the top hazards as identified through the municipal led HIRA

6.2 City of Burlington Hazard Identification and Risk Assessment

The City's Hazard Identification and Risk Assessment was reviewed and updated as recently as 2019. As a component of the risk assessment and risk analysis process, the top risks in Burlington were identified. The HIRA assigns likelihood and consequence levels to a list of hazards based on the potential for impacts to people, property and the environment. As a result of this analysis, the top hazards in the City include emergencies relating to the following:

- Flooding
- Winter Weather
- High Winds
- Electrical Energy
- Oil or Natural Gas
- Chemical
- Chemical Biological Radiological Nuclear Explosives (C.B.R.N.E)
- Rail, Light Rail or Subway
- Road and Highway
- Cyber-Attack

6.3 Impacts of Hazards on Fire Protection Services

To better understand the risks of hazards as they pertain to fire protection services, the City's top hazards have been assessed to identify possible impacts on fire protection services. Many of the potential impacts are not unique to a jurisdiction. The results of this review as they pertain to the top hazards in the City of Burlington are presented in **Table 25**.

Table 25: Impacts of Hazards on Fire Protection Services

Hazard (City HIRA)	Possible Impact on Fire Protection Services
Flooding	The 2019 HIRA indicates that the City experiences localized storm surge and both riverine and urban flooding impacts on an annual basis. Storm surge occurs when the City's stormwater systems cannot accommodate increased precipitation resulting in flash flooding in many of the City's neighbourhoods. Similarly, flooding can occur due to the overflow of water from a river or other body of water overland. The impacts of a flooding event could include property or structural damage, resulting in disruptions to the transportation network. Depending on the severity of the flooding, access to various sections of the road network impact fire department response, resulting in extended emergency response times. In instances of long-term flooding, there could be impacts to human health, as an increase in water and moisture could promote the prevalence of pests that thrive in wetter environments. Burlington's most recent severe flooding event occurred in August 2014 whereby the City received approximately 191 millimetres of rain in an eight hour period causing significant damage to property, business and road infrastructure.[44]

[44]Remembering the Flood - Five Years Later. (August 2019). City of Burlington. Retrieved February 18, 2020 from https://www.burlington.ca/en/services-for-you/Remembering-the-Flood-Five-Years-Later.asp

Hazard (City HIRA)	Possible Impact on Fire Protection Services
Winter Weather	According to the City's HIRA, a winter weather event is defined as a severe weather event with varieties of precipitation that can form at low temperatures such as snow, freezing rain and ice. Episodes of freezing rain, ice or heavy snowfall can result in an array of consequences. For example, freezing rain can weigh down electrical transmission lines or branches causing them to break, which in turn can block roadways impeding the fire department or other first response agency's ability to access the road network, leading to extended emergency response and extended travel times. Downed electrical wiring presents electrical current exposure hazards which can cause injuries requiring medical assistance and overall, damages to the electrical grid could lead to energy system disruption. Freezing rain, heavy snowfall or ice can also result in dangerous driving conditions leading to motor vehicle collisions or crashes, driving emergency response call volume.
High Winds	Wind storms or severe weather events that are accompanied by high winds can also cause varying levels of property or structural damage; disrupt multi-modal transportation services and interfere with the delivery of utilities (e.g. hydro) or other critical infrastructure (e.g. telecommunications). Similar to winter weather events, the damage to property and infrastructure cause by high winds can obstruct first responder access to the road network, leading to a delay in emergency response times.
Electrical Energy	Energy emergencies that include power outages can affect critical infrastructure, essential services or a large portion of local residents and businesses, lasting long periods of time. Common causes of power outages include extreme weather events and storms, increased demand on the system, or energy infrastructure failure. Such event could result in the loss of energy for heat, cooling, cooking, refrigeration, fire protection equipment, building elevators, life assistance equipment, and more.

Hazard (City HIRA)	Possible Impact on Fire Protection Services
Oil or Natural Gas	As indicated in **Section 4.0 – Critical Infrastructure**, there are natural gas and oil pipelines within the City of Burlington. There are a number of risks associated with pipelines due to volatile properties and characteristics. Natural gas for example, is highly combustible and is explosive when placed under pressure. A pipeline rupture or leak could result in prolonged or uncontrolled product release requiring specialized emergency response and/or evacuation of the exposed surrounding area. Crude oil is a flammable liquid that can have a high or low flash point depending on the type. For this reason, it is important for local response agencies to understand the type of crude oil that is transported throughout the community and its physical and chemical properties. This is due to the different variations in crude oil may require different response types or personal protective equipment. Pre-incident planning, training and exercise activities with the pipeline operator and other response partners such as the Burlington Fire Department is crucial to ensuring that emergency response personnel are equipped with the right knowledge, skills and equipment needed to respond to a pipeline-related incident. Establishing partnerships and procedures before an incident occurs is conducive to building awareness, and a safe and effective response.
Chemical	According to the City's HIRA, there is no history of fixed site chemical releases in the City of Burlington over the last ten years. However, releases from collisions and dangerous goods in transport do occur. A fire department can perform hazardous materials response or partner with a neighbouring jurisdiction to provide the same service if they are properly trained. It is important for a fire department to possess the proper training and certification required to perform hazardous materials response safety and securely in order to prevent firefighter injury. Specialized rescue and hazardous materials response capabilities of the BFD are described in the Master Fire Plan.

Hazard (City HIRA)	Possible Impact on Fire Protection Services
Chemical, Biological, Radiological, Nuclear, and Explosive (CBRNE)	This hazard involves the release of chemical, biological, radiological, nuclear, and explosive materials. These materials are hazardous and can have harmful effects on human life, property and the environment. A fire department can perform hazardous materials response or partner with a neighbouring jurisdiction to provide the same service if they are properly trained. It is important for a fire department to possess the proper training and certification required to perform hazardous materials response safety and securely in order to prevent firefighter injury. Specialized rescue and hazardous materials response capabilities of the BFD are described in the Master Fire Plan.
Rail, Light Rail or Subway	An incident involving a derailment or rail accident could be a significant emergency event within a community and could involve hazardous materials and/or dangerous goods. An emergency involving rail, light rail or subway in Burlington could require hazardous materials response or other specialized rescue service from the BFD
Road and Highway	Road and highway hazards include transportation emergencies involving vehicles on the road network. A transportation emergency along a road or highway could translate into partial or full closure of a road or major highway route or to the system as a whole with impacts that include injury or loss of life, environmental damage, hazardous materials leak, and/or economic loss. A road or highway emergency in Burlington could require hazardous materials response or other specialized rescue service from the fire department. Based on historical emergency call volume, rescue calls responded to by the BFD account for 9.35% of total emergency call volume. Of those rescue calls, 89.09% pertain to motor vehicle related incidents (**Section 10.2.2.3**).

Hazard (City HIRA)	Possible Impact on Fire Protection Services
Cyber-Attack	With the advancement of technology and its integration into many if not all critical infrastructure sectors, cyber-attacks may become more prevalent. Emergency Management Ontario's 2019 Hazard Identification Report, defines cyber-attacks as "unauthorized access or malicious code to alter computer code, logic or data, resulting in disruptive consequences that can compromise data or misappropriate key systems and resources."[45] As cybercrime continues to rise, there is potential for critical infrastructure from the local to national level to be compromised resulting in a real threat to public safety and security as well as economic well-being. Fire departments, like all public safety response agencies, retain sensitive data pertaining to fire loss and emergency call history. The systems that house this data are not exempt from being compromised.

Source: City of Burlington's 2019 Hazard Identification and Risk Assessment

The Master Fire Plan, which is informed by the findings of this CRA, includes a high-level review of the City's emergency management and planning efforts and operational approaches to the hazards identified in this assessment.

Key Finding: The City's 2019 Hazard Identification and Risk Assessment identifies hazards that could each impact the ability of the City to deliver fire protection services.

[45] Hazard Identification Report 2019. (Modified May 8, 2019). Emergency Management Ontario. Retrieved February 19, 2020 from https://www.emergencymanagementontario.ca/english/emcommunity/ProvincialPrograms/HIRA/Report/SectionF.html#Cyber

7.0 Public Safety Response Profile

As required by **O. Reg. 378/18**, the Public Safety Response Profile includes analysis of the types of incidents responded to by other entities in the community, and those entities' responsibilities. These entities could include police, ambulance, fire and other entities that may be tasked with or able to assist in some capacity the collective response to an emergency situation. The following sections consider these public safety response characteristics within the City of Burlington.

7.1 Public Safety Response Agencies in the City of Burlington

Public safety and response agencies refer to agencies and organizations that respond to specific types of incidents within a community that provide trained personnel and resources critical to upholding public safety. Each of these entities offer specialized skillsets in support of front-line operations. The types of response services offered might include fire protection, medical attention, rescue operations, policing activities or hazardous materials response. In addition to responding individually to certain types of incidents, these entities work closely with one another in the event of major emergencies through a structured standardized response approach to ensure effective coordination among all response agencies.

Table 26 lists the public safety response agencies within Burlington that will be able to assist in a collective emergency response effort and may contribute to the mitigation of risk within the community. Identifying the public safety response agencies within the community can help the fire service become familiar with other public safety response agencies and each agency's specific response capabilities.

Table 26: Public Safety Response Agencies

Identified Public Safety Response Agency	Types of Incidents They Respond To	Agency Role in Incident
Halton Regional Police Service	• Motor vehicle collisions • Medical incidents • Fire incidents • False fire incidents • Public assistance	• Traffic control, scene stabilization, investigation • Patient contact, initial first aid, scene stabilization, investigation • Scene stabilization, evacuation, investigation • Scene stabilization, investigation • Assist in coordinating public information
Victim Services – Halton Regional Police Service	• Homicide • Attempt murder • Serious assault (with a weapon, causing bodily harm, aggravated assault, kidnapping/abduction, forcible confinement) • Domestic violence • Sexual assault • Human trafficking • Hate crimes	• Emergency transportation costs • Emergency child care and dependent care for elderly or special needs dependents • Emergency accommodation, meals and personal care items • Emergency vision care • Crime scene cleanup • Short-term counselling services and related transportation costs immediately after a violent crime has occurred • Funeral expenses for homicide victims • Access to counselling services

Identified Public Safety Response Agency	Types of Incidents They Respond To	Agency Role in Incident
Halton Paramedic Services	• Motor vehicle collisions • Medical incidents • Fire incidents • False fire incidents • Public assistance	• Patient stabilization, extrication, reporting • Patient stabilization, transport, reporting • Standby for firefighter safety, patient stabilization, transport, reporting • Standby for firefighter safety, patient stabilization, transport, reporting • Assist in coordinating public information
Town of Oakville Water Air Rescue Force (TOWARF) (Western Lake Ontario)	• Marine search and rescue missions • Missing persons/boaters	• Search and rescue support in western Lake Ontario • Work in cooperation with other agencies and emergency services like the Canadian Forces, police, fire and ambulance under the coordination of Joint Rescue Coordination Center (JRCC). • Patrol waters (April to October)

Identified Public Safety Response Agency	Types of Incidents They Respond To	Agency Role in Incident
Grimsby Auxiliary Marine Rescue Unit, South Shore Search and Rescue (south shore of Lake Ontario)	• Marine search and rescue missions • Missing persons/boaters	• Search and rescue support on the south shore of Lake Ontario between Hamilton and Port Weller • Work in cooperation with other agencies and emergency services like the Canadian Forces, police, fire and ambulance under the coordination of JRCC • Vessels and members are on stand-by 24 hours a day through the boating season, usually from April to November
Civil Air Search and Rescue Association (CASARA) (several units across Ontario and Canada)	• Incidents requiring volunteer air search and rescue service throughout Southwestern Ontario • Military training exercises	• Support Canada's Search and Rescue (SAR) program and to promote SAR Awareness • May also be called upon to supply certified CASARA. members trained as spotters onboard military aircraft • Tasked on SAR missions by the JRCC, located at CFB Trenton

Identified Public Safety Response Agency	Types of Incidents They Respond To	Agency Role in Incident
Ontario Volunteer Emergency Response Team – services available through request for assistance	• Large scale disasters that may require evacuation including floods, power outages, public health emergencies and more • Incidents requiring technical rescue • Search and rescue/missing persons	• Provides emergency assistance to first responders and emergency management agencies • Incident command • Ground and marine search and rescue • Canine unit support • Technical rescue • Communications
Heavy Urban Search and Rescue	• Urban building collapses • Mudslides • Forest fires • Other disasters	• Search and rescue • Communications • Logistics • Emergency medical assistance • Canine search • Structural assessment
Provincial Chemical, Biological, Radiological, Nuclear, and high yield Explosives (CBRNE)/HazMat	• CBRNE / Hazardous material incidents	• Provide specialized expert (technician) Level 3 CBRNE Response Teams

7.1.1 Mutual Aid Agreements

Mutual aid agreements can provide additional depth of resources and response that may not have been dispatched as part of a municipality's initial response. These agreements establish a mutual relationship between multiple public safety and response agencies whereby emergency services and resources are shared to promote a more effective response and strengthen the depth of emergency response provided by a fire department. Currently, the BFD is a participant in the **Halton Region Mutual Aid Agreement.** The Mutual Aid Agreement is discussed within the Master Fire Plan.

7.1.2 Automatic Aid Agreements

Agreements between public safety and response agencies such as fire departments can also provide for initial or supplemental emergency response services. Automatic aid agreements are programs designed to provide and/or receive assistance from the closest available resource, regardless of municipal boundaries, on a day-to-day basis. **Table 27** summarizes the automatic aid agreements established between the City of Burlington and its surrounding municipalities for the provision of fire protection services. The automatic aid agreements to which the City is party to will be discussed further within the Master Fire Plan.

Consultation with the BFD indicates that there is also a memorandum of understanding with the City of Mississauga for Trench Rescue.

Table 27: Public Safety Response Agencies through Automatic Aid Agreements

Identified Public Safety Response Agency	Types of Incidents They Respond To	Agency Role in Incident
Town of Milton	• Fire scenes • Motor Vehicle Collisions • Rescue scenes	• Firefighting • Fire scene control • Rescue services • Provide services listed above for the following areas within Burlington for all emergency call types: ○ Commencing at Appleby Line, proceeding easterly on Derry Road, covering the south side of the road to Bell School Line ○ South on Bell School Line, covering the south side of the road to Burnhamthorpe Road (#1 Side Road) ○ East on Burnhamthorpe Road, covering the south side of the road, ending at Burloak Drive
City of Hamilton	• Fire scenes • Motor Vehicle Collisions • Rescue scenes	• Hamilton responds to the following areas: ○ Skyway Bridge (Burlington goes QEW south to Woodward Ave the cut off and Hamilton goes north to Northshore Blvd. for all emergency call types) ○ Highway #403 (Eastbound) - Highway 6 to the QEW Niagara Cut-Off, minimum Hamilton response will be two units for all emergency call types

Identified Public Safety Response Agency	Types of Incidents They Respond To	Agency Role in Incident
		○ Lost Forest Park - 4449 Milborough Townline Rd. (, a typical Hamilton response for the event type being dealt with will be dispatched to assist) ○ Highway #6 - West side of Highway belongs to Hamilton and East side of Highway belongs to Burlington, therefore both departments will automatically respond to all emergency call types ○ Rural area including Kilbride area - Dundas St. (Hwy 5) northerly to Derry Rd., Milborough Townline Rd., easterly to Tremaine Rd. (Upon request, Hamilton will respond two (2) Tankers to the area west of Guelph Line, and only one (1) Tanker to the area east of Guelph Line for structure and tanker shuttle operations only ○ Aldershot - Hwy 403 northerly to the top of the escarpment, from Hwy 6 easterly to King Rd (Upon request, Hamilton will respond two (2) Tankers into this area for structure and tanker shuttle operations only

Source: Automatic Aid Agreement between the City of Burlington and Town of Milton, dated April 2003 and the Automatic Aid Assistance Agreement between the City of Burlington and the City of Hamilton, revised October 2010.

8.0 Community Services Profile

As referenced in **O. Reg. 378/18**, the community service profile assessment includes analysis of the types of services provided by other entities in the community, and those entities' service capabilities. This includes the presence or absence and potential abilities of other agencies, organizations or associations to provide services that may assist in mitigating the impacts of emergencies to which the fire department responds. The following sections consider these community service characteristics within the City of Burlington.

8.1 Community Services in the City of Burlington

Fires and other emergency events can have devastating effects on a community, and at times, can overwhelm public safety and security agencies' capacity to respond. In an emergency event, community-based agencies, organizations and associations can provide surge capacity to the response and recovery efforts of first responders and a useful resource to call upon if integrated into the emergency management framework of a municipality early on. These types of affiliations can contribute a variety of capabilities essential to response and recovery efforts including support in the areas of communications, health care, logistics, shelter, food and water supply, emergency clothing, and more specialized skillsets.

Investigating new community partnerships and strengthening existing ones may be an effective strategy for consideration towards enhancing the current public fire and life safety education program, fire inspection efforts and emergency response and recovery capabilities of the BFD **Table 28** identifies community agencies, organizations and associations within Burlington.

Table 28: Community Service Agencies, Organizations and Associations

Community Service Agency	Types of Assistance Provided
Canadian Red Cross – Burlington Branch (located in Burlington)	In the event of a fire incident or emergency, the Burlington Branch of the Red Cross can provide temporary lodging, clothing and food to persons who cannot return to their home or, who cannot find alternate accommodations. In larger emergencies requiring evacuation, the organization has the capability to set up reception and information services to greet evacuees, provide information, provide family reunification and control facility access.
Salvation Army – Burlington Mainway (located in Burlington)	The Salvation Army is capable of providing both immediate and long-term recovery assistance in cooperation with Fire and Police Services. The Salvation Army's Emergency Disaster Services program can provide food and hydration resources, emotional and spiritual care, donations management, social services, long-term recovery and training and volunteers.
St. John's Ambulance (located in Burlington)	As a member of the Disaster Response Service Agencies, St. John's Ambulance Emergency Preparedness and Disaster Response Teams are integrated into the collective community disaster and emergency response and preparedness effort. The organization has the capacity to provide health care and first aid in reception centres, casualty care at the scene of an event, patient transportation, and evacuation assistance.
Burlington Amateur Radio Club (located in Burlington)	Local amateur radio club can provide communications support in the event of an emergency.

Community Service Agency	Types of Assistance Provided
Local community faith-based organizations	Public fire safety messaging does not always reach community's most vulnerable populations. Partnering with local faith based organizations can provide the BFD with the opportunity to improve its public education program as a method of information sharing to a wider audience within the City. This type of opportunity could involve distributing printed materials with fire safety messaging and smoke alarm installation information among the congregation, or faith-based leaders may allow representatives from the BFD to address congregations at faith based events with fire safety messaging in person. These organizations may also be able to identify residents within the community who are at great risk of fire danger due to substandard housing or hoarding.
Alcohol and Gaming Commission of Ontario	The BFD can partner with local organizations that may be able to provide additional support in the area of fire inspection and enforcement. For example, the Alcohol and Gaming Commission of Ontario may be able to assist in the enforcement of occupancy loads in nightclubs through after hour inspections. Establishing lines of communications and collaborative partnerships early on with agencies who share a common concern for people's welfare and safety can inform and strengthen the fire department's inspection and enforcement program.

Community Service Agency	Types of Assistance Provided
Farm and Food Care Ontario	As discussed in **Section 2.0 – Geographic Profile**, Burlington has a large rural area north of Highway 407. Barn fires can be devastating incidents leading to loss of livestock, buildings, and equipment. Farm & Food Care Ontario operates a lending program of FLIR (heat sensing) modules to be used as a fire prevention and awareness tool by farmers to increase their awareness of fire safety, potential risks and prevention. The BFD could consider partnering with local agricultural organizations to bring awareness to some of these important resources.
Halton Catholic District School Board and Halton District School Board, and local private schools	As reported in **Section 5.2 – Population Age**, the 2016 Census data indicates that children aged 14 and under represent 16.73% of the City's total population. The proportion of children in the City is significant, especially when considering the opportunity for public education. This percentage supports the development of enhanced public education programming that targets children/youth of all ages. Partnering with school boards and other agencies that work with children can provide opportunity for fire and life safety education.
Halton Children's Aid Society	The Halton Children's Aid Society is responsible for providing child protection services to children who live in Halton Region. It is common practice for this agency to investigate and inspect living conditions where there is a concern for a child's welfare. C.A.S. workers may encounter property conditions that they feel warrant follow up by the BFD due to unsafe conditions or fire hazard related concerns.

Community Service Agency	Types of Assistance Provided
Senior Care Agencies (such as the Senior Care Agency – Home Care Services, Home Well Senior Care, Living Assistance Services – Burloak Region, Supportive Living, Halton Seniors Homecare)	As reported within **Section 5.2 – Population Age** of this CRA, seniors (those 65 years and over) are considered to represent one of the highest fire risk groups across the Province based on residential fire death rate (fire deaths per mission of population). According to the 2016 Census, seniors represent 19.27% of the City's total population and 28.21% of the City's population fall into the age range of 45 to 64, representing a cohort aging towards the seniors demographic of 65 years or older. Agencies that provide at-home care and assisted living services to seniors can assist the BFD in identifying occupants who are at increased fire risk due to unsafe living conditions (e.g. absence of a working smoke alarm) which may require follow up or inspection.
Community Development Halton	Community Development Halton is a community-based organization that is committed to social change within the Halton Region. This is accomplished through: • identifying community needs • developing community awareness of identified trends and needs • facilitating and supporting community response to identified trends and needs • facilitating communication and coordinated planning between members of the community, local organizations and governments to develop ways to address these needs • advocating for change A partnership between the fire department and Community Development Halton could aid in the facilitation of communicating public fire and life safety awareness to the public.

Community Service Agency	Types of Assistance Provided
Links2Care (located in Oakville)	Links2Care provides social support to seniors and adults living with disability within Halton Region and the Mississauga area. The organization offers a home maintenance & repair program that helps seniors and those living with disabilities with tasks inside and outside of their home. The fire department can provide educational materials and awareness about the proper installation of smoke alarms and fire and life safety information to employees/volunteers of Links2Care who are responsible for home maintenance and repair.

9.0 Economic Profile

As referenced in **O. Reg. 378/18**, the economic profile assessment includes analysis of the economic sectors affecting the community that are critical to its financial sustainability. This involves economic drivers in the community that have significant influence on the ability of the community to provide or maintain service levels. The following sections consider these economic characteristics within the City of Burlington.

9.1 Economic Sectors and Employers in Burlington

Certain industries, employers and events contribute to the financial sustainability and economic vitality of a community. A fire or other emergency at key sectors and employment facilities within a community could have significant impacts on local economy and employment.

The City of Burlington has a diverse economic base and is home to a growing number of high profile companies. Its workforce and economy are characterized by retail, health care and manufacturing industries, as shown in **Figure 17**.

Figure 17: Industry in Burlington

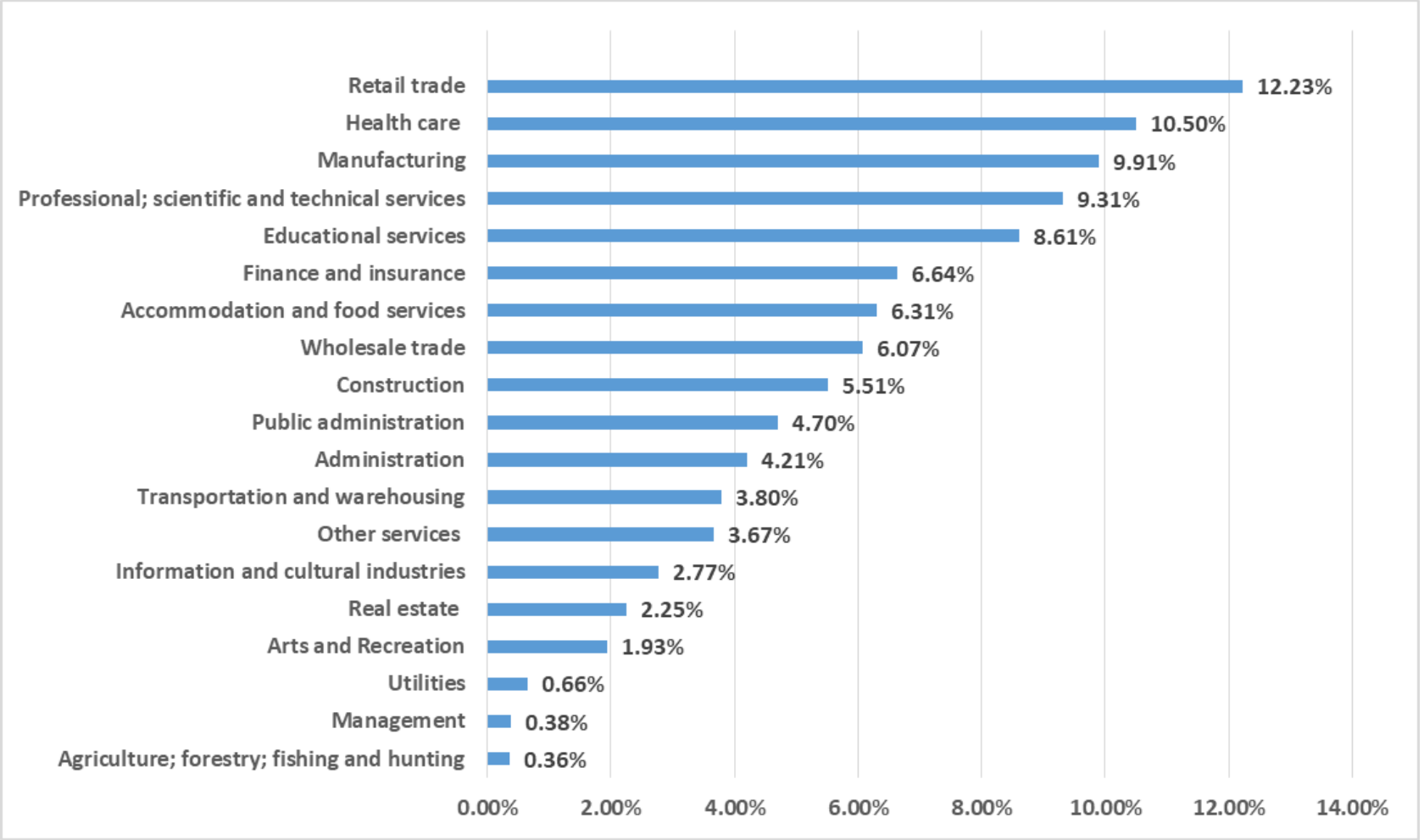


Figure Source: 2016 Census, Statistics Canada[46]

[46] Statistics Canada. 2017. Burlington, CY [Census subdivision], Ontario and Halton, RM [Census division], Ontario (table). Census Profile. 2016 Census. Statistics Canada Catalogue no. 98-316-X2016001. Ottawa. Released November 29, 2017.
Statistics Canada Website

The City is strategically located in the Toronto-Waterloo Innovation Corridor, making it an attractive location for many innovative technology businesses. This prosperous area is home to academic and research centres that support business innovation and growth and contribute to a highly educated workforce. Within the Innovation Corridor there are over 15,000 high-tech companies and over 205,000 tech workers.[47] To position itself as a growing hub for technology-based industry, the Burlington Economic Development Corporation launched TechPlace which supports tech businesses, both newly established and growing, with office space, networking opportunities and resources.

To continue attracting and growing innovative companies to Burlington as a home base, the City aims to increase its competitiveness in a number of strategic ways including the intensification of its Major Transit Station Areas as discussed in **Section 2.0 – Geographic Profile** of this CRA Centred around GO Transit hubs near Aldershot, Burlington and Appleby stations, these hubs will provide options in transportation and will guide future growth promoting transit, employment, and housing in these areas.

The major employers within the City of Burlington are summarized in **Table 29**. These include employers within advanced manufacturing, financial and professional services, the food and beverage or crop production, information and communication technologies, and professional scientific organizations.

Table 29: Top Employers in Burlington

Industry	Employer
Advanced Manufacturing	ABB Inc.
Advanced Manufacturing	ABS Machining
Advanced Manufacturing	Cogent Power
Advanced Manufacturing	Evertz Microsystems Ltd.
Advanced Manufacturing	Gerrie Electric
Advanced Manufacturing	Hadrian Manufacturing Inc.
Advanced Manufacturing	Laurel Steel Ltd.
Advanced Manufacturing	Metrican Stamping Co Inc.
Advanced Manufacturing	Pollard Windows Inc

[47] Innovation Resource Guide, (n.d) Economic development Burlington, provided by the Burlington Fire Department

Industry	Employer
Advanced Manufacturing	Samuel Metal Processing
Advanced Manufacturing	The StressCrete Group
Financial/Professional Services	Bunzl Canada
Financial/Professional Services	Deloitte
Financial/Professional Services	Mercedes-Benz
Financial/Professional Services	Tandia
Financial/Professional Services	The CUMIS Group Limited
Financial/Professional Services	UPS Supply Chain Solutions
Financial/Professional Services	Wolseley
Food and Beverage/Crop Production	Dawn Foods
Food and Beverage/Crop Production	Enviro Mushroom Farm
Food and Beverage/Crop Production	Hood Packaging Corporation
Food and Beverage/Crop Production	Sofina Foods/Fearmans
Food and Beverage/Crop Production	The Ippolito Group
Food and Beverage/Crop Production	Voortman Cookies Ltd.
Information and Communication Technologies	Cogeco Connexion
Information and Communication Technologies	Gemalto Canada
Information and Communication Technologies	Pink Elephant
Information and Communication Technologies	Xiris
Professional Scientific Organizations	Boehringer Ingleheim
Professional Scientific Organizations	Fisher & Ludlow
Professional Scientific Organizations	Hunter Amenities
Professional Scientific Organizations	Innomar Strategies
Professional Scientific Organizations	Thermo Fisher

Source: City of Burlington[48]

[48] Major Employers, Economic Development Burlington, (n.d.). https://bedc.ca/major-employers/

Key Finding: The City has identified top employers that contribute to the economic vitality of the community. If a fire were to occur at one of these facilities it could have a negative impact on the financial well-being of the City.

10.0 Past Loss and Event History Profile

As referenced in **O. Reg. 378/18**, the past loss and event history profile assessment includes analysis of the community's past emergency response experience, including an analysis of the number and types of emergency responses, injuries, deaths and dollar losses, and a comparison of the community's fire loss statistics with provincial fire loss statistics. Evaluation of previous response data will inform decisions on fire protection services delivery including public fire safety education and inspection programs. The following sections consider these past loss and event history characteristics within the City of Burlington.

10.1 Past Loss

Analysis of historical data provides valuable insight into understanding the specific trends within a community. Assessing the key factors of life safety risk and fire risk in relation to provincial statistics provides a foundation for evaluating where specific programs or services may be necessary. The analysis within this section is based on the OFMEM's Standard Incident Reporting for the period of January 1, 2015 to December 31, 2019 in order to provide a comparison with Provincial fire loss data.

10.1.1 Total Fire Loss

Analysis of the total fire loss within the City over the five year period from January 1, 2015 to December 31, 2019 as displayed in **Table 30,** includes three categories representing the primary types of fires and the total amount of dollar loss associated with these fires. This includes 353 structure fires, 41 outdoor fires, and 157 vehicle fires representing $37,700,476 in total dollar loss.

Over this five year period, the City averaged 110 fires and $7,540,095 in property loss per year. On average, 71 structure fires occur per year with an average structural fire property loss of $6,790,036 per year.

Table 30: Total Fire Loss – City of Burlington

Year	Structure # of Fires	Structure Loss ($)	Outdoor # of Fires	Outdoor Loss ($)	Vehicle # of Fires	Vehicle Loss ($)	Total # of Fires	Total Loss ($)
2015	81	$5,185,125	9	$659,440	21	$352,700	111	$6,197,265
2016	83	$2,844,980	12	$23,550	33	$509,100	128	$3,377,630
2017	69	$5,120,800	9	$38,100	36	$566,500	114	$15,725,400
2018	64	$6,647,626	8	$52,200	37	$625,500	109	$7,325,326
2019	56	$4,151,649	3	$6,506	30	$916,700	89	$5,074,855
Total (2015-2019)	**353**	**$33,950,180**	**41**	**$779,796**	**157**	**$2,970,500**	**551**	**$37,700,476**
% of All Fires (2015-2019)	**64.07%**	**90.05%**	**7.44%**	**2.07%**	**28.49%**	**7.88%**	**No Value**	**No Value**
Average (2015-2019)	**71**	**$6,790,036**	**8**	**$155,959**	**31**	**$594,100**	**110**	**$7,540,095**

Source: OFMEM Standard Incident Reporting (2015 to 2019 data)

Table 31 compares the number of structure fires and the associated total property loss within the City of Burlington for the period from January 1, 2015 to December 31, 2019 to the number of structure fires and total property loss that occurred across Ontario for the same period.

The City of Burlington experienced an average of 71 structure fires per year over the five year period from January 1, 2015 to December 31, 2019, representing an average of 12.81% of all fires that occurred in the City. Over this same period, the Province experienced an average of 6,964 structure fires per year representing an average of 12.93% of all fires that occurred in the Province.

Structure fires accounted for the highest percentage of total dollar loss for fires in the City and in the Province. However, the average of all fires in Burlington of 12.81% was slightly lower than that of the Province of 12.93% and the fire loss in Burlington of 18.01% was slightly higher than that of the Province of 17.78%. The higher percentage of all fire loss that occurred in the City than in the Province could be due to the higher median value of dwellings in Burlington. As shown in **Section 5.4.4.4 – Housing Costs**, the median value of dwellings in Burlington is $589,996, higher than the median value of dwellings for the entire Province of Ontario by $189,500.

Table 31: Structure Fires and Property Loss – City of Burlington and Province of Ontario

Year	City of Burlington Structure Fires	City of Burlington Loss ($)	City of Burlington % All Fires	City of Burlington % All Loss ($)	Ontario Structure Fires	Ontario Loss ($)	Ontario % All Fires	Ontario % All Loss ($)
2015	81	$5,185,125	14.70%	13.75%	7241	$658,957,694	13.45%	16.42%
2016	83	$2,844,980	15.06%	7.55%	7171	$654,764,771	13.32%	16.32%
2017	69	$15,120,800	12.52%	40.11%	6683	$658,345,490	12.41%	16.41%
2018	64	$6,647,626	11.62%	17.63%	7012	$734,340,655	13.02%	18.30%
2019	56	$4,151,649	10.16%	11.01%	6715	$860,408,256	12.47%	21.45%
Average (2015-2019)	**353**	**$33,950,180**	**64.07%**	**90.05%**	**34822**	**$3,566,816,866.0**	**64.67%**	**88.90%**
Total for Structure Fires (2015-2019)	**551**	**$37,700,476**	**N/A**	**N/A**	**53844**	**$4,011,958,184.0**	**N/A**	**N/A**

Year	City of Burlington Structure Fires	City of Burlington Loss ($)	City of Burlington % All Fires	City of Burlington % All Loss ($)	Ontario Structure Fires	Ontario Loss ($)	Ontario % All Fires	Ontario % All Loss ($)
Total for All Fires with a Loss (Structure, Vehicle, Outdoor) (2015-2019)	**70.60**	**$6,790,036**	**12.81%**	**18.01%**	**6964.4**	**$713,363,373.2**	**12.93%**	**17.78%**

Source: OFMEM Standard Incident Reporting (2015 to 2019 data).

Key Finding: Over the five year period from January 1, 2015 to December 31, 2019, the City averaged 71 structure fires per year.

10.1.2 Fires by Occupancy Type

This section assesses the structure fires that occurred over the period from January 1, 2015 to December 31, 2019 based on the type of occupancy. OFMEM's Standard Incident Reporting data was utilized to inform this analysis. The analysis in **Table 32** indicates that during this period, Burlington experienced a total of 353 structure fires, 255 of these fires, or 72.24% occurred in Group C-Residential occupancies. These fires account for 48.07% of the City's total fire loss for this period. In comparison, structure fires in Group C-Residential occupancies accounted for 73.24% of structure fires across the Province and 63.86% of all fire loss. Over this period, Burlington experienced a 1.00% lower rate of fires in Group C-Residential occupancies than that of the Province and a 15.79% lower dollar loss in Group C-Residential occupancies.

The second most significant source of property loss in the City, accounting for 36.19% of structure fire loss and 8.22% of the total structure fires over the same period, is Group F – Industrial occupancies (higher than the Provincial structure fire loss within this occupancy type by 23.77%). A significant dollar loss occurred at Paletta International in 2017. This single incident resulted in a $10 million dollar loss, substantially impacting the City's fire loss statistics during the study period.

Some of the trends within this historical fire loss reporting for the City could be explained by the distribution of property stock by major occupancy classification within the City. For example, as found within **Section 3.2.1 – City of Burlington Existing Major Building Classification Summary** of this CRA, 93.53% of the property stock classified by the Ontario Building Code is Group C – Residential. It is therefore reasonable to expect that Group C would account for the highest proportion of structure fires. Additionally, Group F – Industrial occupancies account for the second most predominant occupancy type within the City, accounting for 1.73% of the property stock. Group F occupancies also account for the second highest proportion of structure fires (8.22%).

Table 32: Fires by OBC Major Occupancy Classification – City of Burlington and Province of Ontario

Group	OBC Major Occupancy Classification	City of Burlington Fires	City of Burlington % of Structure Fires	City of Burlington Fire Loss ($)	City of Burlington % of Fire Loss	Ontario % of Structure Fires	Ontario % of Fire Loss
Group A	Assembly	**15**	4.25%	**$1,089,250**	3.21%	3.80%	4.92%
Group B	Care or Detention	**5**	1.42%	**$16,600**	0.05%	1.53%	1.51%
Group C	Residential	**255**	72.24%	**$16,320,090**	48.07%	73.24%	63.86%
Group D	Business and Personal services	**10**	2.83%	**$2,710,000**	7.98%	2.49%	2.33%
Group E	Mercantile	**19**	5.38%	**$172,500**	0.51%	3.41%	5.63%
Group F	Industrial	**29**	8.22%	**$12,286,199**	36.19%	7.59%	12.42%
Other	Not Classified within the OBC	**19**	5.38%	**$855,541**	2.52%	5.22%	1.21%
Farm	Classified within the N.F.B.C.	**1**	0.28%	**$500,000**	1.47%	2.72%	8.14%
All Groups	**Classification Totals**	**353**	**100.00%**	**$33,950,180**	**100.00%**	**100.00%**	**100.00%**

Source: OFMEM Standard Incident Reporting (2015 to 2019)

Key Finding: Over the five year period from January 1, 2015 to December 31, 2019 structure fires occurring in Group F – Industrial occupancies account for 8.22% of total structure fires within the City and 36.19% of total structure fire loss.

10.1.3 Civilian Fire Fatalities and Injuries

As shown in **Table 33**, according to OFMEM Standard Incident Reporting, over the five year period from January 1, 2015 to December 31, 2019, there were 47 reported injuries and no reported fire fatalities within the City of Burlington. The majority of injuries within the City occurred in Group C – Residential Occupancies. This finding is consistent with the fire loss statistics by occupancy type, whereby the majority of fire losses within the Province and within the City occurred in Group C – Residential occupancies.

Table 33: Civilian Fire Fatalities and Injuries by OBC Major Occupancy Classification - City of Burlington

Group	Occupancy Classification	Injuries	Fatalities
Group A	Assembly	0	0
Group B	Care or Detention	2	0
Group C	Residential	47	0
Group D	Business and Personal services	1	0
Group E	Mercantile	0	0
Group F	Industrial	2	0
Other	Not Classified within the OBC	0	0
Total	**All Classifications and Other**	**52**	**0**

Source: OFMEM Standard Incident Reporting (2015 to 2019 data)

Identified Risk: Most reported fire related civilian injuries (47) occurred in Group C – Residential Occupancies.

10.1.4 Reported Fire Cause

The NFPA defines fire cause as "the circumstances, conditions, or agencies that bring together a fuel, ignition source, and oxidizer (such as air or oxygen) resulting in a fire or a combustion explosion."[49] Assessing the possible cause of the fires reported is an important factor in identifying potential trends or areas that may be considered for introducing additional public education or fire prevention initiatives. Within OFMEM fire loss reporting, there are four categories of cause used to classify the cause of a fire. These include intentional, unintentional, other, and undetermined.

Table 34 presents the reported fire causes for the City compared to the Province over the five year period from January 1, 2015 to December 31, 2019.

The "intentional" category recognizes the cause of a fire to be started for a specific reason. These are typically classified as arson fires, acts of vandalism, or to achieve personal gain through insurance payment for example. As indicated in **Table 34**, 6.52% of the fires reported as intentional (i.e. combined categories of arson and vandalism) within the City over the five year period from January 1, 2015 to December 31, 2019 is slightly lower than the Provincial total of intentional fires (7.74%).

The "unintentional" category recognizes a number of the common causes of a fire that represent both human behavioural causes (e.g., playing with matches) and equipment failures (e.g., mechanical failure). In total, unintentional fire causes represented 85.84% of the cause for the 303 fires during this period (compared to 67.97% within the Province). This suggests a need for targeted education programs about fire causes and prevention. The leading cause of unintentionally set fires in Burlington occurred due to misuse of ignition source at 37.96% (134 fires), compared to 29.85% in the Province, followed by mechanical/electrical failure at 22.38% (79 fires), compared to 15.43% in the Province.

[49] Source: NFPA., Glossary of Terms, 2019 Edition.

Table 34: Reported Fire Cause – City of Burlington and Province of Ontario

Case Type/Nature	Reported Fire Cause	City of Burlington # of Fires	City of Burlington % of Fires	Ontario # of Fires	Ontario % of Fires
Intentional	Arson	11	3.12%	2089	6.00%
Intentional	Vandalism	12	3.40%	592	1.70%
Intentional	Other Intentional	0	0.0%	14	0.04%
Unintentional	Children Playing	1	0.28%	147	0.42%
Unintentional	Design/Construction/Maintenance Deficiency	20	5.67%	2498	7.17%
Unintentional	Mechanical/Electrical Failure	79	22.38%	5372	15.43%
Unintentional	Misuse of Ignition Source	134	37.96%	10394	29.85%
Unintentional	Other Unintentional	48	13.60%	2448	7.03%
Unintentional	Undetermined	21	5.95%	2781	7.99%
Unintentional	Vehicle Collision	0	0.00%	30	0.09%
Other	Other	12	3.40%	1866	5.36%
Undetermined	Undetermined	15	4.25%	6517	18.72%
Unknown, not reported	Unknown, not reported	0	0.00%	74	0.21%
All Cases	**Reported Totals**	**353**	**100.00%**	**34822**	**100.00%**

Source: OFMEM Standard Incident Reporting (2015 to 2019 data)

Identified Risk: Of the fires occurring in the City over the five year period from January 1, 2015 to December 31, 2019, the leading cause of unintentionally set fires was due to misuse of ignition source at 37.96% (134 fires), compared to 29.85% in the Province.

Identified Risk: Of the fires occurring in the City over the five year period from January 1, 2015 to December 31, 2019, the second most common cause of unintentionally set fires was due to mechanical/electrical failure at 22.38% (79 fires), compared to 15.43% in the Province.

10.1.5 Ignition Source

According to the 2019 NFPA Glossary of Terms, ignition source is defined as "any item or substance capable of an energy release of type and magnitude sufficient to ignite any flammable mixture of gases or vapors that could occur at the site or onboard the vehicle."[50] **Table 35** provides fire loss by source of ignition for the City of Burlington and the Province.

For the period 2015 to 2019, the most common reported ignition sources within the City are "cooking equipment" at 24.93% (higher than the Province by 7.64%) "open flame tools/smokers' articles" at 19.83% (higher than the Province by 5.87%), and miscellaneous at 13.60% (higher than the Province by 3.70%). This presents the opportunity to incorporate key messages relating to cooking and smoking in public education materials.

[50] Source: NFPA Glossary of Terms, 2019 Edition.

Table 35: Source of Ignition - City of Burlington and Province of Ontario

Reported Ignition Source	City of Burlington # of Fires	City of Burlington % of Fires	Ontario # of Fires	Ontario % of Fires
Appliances	24	6.80%	1591	4.57%
Cooking Equipment	88	24.93%	6019	17.29%
Electrical Distribution	35	9.92%	3074	8.83%
Heating Equipment, chimney etc.	20	5.67%	2692	7.73%
Lighting Equipment	25	7.08%	1101	3.16%
Open flame tools/smokers articles	70	19.83%	4860	13.96%
Other electrical/mechanical	30	8.50%	1730	4.97%
Processing Equipment	2	0.57%	453	1.30%
Miscellaneous	48	13.60%	3447	9.90%
Exposure	10	2.83%	1613	4.63%
Undetermined	1	0.28%	8159	23.43%
Unknown, not reported	0	0.00%	83	0.24%
Total	**353**	**100.00%**	**34,822**	**100.00%**

Source: OFMEM Standard Incident Reporting (2015 to 2019 data)

Key Finding: Of the fires occurring within the City over the five year period from January 1, 2015 to December 31, 2019, 24.93% of fires had a reported ignition source of cooking equipment, which is 7.64% higher than the Province (17.29%).

Key Finding: Of the fires occurring within the City over the five year period from January 1, 2015 to December 31, 2019, 19.83% of fires had a reported ignition source of open flame tools/smokers articles, which is 5.87% higher than the Province (13.96%).

Key Finding: Of the fires occurring within the City over the five year period from January 1, 2015 to December 31, 2019, 13.60% of fires had a reported ignition source of miscellaneous, which is 3.70% higher than the Province (9.90%).

10.1.6 Smoke Alarm Status Processing Equipment

Smoke alarms are required on every level of a dwelling and between sleeping areas in the Province of Ontario, notifying building occupants of a fire and allowing for prompt escape. As a result, smoke alarm programs and compliance are a key component of public education and fire prevention activities provided by the municipal fire departments across the Province.

Data is publicly available at the provincial level for the smoke alarm status in the event of a fire and municipalities collect smoke alarm status information and report it to the Province. This data was provided by the OFMEM as part of the CRA for the City of Burlington and the Province of Ontario over a five year period from January 1, 2015 to December 31, 2019 for Group C - Residential occupancies. **Table 36** highlights whether a smoke alarm was present and operating on the floor or in the suite of fire origin.

Table 36: Smoke Alarm Presence and Operation on the Floor of Fire Origin - City of Burlington and Province of Ontario

Smoke Alarm Status on Floor of Origin	Burlington 2015	Burlington 2016	Burlington 2017	Burlington 2018	Burlington 2019	Burlington Total (2015-2019)	Burlington % (2015-2019)	Ontario Total (2015-2019)	Ontario % (2015-2019)
No Smoke Alarm Present	12	11	4	9	5	**41**	**16.14%**	**4228**	**17.28%**
Smoke Alarm Present and Operated	27	38	31	19	24	**139**	**54.72%**	**11058**	**45.20%**
Smoke Alarm Present, Did Not Operate	14	8	8	10	8	**48**	**18.90%**	**3263**	**13.34%**
Smoke Alarm Present, Operation Undetermined	1	6	2	1	0	**10**	**3.94%**	**1877**	**7.67%**
Smoke Alarm Presence Undetermined	2	4	4	5	1	**16**	**6.30%**	**3986**	**16.29%**
Unknown, not reported	0	0	0	0	0	**0**	**0.00%**	**55**	**0.22%**

Source: OFMEM Standard Incident Reporting (2015 to 2019 data)

Over the five year period from January 1, 2015 to December 31, 2019, there was no smoke alarm present for 16.14% of occurrences in the City compared to 17.28% in the Province. A further 48 incidents (or 18.90%) had a smoke alarm present but it did not operate (compared to 13.34% in the Province). In Burlington, in 54.72% of occurrences, a smoke alarm was present and operated. Smoke alarm presence or operation combined was undetermined in 10.24% of instances in the City.

Provincial and local statistics support having a targeted and proactive smoke alarm program in place and suggest the need for increased enforcement strategies for those properties that are non-compliant. Further the number of non-operational smoke alarms suggest education specific to checking and testing smoke alarms is warranted.

Key Finding: Over the five year period from January 1, 2015 to December 31, 2019, of the fire loss incidents in Group C – Residential occupancies, 16.14% of incidents did not have a smoke alarm present (compared to 17.28% in the Province).

Key Finding: Over the five year period from January 1, 2015 to December 31, 2019, of the fire loss incidents in Group C – Residential occupancies, 54.72% of incidents had a smoke alarm present and operating compared to 45.20% in the Province.

10.2 Event History

Event history seeks to apply the BFD's historic emergency call data to develop an understanding of community risk. Most of the analysis in this section is based on data provided by BFD being all historical calls for the five year period from January 1, 2016 to December 31, 2020. This section provides a statistical assessment of historic emergency call volumes for the City as a whole by different time segments (e.g. annual calls, monthly calls, weekly calls, daily calls, etc.).

The volume and frequency of historic calls informs the understanding of response probability. The types of calls inform the potential consequences of BFD responses and calls for service. The combined consideration of these elements provides an understanding of community risk, based on past calls for service.

10.2.1 Emergency Call Volume – All Incident Types

This section illustrates the historical emergency call volume by year, month, day of week, and time of day for all types of incidents responded to by the BFD for the time period from January 1, 2016 to December 31, 2020.[51]

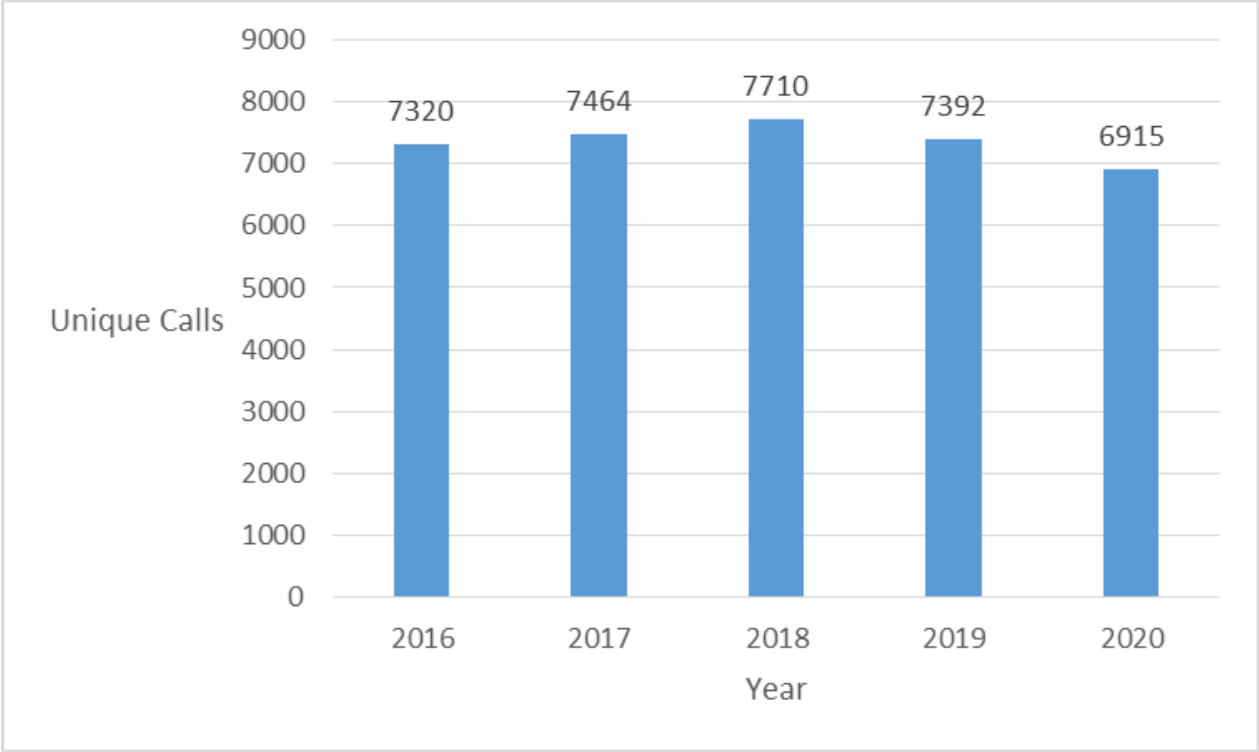
10.2.1.1 Annual Emergency Call Volume – All Incident Types

The analysis of annual emergency call volume can be beneficial in garnering an understanding of where trends may be evolving, or changes in community emergency response demand may be occurring. A summary of the total number of emergency calls for the period from January 1, 2016 to December 31, 2020 is shown in Error! Reference source not found.**Figure 18**. This analysis indicates an increase in the total emergency call volume within the City over this period from 7,320 calls in 2016 to 7,710 calls in 2018 with a decrease in calls from 7,392 in 2019 to 6,915 calls in 2020. This decrease in

[51] The data used for the analysis is a compilation of each of the 5 years (2016-2020) of unit response time reports. For the majority of statistics, only the first truck is considered; this is to ensure a single incident is not counted multiple times as this would not provide an accurate representation of the data. To determine which entries were the first truck entries, the dataset was sorted by Provincial Incident Number then by Arrival Time. The first entry for each incident number was included in the First Truck dataset. The second entry for each incident number was assumed to be the second truck. It should also be noted that calls from stations outside of Burlington were excluded from the analysis. Similarly, all calls with either zero or more than one response type code were excluded from response type analyses.

call volume in 2020 could be attributed to the unique circumstances of the COVID-19 pandemic resulting in an anomalous year of call volume. Overall, there was an average of 7,360 calls per year over this five year timeframe.

Figure 18: Annual Call Volume – All Incidents January 1, 2016 to December 31, 2020



Source: Burlington Fire Department Emergency Response Call Data

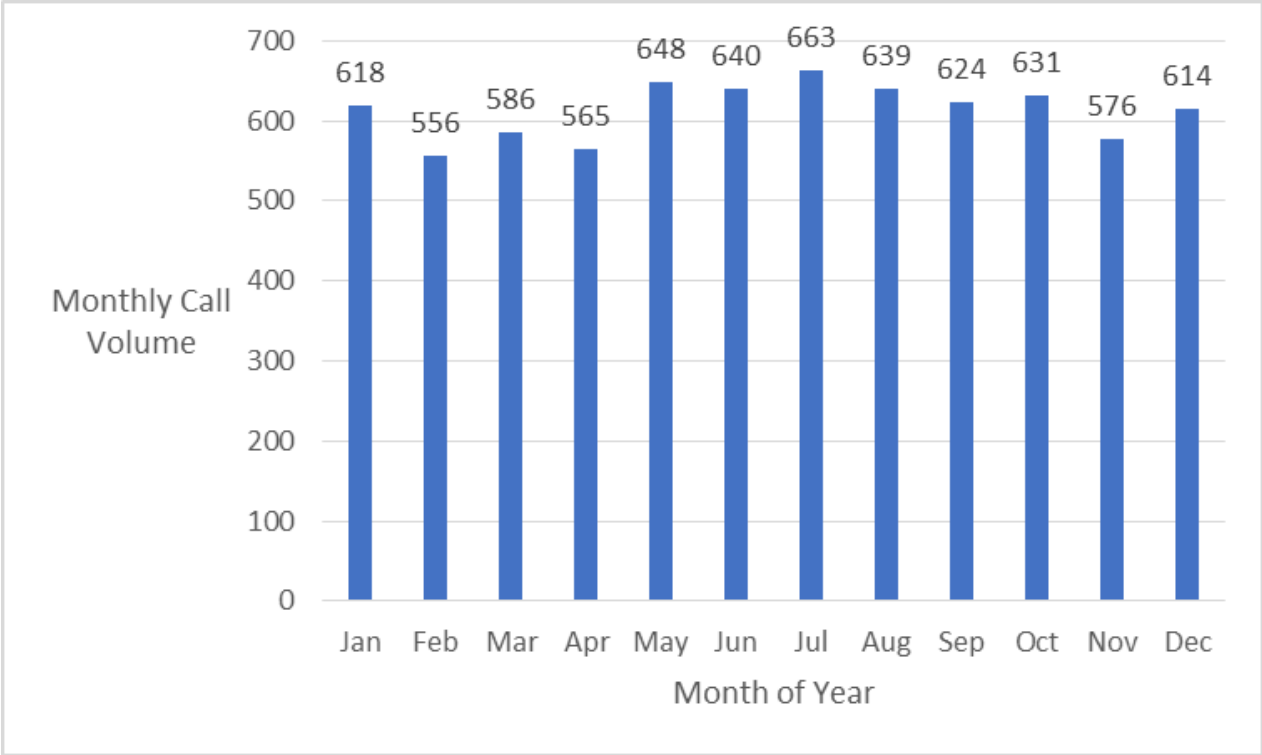
Key Finding: Over the period from January 1, 2016 to December 31, 2020 the volume of emergency calls responded to by the Burlington Fire Department modestly increased between 2016 and 2019 with a slight decrease in 2020.

10.2.1.2 Monthly Average Emergency Call Volume – All Incident Types

The analysis of average emergency call volume for the period from January 1, 2016 to December 31, 2020 by month can be beneficial to identifying any potential variances that may be associated with seasonal trends related to activities such as more motor vehicle travel during summer months, or use of heating devices during winter months.

With an average monthly emergency call volume of 613 calls, **Figure 19** illustrates that the highest percentage of emergency calls occurred in December and January, and from May to October.

Figure 19: Average Call Volume by Month – All Incident January 1, 2016 to December 31, 2020

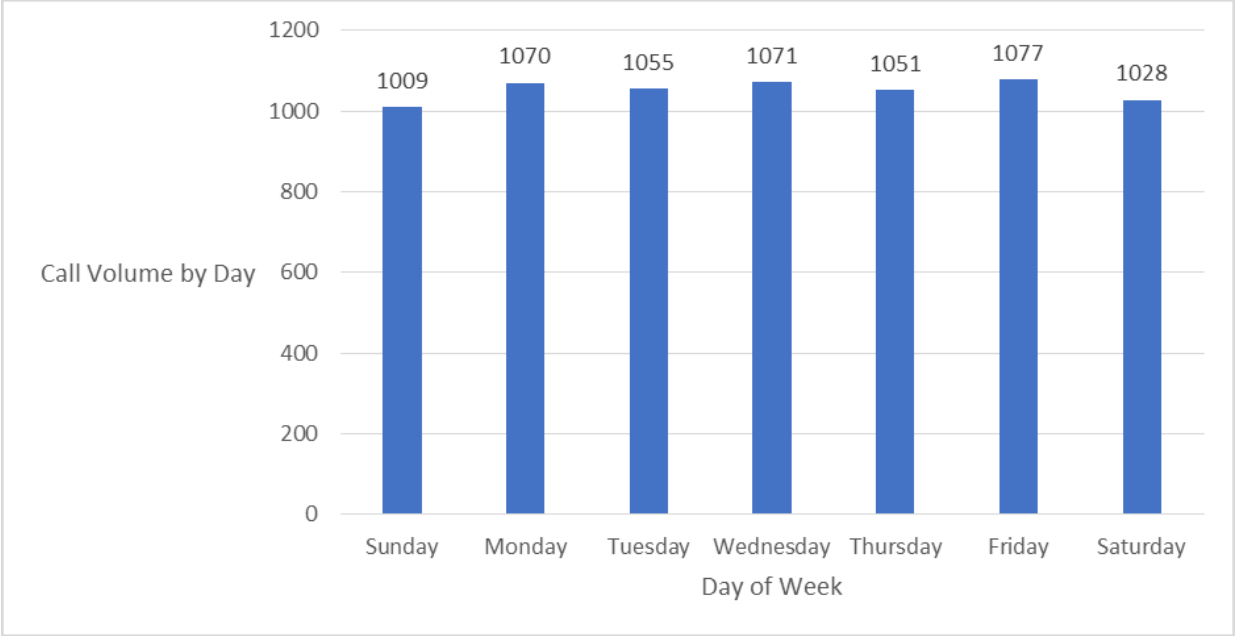


Source: Burlington Fire Department Emergency Response Call Data

10.2.1.3 Weekly Average Emergency Call Volume – All Incident Types

The analysis of average call volume for the period from January 1, 2016 to December 31, 2020 by day of the week as shown in **Figure 20** illustrates that on overall there is limited variability in call volume by day of the week. The highest number of emergency call volume occurs on Mondays, Wednesdays and Fridays, while the lowest emergency call volume occurs on Sundays.

Figure 20: Average Call Volume by Day of Week – All Incidents January 1, 2016 to December 31, 2020



Source: Burlington Fire Department Emergency Response Call Data

10.2.1.4 Daily Emergency Call Volume – All Incident Types

Figure 21 indicates that for the period from January 1, 2016 to December 31, 2020 a higher emergency call volume is typically experienced between 9 A.M. and 7 P.M. The lowest percentage of emergency call volume typically takes place between the hours of 1 A.M. and 5 A.M when the majority of the population is typically sleeping.

Figure 21: Average Call Volume by Time of Day – All Incidents January 1, 2016 to December 31, 2020

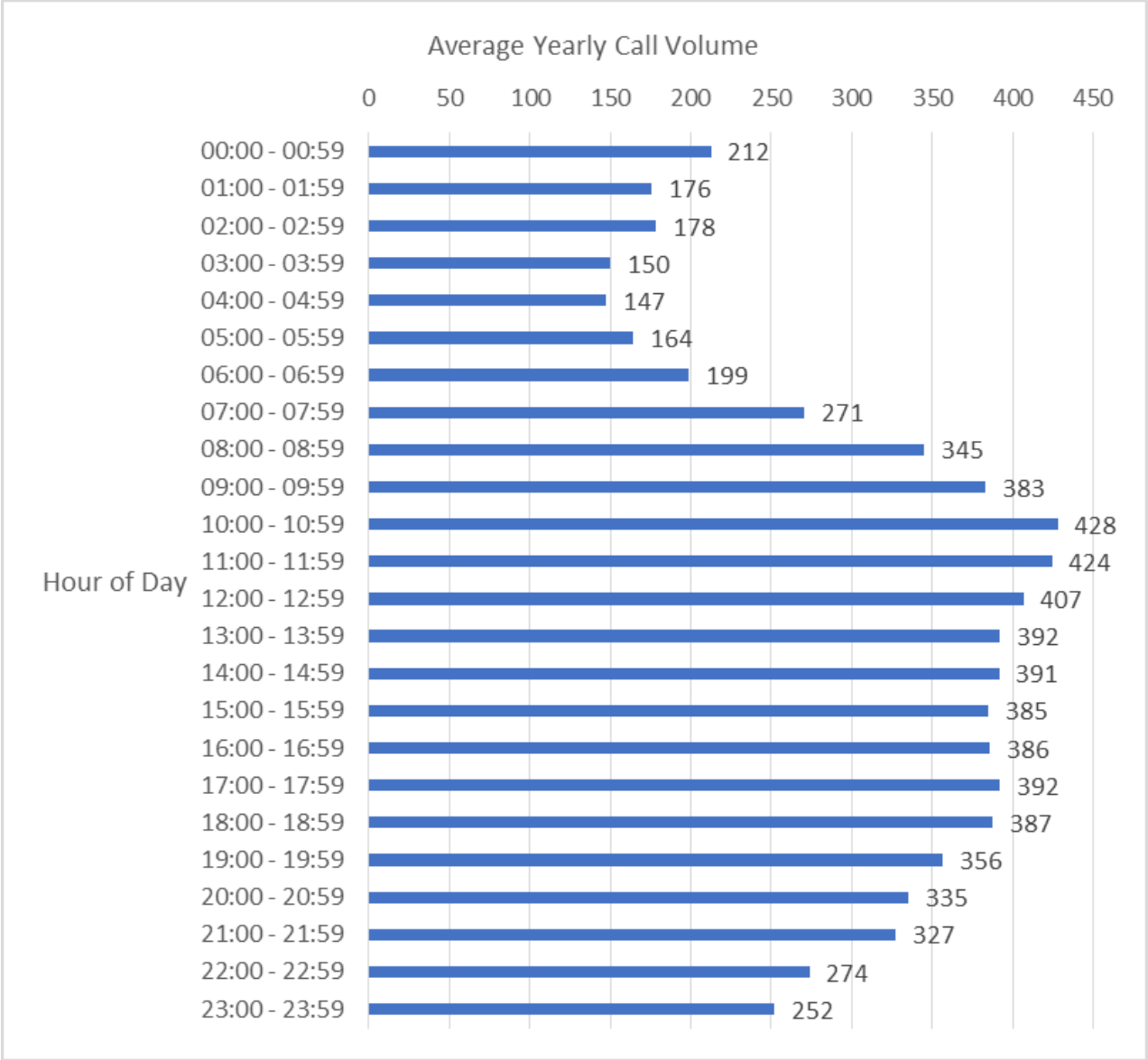


Figure Source: Burlington Fire Department Emergency Response Call Data

10.2.1.5 Total Emergency Call Volume – All Incident Types

This section illustrates the analysis of all emergency call volume for the City of Burlington and the Province of Ontario for the period from January 1, 2015 to December 31, 2019 by OFMEM emergency response type. Note that data used in the analysis of call volume by type was sourced from the OFMEM's Standard Incident Reporting

because call volume by type is compared to the Province as a whole. Data for 2020 for the Province as a whole is not currently available from OFMEM and therefore, the data used in this analysis is for January 1, 2015 to December 31, 2019.

Figure 22 illustrates that during this period, 55.3% of the total emergency calls that the BFD responded to were medical/resuscitator incidents (higher than the Province by 12.3%). Responding to false fire calls was the second highest percentage of total emergency calls representing 13.0% of the fire services' total emergency call volume (slightly lower than the Province by 3.1%). Rescue calls represent the third highest percentage of emergency call volume responded to by the BFD at 9.3% (lower than the Province by 1.8%).

Figure 22: Percentage of BFD Calls by OFMEM Response Type January 1, 2015 to December 31, 2019

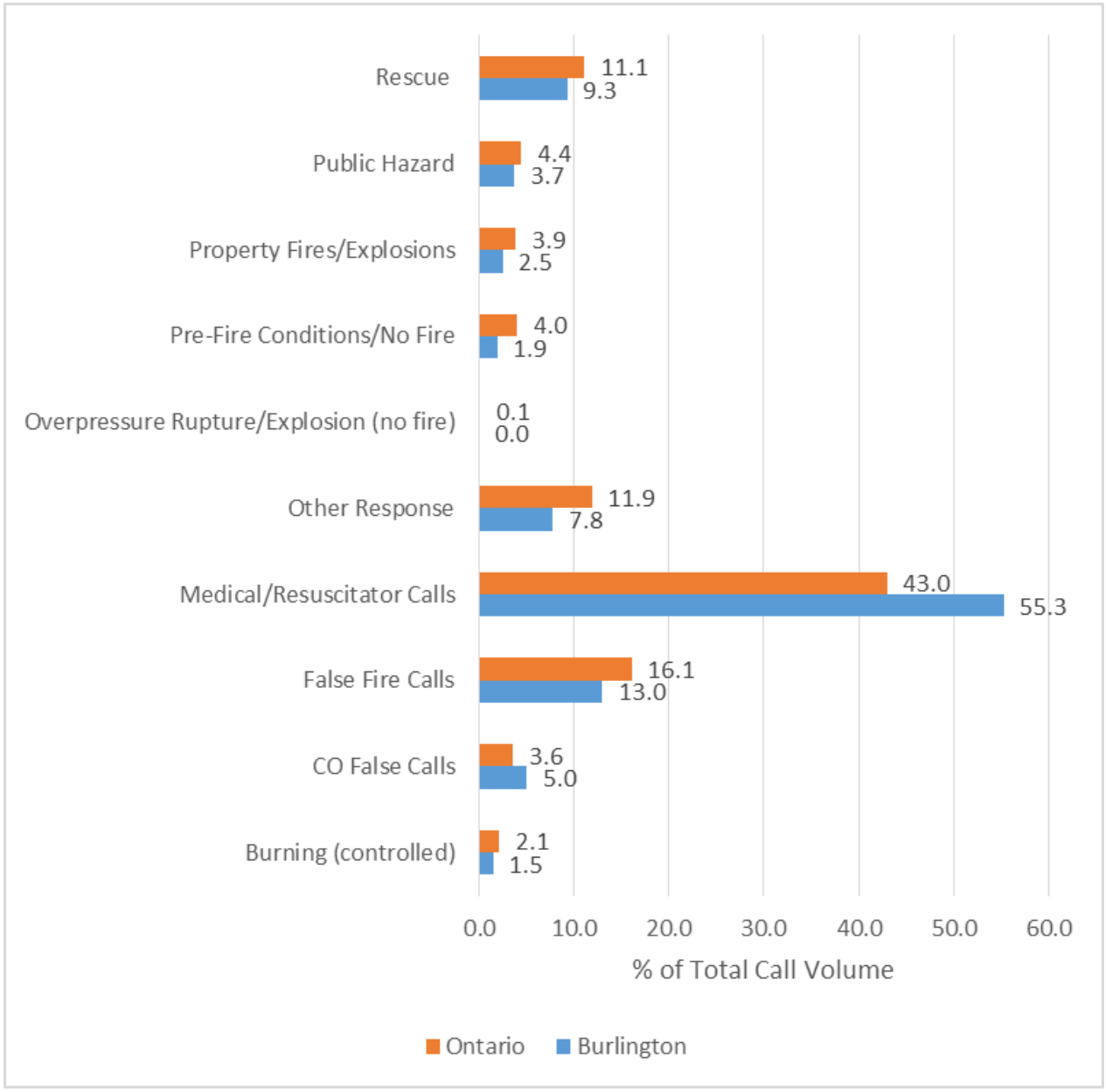


Figure Source: Office of the Fire Marshal and Emergency Management, Municipal Emergency Calls by Response Type Class

Key Finding: For the period from January 1, 2015 to December 31, 2019 the highest percentage of emergency call volume responded to by Burlington Fire Department as

defined by the OFMEM response types was medical/resuscitator calls representing 55.3% of total emergency call volume.

Key Finding: For the period from January 1, 2015 to December 31, 2019 the second highest percentage of emergency call volume responded to by Burlington Fire Department as defined by the OFMEM response types was false fire calls representing 13.0% of total emergency call volume.

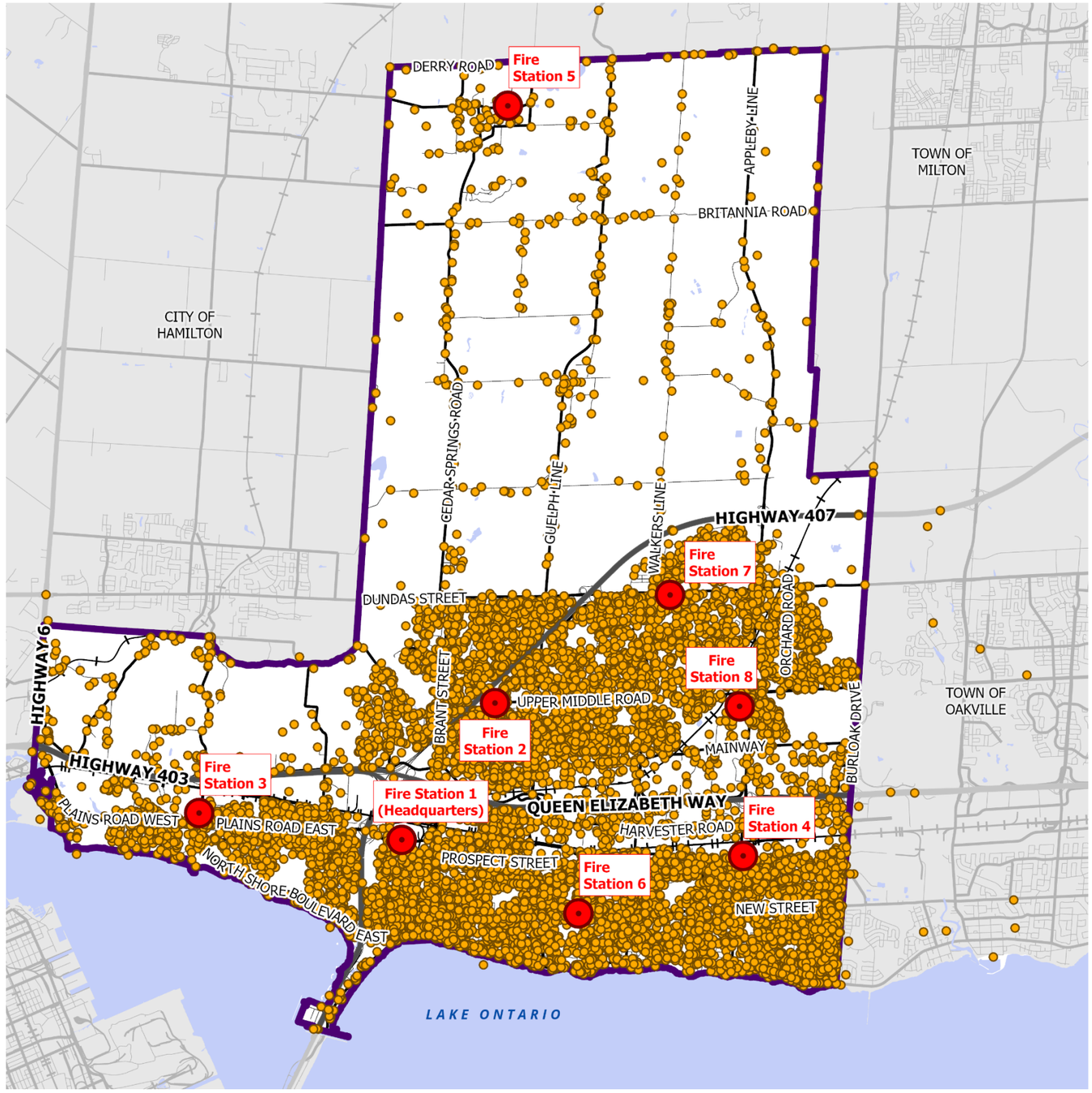
10.2.2 Emergency Call Volume – Spatial Modelling

The analysis within this section illustrates the distribution of the emergency call volume within the City for the period from January 1, 2016 to December 31, 2020. The analysis includes the spatial distribution of all emergency incidents that occurred during this period based on the OFMEM response types including medical/resuscitator, rescue, false fire and fire /explosions incidents over this five year period.

10.2.2.1 Spatial Modelling – All Emergency Incidents

Figure 23 illustrates the distribution of all emergency incidents that occurred within the City over this five year period. The model shows a wide distribution of emergency incidents across the City with a prevalence of incidents throughout residential areas. The number of incidents in residential areas seems to increase as the density of the area increases. The spatial concentration of all emergency incidents is shown in **Figure 24** below. There are pockets of areas with a high concentration of all emergency call types throughout the urban areas of the City. Many of these areas correspond to higher density residential areas, or the downtown area. The location of high-rise buildings can be seen in **Section 3.5.1.2 - Figure 6.** The highest concentration of calls is found southeast of the Queen Elizabeth Parkway including downtown. There is a notable high concentration of all emergency call type calls near Fire Station 3 and Fire Station 8, and along Lakeshore Road south of Fire Station 4 as well as west of Fire Station 1 and northwest of Fire Station 6. There is also a notable concentration east of the Skyway Bridge.

Figure 23: Spatial Modelling – All Emergency Incidents



CITY OF BURLINGTON

SPATIAL MODELLING OF ALL EMERGENCY INCIDENTS FOR THE PERIOD FROM JANUARY 1ST, 2016 TO DECEMBER 31ST, 2020

Fire Station

Emergency Incident (2016-2020)

Base Data

City of Burlington Boundary

Railway

Expressway / Highway / Freeway

Collector / Arterial Road

Local Road / Ramp

Waterbody

0 0.75 1.5 3 km

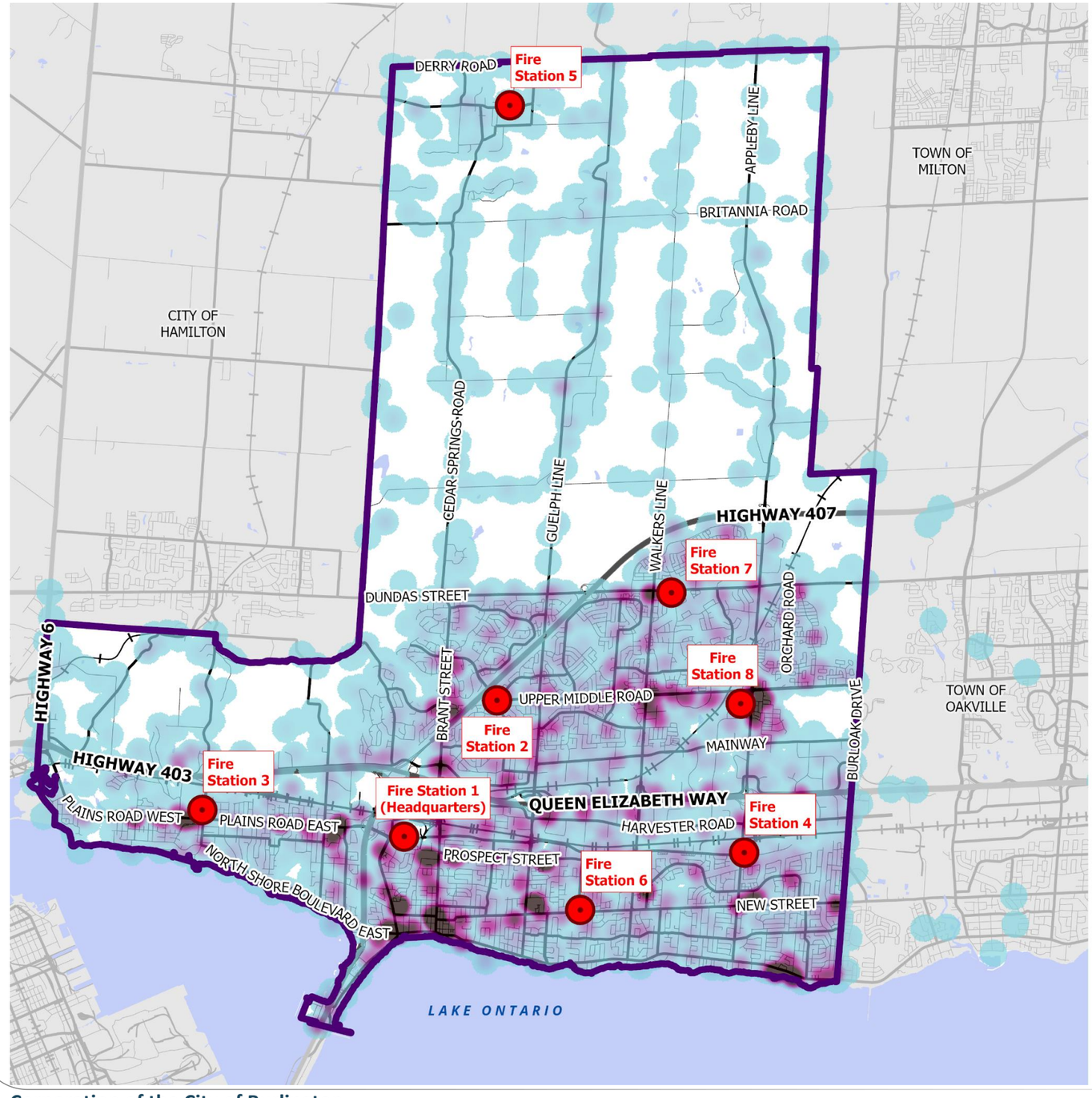
MAP DRAWING INFORMATION:
BASE DATA PROVIDED BY MNRF, CITY OF BURLINGTON

MAP CREATED BY: LK
MAP CHECKED BY: CB/AN
MAP PROJECTION: NAD 1983 UTM Zone 17N

DILLON CONSULTING

PROJECT: 199811
STATUS: DRAFT
DATE: 2021-08-31

Figure 24: Spatial Concentration – All Emergency Incidents



CITY OF BURLINGTON

SPATIAL CONCENTRATION OF ALL EMERGENCY INCIDENTS FOR THE PERIOD FROM JANUARY 1ST, 2016 TO DECEMBER 31ST, 2020

Fire Station

All Emergency Incidents (2016-2020)

Sparse

Dense

Base Data

City of Burlington Boundary

Railway

Expressway / Highway / Freeway

Collector / Arterial Road

Local Road / Ramp

Waterbody

0 0.75 1.5 3 km

MAP DRAWING INFORMATION:
BASE DATA PROVIDED BY MNRF, CITY OF BURLINGTON

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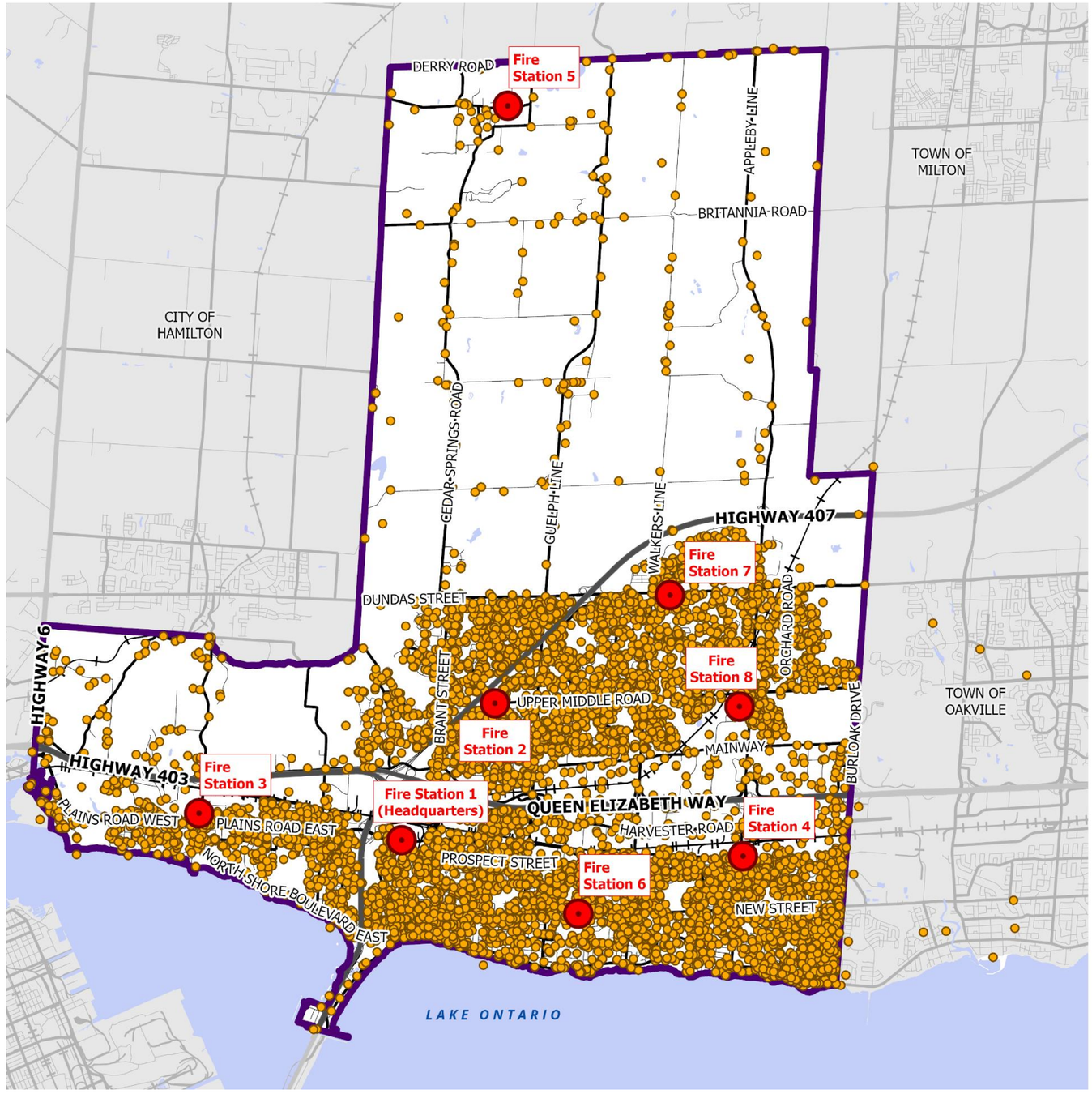
DILLON CONSULTING

PROJECT: 199811
STATUS: DRAFT
DATE: 2021-08-31

10.2.2.2 Spatial Modelling – Medical/Resuscitator Incidents

Figure 25 illustrates the locations where the medical/resuscitator incidents occurred during the period from January 1, 2016 to December 31, 2020. **Figure 25** shows a prevalence of medical/resuscitator calls within the residential areas of the urban area within the City. **Figure 26** further illustrates the spatial concentration of medical/resuscitator calls over the five year period. As shown, there is a notable concentration of incidents in the downtown core, and in the vicinity of Fire Station 3 and Fire Station 8. There is a concentration of calls in medium and high density areas, such as along Lakeshore Road south of Fire Station 4 as well as northwest of Fire Station 6. There is also a notable concentration east of the Skyway Bridge.

Figure 25: Spatial Modelling – Medical/Resuscitator Incidents



CITY OF BURLINGTON

SPATIAL MODELLING OF ALL MEDICAL/RESUSCITATOR INCIDENTS FOR THE PERIOD FROM JANUARY 1ST, 2016 TO DECEMBER 31ST, 2020

Fire Station

Medical/Resuscitator Incident (2016-2020)

Base Data

City of Burlington Boundary

Railway

Expressway / Highway / Freeway

Collector / Arterial Road

Local Road / Ramp

Waterbody

0 0.75 1.5 3 km

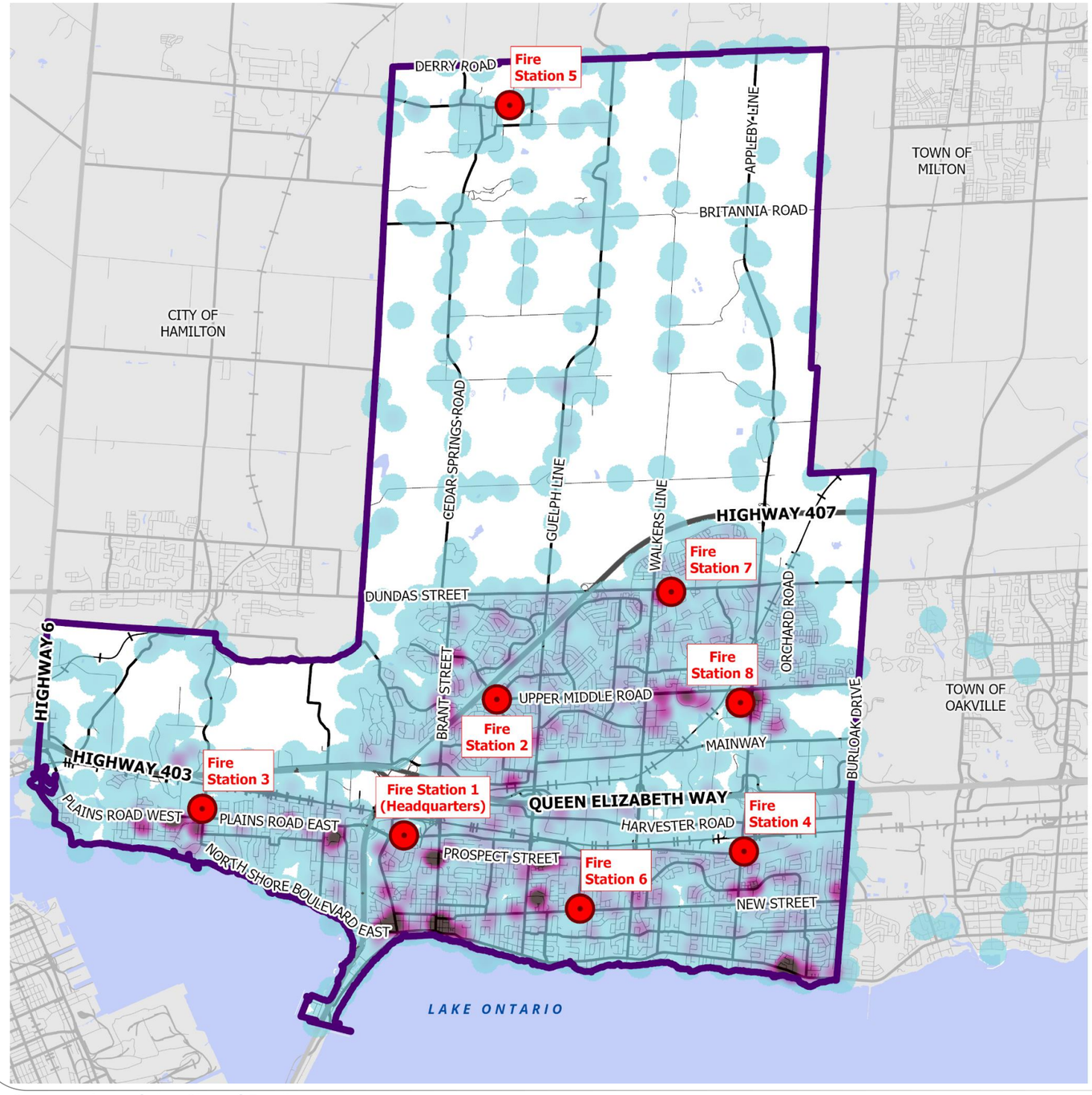
MAP DRAWING INFORMATION:
BASE DATA PROVIDED BY MNRF, CITY OF BURLINGTON

MAP CREATED BY: LK
MAP CHECKED BY: CB/AN
MAP PROJECTION: NAD 1983 UTM Zone 17N

DILLON CONSULTING

PROJECT: 199811
STATUS: DRAFT
DATE: 2021-08-31

Figure 26: Spatial Concentration – Medical/Resuscitator Incidents



CITY OF BURLINGTON

SPATIAL CONCENTRATION OF MEDICAL/ RESUSCITATOR INCIDENTS FOR THE PERIOD FROM JANUARY 1ST, 2016 TO DECEMBER 31ST, 2020

Fire Station

Medical/Resuscitator Incidents (2016-2020)

Sparse

Dense

Base Data

City of Burlington Boundary

Railway

Expressway / Highway / Freeway

Collector / Arterial Road

Local Road / Ramp

Waterbody

0 0.75 1.5 3 km

MAP DRAWING INFORMATION:
BASE DATA PROVIDED BY MNRF, CITY OF BURLINGTON

MAP CREATED BY: LK
MAP CHECKED BY: CB/AN
MAP PROJECTION: NAD 1983 UTM Zone 17N

DILLON CONSULTING

PROJECT: 199811
STATUS: DRAFT
DATE: 2021-08-31

10.2.2.3 Spatial Modelling – Rescue Incidents

Figure 27 illustrates the locations where the rescue incidents occurred during the period from January 1, 2016 to December 31, 2020. **Table 37** presents a comprehensive analysis of rescue incidents that BFD responded to during this five year period. The BFD experienced 3,199 calls (shown in **Table 37**) of which 89.09% of the rescue incidents were related to vehicle collisions or vehicle extrication.

Table 37: Rescue Incidents – Analysis (January 1, 2016 to December 31, 2020)

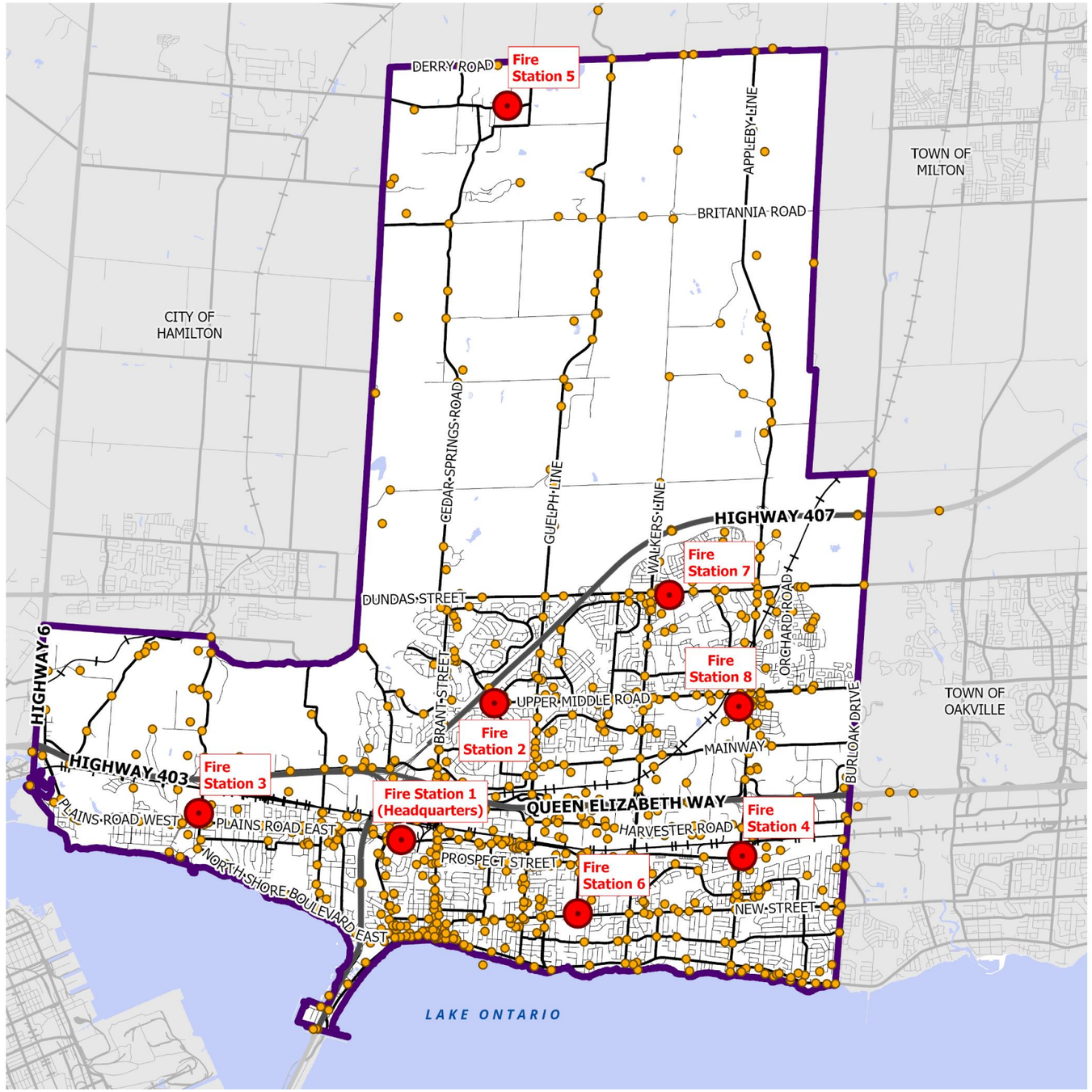
Response Type	Number of Calls	% of Calls
Animal Rescue	10	0.31%
Building Collapse	1	0.03%
Commercial/Industrial Accident	0	0.00%
Confined Space Rescue (non-fire)	1	0.03%
High Angle Rescue (non-fire)	10	0.31%
Home/Residential Accident	12	0.38%
Low Angle Rescue (non-fire)	11	0.34%
Other Rescue	40	1.25%
Persons Trapped in Elevator	143	4.47%
Rescue False Alarm	13	0.41%
Rescue No Action Required	92	2.888%
Trench Rescue (non-fire)	0	0.00%
Vehicle Collision	2,782	86.96%
Vehicle Extrication	68	2.13%
Water Ice Rescue	0	0.00%
Water Rescue	16	0.50%

Source: Burlington Fire Department Emergency Response Call Data

As a result of the prevalent type, the majority of the rescue incidents the BFD responds to are distributed along major arterial roads within the City, and along the major highways. There is a noticeable prevalence of calls west of the intersection of Guelph Line and Fairview Street, east of Fire Station 1, and along Brant Street east of Fire

Station 1. **Figure 28, Spatial Concentration – Rescue Incidents,** further illustrates the distribution of the historical rescue incidents occurring along Fairview Street.

Figure 27: Spatial Modelling – Rescue Incidents



CITY OF BURLINGTON

SPATIAL MODELLING OF ALL RESCUE INCIDENTS FOR THE PERIOD FROM JANUARY 1ST, 2016 TO DECEMBER 31ST, 2020

Fire Station

Rescue Incident (2016-2020)

Base Data

City of Burlington Boundary

Railway

Expressway / Highway / Freeway

Collector / Arterial Road

Local Road / Ramp

Waterbody

0 0.75 1.5 3 km

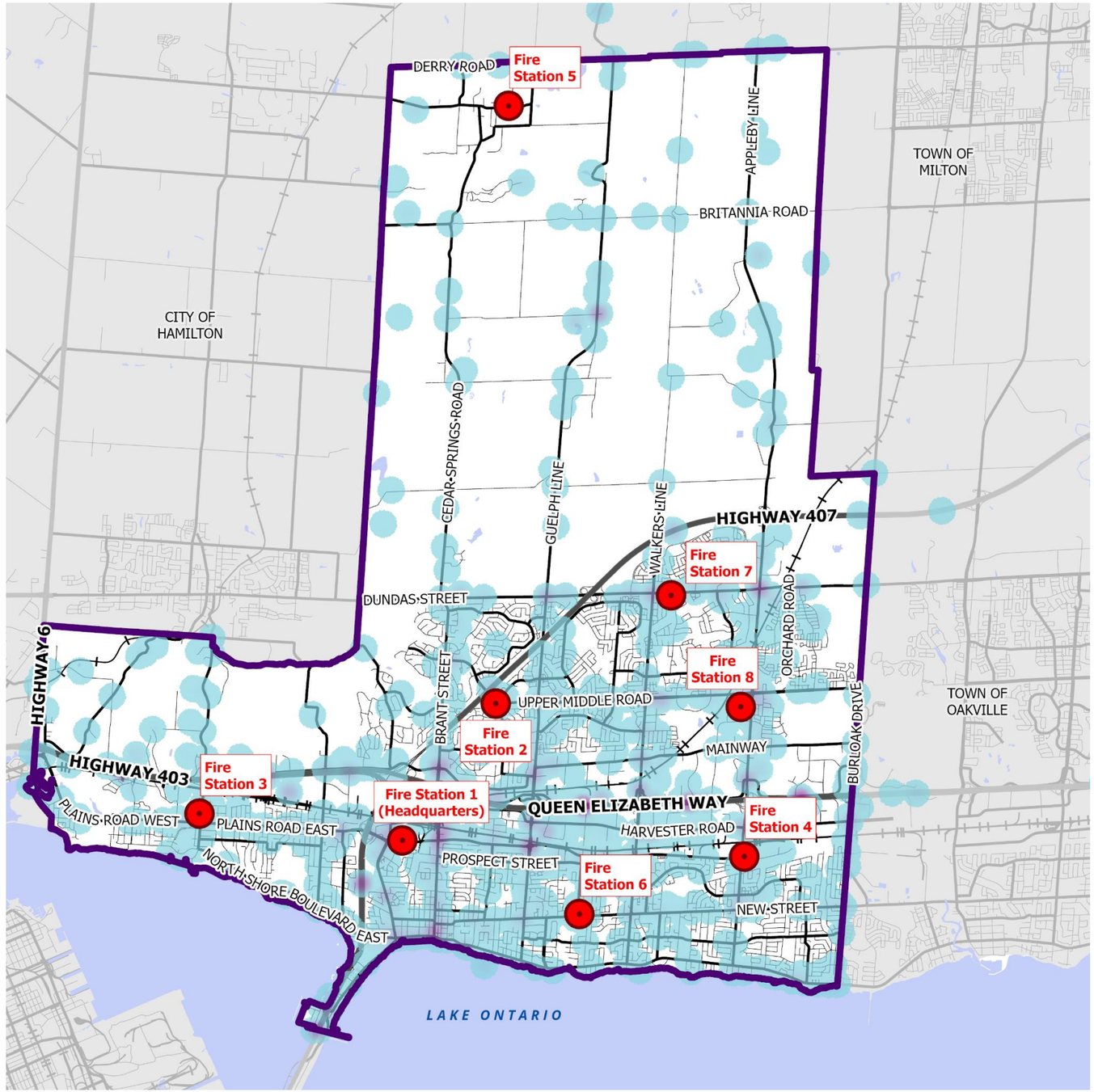
MAP DRAWING INFORMATION:
BASE DATA PROVIDED BY MNRF, CITY OF BURLINGTON

MAP CREATED BY: LK
MAP CHECKED BY: CB/AN
MAP PROJECTION: NAD 1983 UTM Zone 17N

DILLON CONSULTING

PROJECT: 199811
STATUS: DRAFT
DATE: 2021-08-31

Figure 28: Spatial Concentration – Rescue Incidents



CITY OF BURLINGTON

SPATIAL CONCENTRATION OF RESCUE INCIDENTS FOR THE PERIOD FROM JANUARY 1ST, 2016 TO DECEMBER 31ST, 2020

Fire Station

Rescue Incidents (2016-2020)

Sparse

Dense

Base Data

- City of Burlington Boundary
- Railway
- Expressway / Highway / Freeway
- Collector / Arterial Road
- Local Road / Ramp
- Waterbody

0 0.75 1.5 3 km

MAP DRAWING INFORMATION:
BASE DATA PROVIDED BY MNRF, CITY OF BURLINGTON

MAP CREATED BY: LK
MAP CHECKED BY: CB/AN
MAP PROJECTION: NAD 1983 UTM Zone 17N

DILLON CONSULTING

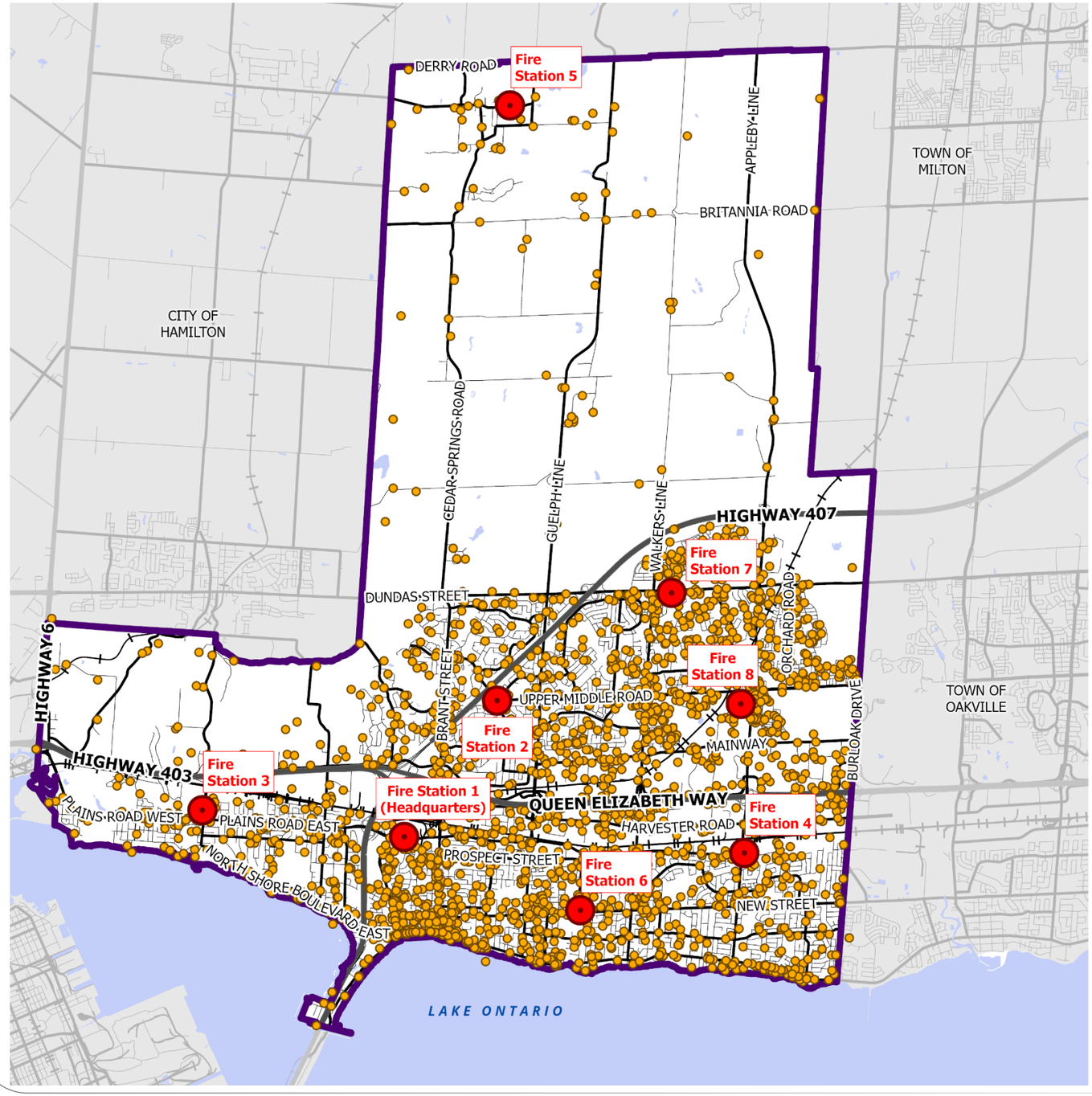
PROJECT: 199811
STATUS: DRAFT
DATE: 2021-08-31

10.2.2.4 Spatial Modelling – False Fire Incidents

Figure 29 illustrates the locations where the false fire incidents occurred during the period from January 1, 2016 to December 31, 2020. During this five year period false fire incidents accounted for 13.0% of BFD total emergency call volume.

This figure illustrates a wide and relatively consistent distribution of false fire calls across the residential areas of the City, with a prevalence of false fire incidents in the urban area. Specifically, these areas include Lakeshore Road east of Maple Avenue and Appleby Line northeast of Fire Station 7. **Figure 30** identifies additional areas that have a concentration of false fire incidents, including the Downtown along the lakeshore and in the area of Fire Station 8.

Figure 29: Spatial Modelling – False Fire Incidents



CITY OF BURLINGTON

SPATIAL MODELLING OF ALL FALSE FIRE INCIDENTS FOR THE PERIOD FROM JANUARY 1ST, 2016 TO DECEMBER 31ST, 2020

Fire Station

False Fire Incident (2016-2020)

Base Data

City of Burlington Boundary

Railway

Expressway / Highway / Freeway

Collector / Arterial Road

Local Road / Ramp

Waterbody

0 0.75 1.5 3 km

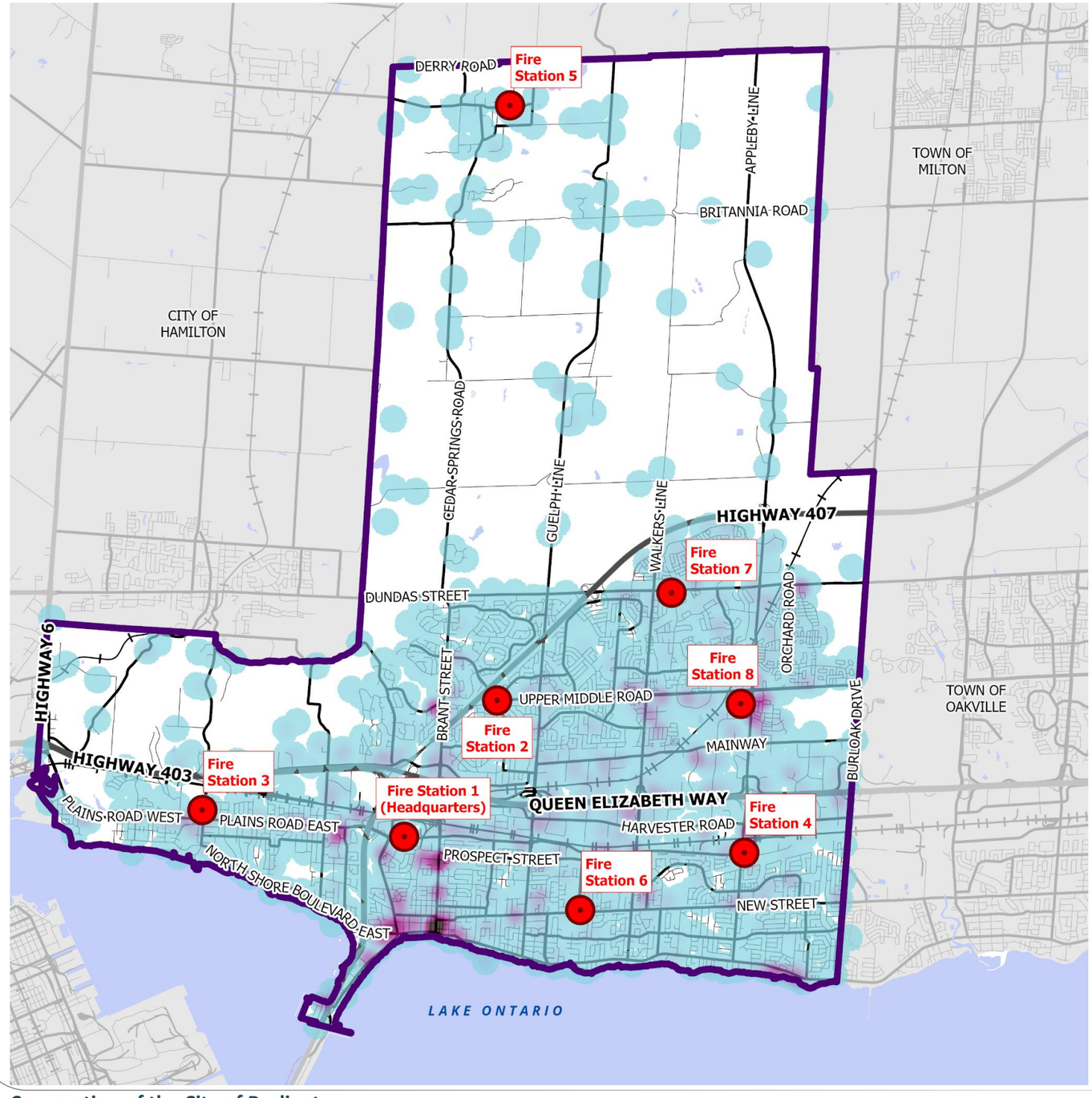
MAP DRAWING INFORMATION:
BASE DATA PROVIDED BY MNRF, CITY OF BURLINGTON

MAP CREATED BY: LK
MAP CHECKED BY: CB/AN
MAP PROJECTION: NAD 1983 UTM Zone 17N

DILLON CONSULTING

PROJECT: 199811
STATUS: DRAFT
DATE: 2021-08-31

Figure 30: Spatial Concentration – False Fire Incidents



CITY OF BURLINGTON

SPATIAL CONCENTRATION OF FALSE FIRE INCIDENTS FOR THE PERIOD FROM JANUARY 1ST, 2016 TO DECEMBER 31ST, 2020

Fire Station

False Fire Incidents (2016-2020)

Sparse

Dense

Base Data

- City of Burlington Boundary
- Railway
- Expressway / Highway / Freeway
- Collector / Arterial Road
- Local Road / Ramp
- Waterbody

0 0.75 1.5 3 km

MAP DRAWING INFORMATION:
BASE DATA PROVIDED BY MNRF, CITY OF BURLINGTON

MAP CREATED BY: LK
MAP CHECKED BY: CB/AN
MAP PROJECTION: NAD 1983 UTM Zone 17N

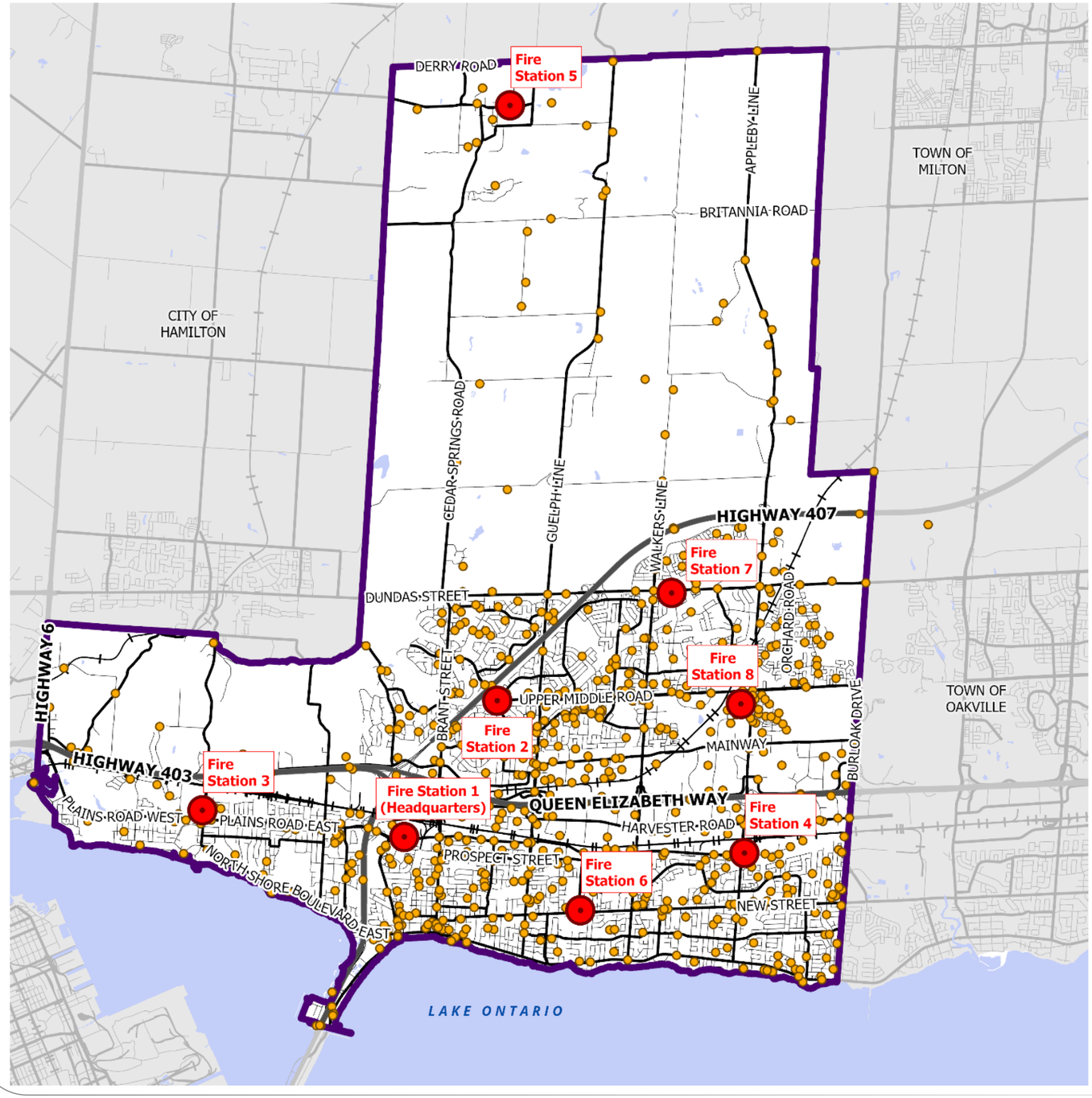
DILLON CONSULTING

PROJECT: 199811
STATUS: DRAFT
DATE: 2021-08-31

10.2.2.5 Spatial Modelling – Fire/Explosion Incidents

Figure 31 illustrates the locations where the fire/explosion incidents occurred during the period from January 1, 2016 to December 31, 2020. During this five year period property fire / explosion incidents accounted for 2.4% of all BFD calls. This figure shows a wide distribution of incidents throughout the City. **Figure 32** illustrates a concentration of fire/explosion incidents Downtown and west of Station 1.

Figure 31: Spatial Modelling – Fire/Explosion Incidents



CITY OF BURLINGTON

SPATIAL MODELLING OF ALL FIRE/EXPLOSION INCIDENTS FOR THE PERIOD FROM JANUARY 1ST, 2016 TO DECEMBER 31ST, 2020

- Fire Station
- Fire/Explosion Incident (2016-2020)

Base Data

- City of Burlington Boundary
- Railway
- Expressway / Highway / Freeway
- Collector / Arterial Road
- Local Road / Ramp
- Waterbody

0 0.75 1.5 3 km

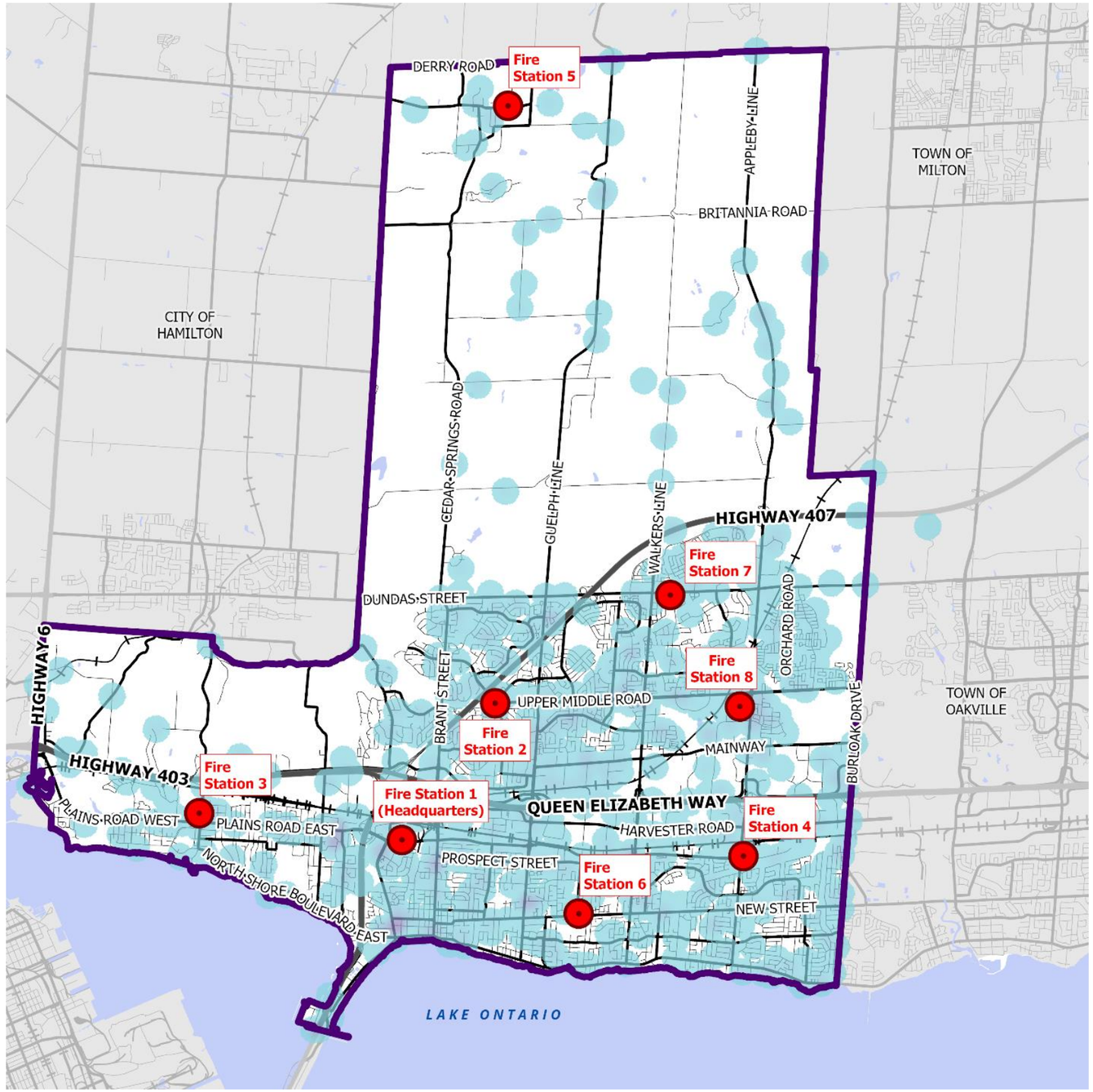
MAP DRAWING INFORMATION:
BASE DATA PROVIDED BY MNRF, CITY OF BURLINGTON

MAP CREATED BY: LK
MAP CHECKED BY: CB/AN
MAP PROJECTION: NAD 1983 UTM Zone 17N

DILLON CONSULTING

PROJECT: 199811
STATUS: DRAFT
DATE: 2021-08-31

Figure 32: Spatial Concentration – Fire/Explosion Incidents



CITY OF BURLINGTON

SPATIAL CONCENTRATION OF FIRE/EXPLOSION INCIDENTS FOR THE PERIOD FROM JANUARY 1ST, 2016 TO DECEMBER 31ST, 2020

Fire Station

Fire/Explosion Incidents (2016-2020)

Sparse

Dense

Base Data

City of Burlington Boundary

Railway

Expressway / Highway / Freeway

Collector / Arterial Road

Local Road / Ramp

Waterbody

0 0.75 1.5 3 km

MAP DRAWING INFORMATION:
BASE DATA PROVIDED BY MNRF, CITY OF BURLINGTON

MAP CREATED BY: LK
MAP CHECKED BY: CB/AN
MAP PROJECTION: NAD 1983 UTM Zone 17N

DILLON CONSULTING

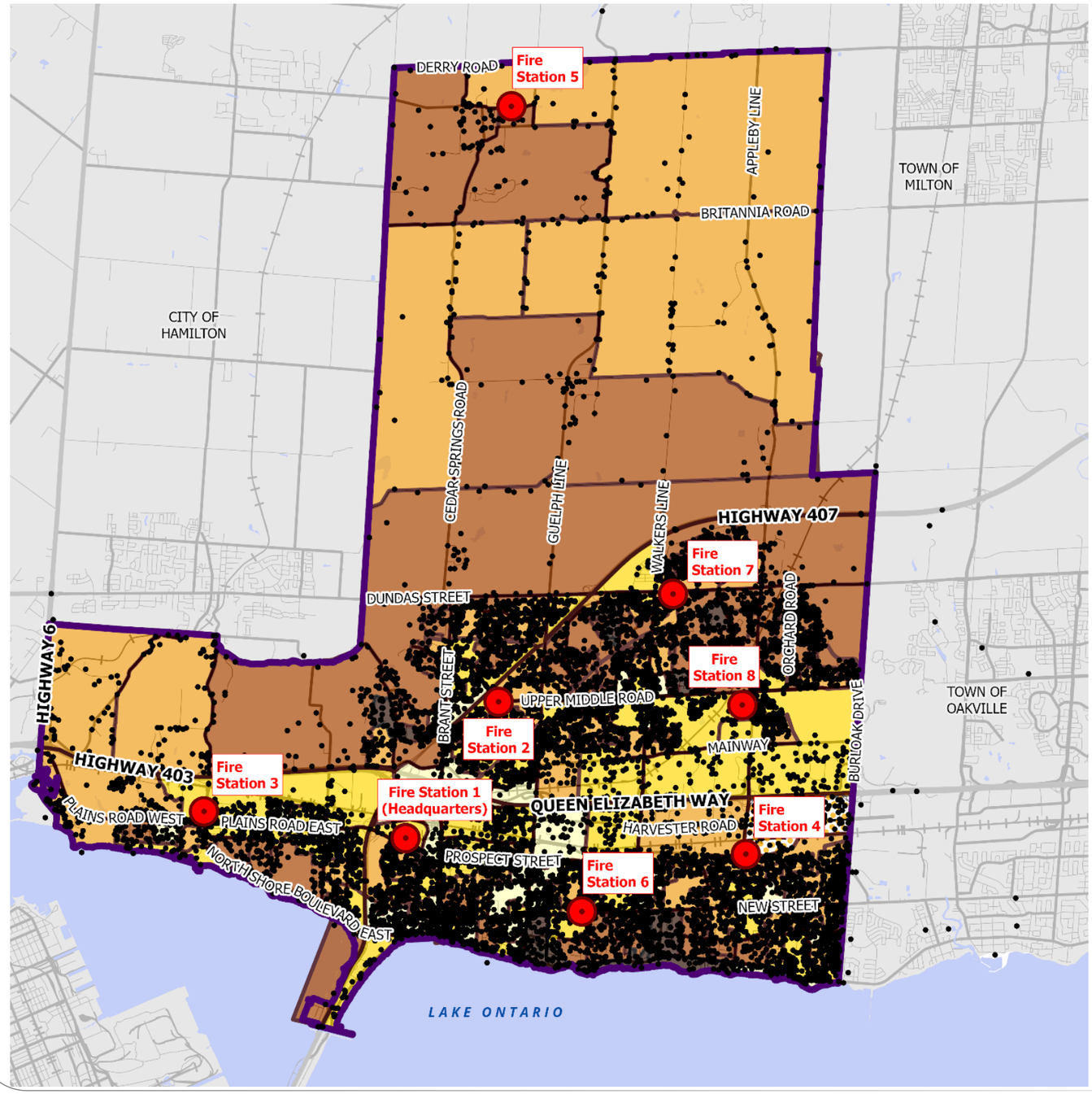
PROJECT: 199811
STATUS: DRAFT
DATE: 2021-08-31

10.2.2.6 Spatial Modelling – Median Income Dissemination Area

Research within the fire service has identified a potential correlation between median income and the available financial capability to support fire and life safety measures within a home. This could include the purchase of smoke alarms and carbon monoxide alarms, or alterations to ensure two exists from every room.

Figure 33 illustrates results of analyzing the median income by dissemination areas within the City of Burlington based on 2016 Census data. This analysis identifies a higher concentration of median income between $28,832 and $69,504 in areas along Highway 403 and Queen Elizabeth Way corridor. Areas with a median income within this range are all within the urban areas of the City.

Figure 33: Spatial Modelling – Median Income and Emergency Response Calls – All Incident Types



CITY OF BURLINGTON

SPATIAL CONCENTRATION OF EMERGENCY INCIDENTS FOR THE PERIOD FROM JANUARY 1ST, 2016 TO DECEMBER 31ST, 2020 AND MEDIAN INCOME

- Fire Station
- Emergency Incident (2016-2020)

Median Total Income of Households in 2015 ($)

- $28,832 - $69,504
- $69,504 - $95,488
- $95,488 - $124,672
- $124,672 - $165,205
- $165,205 - $230,912
- Data Not Available

Base Data

- City of Burlington Boundary
- Railway
- Expressway / Highway / Freeway
- Collector / Arterial Road
- Local Road / Ramp
- Waterbody

0 0.75 1.5 3 km

MAP DRAWING INFORMATION:
BASE DATA PROVIDED BY MNRF, CITY OF BURLINGTON, STATISTICS CANADA
MAP CREATED BY: LK
MAP CHECKED BY: CB/AN
MAP PROJECTION: NAD 1983 UTM Zone 17N

DILLON CONSULTING

PROJECT: 199811
STATUS: DRAFT
DATE: 2021-08-31

10.2.3 Emergency Call Volume – Summary

The spatial analysis of the City's historical emergency call volume for the period January 1, 2016 to December 31, 2020 indicates a consistent distribution of emergency call types within the defined urban area of the City, and is relatively consistent with residential population density and the location of high rise buildings. Additionally, there are other areas throughout the City that have been identified that have a reoccurring higher concentration of emergency incidents. These areas include: near Fire Station 3 on Plains Road West and Plains Road East at King Road; south of Station 1 in the Downtown, including Lakeshore Road and along Brant Street; near Station 8 at Upper Middle Road and Appleby Line; and south of Station 4 on Lakeshore Road.

Key Finding: There are multiple areas with a high concentration of all emergency call types in the downtown core, and along Lakeshore Road south of Fire Station 1.

Identified Risk: For the period from January 1, 2016 to December 31, 2020, there is a higher concentration of all emergency call types near the intersection of Plains Road East and King Road. Further analysis indicates that there are several high rise buildings in these areas.

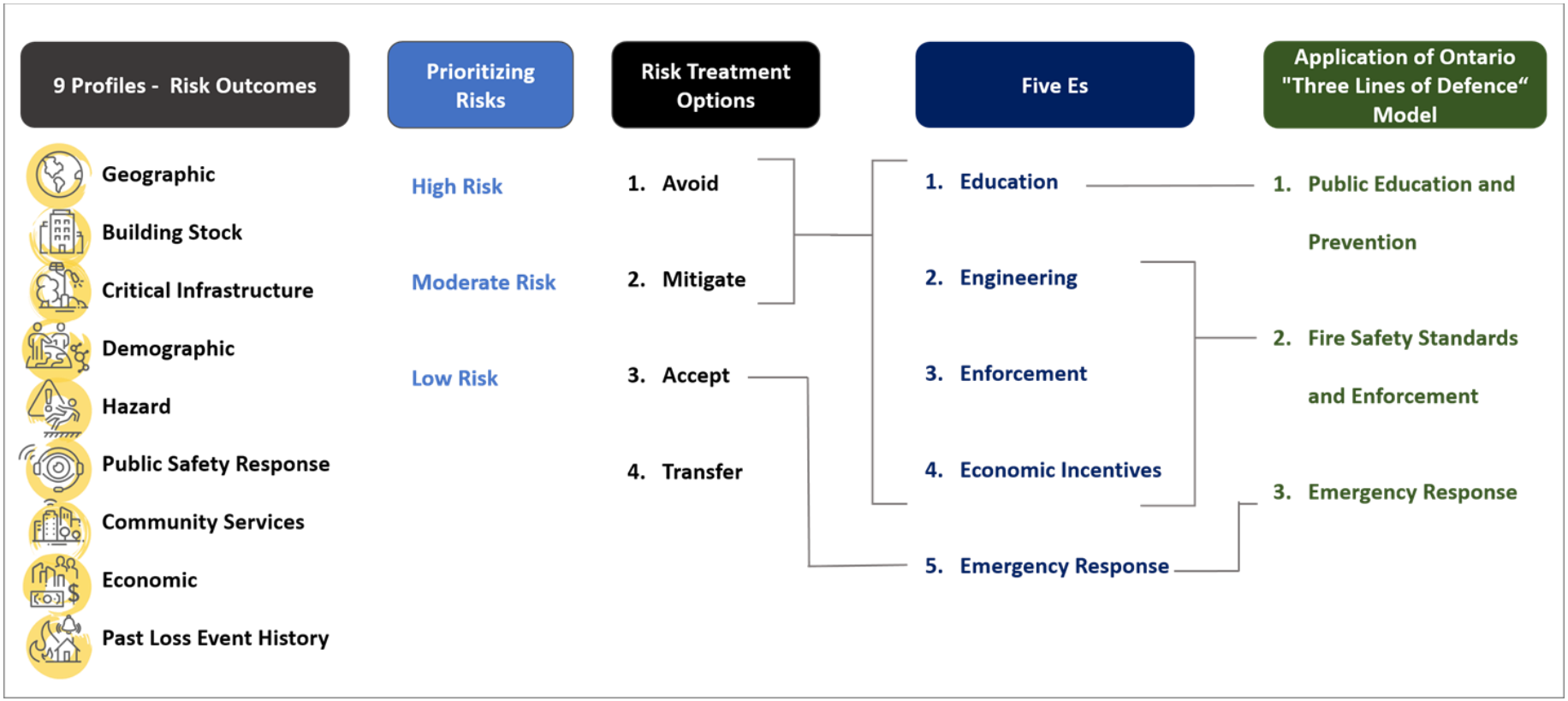
Key Finding: For the period from January 1, 2016 to December 31, 2020 there is a higher concentration of medical/resuscitator, false fire and fire/explosion incidents in areas including near Fire Station 3 on Plains Road West and Plains Road East at King Road; south of Station 1 in the Downtown, including Lakeshore Road and along Brant Street; near Station 8 at Upper Middle Road and Appleby Line; and south of Station 4 on Lakeshore Road.

11.0 Applying Key Findings and Identified Risks

The purpose of a CRA is to identify risks that are then used to inform decision-making regarding the provision of fire protection services. The analysis throughout this CRA identifies '**Key Findings**' and '**Identified Risks'** to be considered within the MFP. In alignment with TG-02-2019, this section takes the identified risk conclusions (both the key findings and the identified risks) through a risk assignment process to assist in the prioritization of risks, as well as a risk treatment process.

This section of the CRA brings together all of the key findings and identified risks and frames how they will be used to inform the MFP They are taken through a risk treatment process and aligned with the "Five E's" of Community Risk Reduction and three lines of defence in order to inform the analysis and recommendations within the Master Fire Plan as shown in **Figure 34**.

Figure 34: Risk Conclusions Application Process



11.1 Prioritizing Risks

NFPA 1300 and OFMEM TG-02-2019 identify that risks can be prioritized based on probability and consequence. OFMEM TG-02-2019 further emphasizes that all the risk findings and profiles should be considered together.

Following the probability and consequence levels identified by the O.F.M.E.M as described in the subsections below, the risk assignment process considers probability and consequence of each identified risk. This will result in each risk having a risk level (e.g., low, moderate, or high) assigned. These risk levels will then be used to assist in the prioritization of risks as part of the Master Fire Plan.

11.1.1 Risk Assignment Process Overview

The risk assignment methodology used as part of this C.R.A is informed by the OFMEM Technical Guideline (TG)-02-2019 Community Risk Assessment Guideline.

There are three steps included in the risk assignment exercise used for this CRA:

1. Determine a probability level
2. Determine a consequence level
3. Establish the risk level (i.e., low, moderate or high) for each based on the identified probability and consequence for each event

The following sections provide additional insight into the assignment process.

11.1.1.1 Step 1 - Probability Levels

The probability of a fire or emergency event occurring can be estimated in part based on historical experience of the community and that of the province as a whole. The likelihood categories, and the values presented, follow OFMEM TG-02-2019 Community Risk Assessment Guideline. **Table 38** presents the probability levels and the adjusted descriptions.

Table 38: Probability Levels

Likelihood Category*	Numerical Value	Description (Adjusted)
Rare	1	• may occur in exceptional circumstances • no incidents in the past 15 years
Unlikely	10	• could occur at some time, especially if circumstances change • 5 to 15 years since the last incident
Possible	100	• might occur under current circumstances • 1 incident in the past 5 years
Likely	1,000	• will probably occur at some time under current circumstances • multiple or recurring incidents in the past 5 years
Almost Certain	10,000	• expected to occur in most circumstances unless circumstances change • multiple or recurring incidents in the past year

Source: OFMEM TG-02-2019 Community Risk Assessment Guideline

11.1.1.2 Step 2 - Consequence Levels

The consequences of an emergency event relate to the potential losses or negative outcomes associated with the incident. There are four components that should be evaluated in terms of assessing consequence. These include:

1. **Life Safety:** Injuries or loss of life due to occupant and firefighter exposure to life threatening fire or other situations;
2. **Property Loss:** Monetary losses relating to private and public buildings, property content, irreplaceable assets, significant historic/symbolic landmarks and critical infrastructure due to fire;
3. **Economic Impact:** Monetary losses associated with property income, business closures, downturn in tourism, tax assessment value and employment layoffs due to fire; and,

4. **Environmental Impact:** Harm to human and non-human (e.g., wildlife, fish and vegetation) species of life and general decline in quality of life within the community due to air/water/soil contamination as a result of fire or fire suppression activities.

Table 39 presents the consequence levels.

Table 39: Consequence Levels

Consequence Category	Numerical Value	Description
Insignificant	1	• No life safety issue • Limited valued or no property loss • No impact to local economy and/or • No effect on general living conditions
Minor	10	• Potential risk to life safety of occupants • Minor property loss • Minimal disruption to business activity and/or • Minimal impact on general living conditions
Moderate	100	• Threat to life safety of occupants • Moderate property loss • Poses threat to small local businesses and/or • Could pose threat to quality of the environment
Major	1,000	• Potential for large loss of life • Would result in significant property damage • Significant threat to businesses, local economy, and tourism and/or • Impact to environment would result in a short term, partial evacuation of local residents and businesses

Consequence Category	Numerical Value	Description
Catastrophic	10,000	• Significant loss of life • Multiple property damage to significant portion of the municipality • Long term disruption of businesses, local employment, and tourism and/or • Environmental damage that would result in long-term evacuation of local residents and businesses

Source: OFMEM TG-02-2019 Community Risk Assessment Guideline

11.1.1.3 Step 3 - Risk Level

Once probability and consequence are determined the level of risk is calculated by multiplying the numerical values for probability and consequence. The relationship between probability and consequence as it pertains to risk levels can be illustrated in a risk matrix. In a risk matrix, probability and consequence are defined on separate scales with varying descriptors providing direction on how to assign the probability and consequence of an event. **Figure 35** shows the risk matrix for this CRA

Figure 35: Risk Matrix

Probability \ Consequence		Insignificant	Minor	Moderate	Major	Catastrophic
		1	10	100	1,000	10,000
Almost Certain	10,000	Moderate	Moderate	High	High	High
Likely	1,000	Moderate	Moderate	Moderate	High	High
Possible	100	Low	Moderate	Moderate	Moderate	High
Unlikely	10	Low	Low	Moderate	Moderate	Moderate
Rare	1	Low	Low	Low	Moderate	Moderate

11.1.2 Assigned Risk Levels

The purpose of assigning a risk level is to assist in the prioritization of the range of risks that were identified as part of this CRA

The results of the risk assignment process are presented in **Table 40**. Where possible, quantitative data was used to inform the risk assignment as described in the rationale in the table. It is important to recognize that with the availability of new or updated data, the probability levels could change or be refined. It should also be recognized that, as identified in OFMEM TG-02-2019, "professional judgment based on experience should also be exercised in combination with historical information to estimate probability levels".[52] Similarly, OFMEM TG-02-2019 acknowledges the role of professional judgment and reviews of past occurrences in determining consequence levels. The rationale provided for both probability and consequence takes into account information from the nine profiles, as OFMEM TG-02-2019 supports consideration of the profiles together in order to inform decision making about the provision of fire protection services in the specific municipality/community.

[52] Source: O.F.M.E.M. T.G.-02-2019 Community Risk Assessment Guideline, p.12

Table 40: Risk Assignment

Identified Risk	Probability Level	Rationale	Consequence Level	Rationale	Risk Level
Increasing traffic congestion and other natural and human-made barriers on the existing road network presents the potential for a delay in emergency response times. (Geographic Profile)	Likely	• BFD responded to a total of 2,946 calls pertaining to motor-vehicle related incidents over a five year period (Event History) • Some identified hazards including flooding, chemical release, winter weather, road and highway incidents and oil or natural gas incidents could contribute to the disruption of the road network (Hazard)	Minor	• Potential for extended emergency response travel time • Potential for risk to life safety of occupants if increase in the number of vehicles on the road leads to motor vehicle accidents • Potential risk for property loss • Consequence level could be impacted by the magnitude of a hazard event.	**Moderate**
Motor vehicle-related incidents on the existing road network represent 89.14% (2,946) of all rescue responses of the Burlington Fire Department. (Geographic Profile)	Almost Certain	• BFD responded to a total of 2,946 calls pertaining to motor-vehicle related incidents over a five-year period (Event History) • Winter weather could contribute to motor vehicle incidents (Hazard)	Moderate	• Potential for risk to life safety of occupants of motor vehicles • Potential risk for property loss • Could pose a threat to small local business • Could pose a threat to the quality of the environment • Consequence level could be impacted by the magnitude of a hazard event.	**High**
The presence of waterways within the City of Burlington creates a potential need for specialized technical ice and water rescue services. (Geographic Profile)	Likely	• Waterways in Burlington include Lake Ontario and Bronte Creek. (Geographic) • Over a five year period (2016 to 2020) 16 calls pertained to water rescue (an average of 3.40 water rescue calls per year) (Event History)	Minor	• Potential risk to life safety of individuals needing rescue.	**Moderate**
Mount Nemo Conservation Area presents a risk associated with residents and visitors participating in activities that may require specialized rescue services. (Geographic Profile)	Likely	• Over a five year period (2016 to 2020), 10 calls pertained to high angle rescue (non-fire) for an average of 2 calls per year, some of which may have occurred at Mount Nemo. (Event History)	Minor	• Potential risk to life safety of occupants • Minor property loss • Minimal disruption to business activity and/or • Minimal impact on general living conditions	**Moderate**

Identified Risk	Probability Level	Rationale	Consequence Level	Rationale	Risk Level
Group C - Residential Occupancies represent 93.53% of the City's existing property stock, and over the five-year period from January 1, 2015 to December 31, 2019 were associated with 72.24% of the structure fires within the City. (Building Stock)	Almost Certain	• The majority of property stock is Group C – Residential (Building Stock) • 255 fires (72.24%) over the five year period (2015 to 2019) occurred in Group C – Residential (Past Loss)	Moderate	• Could pose a threat to the life safety of occupants • Could result in moderate property loss • Could pose a threat to small local businesses, and/or pose a threat to the quality of the environment • Potential for vulnerable individuals including seniors and youth within Group C – Residential (Demographic) • Most reported fire-related civilian injuries (47) occurred in Group C – Residential (Past Loss) • Of the fire loss incidents in Group C – Residential occupancies 35.04% of incidents did not have a smoke alarm present and operating (Past Loss) • Potential for exposure risk depending on dwelling type and building age (Building Stock) • Potential presence and maintenance of fire protection equipment would influence consequence level (Building Stock) • As the City continues to grow, construction may include increased numbers of multifamily dwellings and high rise occupancies. (Building Stock) • The City currently has 105 buildings defined by the OBC as high-rise buildings with a floor level 18 metres (59 feet) above grade, or 6 storeys. (Building Stock)	**High**

Identified Risk	Probability Level	Rationale	Consequence Level	Rationale	Risk Level
The 2016 Census data indicates that 49.51% of the City's Group C-Residential building stock was built prior to the introduction of the 1981 Ontario Fire Code. (Building Stock)	Almost Certain	• The majority of property stock is Group C – Residential (Building Stock) • 255 fires (72.24%) over the five-year period (2015 to 2019) occurred in Group C – Residential (Past Loss)	Moderate	• Could pose a threat to the life safety of occupants • Could result in moderate property loss • Could pose a threat to small local businesses, and/or pose a threat to the quality of the environment • Occupants could be vulnerable individuals including seniors and youth within Group C – Residential (Demographic) • Most reported fire-related civilian injuries (47) and occurred in Group C – Residential (Past Loss) • Of the fire loss incidents in Group C – Residential occupancies 35.04% of incidents did not have a smoke alarm present and operating (Past Loss) • Potential for exposure risk depending on dwelling type and building age (Building Stock) • Potential presence and maintenance of fire protection equipment would influence consequence level (Building Stock)	**High**

Identified Risk	Probability Level	Rationale	Consequence Level	Rationale	Risk Level
The City currently has 105 buildings defined by the OBC as high-rise buildings with a floor level 18 metres (59 feet) above grade, or 6 storeys. These buildings are distributed throughout the urban area. (Building Stock)	Almost Certain	• The majority of property stock is Group C – Residential (Building Stock) • 255 fires (72.24%) over the five-year period (2015 to 2019) occurred in Group C – Residential (Past Loss)	Moderate	• Could pose a threat to the life safety of occupants • Could result in moderate property loss • Could pose a threat to small local businesses, and/or pose a threat to the quality of the environment • Occupants could be vulnerable individuals including seniors and youth within Group C – Residential (Demographic) • Most reported fire-related civilian injuries (47) and occurred in Group C – Residential (Past Loss) • Of the fire loss incidents in Group C – Residential occupancies 35.04% of incidents did not have a smoke alarm present and operating (Past Loss) • Potential for exposure risk depending on dwelling type and building age (Building Stock) • Potential presence and maintenance of fire protection equipment would influence consequence level (Building Stock)	**High**

Identified Risk	Probability Level	Rationale	Consequence Level	Rationale	Risk Level
The City has 225 buildings with a total building area (footprint) that exceed 50,000 square feet (4,655 square metres). These buildings are predominantly located in the general employment and business corridor along the QEW (Building Stock)	Almost Certain	• Group D – Business, Group E - Mercantile, Group F - Industrial or a mix of uses represent 2.60% of the City's existing property stock (Building Stock) • Over the five year period (2015 to 2019), Group D, E and F were associated with 58 (16.43%) of the structure fires within the City (Past Loss) • Potential for presence and maintenance of fire protection equipment, for example, fire alarm system, sprinklers, etc. (Building Stock)	Major	• Due to the potential for these buildings to contain large volumes of combustible materials, as well as horizontal travel distances for fire suppression activities, an incident occurring could result in a large loss of life • Could result in significant property damage • Could result in significant threat to large businesses, local economy and tourism, and/or impact to the environment • Potential for presence and maintenance of fire protection equipment, for example, fire alarm system, sprinklers, etc. (Building Stock) • Some of the identified occupancies may play a role in the economic well-being of the City (Economic)	**High**
The City of Burlington currently has forty-three (43) registered vulnerable occupancies. (Building Stock)	Possible	• These vulnerable occupancies may fall into different occupancy types such as Group B – Care or Detention or Group C – Residential (Building Stock) • Group B – Care or Detention occupancies represent 0.07% and Group C – Residential occupancies represent 93.53% of the City's existing property stock (Building Stock) • 255 fires (72.24%) over the five year period (2015 to 2019) occurred in Group C – Residential (Past Loss) • Ontario Regulation 150/13 requires fire departments to perform annual inspections and approve and witness fire drill scenarios which may influence the probability of a fire occurring in a vulnerable occupancy (Building Stock)	Catastrophic	• Ontario Regulation 150/13 requires fire departments to perform annual inspections and approve and witness fire drill scenarios (Building Stock) • Presence and maintenance of fire protection equipment, for example, fire alarm system, sprinklers, etc. (Building Stock) • Most reported fire-related civilian injuries (47) and occurred in Group C – Residential (Past Loss) • Potential for vulnerable individuals including those who receive special care or treatment within a Group B occupancy (Building Stock)	

Identified Risk	Probability Level	Rationale	Consequence Level	Rationale	Risk Level
The Burlington Executive Airport presents a number of unique fire related risks associated with aircraft, supporting infrastructure and the potential transportation of dangerous goods requiring specialized fire protection services. (Critical Infrastructure)	Not Applicable	• Special Consideration	Not Applicable	• Special Consideration	**Not Applicable**
Seniors (those 65 years and over) are considered to represent one of the highest fire risk groups across the Province based on residential fire death rate. According to the 2016 Census, seniors represent 19.27% of the City's total population. (Demographics)	Almost Certain	• Seniors represent one of the most vulnerable demographics and are 19.27% of the City's population (Demographic) • The majority of property stock is Group C – Residential (Building Stock) • 255 fires (72.24%) over the five-year period (2015 to 2019) occurred in Group C – Residential (Past Loss)	Moderate	• Could pose a threat to the life safety of occupants • Could result in moderate property loss • Most reported fire-related civilian injuries (47) and occurred in Group C – Residential (Past Loss) • Of the fire loss incidents in Group C – Residential occupancies 35.04% of incidents did not have a smoke alarm present and operating (Past Loss) • Potential for exposure risk depending on dwelling type and building age (Building Stock) • Potential presence and maintenance of fire protection equipment would influence consequence level (Building Stock)	**High**
The City's commuter population presents a factor that may impact traffic congestion, and the potential occurrence of motor vehicle accidents within the City. (Demographics)	Almost Certain	• Congestion during peak travel times such as between 5 PM and 6 PM, can influence emergency response times, in part through commuter populations (Demographic) • Motor vehicle-related incidents on the existing road network may contribute to congestion (Event History) • Winter weather could contribute to motor vehicle incidents, especially around commuting times (Hazard)	Minor	• Potential for extended emergency response travel time • Potential for risk to life safety of occupants • Potential risk for property loss • Consequence level could be impacted by the magnitude of a hazard event	**Moderate**

Identified Risk	Probability Level	Rationale	Consequence Level	Rationale	Risk Level
Most reported fire related civilian injuries (47) occurred in Group C – Residential Occupancies. (Past Loss)	Almost Certain	• The majority of property stock is Group C – Residential (Building Stock) • 255 fires (72.24%) over the five year period (2015 to 2019) occurred in Group C – Residential (Past Loss)	Moderate	• Could pose a threat to the life safety of occupants • Could result in moderate property loss • Could pose a threat to small local businesses, and/or pose a threat to the quality of the environment • Potential for vulnerable individuals including seniors and youth within Group C – Residential (Demographic) • Most reported fire-related civilian injuries (47) and occurred in Group C – Residential (Past Loss) • Of the fire loss incidents in Group C – Residential occupancies 35.04% of incidents did not have a smoke alarm present and operating (Past Loss) • Potential for exposure risk depending on dwelling type and building age (Building Stock) • Potential presence and maintenance of fire protection equipment would influence consequence level (Building Stock) • As the City continues to grow, construction may include increased numbers of multifamily dwellings and high rise occupancies. (Building Stock) • The City currently has 105 buildings defined by the OBC as high-rise buildings with a floor level 18 metres (59 feet) above grade, or 6 storeys. (Building Stock)	**High**
Of the fires occurring in the City over the five year period from January 1, 2015 to December 31, 2019, the leading cause of unintentionally set fires was due to misuse of ignition source at 37.96% (134 fires), compared to 29.85% in the Province. (Past Loss)	Almost Certain	• Over the five year period (2015 to 2019) 134 fires were caused by misuse of ignition source, an average of 27 fires of this type of cause per year (Past Loss)	Minor	• Potential risk to life safety of occupants • Minor property loss • Minimal disruption to business activity and/or • Minimal impact on general living conditions	**Moderate**

Identified Risk	Probability Level	Rationale	Consequence Level	Rationale	Risk Level
Of the fires occurring in the City over the five year period from January 1, 2015 to December 31, 2019, the second most common cause of unintentionally set fires was due to mechanical/electrical failure at 22.38% (79 fires), compared to 15.43% in the Province. (Past Loss)	Almost Certain	• Over the five year period (2015 to 2019) 79 fires were caused by mechanical/electrical failure, an average of 16 fires of this type of cause per year (Past Loss)	Minor	• Potential risk to life safety of occupants • Minor property loss • Minimal disruption to business activity and/or • Minimal impact on general living conditions Potential for exposure risk depending on dwelling type and building age (Building Stock) • Potential presence and maintenance of fire protection equipment would influence consequence level (Building Stock)	**Moderate**
For the period from January 1, 2016 to December 31, 2020, there is a higher concentration of all emergency call types near the intersection of Plains Road East and King Road. Further analysis indicates that there are several high rise buildings in these areas.	Almost Certain	• The City currently has 105 buildings defined by the OBC as high-rise buildings with a floor level 18 metres (59 feet) above grade, or 6 storeys. These buildings are distributed throughout the urban area. (Building Stock) • The majority of property stock is Group C – Residential (Building Stock) • 255 fires (72.24%) over the five year period (2015 to 2019) occurred in Group C – Residential (Past Loss)	Major	• Potential for large loss of life • Would result in significant property damage • Significant threat to businesses, local economy, and tourism and/or • Impact to environment would result in a short term, partial evacuation of local residents and businesses	**High**

11.2 Risk Treatment Options

NFPA 1300 - Standard on Community Risk Assessment and Community Risk Reduction Plan Development (2020 Edition) and the OFMEM TG-02-2019 apply the process of identifying a risk treatment option for an identified risk. The risk treatment options include avoidance, mitigation, acceptance, and transfer. Further detail on these options can be found in **Table 41**. There are four risk treatment options:

1. Avoid
2. Mitigate
3. Accept
4. Transfer

Table 41: Risk Treatment Options

Treatment Option	NFPA 1300 Description	OFMEM TG-02-2019 Description
Avoid	Eliminate the hazard.	Implementing programs and initiatives to prevent a fire or emergency from happening.
Mitigate	Reduce probability or impact (consequence) of the risk.	Implementing programs and initiatives to reduce the probability and/or consequence of a fire or emergency.
Accept	Take no actions.	No specific programs or initiatives will be implemented. Accept the risk and respond if it occurs.
Transfer	Transfer the risk to another party.	Transfer the impact and/or management of the risk to another organization or body.

Most of these options, if chosen by a fire department, will require some action or consideration as they pertain to fire protection services. As part of the application of the risk conclusions, a risk treatment option will be identified for each outcome followed by the application of the Five Es as described in the next section.

11.2.1 The 'Five Es' of Community Risk Reduction

NFPA 1300 - Standard on Community Risk Assessment and Community Risk Reduction Plan Development (2020 Edition) defines a Community Risk Reduction Plan as a "document that outlines the goals, objectives, programs, and resources used to reduce the risks identified by the community risk assessment".[53] Establishing service levels in regards to programs and resources in alignment with a CRA is required of Ontario municipalities as part of **O. Reg. 378/18**. As such, the recommendations of the MFP if implemented can be considered a part of community risk reduction plan since it includes a review of Fire Prevention and Public Education.

To apply the risk conclusions to the MFP, each risk conclusion ('key finding' or 'identified risk') will be reviewed through the lens of the "Five Es". The Five Es is a framework outlined in NFPA 1300 - Standard on Community Risk Assessment and Community Risk Reduction Plan Development (2020 Edition), and the Institution of Fire Engineers' Vision 20/20 National Strategy for Fire Loss Prevention. The Five Es are summarized in **Table 42**. They include:

1. increasing awareness (Education)
2. changes to the physical environment (Engineering)
3. influencing change through economic incentives (Economic Incentives)
4. enforcing legislation through inspection programs (Enforcement)
5. mitigating injury, illness and saving lives (Emergency Response)

[53] NFPA 1300, 3.3.6.

Table 42: Overview of the NFPA 1300 - Standard on Community Risk Assessment and Community Risk Reduction Plan Development (2020 Edition) Five "E's"

Five E's	Description
Education	Education influences audiences to refrain from risky or unhealthy behavior or take positive action to reduce risk.
Enforcement	Enforcement reduces risks through enforcing legislation through inspections and fines for noncompliance.
Engineering	Engineering includes incorporating new products and technology to modify the environment to prevent or mitigate injuries and deaths.
Economic Incentives	Economic incentives are typically offered to encourage better choices and changes in behaviour.
Emergency Response	Effective emergency response can mitigate the effects of unintentional injuries and save lives.

Source: Community Risk Reduction: Doing More with More, The NFPA Urban Fire and Life Safety Task Force, June 2016.

It is important to note that NFPA 1300 - Standard on Community Risk Assessment and Community Risk Reduction Plan Development (2020 Edition) discusses the application of the Five Es to develop specific goals and objectives to reduce risk. It also acknowledges that some strategies may require policy advocacy or legislative work. These are important considerations for a department but are beyond the purview of the recommendations found within a Master Fire Plan. As a result, the recommendations of the MFP will focus on ways to reduce risk from the perspective of the typical suppression and public education/prevention operations of the department. This includes a focus on a proactive reduction of risk through education, prevention, and enforcement with fire suppression as the fail-safe.

11.2.2 Risk Conclusions, Treatment Options, and the Five Es

When it comes to aligning service levels with risks that define local needs and circumstances, it is important to recognize that not all risk conclusions align with the services provided by a fire department in the same way. For this reason, the risk

conclusions are categorized based on the identified treatment options and how they can be used to inform the activities, strategies, and services provided by the department through the lens of the Five Es. This categorization will then be used to inform the Master Fire Plan. The purpose of the Five Es as they pertain to this study is shown in **Table 43**.

Table 43: Risk Analysis Conclusions – 5 E's Categorization

Five E's	Description	Purpose
Education	Education influences audiences to refrain from risky or unhealthy behavior or take positive action to reduce risk.	For consideration within the proposed Public Education Program
Enforcement	Enforcement reduces risks through enforcing legislation through inspections and fines for noncompliance.	For consideration within the proposed Inspection/Enforcement Program
Engineering	Engineering includes incorporating new products and technology to modify the environment to prevent or mitigate injuries and deaths.	For consideration within the proposed Fire Inspection and Enforcement Program
Economic Incentives	Economic incentives are typically offered to encourage better choices and changes in behaviour.	For consideration within the proposed Inspection/Enforcement Program
Emergency Response	Effective emergency response can mitigate the effects of unintentional injuries and save lives.	For consideration within the proposed Emergency Response Deployment Options

Table 44 presents the identified risks in a matrix format to indicate the ways in which the risks can be addressed by BFD and ultimately considered within the Master Fire Plan

analysis and recommendations. The same process is applied to the key findings in **Table 45**.

For those risk conclusions that will not be considered within the MFP, the department should use the findings of the risk assessment to review other fire protection services provided by the department to help ensure compliance with **O. Reg. 378/18** (e.g., training, by-laws, fleet, equipment, all department policies and guidelines, etc.).

Table 44: Treatment Options and Five E's Categorization – Identified Risks

Profile	Identified Risk	Risk Level	Risk Treatment Option: Avoid Mitigate Accept Transfer	Education For consideration within the proposed Public Education Program	Enforcement For consideration within the proposed Inspection and Enforcement Program	Engineering For consideration within the proposed Inspection and Enforcement Program	Economic Incentive For consideration within the proposed Inspection and Enforcement Program	Emergency Response For consideration within the proposed Emergency Response Program
Geographic	Increasing traffic congestion on the existing road network presents the potential for a delay in emergency response times.	**Moderate**	Mitigate Accept	No	No	No	No	Yes
Geographic	Motor vehicle-related incidents on the existing road network represent 89.14% (2,946) of all rescue responses of the Burlington Fire Department.	**High**	Accept	No	No	No	No	Yes
Geographic	The presence of waterways within the City of Burlington creates a potential need for specialized technical ice and water rescue services.	**Moderate**	Mitigate Accept	Yes	No	No	No	Yes
Geographic	Mount Nemo Conservation Area presents a risk associated with residents and visitors participating in activities that may require specialized rescue services.	**Moderate**	Mitigate Accept	Yes	Yes	No	No	Yes
Building Stock	Group C - Residential Occupancies represent 93.53% of the City's existing property stock, and over the five year period from January 1, 2015 to December 31, 2019 were associated with 72.24% of the structure fires within the City.	**High**	Mitigate Accept	Yes	Yes	Yes	Yes	Yes
Building Stock	The 2016 Census data indicates that 49.51% of the City's Group C-Residential building stock was built prior to the introduction of the 1981 Ontario Fire Code.	**High**	Mitigate Accept	Yes	Yes	No	No	Yes

Profile	Identified Risk	Risk Level	Risk Treatment Option: Avoid Mitigate Accept Transfer	Education For consideration within the proposed Public Education Program	Enforcement For consideration within the proposed Inspection and Enforcement Program	Engineering For consideration within the proposed Inspection and Enforcement Program	Economic Incentive For consideration within the proposed Inspection and Enforcement Program	Emergency Response For consideration within the proposed Emergency Response Program
Building Stock	The City currently has 105 buildings defined by the OBC as high-rise buildings with a floor level 18 metres (59 feet) above grade, or 6 storeys. These buildings are distributed throughout the urban area.	**High**	Mitigate Accept	Yes	Yes	Yes	Yes	Yes
Building Stock	The City has 225 buildings with a total building area (footprint) that exceed 50,000 square feet (4,655 square metres). These buildings are predominantly located in the general employment and business corridor along the QEW	**High**	Mitigate Accept	Yes	Yes	Yes	Yes	Yes
Building Stock	The City of Burlington currently has forty-three (43) registered vulnerable occupancies.	**High**	Mitigate Accept	Yes	Yes	Yes	Yes	Yes
Critical Infrastructure	The Burlington Executive Airport presents a number of unique fire related risks associated with aircraft, supporting infrastructure and the potential transportation of dangerous goods requiring specialized fire protection services.	**Special Consideration**	Mitigate Accept	Yes	Yes	Yes	Yes	Yes
Demographic	Seniors (those 65 years and over) are considered to represent one of the highest fire risk groups across the Province based on residential fire death rate. According to the 2016 Census, seniors represent 19.27% of the City's total population.	**High**	Mitigate Accept	Yes	Yes	Yes	Yes	Yes

Profile	Identified Risk	Risk Level	Risk Treatment Option: Avoid Mitigate Accept Transfer	Education For consideration within the proposed Public Education Program	Enforcement For consideration within the proposed Inspection and Enforcement Program	Engineering For consideration within the proposed Inspection and Enforcement Program	Economic Incentive For consideration within the proposed Inspection and Enforcement Program	Emergency Response For consideration within the proposed Emergency Response Program
Demographic	The City's commuter population presents a factor that may impact traffic congestion, and the potential occurrence of motor vehicle accidents within the City.	**Moderate**	Accept	No	No	No	No	Yes
Past Loss and Event History	Most reported fire related civilian injuries (47) occurred in Group C – Residential Occupancies.	**High**	Mitigate Accept	Yes	Yes	Yes	Yes	Yes
Past Loss and Event History	Of the fires occurring in the City over the five year period from January 1, 2015 to December 31, 2019, the leading cause of unintentionally set fires was due to misuse of ignition source at 37.96% (134 fires), compared to 29.85% in the Province.	**High**	Mitigate Accept	Yes	Yes	Yes	Yes	Yes
Past Loss and Event History	Of the fires occurring in the City over the five-year period from January 1, 2015 to December 31, 2019, the second most common cause of unintentionally set fires was due to mechanical/electrical failure at 22.38% (79 fires), compared to 15.43% in the Province.	**High**	Mitigate Accept	Yes	Yes	Yes	Yes	Yes
Past Loss and Event History	For the period from January 1, 2016 to December 31, 2020, there is a higher concentration of all emergency call types near the intersection of Plains Road East and King Road. Further analysis indicates that there are several high-rise buildings in these areas.	**High**	Mitigate Accept	Yes	Yes	Yes	Yes	Yes

Table 45: Treatment Options and Five E's Categorization – Key Findings

Profile	Key Finding	Risk Treatment Option: Avoid Mitigate Accept Transfer	Education For consideration within the proposed Public Education Program	Enforcement For consideration within the proposed Inspection and Enforcement Program	Engineering For consideration within the proposed Inspection and Enforcement Program	Economic Incentive For consideration within the proposed Inspection and Enforcement Program	Emergency Response For consideration within the proposed Emergency Response Program
Geographic	Bridges, with restrictions or closures, have the potential to reduce the connectivity of the City's road network resulting in the potential for delays in emergency response times.	Accept	No	No	No	No	Yes
Geographic	Grade level rail crossings could create a physical barrier to the connectivity of the City's road network that can potentially result in delays in emergency response times.	Accept	No	No	No	No	Yes
Building Stock	The City includes areas of building stock that have higher density and, as such, greater potential for exposure in the event of a fire. Statistics Canada 2016 census data indicates that 18.65% of the City's building stock is comprised of row housing, this is 9.74% higher than the Province (where 8.91% of provincial building stock is row housing).	Mitigate Accept	Yes	Yes	Yes	Yes	Yes
Building Stock	BFD identified several properties within Burlington as having an increased potential for high fire risk in regards to fuel load.	Mitigate	Yes	Yes	Yes	Yes	Yes
Building Stock	In addition to registered vulnerable occupancies, the City has 63 schools and 46 identified daycare centres, representing higher fire life-safety risks due to the number of children attending these facilities.	Mitigate Accept	Yes	Yes	Yes	Yes	Yes
Building Stock	There are a number of identified heritage buildings within Burlington, many of which were constructed prior to the introduction of the Ontario Fire Code.	Mitigate Accept	Yes	Yes	Yes	No	Yes

Profile	Key Finding	Risk Treatment Option: Avoid Mitigate Accept Transfer	Education For consideration within the proposed Public Education Program	Enforcement For consideration within the proposed Inspection and Enforcement Program	Engineering For consideration within the proposed Inspection and Enforcement Program	Economic Incentive For consideration within the proposed Inspection and Enforcement Program	Emergency Response For consideration within the proposed Emergency Response Program
Demographic	The 2016 Census data indicates that children aged 14 and under represent 16.73% of the City's total population.	Mitigate Accept	Yes	No	No	No	Yes
Demographic	Of the City's total population, 13.02% fall into the age range of 55 to 64, representing a cohort aging towards the seniors demographic of 65 years or older.	Mitigate Accept	Yes	No	No	No	Yes
Hazard	The City's 2019 Hazard Identification and Risk Assessment identifies hazards that could each impact the ability of the City to deliver fire protection services.	Mitigate Accept	Yes	Yes	Yes	Yes	Yes
Economic	The City has identified top employers that contribute to the economic vitality of the community. If a fire were to occur at one of these facilities it could have a negative impact on the financial well-being of the City.	Mitigate Accept	Yes	Yes	Yes	Yes	Yes
Past Loss and Event History	Over the five year period from January 1, 2015 to December 31, 2019, the City averaged 71 structure fires per year.	Mitigate Accept	Yes	Yes	Yes	Yes	Yes
Past Loss and Event History	Over the five year period from January 1, 2015 to December 31, 2019 structure fires occurring in Group F – Industrial occupancies account for 8.22% of total structure fires within the City and 36.19% of total structure fire loss.	Mitigate	Yes	Yes	Yes	Yes	Yes
Past Loss and Event History	Of the fires occurring within the City over the five year period from January 1, 2015 to December 31, 2019, 24.93% of fires had a reported ignition source of cooking equipment, which is 7.64% higher than the Province (17.29%).	Mitigate Accept	Yes	Yes	Yes	Yes	Yes

Profile	Key Finding	Risk Treatment Option: Avoid Mitigate Accept Transfer	Education For consideration within the proposed Public Education Program	Enforcement For consideration within the proposed Inspection and Enforcement Program	Engineering For consideration within the proposed Inspection and Enforcement Program	Economic Incentive For consideration within the proposed Inspection and Enforcement Program	Emergency Response For consideration within the proposed Emergency Response Program
Past Loss and Event History	Of the fires occurring within the City over the five year period from January 1, 2015 to December 31, 2019, 19.83% of fires had a reported ignition source of open flame tools/smokers articles, which is 5.87% higher than the Province (13.96%).	Mitigate Accept	Yes	Yes	Yes	Yes	Yes
Past Loss and Event History	Of the fires occurring within the City over the five year period from January 1, 2015 to December 31, 2019, 13.60% of fires had a reported ignition source of miscellaneous, which is 3.70% higher than the Province (9.90%).	Mitigate Accept	Yes	Yes	Yes	Yes	Yes
Past Loss and Event History	Over the five year period from January 1, 2015 to December 31, 2019, of the fire loss incidents in Group C – Residential occupancies, 16.14% of incidents did not have a smoke alarm present (compared to 17.28% in the Province).	Mitigate Accept	Yes	Yes	Yes	Yes	Yes
Past Loss and Event History	Over the five year period from January 1, 2015 to December 31, 2019, of the fire loss incidents in Group C – Residential occupancies, 54.72% of incidents had a smoke alarm present and operating compared to 45.20% in the Province.	Mitigate Accept	Yes	Yes	Yes	Yes	Yes
Past Loss and Event History	Over the period from January 1, 2016 to December 31, 2019 the volume of emergency calls responded to by the Burlington Fire Department modestly increased by 1.56% with a slight decrease in 2020.	Mitigate Accept	Yes	Yes	Yes	No	Yes

Profile	Key Finding	Risk Treatment Option: Avoid Mitigate Accept Transfer	Education For consideration within the proposed Public Education Program	Enforcement For consideration within the proposed Inspection and Enforcement Program	Engineering For consideration within the proposed Inspection and Enforcement Program	Economic Incentive For consideration within the proposed Inspection and Enforcement Program	Emergency Response For consideration within the proposed Emergency Response Program
Past Loss and Event History	For the period from January 1, 2015 to December 31, 2019 the highest percentage of emergency call volume responded to by Burlington Fire Department as defined by the OFMEM response types was medical/resuscitator calls representing 55.3% of total emergency call volume.	Accept	No	No	No	No	Yes
Past Loss and Event History	For the period from January 1, 2015 to December 31, 2019 the second highest percentage of emergency call volume responded to by Burlington Fire Department as defined by the OFMEM response types was false fire calls representing 13.0% of total emergency call volume.	Mitigate Accept	Yes	Yes	Yes	Yes	Yes
Past Loss and Event History	There are multiple areas with a high concentration of all emergency call types in the downtown core, and along Lakeshore Road south of Fire Station 1.	Accept	Yes	Yes	Yes	Yes	Yes
Past Loss and Event History	For the period from January 1, 2016 to December 31, 2020 there is a higher concentration of medical/resuscitator, false fire and fire/explosion incidents in areas including near Fire Station 3 on Plains Road West and Plains Road East at King Road; south of Station 1 in the Downtown, including Lakeshore Road and along Brant Street; near Station 8 at Upper Middle Road and Appleby Line; and south of Station 4 on Lakeshore Road.	Accept	No	No	No	No	Yes