



FIRE MASTER PLAN – Update 2016 - 2025



ACKNOWLEDGEMENTS

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Barrie Fire and Emergency Service would like to thank all its internal business partner departments that have contributed to this Fire Master Plan.

EXECUTIVE SUMMARY

Barrie Fire and Emergency Service is the City of Barrie’s “all hazards” emergency response organization and provides City of Barrie residents, visitors and businesses with protection against loss of life, property and the environment from the effects of fire, illness, accidents and all other hazards through preparedness, prevention, public education and emergency response with an emphasis on quality, efficiency, effectiveness and safety.

The City of Barrie’s population has and will continue to grow steadily, increasing the demand for emergency services. Combined with climate change, extreme weather events present an increasing need for BFES to continue to be proactive in terms of emergency planning and specialized training.

The Fire Master Plan is also designed to be a precursor as BFES embarks on its upcoming application for accreditation with the Commission on Fire Accreditation International (CFAI). The accreditation process and commitment to continuous improvement, based on local needs and circumstances, will support BFES in achieving its objectives.

Barrie Fire and Emergency Service have undertaken this review and provide recommendations to update the current Fire Master Plan for the years 2016-2025, with an outlook to 2031. This review is necessitated in part because of the anticipated development into the annexed lands within the next few years, and with any successful master plan there should be an ongoing review of the plan to keep it current and focused on the direction of the department, the city, and levels of service set by Council.

The previous Fire Master Plan was adopted in part (Short Term Goals) by Council in 2015 and directed the department to further consider the Medium and Long Term goals and report back to the Community Services Committee. As 2015 is nearing end and an annual review of the Fire Master Plan is scheduled, the department has adjusted the plan. This update was produced in partnership with multiple other City Business Partner Departments, external consultants and members of Barrie Fire and Emergency Service.

The following scope was utilized to update the Fire Master Plan:

- Conduct a current gap analysis on the risks identified;
- Determine the current effectiveness and efficiency of the department against the risks identified and present options to mitigate, respond and manage the risks;
- Evaluate the current and anticipated infrastructure and station locations by measuring the risk and anticipated growth identified matched with deployment standards to arrive at future facility, site, spatial and infrastructure requirements, and;

- Make recommendations to reflect short, intermediate and long term objectives with an outlook to 2031.

There are two basic risks that are considered in the fire service, operational risk and organizational risk. Operational risk is the responsibility of the department to determine the risk associated with the varying aspects and responsibilities within the department. Operational risk streams from the Fire Chief down, following the organizational chart. Organizational risk is the responsibility of the Council to determine the disciplines, level of service, staffing, number of stations and business planning request based on the risk assessment of the community as recommended by the Fire Chief.

There are many factors that are increasing the level of risk facing the community and the department, but several are especially important over the period of this Fire Master Plan period. They include:

- Increasing stock of residential infrastructure due to a rise in population
- Increasing stock of commercial, industrial and institutional facilities
- Increasing volumes of traffic on city streets and highways
- Increasing density requirements in growth node areas and vertical growth
- Climate change, emergency preparedness and business continuity planning

There are several aspects of the current resources available to the department that requires continued monitoring for effectiveness and efficiencies. They include:

- The need to ensure that the communications systems, a major component of enhancing the life safety of responders/citizens, and reducing property loss, continues to be staffed with highly qualified communications operators, and that the communications infrastructure remains current to rapid technological change.
- Monitor and adjust staffing levels in all branches consistent with the service delivery needs based on growth, intensification and balancing the needs with the business plan process yearly.
- Ensure training, policies, standard operating guidelines are kept to current legislated, mandated and best practice standards to enhance safety and increase efficiency and effectiveness in the department.
- Apparatus must meet the strenuous conditions required to respond and mitigate incidents in a safe and timely fashion. Apparatus should be reviewed for condition on an ongoing basis and replacement scheduling should be formalized to ensure it meets current standards and meets the needs of the department.

SUMMARY OF RECOMMENDATIONS

Short Term Objectives (1 – 3 years) 2016-2018

- A records and data management system should be integrated into the Fire Prevention Branch as soon as reasonably practicable using business intelligence software to better analyzes historical data. **Underway**
- Initiate accreditation with the Centre for Public Safety Excellence, a nonprofit organization that helps local public safety agencies around the world streamline and improve the services they provide their communities. **Underway**
- **Work with other City Departments to ensure an all hazards approach to business continuity planning that supports the City of Barrie Emergency Plan. Underway**
- Complete a communications service delivery standard between IT and BFES, and develop a communications service delivery standard between BFES and its communications customers. **Underway**
- Improve statistical data with improved reporting processes using business intelligence software to better analyze historical data. **Underway**
- **Conduct a comprehensive qualitative and quantitative risk assessment for the City of Barrie. Developing**
- Develop a plan to increase the number of pre-incident plans with a focus on high risk buildings by occupancy code. **Developing**
- Land acquisition and design for a station in the south-east quadrant consistent with the Genivar Station Location Study (2013).
- Renovations and alterations to Stations 3 and 4 to increase functionality of both stations. **Underway**
- **Develop an inspection schedule where the frequency of inspections is appropriately suited to the risk profile of each occupancy.**
- BFES, the Engineering Department, Corporate Asset Management, IT and Water Operations should develop a strategic plan to implement the recommendations contained in the Fire Underwriters Survey and report the improvements to FUS.
- Explore partnerships with other municipalities to provide technical rescue disciplines on a total cost recovery basis and possible source of revenue through response and/or training initiatives. **Underway**
- Implement a sustainable back-up communications location consistent with best practices and standards. **Developing**
- **Explore partnerships opportunities with academic institutions, organizations and government agencies where BFES can contribute to relevant and current research projects. Underway**

- Review the service levels provided to maintain and repair the growing fleet balanced against capital costs of replacement. **Underway**
- Begin implementation of a Computer Aided Dispatch, Automatic Vehicle Locator and GPS traffic pre-emption link project to enhance response times throughout the city.
- Review staffing levels in the branches consistent with an organizational review of service delivery needs of the department/public and anticipated growth aligned with the annual business planning process.
- Work with the Building Department to develop a bidirectional antenna strategy
- Annually review and revise as necessary the Fire Master Plan.

NEW OBJECTIVE

Intermediate Term Objectives (3 - 5 years) 2018-2020

- Construction of Station 6 in the south-east.
- Hire staff for Station 6 based on service delivery standards and legislative requirements.
- Acquisition of a Pumper for Station 6.
- Review staffing levels in the branches consistent with an organizational review of service delivery needs of the department/public and anticipated growth aligned with the annual business planning process.
- Upgrade communications equipment and associated systems consistent with current and advanced technology.
- Land acquisition and design for a Training Facility to meet fire department training requirements and support other city and regional requirements.
- BFES, the Engineering Department, Corporate Asset Management and Water Operations should continue to implement the recommendations contained in the Fire Underwriters Survey and report the improvements to FUS.
- Review and revise the Fire Master Plan.

Long Term Objectives (5 – 10 years) 2020-2025

- Phased construction (Phase 1) of the Fire Training Facility based on balancing demand and the Business Planning process.
- Construction of a permanent Station 5 in the south-west quadrant.
- Upgrade communications equipment and associated systems consistent with current and advanced technology.

- Review staffing levels in the branches consistent with an organizational review of service delivery needs of the department/public and anticipated growth aligned with the annual business planning process.
- Develop a deployment strategy based on service delivery standards and legislative requirements with a full review scheduled for 2018.
- BFES, the Engineering Department, Corporate Asset Management and Water Operations should develop a strategic plan to implement the recommendations contained in the Fire Underwriters Survey and report the improvements to FUS.
- Review and revise the Fire Master Plan.

Outlook to 2031

- Continue phased Fire Training Facility.
- Upgrade communications equipment and associated systems consistent with current and advanced technology.
- Replacement of Station 2.

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SECTION 1 - INTRODUCTION:

1.1 Background

In 2007, the City of Barrie Council passed a motion to create a Fire Master Plan to provide strategic directions for the fire service that would take them into 2013 with a vision for an additional five (5) years. In 2009, the City of Barrie Council passed and adopted the Fire Master Plan that contained short, intermediate and long term goals. The Fire Master Plan was developed prior to the annexation of the new lands in Innisfil. As part of the planning exercise of the new lands in 2012, a station location study was conducted by Genivar with the assistance of multiple City of Barrie Departments. As a result, in 2014, Barrie Fire and Emergency Service amended the existing Fire Master Plan with update information and outlooks for the period 2014 – 2023, with a vision out to 2031. This update was presented to the Community Services Committee in March of 2015. The Committee recommended to Council:

1. That the Short Term Goals (1-3 years) for the period of 2014 – 2016 identified in the Fire Master Plan Update 2014 – 2023, with the exception of the implementation of the marine response service levels and capabilities for open water rescue, be adopted in principle to provide strategic direction for the Barrie Fire and Emergency service Department.
2. That the marine response service levels and capabilities for open water rescue, as well as the Medium and Long term Goals identified in the fire Master Plan Update 2014 – 2023 be referred back to staff for further consideration and report back to Community Services Committee.

Council approved the recommendation.

Staff have reviewed and revised the Fire Master Plan, taking into consideration that as we are late in 2015, the entire plan should be updated, and as a result created an updated version covering the years 2016-2025.

1.2 Project Scope

The following scope was considered in the development of this Fire Master Plan update:

- Review the Fire Master Plan and update and revise the short, intermediate and long term objectives,
- Re-evaluate the current infrastructure and station locations to recommend future facility, site, spatial and infrastructure requirements based on projected growth.
- Weigh the effectiveness and efficiency of the department to manage and mitigate incidents.

- Make recommendations as to the implementation strategy for the short, intermediate, long term objectives with a vision extending to 2031.

1.3 Methodology

A systematic approach was used to develop this updated Fire Master Plan by using current legislative requirements, provincial guidelines, fire service standards and best practice benchmarking using the following:

- The Fire Master Plan – 2009 & 2014
- The Genivar Station Location Study – 2012
- The Fire Underwriters Survey - 2014
- The City of Barrie Draft Secondary Plan
- Annexed Lands Secondary Plan Fiscal Impact Assessment
- The Thomas Brown – Design Study for the New BFES Training Facility – 2009
- Barrie Fire and Emergency Service Establishing and Regulating By-law 2012-200
- Barrie Fire and Emergency Service Simplified Risk

The Fire Master Plan – 2009 & 2014 - Recommendations were reviewed for progress updates and categorized into completed, in-progress, pending and incomplete. A total re-examination of the document and background information was conducted to ensure that changes were identified and updated as required. The review concluded that there needs to be changes to the 2014 version to reflect current status and new data with respect changes in the City of Barrie.

The Genivar Station Location Study – Genivar completed a station location study based on data provided by the City of Barrie in combination with other related studies they were conducting in relation to the annexed lands. In order to have a robust station location study as current fire response zones intersect one another for multiple apparatus, it was necessary to review existing station locations and review previous modelling on response capabilities throughout the city.

The Fire Underwriters Survey – Fire Underwriters Survey is a national organization that represents more than 85% of the private sector property and casualty insurers in Canada. Fire Underwriters Survey provides data to program subscribers regarding public fire protection for fire insurance statistical and underwriting evaluation. It also advises municipalities if the desire to review the current levels of fire defense in the community and provide direction with recommendations where improvements will enable them to better deal with fire protection problems.

The City of Barrie Draft Secondary Plan – The draft secondary Plan was a major component of this review as it sets out projected growth phases relating to land uses, arterial networking and major components of the city until 2031. Development phasing will play a major role in the growth needs of BFES. Capital and operating business plan needs are established throughout this Master Plan based on current assumptions of development growth.

Annexed Lands Secondary Plan Fiscal Impact Assessment – This report produced with the cooperation of various city departments that deliver capital needs to BFES was reviewed with the Draft Secondary Plan to distinguish in which years capital projects are projected to occur.

The Thomas Brown – Design Study for the New BFES Training Facility – 2009 – This study was commissioned in 2009 as a feasibility study to review the current and future needs of maintaining legislated and industry best practice training requirements for BFES. It resulted in a phased approach from land acquisition through phased construction phases. This facility could be developed to suit the needs of other city departments including Barrie Police, and assumptions that the possibility of renting out this facility to other Simcoe County agencies will off-set operating cost.

Barrie Fire and Emergency Service Establishing and Regulating By-law – The Establishing and Regulating by-law is a legislated under the Fire Protection and Prevention Act and was updated and passed by Council in November of 2012. The by-law sets out the mandated services, classification and task objectives of the mandated services. This is the fundamental principle of providing service delivery needs to the community.

Barrie Fire and Emergency Service Simplified Risk Assessment – this report prepared by Fire Prevention Officer Dave Lalonde is a report legislated by the Fire Protection and Prevention Act. This report looks at a gap analysis and means to reduce or eliminate the gaps through the three lines of defense of the fire service – public education, code enforcement and response capabilities.

SECTION 2 – ACCOMPLISHMENTS

2.1 Background

The original Fire Master Plan was approved by Council in 2009, and set out short, intermediate and long term objectives. Since that original plan was adopted several goals have been achieved, while others are still underway in different phases of completion. The ability of BFES to accomplish these would not have been possible without the collaboration of several other city departments that BFES relies on for the service delivery needs of BFES. Another important aspect is the willingness of City Council to support the ongoing commitment to the department in its deliberations of the annual business plan. The following is an update on completed and underway goals that were targeted objectives.

2.2 Short Term Objectives (1 – 3 years)

- Construct new Station 1, Communications Centre and Emergency Operations Centre – **Completed**
- Complete a fire station location and current station feasibility study – **Completed**
- Upgrade communications equipment and associated systems consistent with current and advanced technology as part of Station 1 replacement – **Completed**
- Implement an internal process review of the Communications Branch effectiveness in providing service to municipal fire service clients, including possible increase in client base – **Completed**
- Training needs to reorganize delivery modules as soon as possible in order to ensure firefighter safety in enhanced through knowledge and practical training experience – **Completed**
- Review and have Council approve a Service Delivery Standard (Establishing and Regulating By-law) – **Completed**
- Review and revise of the Fire Master Plan on a continuous basis – **Completed**
- Review the service levels provided to maintain and repair the fire fleet balanced against capital cost of replacement - **Underway**

2.3 Intermediate Term Objectives (3 – 5 years)

- Construction of Station 5 to open in 2011 – **Completed**
- Hire staffing for Station 5 (20 fire fighters) – **Completed**
- Fully implement a succession plan for all positions in the department for sustainability – **Underway**

SECTION 3 – RISK ASSESMENT

3.1 What is Risk Assessment?

Risk assessment is the process utilized to identify the City of Barrie’s fire protection and other emergency service needs by measuring the probability and consequence of an adverse effect to health, property, organization, environment, or community as a result of an event, activity or operation.

There are two basic risks associated with the fire service, operational risk and organizational risk. Operational risk is the responsibility of the Barrie Fire and Emergency Service to determine risks in the community and plan strategic, tactical and task oriented plans to mitigate incidents. Organizational risk is a function and responsibility of Council to determine the disciplines, level of service, staffing, stations and approval of the department business plan based on the overall risk assessment of the community as recommended by the Fire Chief.

It is the process of examining and analyzing the relevant factors that characterize the City of Barrie and applying this information to identify potential risk scenarios using results based accountability and evidence based decision making. The assessment includes an analysis of the likelihood of these scenarios occurring and subsequent consequences. In essence, risk assessment attempts to answer the following questions:

- What could happen?
- When could it happen?
- Where could it happen?
- Who could it happen to?
- Why could it happen?
- How likely is it to happen?
- How bad would it be if it happened?
- What can be done to lessen or prevent any or all the above?

This information serves as the basis for formulating and prioritizing risk management decisions to reduce the likelihood of these incidents from occurring and to mitigate the impact of these incidents when they occur.

The City of Barrie has a legislated responsibility under the Fire Protection and Prevention Act (FPPA) to provide public education with respect to fire safety and certain components of fire prevention. Conducting a simplified risk assessment is the first step towards compliance with these requirements and is intended to identify information required by a municipality to make informed decisions about the programs and

activities necessary to effectively manage the community fire risk based upon local needs and circumstances.

The Office of the Fire Marshal and Emergency Management has two risk assessment tools; the Simplified Risk Assessment model as described above is an annual compliance document that is submitted to the Office of the Fire Marshal and Emergency Management. The second model is a more expansive Comprehensive Risk Assessment model that is one of seven components of the Comprehensive Fire Safety Effectiveness Model. The OFMEM has recently introduced an “Integrated Risk Management Web Tool”. The tool is intended for municipal and fire service decision-makers to determine building risks by taking into account building characteristics and assist municipalities in fulfilling the responsibilities prescribed in Section 2 of the Fire Protection and Prevention Act, 1997.

It is important to note that the legislative requirements for risk assessment required by the Office of the Fire Marshal and Emergency Management relate only to fire related public education, fire prevention and fire protection and Carbon Monoxide regulations. It does not address the multiple disciplines that the Barrie Fire and Emergency Service deliver to the citizens of the City of Barrie; therefore it would not be practical to base the Fire Master Plan solely on this requirement. A risk assessment must be conducted for all services and service levels that Barrie Fire and Emergency Service provide that besides those listed above include but are not limited to:

- Hazardous Materials Response & Protection of the Environment
- Extrication and Rescue
- Land and Vessel Based Ice/Water Rescue
- High/Low Angle Rescue
- Confined Space Rescue
- Tiered Medical Response
- Trench Rescue
- Elevator Rescue
- Public Assistance
- Fire Inspections
- Fire Code Enforcement
- Municipal Code and By-law Enforcement
- Public Education
- Fire Investigations into Origin and Cause
- Provisions of the Propane Handling Act
- Communications (dispatch services)

- Community Emergency Preparedness
- Corporation of the City of Barrie Business Continuity Planning

The Emergency Management and Civil Protection Act states: “in developing its emergency management program, every management program, every municipality shall identify and access 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.”

3.2 Risk Analysis

A thorough review of the 2009 and 2014 Fire Master Plan information, present levels of service and assumptions on growth and service delivery in the foreseeable future has resulted in the following areas of risk that require a review to eliminate, control or manage the risk, based on the three principles of public education, inspection and enforcement and finally response.

3.3 Areas under Review

3.3.1 Infrastructure

- Current Fire Stations, lifecycle analysis and locations
- Future Station locations
- Training Facility
- Communications Centre back-up location

3.3.2 Apparatus/Equipment

- Aerials, pumpers, rescues, tankers and specialty apparatus
- Technical rescue equipment
- Legislated equipment replacement
- Minor capital equipment purchase and replacement

3.3.3 Communications

- Radio system components and infrastructure
- Computer Aided Dispatch system
- Software and information technology systems
- GIS,
- GPS, AVL and traffic pre-emption systems

3.3.4 Personnel

- Staffing in Administration, Operations, Fire Prevention, Public Education, Communications, Mechanical and Logistics
- Support Services

- Succession planning (leadership training and career development)
- Performance development plans (evaluations)

3.3.5 Administration

- Records Management
- Policy Manual
- Service Delivery Standards
- Medical Response Protocol
- Business Planning
- Position Descriptions
- Standard Operating Guidelines
- Occupation Health and Safety
- Legislative Requirements

Given the increasing growth the city will experience during the development of the annexed lands and anticipated vertical growth as a result of intensification, BFES will need to evaluate this growth to maintain current levels of service and address the gaps in the areas of identified risks.

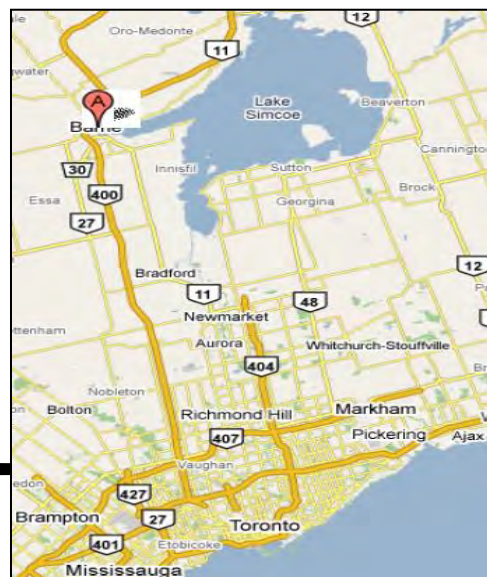
The following risks need to be considered by BFES and the City of Barrie for action to be planned and implemented in the future as outlined. Some will require attention in the short term while others seek longer term solutions and phased approaches to help control or spread costs over a period of time.

3.4 Area Characteristics

The characteristics of the City of Barrie are documented by collecting historical data, current data and growth forecasts by which risks are identified; defined and potential organizational and operational objectives and objectives are established. The City of Barrie is a city of 144,000 residents, is the 34th largest City in Canada and the 16th in Ontario according to the 2011 Stats-Canada Census. With the pending development of the annexed lands, the City will again be one of Canada’s fastest growing cities in the very near future.

3.4.1 Geography

Barrie is located on Kempenfelt Bay, an arm of Lake Simcoe in the central region of Southern Ontario. Although geographically lies inside the County of Simcoe, the City of Barrie is a



separated city from the County of Simcoe and is a single tier municipality.

The city is predominantly a bowl shape around Kempenfelt Bay and elevation rises from the shores of Kempenfelt Lake outward. Highway 400 running north and south intersects the city. The total land mass with the inclusion of the annexed lands is $100km^2$

3.4.2 Economy

There are multiple manufacturers located in and around Barrie and Canadian Forces Base Borden is nearby. Barrie has established itself as a commercial hub for the area north of the GTA.

The Royal Victoria Regional Health Centre has just completed a major expansion and also becomes the regions Cancer Care Centre. The hospital total workforce is 3200 people. Georgian College has its main campus in Barrie and has recently undergone an expansion and is another major employer in Barrie current enrolment is 10,000 full-time and 30,000 part-time students.

In recent years Barrie has attracted some major financial institutions to Barrie including four data centres, establishing itself as an economic sector centre.

Several large developments are underway or proposed to begin in the next couple of years, including plans for intensification in the downtown core and approved growth corridors.

3.4.3 Demographic and Geographic Risks

Population

- The City of Barrie has experienced tremendous growth in the past and is posed to experience this growth again with the development of the annexed lands in the next few years. Barrie has a typical mix of residential occupancies ranging from low density single family residential through to high density high rise complexes. Future plans for population intensification in the growth nodes will result in higher density development in these areas and in particular the downtown core. The staffing required to evacuate, contain and extinguish a fire in a multi-residential complex far exceeds the required staffing level for a single family residential structure. A fire in a high rise structure demands a response of significant staffing that would tax the current on-duty minimum staffing of the fire service. The National Fire Protection Association defines a Low Hazard Occupancy as a one, two or three family dwelling and some small businesses, Medium Hazard Occupancies include apartments, offices, mercantile and

industrial occupancies not normally requiring extensive rescue or firefighting forces and High Hazard Occupancies include schools, hospitals, nursing and care facilities, high-rise buildings and other high life hazard or large fire potential occupancies.

- In May, 2014, the Ontario Office of the Fire Marshal and Emergency Management issued a Public Fire Safety Guideline, “Integrated Risk Management Web Tool”. The purpose of the guideline is to assist municipalities in meeting their obligations as set out in Section 2 of the Fire Protection and Prevention Act, 1997 (FPPA). This evaluation system is part of an overall package of risk management tools designed to provide a systematic process for determining community risks, evaluating current fire service resource capabilities, identifying gaps, and developing options and recommendations for council consideration. The principles of this evaluation system build upon and enhance the Office of the Fire Marshal and Emergency Management’s risk management tools and other tools of recognized leaders in the North American fire service.
- The increase in the volume of housing is directly relative to the overall risk. The projected population growth for the city is
 - 2016 146,700
 - 2021 170,000
 - 2026 191,000
 - 2031 210,000

Residential

- Increasing size of an average single family dwelling, and decreasing property separations continue while the common construction methods have lowered tenability in terms of rescue and greater risk to fire fighting operations. Lightweight engineered wood construction products and other code compliant but potentially hazardous materials have also affected levels of risk. Incident Commanders must accurately assess building construction; develop attack strategies for the type of residential building which depending on construction, and pose a threat to firefighters in terms of early floor separation and collapse.
- The Ontario Government through its legislated “Places to Grow” program has established Barrie as an urban growth centre which will require intensification within the original boundaries adding stressors to the current transportation infrastructure and the ability of the fire department to respond to all types of incidents within Council approved timelines.

- The increasing number of multi-residential, apartment and condo units (vertical growth) impose a firefighting, rescue and recovery risk on the community for a number of reasons
- Vertical growth: the proliferation of high-rise developments increases the need for re-assessing overall placement of stations and firefighting apparatus due to the impact of vertical response times. Vertical growth can result in extended response times as firefighters require extra travel time to get to the location of the emergency incident. Vertical response issues can be tempered somewhat through recent changes to the Building code requiring sprinklers in new multiple unit residential buildings over three storeys (since 2010), although a significant stock of older buildings exist in the city with no retrofit requirements
- Fires in these occupancies are very labour intensive and require significant resources to control
- Even if confined to a unit of origin, these incidents can displace a large number of people during the incident and at times until the building is declared safe after repairs are completed.

Industrial

Barrie has a vibrant and diverse economy with major exports from industry that includes: automotive parts, medical instruments, communications software and household products just to name a few.

- The city has a mix of light and medium industrial occupancies serving a number of industries including heavy equipment parts, corrugated packaging and automotive parts, along with continuous support to the local college, hospital and the military.
- The importance of Barrie as a hub cannot be underestimated with its ideal location for product assembly, upgrading and redistribution to 6.2 million consumers living within a 100 mile radius of Barrie. Planning and responding to this specialized growth will be a challenge for emergency responders. With the advanced technology in the industrial sector, a fire in any of these occupancies can create economic loss to the business, the employees and the city for extended periods.
- There is need for collaboration in terms of land use planning for future development in the city to maintain safe distances between residential and industry, so firefighters can focus on controlling the incident and not be overwhelmed by evacuations or health issues because of close proximity of the two occupancy types.

Technological

The City of Barrie has been successful in attracting a new emerging sector into Barrie. Currently four data centres have established large complex data centres in the city. This industry requires distinct attention from the fire service.

- Typically large buildings with construction methods to ensure security and the ability to withstand the forces of nature or humans. This creates communication issues with crews entering the complex and their ability to communicate outside to the incident commander or others.
- These buildings are also constructed to ensure their ability to continue to function during any power outage and require massive battery and fuel backup systems.
- The technology contained in these buildings is the most sophisticated systems and an incident in one of these could have a devastating effect on the company, the employees and the City of Barrie and result in many millions of dollars in damage.
- These buildings normally have very special fire detection and extinguishment system that require special training for the firefighters who may be required to enter these locations.

Commercial

The growth of the commercial sector in the City of Barrie has been phenomenal, and has made Barrie the commercial hub north of the GTA. The number and variety of commercial occupancies has expanded Barrie's catchment area to vast areas well beyond the Barrie area. There are currently draft plans that will continue to see the amazing growth of this sector in Barrie

- The majority of new commercial occupancies appear to be in three broad categories, big box mercantile, service occupancies and a boom in the restaurant business.
- The big box stores represent potential large loss fires due to the design of large open areas combined with significant combustible fire loads, but are usually single occupancy and meet code requirements for rated fire separations, smoke detection and fire containment (sprinklers). A fire in one of these occupancies would tax the current ability of the department to contain, control and extinguish a fire without recalling firefighters to assist or provide coverage for the rest of the city. A large percentage of multiple firefighter fatality fires are in these types of occupancies.
- The City of Barrie being a commercial hub attracts people from a large surrounding area that not only contributes to the economy, but also adds

pressure to the traffic patterns in the commercial sections of the city, increasing the congestion and ultimately affecting the response times of the department in these areas.

- The heart of Barrie is its downtown core, generally made up of historic interconnected buildings that share stairwells and are interconnected internally with open halls. Most contain retail and businesses on the street level and various residential occupancies on the floors above. Barrie has a historic experience with downtown fires, with three occurring in the last few years. Total damage in these three fires exceeds \$9 million. Required in excess of 100 firefighters, 7 apparatus from Barrie, 5 Mutual Aid departments and left the rest of Barrie protected by outside departments that are rural in nature and not trained to the distinct requirements of the City of Barrie. Much of the construction now is new and low maintenance, but has a relatively short life cycle and should be monitored to ensure the fire and life safety risks are not exceeding the original design criteria. However, there is still considerable aging infrastructure in the older sections of the city such as water mains, undersized mains, hydrants and transportation patterns.

Institutional

The growth in the institutional sector in Barrie has also seen tremendous growth over the years and will continue as the percentage population age median increases. This varies from smaller seniors residences to larger nursing homes and complexes. This type of occupancy, with its high density of seniors and their ability to self-evacuate or react in a timely fashion adds to the task of evacuation and rescue required for the generally slower or handicapped population. Responses to these types of occupancies are basically two simultaneous incidents at the same time, one for evacuation and the other for containment and control of the incident, obviously requiring a substantial response of personnel to mitigate the incident. Several Ontario fires in these vulnerable people care facilities in the past decade have contributed to multiple fire deaths of the residents and resulted in numerous Coroner's Inquests. Some of the larger institutional facilities in Barrie are:

- Royal Victoria Regional Health Centre
- Georgian College
- 75 Public, Separate and Private Schools
- IOOF
- Roberta Place
- Woods Park

- Victoria Village
- Tollendale Village
- Grove Park Home
- Coleman Health Care
- Leisureworld
- Little Lake Seniors Community

Road/Rail

- Highway 400 provides access to both Canadian and US markets to over 125 million consumers within one day's travel for the trucking industry. Highway 400 is the major route for road transportation to western Canada.
- The road network through Barrie has not developed in unison with the growth of Barrie. Highway 400 intersects the city and is constructed with several bridges and interchanges built in the 1960's and 70's that were not designed to carry current traffic volumes being experienced. With anticipated growth of Barrie and the surrounding municipalities this will increase dramatically in the near future if not addressed. Closure of the Highway 400 due to weather or incidents on the highway force traffic through the city and cause major transportation interruptions throughout the city and greatly impact response times. Highway 400 is the major north/south transportation route to Central/Northern Ontario and Western Canada. Increased growth in the Barrie area and reliance on more road transportation since the highway was constructed has exceeded design volumes, increasing the risk of incidents on the highway.
- The rail line separates Barrie into north and south sections. The rail line is used for both passenger and freight trains. Currently there are two GO stations in Barrie with daily train service into Toronto. The freight trains carry a variety of materials, including hazardous materials, through the city. A hazardous materials incident on the rails in Barrie could require evacuations of business and/or residents and have an effect on the environment through gaseous release or ground penetration. Derailments that result in a hazardous material release are usually long term events that require tremendous staffing and resources to evacuate, control and mitigate the event. A train derailment in Medonte Township in 1982 lasted 11 days before the threat was totally mitigated.
- The arrival of the GO train service to Barrie in 2007 has had a positive influence in Barrie and the second station opened in 2011. With increased rail traffic, the

risk of an incident increases. To date, only one incident involving the GO service has been reported and that was a suicide.

- Rail is an important factor in the city's development and the railway users need to partner in controlling incidents and improving access for responders.

Water

Kempfenfelt Bay is the crown jewel of the City of Barrie. The waterfront is at the heart of major tourism attractions with events throughout the year including Kempenfest, the arts and crafts festival that attracts more than 300,000 people. Every year the events along the waterfront increase in numbers and size. The number of boats and on-water recreational events has a direct impact for Barrie Fire and Emergency service in response, rescue and recovery during incidents that occur both in the summer and winter.

As the city boosts the waterfront as the crown jewel, it would be expected that with this would be the due diligence to enhance the safety of the citizens and visitors in providing timely response capabilities in the event of an incident on the bay.

The current ability of the department to respond, evacuate and mitigate an incident on the bay is limited in the summer by its dependency on the Barrie Police Marine Unit.

Currently, the ice rescue capabilities of the department are adequate with the use of an air boat that is basically designed for winter operations. This vessel has been responsible for multiple lifesaving missions to date, multiple assistance and fire calls since put into service both inside the city and at other events on Lake Simcoe in other jurisdictions.

The Office of the Fire Marshal and Emergency Management's Public Safety Guideline 04-83-01 deals with selecting a water/ice rescue capability. The City of Barrie is the authority having jurisdiction, and is responsible for setting the level of service for water/ice rescue in the city.

There are currently 3 marinas in Barrie with a total of 569 boat slips, which will more than likely increase as Barrie builds out further.

Air

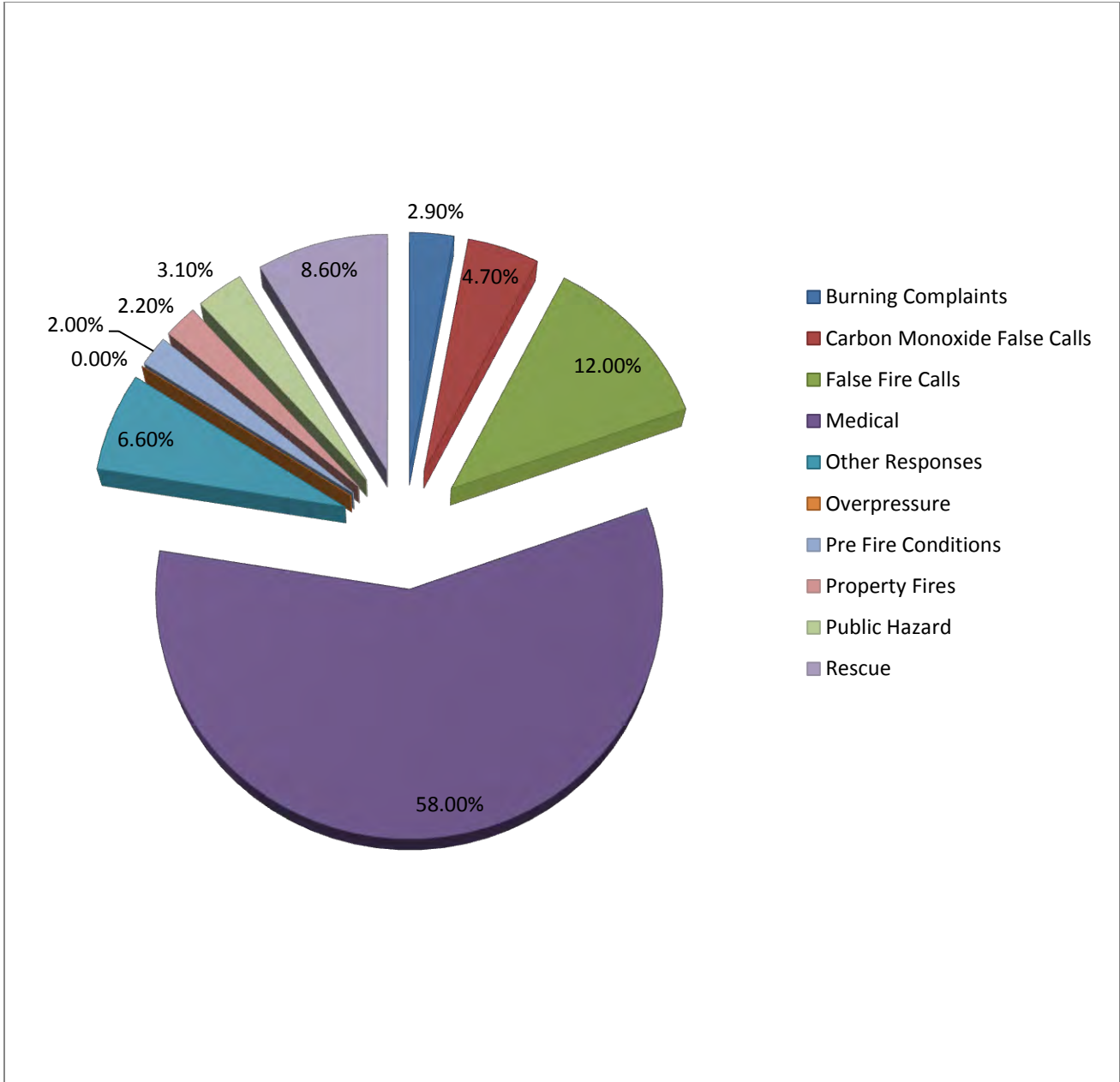
The Lake Simcoe Regional Airport is one of the newest and most sophisticated regional airports in Canada. Located less than 20 minutes from Barrie, it boasts a 6000 ft. lighted runway capable of handling a broad range of aircraft including

helicopters and commercial jet aircraft. Services include; terminal building, car park, restaurant, aviation fuel, aircraft parking, lease areas for hangers and instrument access. Lake Simcoe regional Airport offers Port of Entry status, full Canada Customs facilities for all in-bound international flights. Although the airport is not located in the city of Barrie, flight paths of departing and landing aircraft cross the city. Barrie Fire and Emergency Service with its advanced technical rescue training and capabilities in extrication, hazardous materials response and foam capabilities could be requested to respond to the airport in the event of an incident beyond the capabilities of the local fire department. The City of Barrie also co-owns the airport. The Barrie Executive Airport lies on the north-west boundary of Barrie, with flight paths over the large Bayfield Street commercial/residential sector. Although generally smaller size planes utilize this airport, a crash short of the runway within the city's higher populated areas could exceed normal response and rescue capabilities of the department.

3.5 Statistics

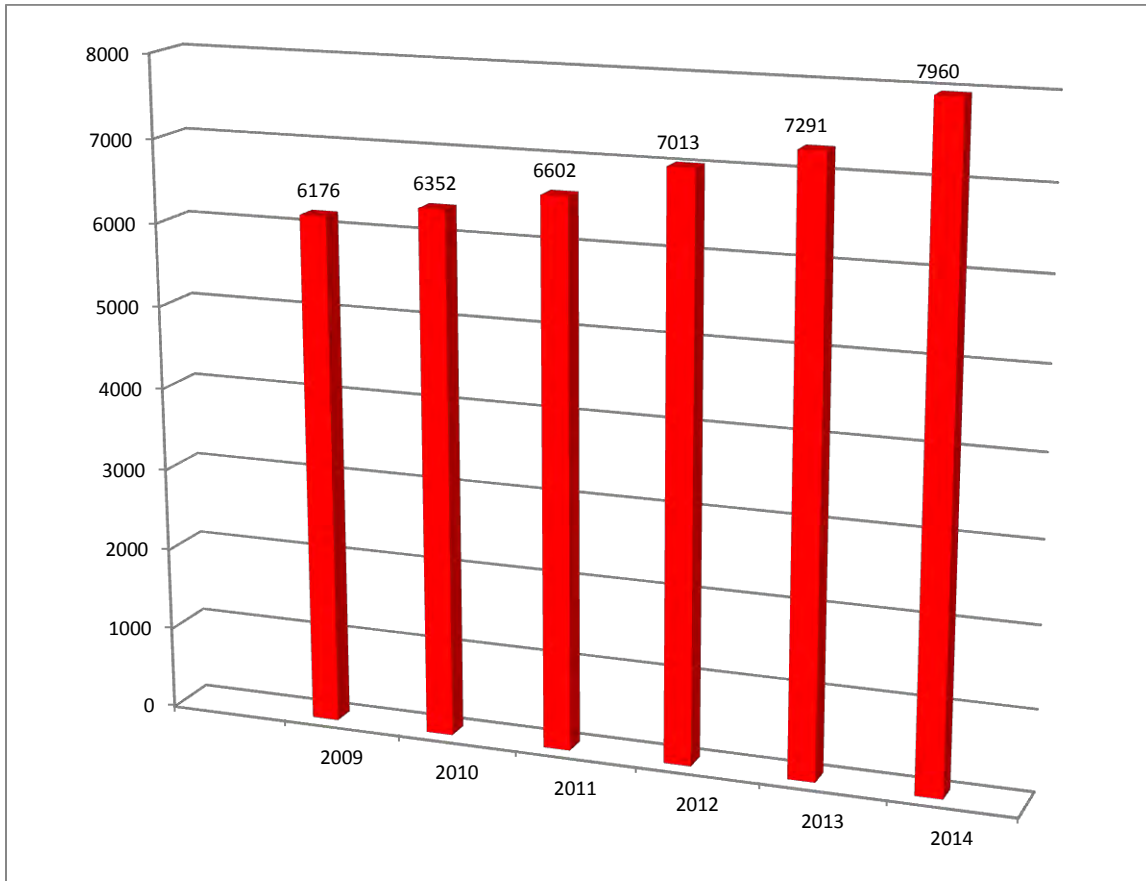
Statistics are a valuable measure of current and past risks and trends for the department and can be used to predict future trends, risks and conduct gap analysis to better determine methods to reduce the gaps and risks through evidence based decision making. The types of calls and resources needed to deal with those emergency responses provide the starting point. The following graph shows incident calls by response type class and covers the years 2008 – 2012. The data is classified in accordance with the reporting criteria to the Office of the Fire Marshal and Emergency Management in the following categories:

- Burning Complaints
- Carbon Monoxide False Calls
- False Fire Calls
- Medical/Resuscitator Calls
- Other Responses
- Overpressure Rupture/explosion (no fire)
- Pre Fire Conditions/no fire
- Property Fires/explosions
- Public Hazard
- Rescue



5 Year Average Calls by Response Type Class 2009-2013

The following graph shows the total number of responses for the period 2009 – 2014



Annual Responses by Year

30% increase in incident responses

SECTION 4 – PROGRAMS & SERVICES

4.1 Introduction

The level of service, activities and responses provided by Barrie Fire and Emergency Service for the community are designed, organized and operated in compliance with the Establishing and Regulating By-law, the Fire Protection and Prevention Act, 1997, the Emergency Management and Civil Protection Act, 1990, other legislation relative to the operation of a fire service, Council motions and the departments mission, goals and objectives. The key elements of evaluating the effectiveness and efficiencies of the department determine the ability to identify gaps and methods to eliminate or reduce risks.

The current Establishing and Regulating By-law was passed by Council in 2012 and was amended to update the previous 2002 By-law and several Council motions into a more comprehensive document that reflects the current level of service and Council endorsed time response criteria for emergency responses. This By-law establishes the basic mandates of the department (the organizational mandated is updated yearly with Council approval of the business plan) which includes:

- Public Education
- Fire Prevention and Fire Code Enforcement
- Fire Suppression
- Technical Rescue
 - Control of Hazardous Materials Incidents
 - Extrication and Rescue
 - Vessel Based Ice/Water Rescue
 - Rope/Confined Space Rescue
 - Trench Rescue
 - Medical Tiered Response
- Public Assistance
- Fire Cause and Determination
- Training
- Communications

Details of the Establishing and Regulating By-law are contained in Appendix “C” and was amended and passed by Council in 2012, combining several Council motions into one document.

4.1.1 Vision

The **Vision** of Barrie Fire and Emergency Service is to be a dynamic organization recognized and respected by the community as being on the leading edge of service provision.

4.1.2 Mission

The **Mission** of Barrie Fire and Emergency Service is to protect the lives, well-being and property of the people of Barrie through dedication to life safety, commitment to community service and preservation of the environment.

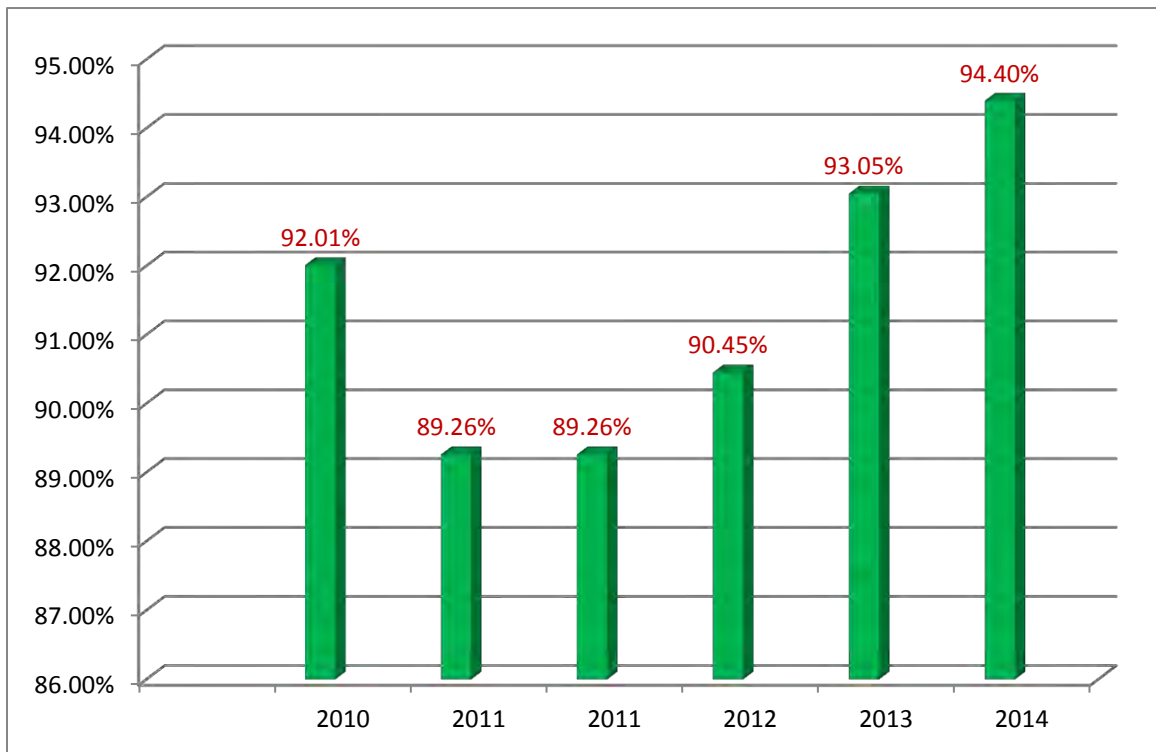
4.1.3 Values

The **Values** of Barrie Fire and Emergency Service reflect leadership through team involvement encompassing:

- Safety
- Professionalism
- Commitment
- Accountability
- Efficiency
- Integrity
- Innovation

4.2 Fire Operations Branch

The 2004 Council motion directed the department to have a less than 6 minute road response to structure fires and alarms sounding, 90% of the time. The 2012 Establishing and Regulating by-law was amended to a desired road response time of less than 6 minutes to all emergency responses, 90% of the time. The following chart shows the historical data to achieve the less than 6 minute road response.



Less than 6 minute road response

The Office of the Fire Marshal and Emergency Management (OFMEM) has developed an evaluation tool entitled, “Integrated Risk Management Tool” to assist municipalities in meeting their obligations as set out in Section 2 of the Fire Protection and Prevention Act, 1997 (FPPA). This evaluation system is part of an overall package of risk management tools designed to provide a systematic process for determining community risks, evaluating current fire service resource capabilities, identifying gaps, and developing options and recommendations designed for fire incidents for council consideration. The principles of this evaluation system build upon and enhance OFMEM risk management tools and other tools of recognized leaders in the North American fire service.

Municipalities are responsible for the establishment, funding and delivery of fire protection services in accordance with the obligations set out in Section 2 of the FPPA. It

is the expectation of the OFMEM that all municipalities have conducted a risk assessment to determine their own level of service. Historically, guidelines for resource deployment have been based solely on the single-family dwelling. This guide, which includes a Critical Task Matrix, addresses the overall structural fire risk in a community and the need to plan for it, and takes a more comprehensive approach than previous OFMEM guidelines.

The FPPA and the requirements it created for municipalities have been in place since 1997. But the concepts and the value of matching level of service to risks in the community pre-date the FPPA. In 1983, when Justice Webber prepared the “Report of the Public Inquiry into Fire Safety in High-rise Buildings,” he recognized that “to determine the level of fire department staffing, one must consider the history of fire in the community and the size of the responses which have been necessary, and the anticipated need to protect adjacent properties and rescue endangered persons. Consideration of the type of buildings and fire hazards which exist in the municipality is also necessary.” The following recommendation of Justice Webber is as relevant today as they were in 1983:

- There should be adequate fire protection for the citizens of Ontario commensurate with the needs of each municipality

Recent studies and articles from organizations such as the National Institute of Standards and Technology (NIST) and the National Fire Protection Association (NFPA) have identified the need to provide additional guidance to determine an effective fire ground response for buildings that are more complex and of a higher risk. This guide, in conjunction with an overall risk management program, will provide information for councils to make informed decisions in meeting their legislative responsibilities regarding the delivery of fire protection services.

The National Fire Protection Association standard 1710 indicates that a fire department requires 14 to 17 firefighters to fight a residential structure fire. Currently BFES has a minimum on-duty staffing level of 27, consisting of a minimum of 4 on 5 pumpers and 3 on the current 2 staffed aerials and a Platoon Chief.

Incidents involving occupancies larger than a single family residential structure such as a high-rise, commercial, industrial or institutional require a larger proportionate number of firefighters to mitigate the situation. This requires more firefighters and equipment which must travel further distances and increase response times to complete; evacuation, rescue, fire suppression and ventilation of a large structure. Historic events have required the commitment of all or most on-duty staffing and the requirement to

recall off-duty staff on overtime and/or mutual aid to assist with the emergency or provide coverage to the other areas of the city to provide coverage. With the current provincial mandate for intensification within growth nodes in Barrie, there has been and will continue to be an increase in the construction of high-rises, along with large commercial complexes as Barrie continues to be a commercial hub and Barrie's current attraction to large expensive data centres. This will require further strategic planning as the city develops further, intensification increases and the new lands are developed.

It should be recognized that incidents that involve rescue and suppression or mitigation tasks should be considered as two simultaneous incidents requiring adequate and additional staff for both incidents.

4.3 Fire Prevention Branch

The Fire Prevention Branch is divided into three intertwined disciplines; code enforcement/inspections, origin and cause investigation, and public education. All of these are legislated by the Fire Protection and Prevention Act. The Ontario Fire Marshal and Emergency Management has established the three lines of defense, a fundamental model to try and reduce loss of life and reduced property loss in Ontario; public education and fire prevention, fire safety standards and enforcement, emergency response.

4.3.1 Public Education

As stated, public education is the first line of defense and one which continues to grow in importance within BFES and the community. In 2011, BFES hired a Public Fire and Life Safety Officer. There are several aspects to this important portfolio including marketing of important safety information, developing school programs, media messaging for specific educational messaging, targeting specific areas or groups in the community on specific safety concepts and community awareness of important developments that have/or are occurring in the province or community. This position also has involvement as a public information officer during and post incidents of significant interest to the public. As the city continues increase in population and ethnic diversity there will be an increased demand and requirement for public education.

4.3.2 Inspections and Code Enforcement

The Fire Prevention Branch is responsible for community life safety issues concerning fire code inspections and enforcement of the Fire Code. Fire inspections of all types of occupancies in the municipality, with the intent of compliance with the Fire code, is crucial to the protection of persons and property from the hazards of fire. The reduction of risks from fire and other life safety hazards with detection

and reporting through the inspection process is necessary for the creation of a fire safe community, occupant safety and building preservation. Inspections also provide assurances that fire detection equipment in buildings meet code standards, is present and operational and that firefighting equipment in buildings have been tested to the standards.

Currently the Fire Prevention Branch is capable of carrying out the legislated requirements of the Fire Protection and Prevention Act, for “complaint and request inspections”; there continues to be limited capability to conduct high-risk occupancies on a regular basis based on the current work load of the branch. Development of an inspection schedule that set the frequency of inspections which is appropriately suited to the risk profile of each occupancy should be an objective of the Branch. Annually, the number of required inspections has increased. It is anticipated that several recent legislated changes by the provincial government will further increase the work load on the department. New provincial legislation now require carbon monoxide detectors in all residences is the responsibility under the Fire Code for inspection and code enforcement through the municipal fire services. Also, changes to care facilities and the requirements for inspections and reviews every year have further taxed the branch.

Consideration must be given to developing a new building stock data management program with auditing capabilities to communicate and connect with other city departments. It is suggested that the fire department utilize a records/data management system compatible with the Building Department. The system must be user friendly, mobile and able to record notes, print records and manage timelines of the Fire Prevention Officers. There is a legislative requirement to conduct a Hazard Identification Risk Analysis under the “Emergency Management and Civil Protection Act” and here is currently no obvious comprehensive building stock in the City of Barrie. The implementation of such a program would definitely lead to effectiveness and efficiencies in the branch and greatly assist in the ability to reduce the gap identified above with regard to increased workloads. This will also enhance the requirements under Emergency Management and Civil Protection Act to meet preparedness obligations under the act.

4.3.3 Origin and Cause

The Fire Protection and Prevention Act require the Barrie Fire and Emergency Service to investigate and determine the origin and cause of all fires. Currently five Fire Prevention Officers are certified Fire Investigators. Knowledge from determining origin and cause assist in targeting groups or causes to better educate

the public on fire safety. Another purpose is to ensure fire code compliance, such as were working smoke alarms present and working. The Fire Investigators respond when the Officer on scene at a fire cannot determine origin and cause, damage exceeds \$50,000, there is serious injury or a fatality, there is an explosion, the Fire Marshal's Office is called in, or if arson is suspected.

4.4 Technical Rescue

As directed in the Establishing and Regulating By-law, BFES is responsible for many forms of technical rescue. These include land and vessel based and ice/water, extrication and rescue, control of hazardous materials incidents, high/low angle and confined space rescue, tiered medical response, trench rescue and elevator rescue. Each of these disciplines requires a commitment of on-going training, recertification and providing the equipment necessary to conduct the rescue in a proficient manner and enhance the safety of the firefighters performing the rescue. BFES is always in the process of enhancing their ability to respond to these technical rescues.

The level of service provided for technical rescues are defined by the National Fire Protection Association (NFPA), these are; awareness, operations and technician. The skills required increase with each level. Barrie Fire and Emergency Service operate at various levels depending on the technical rescue. Barrie Fire and Emergency Service operates at the technician level for Extrication and Rescue, hazardous materials incidents and operations level for land/vessel based ice/water rescue, high/low and confined space rescue, tiered medical response, trench rescue and elevator rescue. BFES is at the awareness level for structural collapse at this time due to the training commitment and cost associated with the training and equipment that would be required.

4.5 Hazardous Materials Response

Hazardous Materials responsibilities encompass emergency response to spills and air borne releases or accidents. Being able to respond to such events requires strategic planning, very in-depth training, recertification and an array of expensive specialized equipment. BFES is now qualified to NFPA 472 Technician level, in 2009 BFES was at awareness level, this is a major milestone for the department in a short period of time. Currently over 100 staff are trained to the operations level and more than 25 are trained to the technician level, which allows the department to operate at the technician level. There is an ever increasing volume of types of chemicals that are used by various manufacturing industries in Barrie and transported into and through the city daily. The number of responses to hazardous materials incident is growing annually for the department. With growth, both within the boundaries of the city and our neighbour

municipalities, higher traffic flow on the major transportation route to western Canada, the number of responses is expected to continue to grow. The role of BFES in hazardous materials response is not only rescue but also protection of the environment including land, air and waterways.

As Barrie Fire and Emergency Service is the largest fire service provider in the geographical Simcoe County and has the ability to respond to hazardous materials incidents, they have entered into an agreement to provide this service throughout the county on a cost recovery basis for life threatening situations. It should be noted that BFES does not clean-up hazardous materials, they respond to rescue, protect the environment and where possible control the spill or leak. Clean-up is the responsibility of the spiller and there are specially trained private contractors that do the clean-up.

4.6 Community Emergency Management

Pursuant to the Emergency Management and Civil Protection Act, the City of Barrie's Community Emergency Management Program uses the principles of risk management to save lives and money, to protect property and the environment, to maintain economic stability and to assure the continuance of critical infrastructure during emergencies and disasters. The City of Barrie takes an "all hazards" approach to emergency management and develops plans to prioritize risk through probability and consequence, whether manmade or natural.

Community Emergency Management Program activities include: identifying the hazards and assessing the associated risk to public safety and security, having emergency plans governing the provision of necessary services during an emergency and the procedures by which employees of the municipality and others respond to the emergency, conducting training and exercises to ensure the readiness of municipal employees and other persons to act under the plan, and carrying out public awareness and education programs on the risks to public safety and on public preparedness for emergencies. The program also includes an emergency operations centre from which to control and coordinate the City's response to an emergency where it can be efficiently exercised.

The current gap in regards to Community Emergency Management is a lack of a sustainable building stock inventory in the City of Barrie. It is essential, that if a community is to be prepared for disaster management that they are aware of the hazards that are present in the community. There is currently a gap in identifying buildings that would be expected to survive a given risk and provide the basis for mitigating an incident.

In May, 2013, responsibility for Community Emergency Management was transferred to the fire service. This adds increased workload on the service.

4.7 Training Programs

The Training Branch of BFES holds the responsibility for the education, skills development, practical preparation, record keeping and maintaining legislative requirements for the entire department of 179 personnel whose responsibility is for the mitigation of any emergency the community may experience. BFES requires numerous types of training to provide the community with a successful, safe response. A successful training program requires a commitment to ensure adequate resources are provided for skills development and the corresponding maintenance training required remaining satisfactorily qualified to meet Occupational Health and Safety. The delivery of most of the specialized training is possible with the use of Shift Training Instructors (STIs). The STIs provide the knowledge, commitment and time required to deliver the specialized training on-shift thus reducing the dependency on overtime. Further, the future of training is to an e-learning model and BFES is in the process, with the assistance of the IT Department, of developing this model and should be implemented in the near future. Skills development, education, e-learning, records management and career path development are some of the areas the Training Branch is involved with at this point in time.

Barrie Fire and Emergency Service have undertaken to contribute to the health and well-being of the citizens of the City of Barrie during medical emergencies. BFES has partnered with Barrie based physicians to oversee the medical protocols delivered by BFES to ensure they meet the standards. Simcoe County Paramedic Services is another partner to this program. This program provides the knowledge and skills necessary in an emergency to help sustain life, reduce pain, and minimize the consequences of injury or sudden illness until the next level of health care takes over. Barrie was the second city, next to Toronto to implement this program which has a proven record of increased survivability. The program is called the Emergency Medical Responder Program and includes the latest First Aid and CPR guidelines, meets the Paramedic Association of Canada National Occupational Competency Profiles for the practitioner level of Emergency Medical Responder (EMR). The course is an 80 hour course with flexible scheduling options, carries a 3 year certification as an EMR with CPR level HCP (Healthcare Professional) and includes AED (Automated External Defibrillation) certification, all under the guidance and monitoring off doctors from Barrie. In 2014 BFES added certification to use epinephrine auto-injector for the emergency treatment of severe allergic reactions.

4.8 Water Supplies

The City of Barrie's water system design is based on standards which include various firefighting components such as minimum size water mains (150mm), fire hydrants with set spacing, reservoirs/elevated tanks, wells, pumping stations and minimum/preferred fire flow requirements. Several major projects have been undertaken by the City of Barrie since the 2009 Fire Master Plan, including the Surface Water Treatment Plant and the Sunnidale Reservoir. BFES, in conjunction with the Engineering Department, Corporate Asset Management and Water Operations have completed a Fire Underwriters Survey. This survey could result in reduced fire insurance premiums for all taxpayers in Barrie if, some or all recommendations are applied.

4.9 Fire Department Administration

The Administration Branch will experience an increase in workload as a result of a growing staff compliment, changes to legislation and reporting requirements. Currently, the Administration staff beside the Fire Chief and three Deputy Fire Chiefs, consist of an Office Coordinator, Payroll/Administrative Assistant and three Clerk/Secretaries assigned to Fire Prevention and Training. 2014 saw an Administration review established that changed the roles and responsibilities to make the branch more effective and efficient.

4.10 Communications

The Communications Centre continues to shift to new technology, new operational methods of dispatching and new growth of clients. BFES now dispatches 18 other municipalities in Simcoe County, Dufferin County, District of Muskoka and Christian Island First Nations, creating revenue for BFES and IT. Another from Grey County is anticipated in 2015. There continues to be interest from other fire services for delivery of dispatch services. As Barrie develops the annexed lands call volume is expected to increase at a steady rate as is the growing population in the municipalities we deliver service to. A review of the limits of the Branch should be conducted in partnership with their IT partners to determine capacity thresholds currently and in the future.

Working with the Ministry of Health and Long-Term Care, Barrie was the second municipality in Ontario to have simultaneous dispatch with the provincially run ambulance dispatch centres. This new technology allows simultaneous downloading of calls being answered in the ambulance dispatch centres to BFES, resulting in reduce response times for tiered medicals that BFES responds to, and has resulted in increased survivability for someone suffering a life threatening condition and reduce the pain and suffering for citizens.

New technology in Computer Aided Dispatch, Automatic Vehicle Locator and GPS traffic pre-emption link project to enhance response times throughout the city should be explored. This is new emerging technology that is being implemented in other municipalities in Ontario with very positive results.

The technology is rapidly changing in the industry and must be kept current and replaced before end of life cycle to avoid downtimes that threaten the safety of the firefighters and the public.

SECTION 5 – RESOURCES

5.1 Human Resources

Human resources include all aspects of personnel administration. The heart and soul of any organization is its people and their commitment and dedication to the organization, this section is dedicated to appraise the importance and results of the human resources program in BFES. It is recognized that the completion of this human resources section involves members from other governing entities and other elements of the community.

5.2 Personnel and Administration

BFES is comprised of six Branches; Administration, Operations, Training, Fire Prevention/Public Education, Communications and Community Emergency Management.

- Administration Branch – Fire Chief, Deputy Fire Chief of Operations and Training, Deputy Fire Chief of Fire Prevention and Community Emergency Management Coordinator, Deputy Fire Chief of Communications and Business Services, Office Coordinator, Payroll/Administrative Assistant and three Fire Support Administrators assigned to Training and Fire Prevention for a total of nine staff. As stated previously, an Administration Review was conducted and resulted in a realignment of responsibilities that resulted in the reduction of one FTE in Administration.
- Operations Branch – 4 Platoon Chiefs, 28 Captains and 112 firefighters. Operations consists of four shifts of 36 working out of 5 stations, staffing 5 pumpers, 2 aerials and the Platoon Chief’s car. There are several other pieces of specialty apparatus that are not staffed, but used on an as needed basis using on-duty personnel from one of the above mentioned apparatus to respond with it. Minimum staffing is 27 per shift, allowing for 4 personnel on each pumper, 3 on each aerial and a Platoon Chief. This level of staffing allows for a response to a residential structure fire and two other simultaneous single apparatus responses. An incident at a large incident such as a high rise fire would require the entire on-duty staff and require a call back of off-duty firefighters.
- Training Branch – consists of a Chief Training Officer and 4 Training Officers who are assigned to each of the four platoons of firefighters. Their duties besides delivering specialized training are to operate at incidents as an Incident Safety Officer to enhance the safety of firefighters. They are also seconded to straight days to deliver recruit training and as required to develop and deliver special programs.
- Fire Prevention/Public Education Branch – consists of a Chief Fire Prevention Officer, a Fire and Life Safety Officer (Public Education) and 6 Fire Prevention Officers with

one specializing in plans examinations for fire and life safety issues with new and existing buildings.

- Communications Branch – consists of 4 Communications Supervisors, 8 full-time Communications Operators and up to 3 part-time Communications Operators.
- Community Emergency Management – Emergency Management was brought under the umbrella of BFES in June of 2012 and is assigned to the Deputy Chief of Fire Prevention and CEMC. The Emergency Management and Civil Protection Act require all municipalities in Ontario to have a designated CEMC and appointed by by-law.
- The total complement of the department is 180 personnel.

5.3 Recruitment, Selection, Retention and Promotion

Unlike the 2009 Fire Master Plan, the future attrition plan is concerning, in the past few years, 12 Officers have retired and currently over the next 5 years, an additional 15 officers are expected or can retire. A sustainable succession plan is needed. Most of the planning material is available but needs to be collated into a simple format for all positions in the department to enhance career path development both department developed and self-guided. This concern will continue in future years as rapid growth of the department in past years has created large generation levels where multiple retirements in a short time span are expected.

The department is developing an Officer Program that will enhance the skill level and abilities of the Officer complement in Operations. The examination process is realistic, credible and able to promote qualified individuals to sit in the “Captains seat”. The task is to continually re-evaluate the process conducive to enhancing the promotion of an excellent class of Officers able to manage any emergency of any size and at any time with skill, command presence and operational precision. The development needs to extend beyond the Operations Branch to include all Branches in the department.

5.4 Policies and Standard Operating Guidelines

Corporate and BFES policies have been developed and are reviewed and revised as required. There are corporate programs that reflect legislative requirements and others that are in place to support corporate values and expectations of its employees in a positive human relations direction.

Standard Operating Guidelines are developed by a joint Labour/Management team and guide both administrative and personnel behaviour and addresses emerging issues with an emphasis on health and safety. The SOGs are reviewed regularly and submitted to the Fire Chief for approval and implementation. SOGs give fundamental direction to all staff on the various aspects of job performance and expectations under certain

conditions. All SOGs have an enabling policy attached that drives the SOG. In the past few years the Policies and SOGs have been transformed from paper to electronic, making for easy access for all staff to locate.

5.5 Use of Human Resources

Development and utilization of human resources is consistent with the established mission, vision and objectives.

Through a cooperative approach the management team and the association have started developing performance appraisals that are job specific to the various jobs within the department, because of the diversity of the job functions from branch to branch. When developed, all personnel will have an appraisal conducted on a yearly basis, which is currently absent except for step increase in the Operations Branch.

The Association and management should develop the appraisals to ensure performance measures on an annual basis for all staff, which will help develop individuals.

Consideration for creating a sustainable Labour/Management Relations Committee should be explored to meet on a regular basis to discuss emerging issues and matters of mutual interest or concern in an effort to overall improvement to labour relations.

5.6 Compensation

Compensation and working conditions are established in the Collective Agreement and legislated by the Fire Protection and Prevention Act. In the past, there have been long periods of time where the Collective Agreement has expired with long processes of negotiations and arbitrations of long duration. This is in part to the current arbitration process in the province where awards are normally longer than a year after the arbitration hearings, depending on the complexities of the matters before the Board.

The number and nature of grievances are mostly policy grievances. With mutual understanding these have been resolved without the need to proceed to grievance arbitrations. There have been no grievance arbitrations since 2006 to date.

5.7 Risk Management and Personnel Safety

There is a risk management program designed to protect the organization and personnel from unnecessary injuries or losses from accidents or liabilities. The fundamental principles are that the department will risk a life to save a life, take a calculated risk to save valuable property, and take no risk to save what is lost.

A Joint Occupational Health and Safety Committee have been well established in BFES and matters are dealt with in a timely fashion.

All Ontario Fire Service Advisory Committee, Section 21 Guidance Notes as approved by the Ministry of Labour are adhered to and SOGs developed based on the contents of the Guidance Notes.

Recently, Labour and Management have agreed to implement a Wellness Fitness Program. The program is designed for the wellbeing both mental and physical of firefighters with early screening for occupational diseases that are normal to the fire service. It is proven by other departments in both Canada and the United States that prevention, early detection and treatment of a disease that is considered under presumptive legislation saves the corporation a considerable amount of money that may otherwise have to be paid out through WSIB or Line of Duty Death Benefits.

5.8 Training

5.8.1 Introduction

Training and competencies are the specific programs, resources and capabilities within a Fire Service which exist to support the services the Fire Service provides, and thereby accomplish organizational purposes required by each Branch within the service.

Training and educational resource programs express the philosophy of the organization they serve and are central to its mission. Learning resources should include a library, other collections of materials that support teaching and learning, instructional methodologies and technologies, support services, distribution and maintenance systems for equipment and materials, instructional information systems, such as computers and software, telecommunications, other audio visual media and the facilities to utilize such equipment and services.

Key to the success of the training and educational process is a learning resources organizational structure and a technically proficient support mechanism. The training staff should provide services that encourage and stimulate competency, innovation, and increased effectiveness. The department and service providers must provide those learning resources necessary to support quality training. The adequacy of a system's success should be judged in terms of its goals, objectives, and programs supporting the organization in achieving its mission.

5.8.2 Training and Education Program Requirements

Training and education program activities are identified to support the Fire Service's needs.

The current training for command officers, who ensure overall incident control including safety of both firefighters and the public, is a challenge. Although there is a current lack of a facility in Barrie to train and hone the skills of the Incident Commander, the creativity of department personnel has enhanced our personnel to receive minimum training on command procedures through a mentoring program with senior Officers and in a virtual world with their imagination to guide them through the incidents that they may face. The department with the assistance of the IT department is currently developing more virtual training through modern technology. This will enhance the delivery of theoretic education and allow for visual e-learning throughout the department.

Barrie Fire and Emergency Service have entered into a short term lease agreement with Innisfil Hydro for vacant property on Saunders Rd. in Barrie. This will allow BFES staff to set up a temporary training facility consisting of several props designed to be used in the training of staff on some of the technical aspects that require practical evolutions to maintain competencies. There is an industry standard to provide live fire training to new and incumbent members of the department. Obviously, the solution would be for Barrie Fire and Emergency Service to have its own permanent facility in the city limits, where on-duty crews could train without the reliance on bringing in overtime. There would also be the benefit of BFES revenue by offering the facility when not in use to other municipalities or agencies. The goal would be to have a multi-purpose, multi-scenario station concept that could be used by various City of Barrie Departments and could be used simultaneously by different users. The 2003 inquest into the death of Barrie Fire Fighter Bill Wilkins recommended the development of a training facility in Barrie, and would enhance the health and safety of the firefighters and the public. This realistic training is irreplaceable for this profession as was determined by the Coroner's Inquest into Bill Wilkins death.

Career Path and Succession development planning has started with a database of educational opportunities. Any firefighter or Officer can request a printout from the Training Branch of courses suggested to be taken to enhance their career responsibilities. While this "cut and paste" approach is a beginning, it does not allow the firefighter a formal education pathway to follow which is credible and realistic. An actual document on career succession planning will be produced for all positions in the department

BFES have been working with the IT Department to establish and develop a number of e-learning programs, including the provision of a training website where training

videos and video conferencing can be hosted. This initiative has been an ongoing process that requires time and business planning budgeting to complete. This initiative will greatly enhance the Training Branch and their ability to extend training by allowing flexibility so firefighters can access the training tool, allow versatility in the messaging tools to deliver training, allow training to be delivered to more than one firefighter at a time and not require the movement of crews and apparatus from their designated and pre-determined area of optimum response capabilities. E-learning is the future of progressive and quality training delivery in the fire service.

5.8.3 Training of Firefighters

There are several legislative requirements that dictate standards for safety, equipment and training for the fire service. There are also standards and industry best practice guidelines that have been widely accepted throughout International, North American, Canadian and Ontario standards of level of service that form the basis of firefighter safety, equipment and training and are relied upon in inquests, court cases and charges under the Occupational Health and Safety Act. One of the most predominate is the National Fire Protection Association (NFPA) Standards which are widely accepted as minimum standards not only in firefighter standards for firefighter safety, equipment and training but is recognized in most building codes, professional codes and fire codes based on these comprehensive standards. This standard is the recognized standard by the Ontario Fire Marshal and Emergency Management and is an accredited certification program endorsed by the International Fire Service Accreditation Council (IFSAC) and the Pro-Board Accreditation, both internationally recognized agencies that review course criteria for educational quality and recognition.

5.8.4 Training of Communications Branch

Past training was generally conducted by the Communications Supervisors or individual taught programs. In 2015 a Certified Communications Process was undertaken with the assistance of the Training Branch, the Ontario Fire College and the Ontario Association of Fire Chiefs. With the above stated shift to NFPA standards, the shift should now be to align with the NFPA Standard for Communication Operators. This alignment should bring the Communications Centre into a more comprehensive and standardized centre ensuring consistency with public expectations and the Branch's ability to meet or exceed industry standards of call taking and dispatch.

5.9 Fire Prevention

Fire Prevention currently consists of eight personnel to provide a comprehensive program for the City of Barrie to meet the first to lines of defense, public education and inspection/code enforcement. The assignments include a Chief Fire Prevention Officer, a Fire and Life Safety Officer, a Fire Prevention Officer whose main purpose is in engineering and plans examination, and five assigned for inspection/enforcement, origin and cause determination and other statutory mandates of the City and the Province. There are currently over 4000 open files. The current program is more reactive than proactive as a result of an ever increasing workload and added responsibilities placed on the Branch.

Fire Prevention is mandated under the Fire Protection and Prevention Act to investigate complaint and request inspections which consume a major portion of their work-plans. Currently the city is divided into 5 districts with each of the above 5 Fire Prevention Officers assigned to a district. Their responsibilities range from inspecting/enforcing the Fire Code through-out all occupancies, complaint investigation, licensing inspections as per the identified occupancies under the City's Licensing By-law, court appearances and accurate report documentation.

Another important facet of the profession is to maintain qualifications through continuing education and professional upgrades with changing standards, codes and knowledge of industry best practices. This is achieved through courses, conferences, research and educational opportunities hosted by stakeholder groups and companies throughout the year.

The current court system in Ontario is a contributing factor in the amount of time Fire Prevention Officers are spending time in the court system for code infractions and tickets issued under the municipal by-laws. Fire Prevention Officers are required to attend on multiple appearances for each case where businesses or persons are charged with a violation.

Several recently passed pieces of Provincial Legislation have or will add more pressure and workload to the Branch. In 2010, the government passed the Propane Handling Act, which puts reliance of the Fire Service to inspect propane dispensing locations of a certain size and to review annually their safety plans. Recently, the Legislature passed a bill to require carbon monoxide detectors in Ontario residences; the Fire Code has been amended to make inspection and enforcement a Fire Service responsibility under the Act. Another change recently in legislation that will affect the Fire Prevention Branch has been changes to Care Facilities that will require more inspections and fire safety

reviews and approvals for all care facilities in Ontario. Barrie currently has over 20 such facilities ranging in size and will consume a considerable amount of staff time on an annual basis.

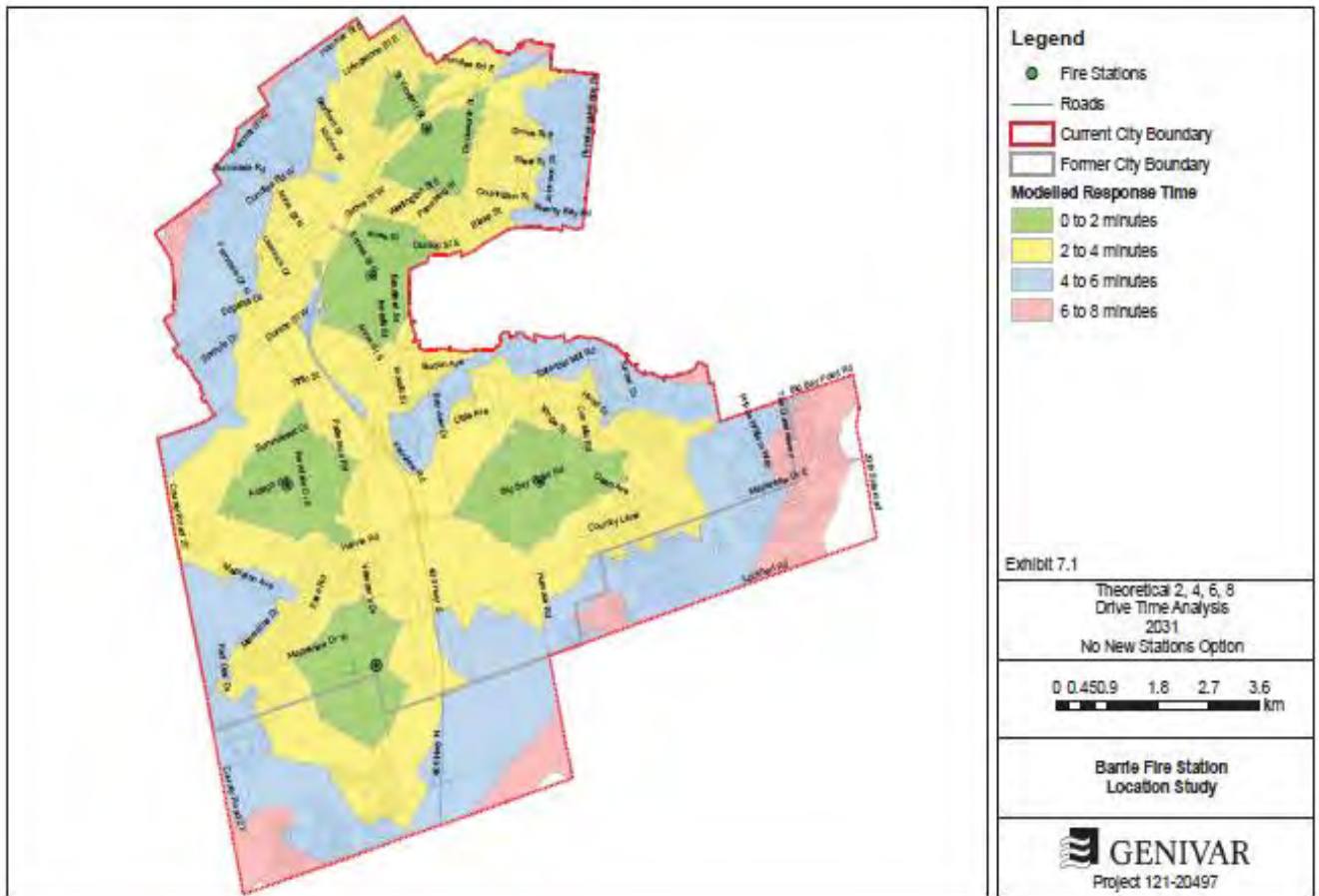
The Fire Prevention Officers are meeting the minimum legislated requirement for complaint and request inspections, however, improvements in the number of inspections requires a new method of recording and documenting data that would be more efficient and better suited to maintain the building audit and records management. Extending the use of records/data management system into the Branch will greatly assist the Fire Prevention Officers in terms of efficiency and productivity. With the annexed lands starting to be developed in 2016/2017, the additional requirements for more Fire Prevention Officers will increase relative to the growth.

5.10 Physical Resources

Physical Resources include fire stations, training facilities, fire apparatus, communications systems and other capital expenditures and outlays that make up the property assets of Barrie Fire and Emergency Service. Considerable attention is necessary to obtain and maintain the physical resources in a high state of readiness and functionality. Facilities that are leased, and/or, jointly operated are also considered for the fire service use if this is accomplished in accordance with properly adopted and clearly established policies.

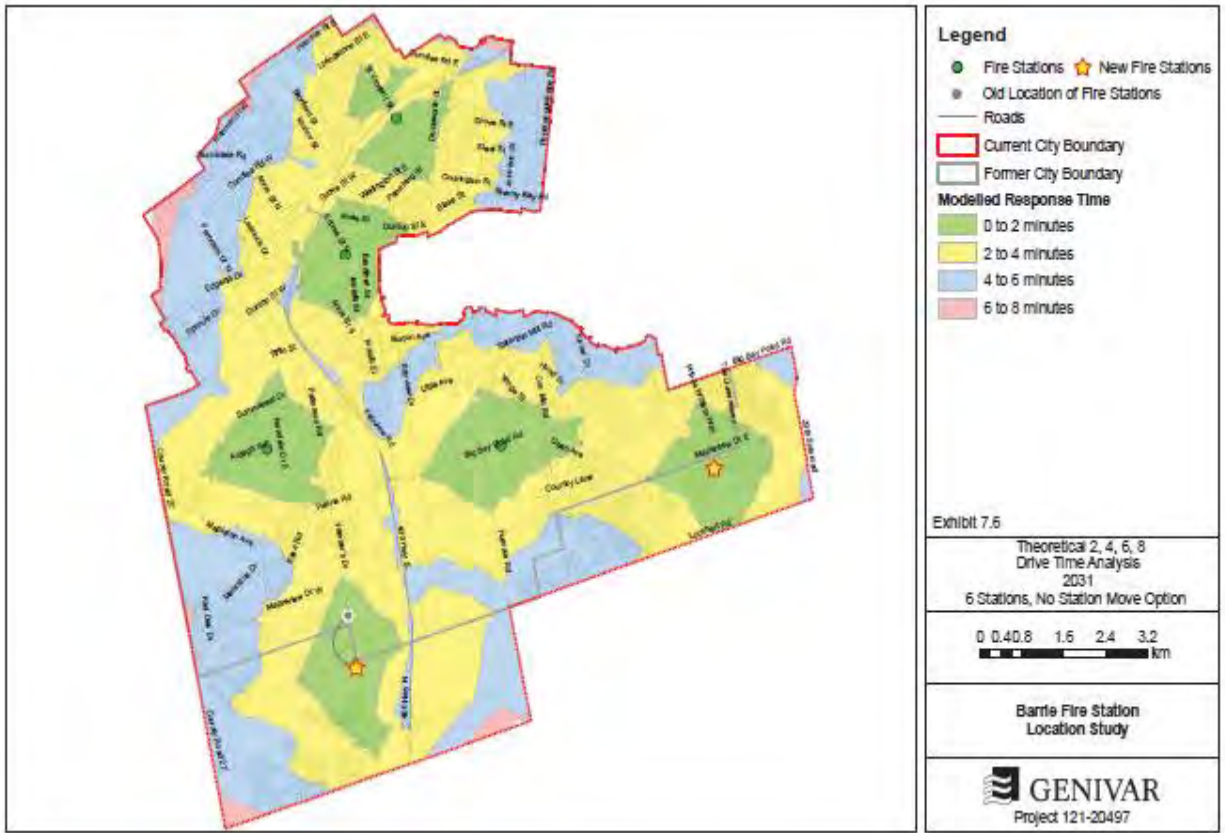
5.10.1 Fixed Facilities

The following map shows the locations of the 5 stations currently being operated by Barrie Fire and Emergency Service and the associated theoretical response times from each location.



BFES Locations of the 5 Current Facilities (March 2013)

The above map shows that current station locations can provide the current Council mandated less than 6 minute road response, 905 of the time, to a large percentage of the City of Barrie with the largest gap analysis areas in the south-east and south-west quadrants of the City. The recently conducted Station Location Study undertaken with the assistance of Genivar looked at all the current stations in Barrie and the results of moving stations to provide best proposed coverage with minimal capital and operating expenses. The Fire Master Plan recommendations result in the following maps theoretical response times from 6 stations.



BFES Proposed Station Locations

As can be observed in the above map, the recommended relocation of the current temporary Station 5 and the addition of a sixth station in the south-east quadrant result in substantial improvement to the response times mandated by Council.

The above map reflects proposed road network improvements as of 2031, thus the ability of the department to achieve this level of coverage is dependent on these road network improvements and the timing of these improvements including upgrading and adding additional Hwy 400 interchanges.

It does not include possible growth in other municipalities and possible traffic congestion as a result of increased traffic on the major corridors throughout Barrie.

Current Station Locations and Apparatus

Below are the current locations and apparatus that are located in the stations. Not all apparatus are staffed. If required, staff would either split their crews, or move from a staffed apparatus to the required apparatus, depending on the nature of the incident.

- Station 1 – Headquarters – 155 Dunlop St. W.



- One Pumper – Staffed with a minimum of 4 firefighters
 - One Aerial – Staffed with a minimum of 3 firefighters
 - Platoon Chief’s Car – Staffed with a Platoon Chief
 - Incident Safety Officer’s Car – Staffed with a Training Officer
 - Squad Truck – Staffed 20% with a minimum of 2 Firefighters
 - Mini-Pumper – Not staffed
 - Marine 1 – Not Staffed
 - Tanker – Not staffed
 - Trench Rescue Trailer
 - Special Operations Trailer
 - Simcoe County Hazardous Materials Response Trailer
-
- Station 2 – 15 Bell Farm Rd.



- One Pumper – Staffed with a minimum of 4 firefighters

- Station 3 – 340 Big Bay Point Rd.



- One Pumper – Staffed with a minimum of 4 firefighters
 - One Aerial – Staffed with a minimum of 3 firefighters
 - One Hazardous Materials Apparatus – Not Staffed
- Station 4 – 250 Ardagh Rd.



- One Pumper – Staffed with a minimum of 4 firefighters
- Station 5 – 361 King St.



- One Pumper – Staffed with a minimum of 4 firefighter

5.11 Apparatus Maintenance

The maintenance of the BFES fleet of apparatus is coordinated and delivered by the City of Barrie's Fleet Services Branch. Due to the complexity of today's fire apparatus there may be an extended period of downtime while awaiting specialized parts that are normally shipped from the United States. Fire apparatus are custom built for each fire

service's particular needs. Since the 2009 Fire Master Plan, Council has approved a standardization of the fire fleet including brand specific, including manufacturer, chassis and fire pump. This direction has several benefits in many areas:

- Less time to train firefighters
- Ability of firefighters to drive any truck without the need for supplemental training on different manufacturers' models
- Ease of maintaining and repairing apparatus by vehicle technicians
- Ability to stock regularly used parts that fit a number of the same apparatus
- Decreased downtime

Below is a list of the current BFES Fleet Assets:

BFES EMEGENCY RESPONSE APPARATUS

STATION	DESIGNATION	APPARATUS TYPE	YEAR	MAKE
1	Pump 1+	Pumper	2006	La France
1	Brush 1	Wildland	2006	Seagrave
1	Squad 1	Heavy Rescue	2005	Seagrave
1	Tank 1	Tanker	2010	Danko
1	Tower 1	Aerial/Platform	2004	Smeal
1	Marine 1	Air Boat	2005	1000 Island
2	Rescue 2	Pumper/Rescue	2008	Seagrave
3	Haz-Mat 3	Haz-Mat	1991	Seagrave
3	Tank 3+	Pumper/Tanker	2003	Superior
3	Tower 3	Aerial/Platform	2009	Smeal
4	Rescue 4	Pumper/Rescue	2007	Seagrave
5	Rescue 5	Pumper/Rescue	2012	Smeal
1	Trench 1 Trailer	Trench Rescue	2012	Wells Cargo
1	Special Ops 1	Special Ops Trailer	2012	Wells Cargo
1	FP 1	Community Events Trailer	2012	American Utility
Reserve	Reserve 8	Pumper/Rescue	2000	Seagrave
Reserve	Reserve 9	Pumper/Rescue	2002	Seagrave
Reserve	Quint 10	Pumper/Squirt	2002	E-One

Reserve	Ladder 11	75' Aerial	1996	KME
Misc.	Command Centre *	Command Centre	1984	RV
Training	Pump 7 *	Training Pump	1990	Superior
Simcoe County	County Haz-Mat	Haz-Mat Trailer	2011	Wells Cargo

+ Budget approved in 2015 for replacement in 2016

* Taken out of service in 2013 as not road worthy

BFES LIGHT DUTY FLEET

CAR #	USE	YEAR	MAKE	MODEL
Car 1	Fire Chief	2012	Ford	Expedition
Car 2	Deputy Chief	2009	Ford	Expedition
Car 3	Deputy Chief	2009	Ford	Expedition
Car 4	Platoon Chief	2012	Ford	Expedition
Car 5	Training	2013	Dodge	Pick Up
Car 6	Fire Prevention	2013	Dodge	Pick Up
Car 7	Fire Prevention	2002	Dodge	Caravan
Car 8	Fire Prevention	2007	Toyota	Camry Hybrid
Car 9	Fire Prevention	2009	Dodge	Neon
Car 10	Fire Prevention	2007	Toyota	Camry Hybrid
Car 11	Fire Prevention	2005	Ford	Freestar
Car 12	Training	2006	Dodge	Ram
Car 14	Incident Safety Officer	2012	Dodge	Ram
Car 15	Fire Prevention	2007	Toyota	Camry Hybrid
Car 17	Fire Prevention	2010	Jeep	Patriot

The Fleet Services Branch currently has one mechanic trained and certified to the Emergency Vehicle Technician level. The servicing of fire apparatus by certified technicians will provide more reliable equipment, thus enhancing the safety of the public and the firefighters. The City of Barrie, employing certified EVT personnel will benefit by having knowledgeable technicians who are trained to work on the complex sophisticated vehicles.

As the fleet of fire apparatus grows there should be consideration to training more current staff or new staff to the EVT certification to assist in speedy diagnosis and repairs to the fleet.

5.12 Safety Equipment

The safety equipment and accessories are adequate and designed to meet the department's needs, goals and objectives, meeting current fire service standards. All new apparatus, bunker gear, self-contained breathing apparatus (SCBA) and equipment meet current National Fire Protection Association Standards, Canadian Safety Association Standards and provincial legislation where required. These standards are reviewed and revised on a scheduled cycle with upgrades and changes and set replacement schedules for certain equipment such as Bunker Gear and other personal protective equipment. These standards also set lifecycle replacement programs. It is important that the fire service keep current on these changes and implement replacement programs of aging equipment consistent with the standards and legislative requirements.

5.13 Communications Branch

5.13.1 Current Status

BFES currently dispatches for over 80% of the fire services in Simcoe County, dispatching 16 of the 20 department, 39 fire stations and over 1,000 firefighters serving a population of over 350,000. The department also dispatches Georgian Bay Township, Huntsville and Lake of Bays. The dispatch centre's call volume has increased to 17,000 emergency calls dispatched per year. With the increased call volumes, the current customer base and potential new customers, a review of the existing capabilities both in human resources, technological advances and support, should be reviewed to ensure compliance with best practices from the Office of the Fire Marshal and Emergency Management, and the NFPA 1061 Standard for Professional Qualifications for Public Safety Tele-communicators. NFPA 1221: Standard for the Installation, Maintenance, and Use of Emergency Services Communications Systems should also be referred to during this review as this

document is referenced in the best practices document from the Office of the Fire Marshal and Emergency Management. It is believed that this review, including process reviews can be conducted internally with little requirements for budget funding.

A requirement for operating a Communications Centre regardless of the size is to ensure redundancy. This includes a requirement for a back-up dispatch centre. Currently, the BFES back-up is at the Police Station and consists of a radio and telephone; there is no ability to page out firefighters. This does not meet current industry standards or best practices. There is an established need to review this situation and determine the best possible location for a back-up centre that meets the needs of emergency services and other departments in the city (IT, Water, and Council).

The existing radio system including infrastructure and user hardware was implemented in 2000. By the end of 2014 infrastructure changes included a fourth simulcast tower location. Radio coverage continues to be something that requires regular attention and review. This is a health and safety issue for the first responders. In order to address these and other public safety issues, such as opportunities to optimize communications tower sites in order to provide ideal radio coverage and correct existing redundancy issues, a joint Emergency Services Technology Steering Committee, consisting of BFES, Barrie Police and the City of Barrie IT Department, has been established to continue to review the status of the current system and look at future needs. The intent of this committee is to update the overall communications strategy for the City of Barrie from emergency services prospective. The existing user hardware is being updated that began in 2013. The newest Motorola portable and mobile radios will be put in service and equipment being used since 2000 will be retired.

The future of Barrie Fire and Emergency Service Communications includes projects such as expanded simultaneous dispatching ambulance and fire vehicles to achieve better service to the public, extensive changes to the 9-1-1 infrastructure that will move us to the next generation of features in 9-1-1 such as the ability to text emergencies to 9-1-1 as well as sharing information with the media and public using various forms of methods including the internet and twitter. Quality assurance within Communications Centres is something that requires policies, procedures and an overall program to be established and implemented.

5.14 External Resources and Partnerships

- BFES has close ties with the surrounding fire services. Currently, BFES has an agreement with the Township of Springwater to provide suppression and rescue services for area adjacent to Barrie, where Barrie can respond in a more effective and efficient fashion.
- BFES has entered into an agreement with the County of Simcoe in the geographical area to provide hazardous materials response on a full cost recovery basis. The County also contributes annually to the training required to maintain this discipline.
- Barrie has dispatch agreements with 19 municipalities currently, covering 80% of the county's population and includes adjacent municipalities with the exception of Oro-Medonte.
- Barrie Fire and Emergency Service is the largest fire service in Simcoe County and possess higher levels of service and capabilities than can be expected in other smaller municipalities. These disciplines are not part of the County Mutual Aid Agreement. Because of this there is an expectation that Barrie would/could provide some of these disciplines to other municipalities. BFES has and should continue to explore partnerships with other municipalities to provide technical rescue disciplines on a total cost recovery basis and possible source of revenue through response and/or training initiatives. These should be entrenched in legal agreements between the municipalities outside of the standard County Mutual Aid Agreement.

SECTION 6 – GAP ANALYSIS

6.1 Risks

The major changes in risk will be as a result of the anticipated growth of the entire region, increased demand for service and maintaining service levels at their present level. Since the 2009 Fire Master Plan, the department has seen a 30% increase in responses over an expanded municipality. This will increase as the annexed lands are developed and the population of both residents and workforce increase. This same risk will also present itself in the growth nodes identified throughout the city. As a part of the Ontario Government's Places to Grow legislation, Barrie will be required to intensify population in the original boundaries of Barrie. These will increase the demand for response and result in an increase of simultaneous incidents occurring throughout the city.

6.2 Policies

The establishment and regulating of a fire service must meet the needs and anticipated service levels of the citizens and businesses in the community. The department never knows when the need or what required service level will be required prior to the call coming in. Some citizens may never have to request the services of the department, but when the emergency occurs the expectation is high that the fire service will respond, deliver a high quality service and provide value for the taxes they pay.

It is the organization risk responsibility of Council to establish, set the regulating service levels and provide direction for the department and ensure that the department's business plans (budgets) are executed as directed. The legislated document for this guidance is the Establishing and Regulating By-law (E&R By-law), which was updated in 2012 (attached in Appendix "C"), and outlines the basic expectations of Barrie Fire and Emergency Service. The by-law outlines the expected level of service and the annual Business Plan should set out the appropriate resources to meet the by-law. This has been established with Council's adoption of the vision, mission and values of the department, the mandate and the classification and task objectives of the mandated services, including a less than 6 minute road response of all emergency responses. The Establishing and Regulating By-law should be reviewed and revised on a regular basis to keep it current with Council's and the public's expectations of the department.

The fire service creates Policies and Standard Operating Guidelines (SOG) to interpret and expand on the classification and task objectives contained in the E&R By-law and other legislated requirements such as the Occupational Health and Safety Act. Barrie Fire and Emergency Service have developed the necessary Policies and SOGs in an

electronic format for easy access to all personnel. A SOG Team consistently reviews and revises SOGs as required to stay current with legislation and industry best practices.

6.3 Facilities

The Barrie Fire and Emergency Service currently operate five stations that are strategically located throughout the city for optimized response coverage across the city. The annexation has left the newer areas with longer than desired intervention times. Intervention time is defined as the time from ignition or when an emergency occurs until effective firefighter operations are conducted to mitigate the incident. Factors that impact intervention time include, but are not limited to:

- The time required to detect an emergency
- The time it takes the public to notify the fire service
- The time it takes Communications to notify the stations
- Preparation time for firefighters to gear-up
- The distance between the Fire Station and location of the incident
- The geographical layout of the travel route
- Impediments such as weather, construction, traffic congestion
- Set-up time
- Type and size of the incident

Fire service intervention time is crucial in determining the outcome and consequence of an incident in terms of death, injuries and loss of property and damage to the environment. Effective fire prevention and public education programs can reduce intervention time and in turn, reducing intervention time can significantly increase the overall fire service effectiveness. Increased intervention times can have three significant impacts; increased rate of injury or death, increased property loss and the possibility of higher insurance premiums.

The new Headquarters was opened in 2011 and combined with the opening of the temporary Station 5 in December of 2012 has led to reduced intervention times in some parts of the city.

6.4 Station Location Study

As a result of the annexation combined with the growth and continued intensification of the city there was a need to study the current and future station location. This exercise was conducted during 2012 with the final report being issued in March, 2013. The Genivar Station Location Report is contained in the Appendix "E" to this plan.

The study viewed current station locations and looked at possible locations for any identified stations to achieve optimal response coverage for the city until 2031. Genivar with the assistance of the IT Department and Barrie Fire and Emergency Service conducted extensive time response modeling using response data and geographical road information, both present and projected to produce optimal station locations.

The review of the existing stations considering their life expectancy and current location in comparison with the planned future growth of the city were rationalized for long term station location planning.

Since 1993, several previous studies have identified the need for a station in the northwest quadrant of the city. During this review considering the road diets and proposed road network improvement, and in particular interchange improvements over the Highway 400, this study shows that the need is greatly reduced based on this information.

6.5 Equipment

Apparatus is the largest equipment capital expenditure. Every department needs to have an integrated maintenance and replacement program to ensure that maximum value is achieved from the purchase. The amount and costs of maintenance must be balanced against the expected life cycle, particularly in the latter years of life cycle. The average age of current apparatus is in line with industry best practices and legislated requirements, however a few older units should be considered for replacement over the next few years. The Technical Rescue Unit and the Command Centre are well past their life cycle. In 2013 the Command Centre was decommissioned as it was not road worthy. Several other units will be approaching this in the next few years. BFES and Fleet Services should continue to build business cases to be considered during the Capital Budget Justification Process.

Apparatus is very specialized equipment and takes a special skill set to repair and maintain. As the fleet is expected to grow in the coming years, attention should be on bringing current Fleet staff up to Emergency Vehicle Technician level or hiring certified technicians.

Other major equipment expenditures should be subjected to life cycle management to ensure maximum usage but timely replacement. The life cycle management must align with industry standards and legislated requirements for replacement.

6.6 Staff

The current Operations Branch staffing level was adjusted in 2012 to staff the additional requirements when Station 5 opened. Aerials in the department are allowed to be staffed with a minimum of 3 personnel. Current best practices and Nation Fire Protection Association Standards are to staff aerials with a minimum of 4 personnel. For BFES's aerials to operate in an efficient and safe manner, it should be staffed with a minimum of 4 personnel, 1 at the pump panel, 1 at the turntable and 2 in the platform to operate the nozzles or effect rescue. During several incidents an aerial was required to ghost operate with no personnel at the turntable (no personnel at this position to monitor the platform operation and ensure safe operations) due to the lack of staffing on the aerial, which is not in accordance with the manufacturers' operating procedures and could be considered an unsafe practice by Occupational Health and Safety.

The Fire Prevention Branch staffing is dependent on service level expectations and their ability to conduct legislated inspections and buildings of a high hazard nature. The level of staffing needs to reflect addressing the legislated complaint and request inspections and the Fire Code inspections in order to allow for regular building inspections of commercial and industrial units on a yearly basis. Staff pressures are increasing for complaint and requested inspections and Fire Code enforced driven inspections are hampering efforts to address any significant number of building inspections. Provincial driven legislation and download on the fire service is increasing. In 2011, the province enacted the Propane Handling Act which requires the fire service to inspect facilities and review/approve safety plans for these facilities. In 2014, amendments to the Fire Protection and Prevention Act will place additional requirements for the fire service to inspect and enforce carbon monoxide detectors in all residences. Further, changes to Care Facilities will require annual inspections, fire drills and safety plan review.

The Communications Branch has seen an increase in its client base and annual increases in call volumes in the Communications Centre. Currently, Communications dispatches 18 other municipalities with another client due to join in 2016. Staffing levels are sufficient at this time to manage the business of the Branch. Although the department is always looking for more client base to reduce the dependency of tax based funding, a strategic review of capabilities within the branch needs to be conducted to determine maximum levels of service and the need to add additional staff.

The Training Branch currently is in the process of developing new methods of training delivery consisting of e-training and the use of Shift Training Instructors. As such, the current level of staffing is sufficient. In the future there could be the need for a Training

Program Coordinator. The main role will be the development of new training programs for all members of the department.

The Administration Branch should be conducted to review current and future needs as the demand for administration and support staff increase. Business cases need to be developed and submitted during the Business Plan process for consideration.

6.7 Communications

The needs in the Communications Branch ranges from the requirement stated above in regards for the need for a service delivery review, a need for service level agreements both inside the city and outside (with vendors, suppliers and customers), a sustainable back-up centre, being able to achieve industry benchmarks and a provincial certification program. As always one of the forefront requirements and one that consumes considerable budget implications is the need to keep current with technology and life cycle replacements of technology on a scheduled basis. The move to the new Headquarters in 2011 has greatly improved the Branch's effectiveness and efficiencies and ability to take on new clients. This also resulted in improvements and replacement to some aging equipment that was at end of life cycle.

6.8 Training

The current training delivery in general, meets the requirements of the Occupational Health and Safety Act. Some adjustments need to be developed to better identify areas identified in the risk assessment. The fire service is governed by the Ontario Fire Service Advisory Committee, Section 21 Guidelines, this committee and the guidelines distributed by this committee fall under Section 21 of the Occupational Health and Safety Act. These guidelines are considered regulations under the Act by inspectors. These guidelines are specific to the fire service in Ontario.

The required amounts of training range from recruit training to team training. Occupation Health and Safety has increased the formal requirements for training and training records. The Ministry of Labour has increased inspections of the fire service throughout Ontario as the result of several firefighter fatalities and close calls over the past few years.

Staff currently trains to standards as established by the Office of the Fire Marshal and Emergency Management, covering all positions in the fire service. This change in 2014 will align the Province of Ontario to the National Fire Protection Association Standards which are universally accepted as industry best practices. Many U.S. States have regulated NFPA Standards; however, will remain as standards in Ontario at this time.

The transition will take time to complete and will require BFES to adjust their training programs to align with NFPA.

6.8.1 Training Facility

In 2015 City Council approved entering into an agreement with Innisfil Hydro to lease some vacant land adjacent to Barrie owned vacant land for the purposes of developing a temporary training facility for the next 5 years. The purpose is to reduce the associated costs of sending personnel on overtime to remote training centres outside of Barrie. On-duty personnel are required to cover the city on a daily basis, so if training is required outside the city it requires overtime. A normal live fire training session would require 8 – 12 personnel on overtime. The cost of renting an outside facility is another expensive cost and there are limited resources available in the immediate area. These were identified in the 2003 Bill Wilkins Inquest.

This is a temporary lease agreement until a permanent Stn. 5 and Training Facility can be considered in the Long Term Objectives.

The cost a developing a Training Facility in Barrie is expensive, however would allow for BFES to meet the requirements of the Occupational Health and Safety Act, the Section 21 Committee and NFPA Standards. There is also the possibility of revenue generation from other municipalities in the area renting the facility and offsetting some of the operating and maintenance costs.

6.9 Safety

Currently, each Training Officers is assigned to a shift. These Training Officers are responsible for ensuring minimum training standards are met on each shift and coordinate the technical rescue capabilities that require specialized and maintenance training to meet certification requirements on a yearly basis. The other important role they perform is as an Incident Safety Officer at incidents. This role supports the Incident Commander and improves the overall safety at the scene and complies with the requirements of the Occupational Health and Safety Act and the Section 21 Guideline.

6.10 Fire Prevention

Fire prevention is mandated by the Fire Protection and Prevention Act (FPPA). The Ontario Fire Marshal and Emergency Management have established the “Three Lines of Defence”; public education and prevention, fire safety standards and Fire Code enforcements and emergency response. The public is used to the lights and sirens of BFES in response to an incident; prevention is the primary focus of the department and

can limit the need for response to an incident. The mitigation of risk of response better serves the city than providing the cost of response.

It is very difficult to measure the actual impact of fire prevention and public education on incident response in a growing community with increased response, however prevention and public education is a positive step. Over time if the prevention and public education program is effective, the data will show this result through less response and a reduction of loss of life, injury and property damage.

Complaint and requested inspections plus targeted area inspections coupled with public education and plans examinations, fire origin and cause investigations absorb almost all of the work plan allocations of the branch. There is a current need to be more proactive in regular inspections and high risk establishments and trying to reduce the frequency of false alarm responses from the Operations Branch.

- Currently, the Fire Prevention Branch has in excess of 4000 open files with a total Branch compliment of 8 personnel. One staff member spends 100% of their time on public education; a second member spends 25% of time to assist on public education and another spends 90% of their time on plans examination. If you calculate origin and cause investigation, time training staff to keep current with code changes and enforcement, there is limited time after legislative complaint and request inspections to conduct regular inspections on high risk buildings. With the anticipated increased requirements on legislative requirements this will increase the pressure on the Branch and will require a further service delivery review of the branch. The Branch has become more reactionary than proactive, without the requested efficiencies, this will continue to be the case.
- Current Fire Underwriters Standards suggest 1 inspector for every 15,000 population and does not include supervisory staff or those involved in plans examinations. The City of Barrie with a population of 141,000 would suggest there should be 9 inspectors.

6.11 Public Fire and Life Safety Officer

Public Education is a requirement under the Fire Protection and Prevention Act and is currently managed by the Public Fire and Life Safety Officer with assistance from other Fire Prevention Officers when time permits. Current Fire Underwriters standards suggest 1 Public Education person for every 50,000 population; therefore theoretically there should be at least 2 and in the near future 3 Public Fire and Life Safety personnel.

Generally it is believed the public tend to be complacent about fires and the resulting losses. The public tends to accept the consequences of fire and offers community support and comprehensive insurance packages to mitigate damages.

Public attitude towards fire needs to be assessed in order to identify, what role it plays in determining the extent of fire losses. An understanding of how the attitude of different groups (e.g. juveniles, people in various socio-economic categories, the aged and vulnerable sectors, etc.) affect fire losses, fire safety and fire awareness will assist in determining some of the underlying causes of fires in Barrie. Properly designed public fire and life safety education programs may significantly improve public attitudes toward prevention of fire and thereby help reduce fire losses in Barrie. This requires a five step process:

- **Conduct a Community Analysis** – A community analysis is a process that identifies fire and life safety problems and the demographic characteristics of those at risk.
- **Develop Partnerships in the Community** – A community partner is a person, group or organization willing to join forces and address a community risk. The most effective risk reduction efforts involve the community in the planning and solution process.
- **Create a Strategy to Solve the Problem** – An intervention strategy is the beginning of the detailed work necessary for the development of a successful fire and life safety risk reduction process.
- **Implement the Strategy in the Community** – Implementing the strategy involves testing the interventions and then putting the plan into action in the community. A well-coordinated and properly sequenced implementation is essential. Implementation occurs when the intervention strategy is put in place and the implementation plan schedules are followed.
- **Evaluate the Results** – The primary goal of the evaluation process is to demonstrate that the risk reduction efforts are reaching target populations, have the planned impact, and are demonstrably reducing loss. The evaluation plan measures performance on several levels, including formative, process, impact, and outcome objectives.

SECTION 7 – RECOMMENDATIONS

7.1 Executive Recommendations

The executive recommendations are incorporated and support the level of services established in the Establishing and Regulating By-law in order to accomplish the departments mandate and mission as approved by Council. Barrie Fire and Emergency Service are committed to the major programs that include, but are not limited to:

- Fire Prevention
- Public Education
- Fire Suppression
- Technical Rescue
 - Control of Hazardous Materials Incidents
 - Extrication and Rescue
 - Land and Vessel Based Ice/Water Rescue
 - High/Low Angle and Confined Space Rescue
 - Tiered Medical Response
 - Trench Rescue
 - Elevator Rescue
- Public Assistance
- Fire Cause and Origin Investigation
- Training
- Communications/Dispatching Services
- Emergency/Disaster Management

The major components that guide and govern Barrie Fire and Emergency Service are the Establishing and Regulating By-law, the Fire Protection and Prevention Act the Emergency Management and Civil Protection Act, and the Occupation Health and Safety Act. There are a host of other municipal by-laws and legislation that affect the operations and business delivery; however, the service delivery of the department is considered appropriate for the community it serves.

Short Term Objectives (1 -3 Years) 2016 - 2018

- **A Records/Data Management System should be integrated into the Fire Prevention Branch as soon as reasonably practicable** – The City of Barrie’s Building Department has an existing database application (AMANDA) which houses comprehensive building and premise information.
 - As part of the requirements of the Fire Protection and Prevention Act, the City of Barrie has to conduct annual simplified risk assessments of the City, a portion of this assessment examines the current building stock in

the City. Currently this is spread between the Building Department and the Fire Prevention Branch that currently uses a different database program. There is a need to conduct a Comprehensive Risk Assessment of the city and this will greatly simplify that data collection.

- There are considerable benefits to the Fire Prevention Branch to be gained through the facilitation of access to this worthy information, including the elimination of duplicate records and redundant work processes. This has been a recommendation since the 2009 Fire Master Plan. Various city departments have been involved in a committee (APLI) and are in the process of implementing a program from Accela. It is a program that provides solutions to automate and streamline civic processes around land, licensing, asset management, environmental health and safety, legislative management, recreation and resource management, and more. This will lead to improved efficiencies and facilitate an increase to the current level of inspections that can be conducted annually.
 - Currently Fire Prevention staff does not have the ability to enter inspections and data in the field and are required to return to the station to enter the data. A Records/Data Management System combined with the use of laptops will allow this automatic transfer.
 - This will also provide a reliable data source for future file searches, eliminate duplication and improve structure and procedures when considering departmental and interdepartmental information and procedure sharing.
 - Fire Prevention Staff will also be able to better communicate risk and safety concerns that are identified in the field when an incident occurs.
-
- **Initiate accreditation with the Centre for Public Safety Excellence** - a nonprofit organization that helps local public safety agencies around the world streamline and improve the services they provide their communities.
 - The Centre for Public Safety Excellence (CPSE) supports and encourages agencies and personnel to meet international performance standards through various programs and the work of two commissions: the Commission on Fire Accreditation International (CFAI) and the Commission on Professional Credentialing (CPC).
 - Accreditation is a comprehensive self-assessment and evaluation model that enables organizations to examine past, current, and future service levels and internal performance and compare them to industry best practices. This process leads to improved service delivery.
 - CPSE's Accreditation Program, administered by the Commission on Fire Accreditation International (CFAI) reflects a comprehensive self-assessment and evaluation model that enables fire and emergency service organizations to examine their service levels and performance in a way that allows them

to compare to industry best practices. This process leads to improved service delivery by helping fire departments to:

- Determine community risk and safety needs.
 - Evaluate the performance of the department.
 - Establish a method for achieving continuous organizational improvement.
 - The CFAI accreditation process provides a well-defined, internationally-recognized benchmark system to measure the quality of fire and emergency services.
 - The self-assessment process demands the largest portion of time to achieve accreditation. Although there is a substantial commitment of time and resources, departments nationwide have realized the value of the self-assessment process and accreditation model because you are documenting policies and procedures that you should have in place already. You are simply documenting what you are doing. The benefit of the accreditation process is realized more in the journey, than the destination.
 - The accreditation process results in the development of planning documents, including short-term action and long-term strategic plans, important tools in the budgeting process and a basis for justifying departmental programs and services. Accreditation has the potential to dramatically improve a department, its services, and its vision for the future.
 - The CFAI process is being undertaken in a number of urban fire departments within Ontario and completing this process will assist in BFES remaining a progressive and future focused organization.
-
- **Work with City Departments to ensure an all hazards approach to business continuity planning that supports the City of Barrie Emergency Plan** – the Emergency Management and Civil Protection Act states:
 - 3. (1) Every municipality shall formulate an emergency plan governing the provision of necessary services during an emergency and the procedures under and the manner in which employees of the municipality and other persons will respond to the emergency and the council of the municipality shall by by-law adopt the emergency plan. 2002, c. 14 ,s. 5 (1) .
 - The services that the City of Barrie provides to the public and interdepartmental are vast. Disruptions of some of these services could potentially impact public safety and security. Therefore, the City of Barrie must continue providing such critical services and/or limit their disruption as a result of emergencies.
 - Continuity of Operations/Business Continuity is a component of the Emergency Management Program (legislated under the Emergency Management and Civil Protection Act, 1990) that ensures the City of Barrie will be able to provide critical functions and services during an emergency. The Continuity of Operations/Business Continuity process provides a framework for the determination of functions and services that are time-

sensitive and critical, and utilizes a risk management approach to assure the continuity of such critical functions/services by identifying and assessing hazards, risks and the impact of potential disruptions; to develop viable mitigation, response and recovery strategies and plans; to earmark resources; to train personnel and to test and maintain plans. Continuity of Operations/Business Continuity should be an ongoing process that is supported by senior management, properly resourced, integrated into the City of Barrie's emergency management planning framework and reviewed for currency from time to time.

- "CSA Z1600-14 Emergency and Continuity Management Program" is a standard that outlines the requirements for an emergency and continuity program. The standard serves as an effective benchmark to allow organizations to evaluate conformity of their emergency and continuity management program to this Canadian Standard.
- 6.2.6.1 The organization shall implement documented plan(s) that detail how the organization will manage a disruptive event and how it will recover or maintain its critical activities to a predetermined level based on management approval.
- 6.2.6.2 The organization shall establish a continuity management structure that provides for capabilities to:
 - confirm the nature and extent of an incident;
 - implement appropriate actions;
 - have processes and procedures for the activation, operation, coordination, and communication of continuity strategies and plans;
 - have resources available to support the processes and procedures to manage an incident; and
 - communicate with stakeholders.
- The residents of Barrie would expect and anticipate that during any type of emergency the City of Barrie would maintain essential services and bring back all services in a timely manner. City staff needs to prioritize the 80 plus services they provide into categories of how long they can withstand not being delivered. Reallocating staff to maintain essential services and methods of bring services back on-line.
- **Complete a communications service delivery standard between IT and BFES, and develop a communications service delivery standard between BFES and its communications customers** – The communications centre is a complex technical system of multiple varying components and require 24/7 service in case of failure or incidents that hamper the ability of the Branch to operate and receive emergency calls or dispatch fire apparatus to required incidents. In addition, as the Branch has expanded its customer base over several years, there is a need to address these complexities.

- BFES, service partners and IT all play critical roles in this process. It would make for a more seamless process if the levels of service delivery by each partner were well defined and, responsibilities and procedures are in place.
 - Response times for repair, maintenance and trouble shooting incidents need to be established. An on-call structure needs to be included to limit the time required to contact the systems analyst required.
 - The Communications Branch dispatches 19 fire services throughout a large geographical area including Simcoe County and the District of Muskoka. Each fire service has its own uniqueness, levels of service and dispatch requirements. A service delivery standard would outline the responsibilities of BFES and its customers.
 - BFES revised its current contracts with a more compressive option based contract, spelling out each option and the costs associated with each option. This will allow for more revenue based on each individual customers needs and should be included in the service delivery standard.

- **Improve statistical data with improved reporting processes** – There are several legislated requirements on the department for reporting statistical data. There are also several corporate requirements with internal and external partner organizations to report accurate data. Appropriate and accurate data is the cornerstone of reporting and maintaining results based accountability.
 - There is significant manual data entry required across the department to complete all the statistical data. Each process does not align with each other’s reporting requirements or is easily transferable. This consumes considerable staff time. An example is listed above with the use of the records/data management program. This is only one example.
 - Currently, there are approximately 60 personnel that enter data into the provincially required records management system using the FIREHOUSE program. Further education and training is required to ensure that all are entering the data using the same definitions and criteria based on the required standards from the province. Furthermore, a review should be completed in the value of retaining the current data warehouse or transitioning to a different data warehouse compatible with or in conjunction with another corporate solution.
 - Meaningful Key Performance Indicators need to be reviewed and developed to be successful in achieving the previously recommended accreditation. These KPIs have to be consistent with results based accountability and lead to evidence based decision making.

- **Conduct a comprehensive qualitative and quantitative risk assessment for the City of Barrie** - Risk assessment is the process utilized to identify the City of Barrie’s fire protection and other emergency service needs by measuring the

probability and consequence of an adverse effect to health, property, organization, environment, or community as a result of an event, activity or operation. It is the process of examining and analyzing the relevant factors that characterize the City of Barrie and applying this information to identify potential risk scenarios using results based accountability and evidence based decision making. The assessment includes an analysis of the likelihood of these scenarios occurring and subsequent consequences.

- The Office of the Fire Marshal and Emergency Management has two risk assessment tools; the Simplified Risk Assessment model as described above is an annual compliance document that is submitted to the Office of the Fire Marshal and Emergency Management. The second model is a more expansive Comprehensive Risk Assessment model that is one of seven components of the Comprehensive Fire Safety Effectiveness Model. The OFMEM has recently introduced an “Integrated Risk Management Web Tool”. The tool is intended for municipal and fire service decision-makers to determine building risks by taking into account building characteristics and assist municipalities in fulfilling the responsibilities prescribed in Section 2 of the Fire Protection and Prevention Act, 1997.
 - The Emergency Management and Civil Protection Act states: “in developing its emergency management program, every management program, every municipality shall 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.”
 - The risk assessment must not only look at the physical risk assets, but also the demographics of the population in order to effectively deliver public education and fire prevention programs to target audiences.
 - A comprehensive risk assessment will result in improved response times and improved risk-to-resource allocation.
- **Develop a plan to increase the number of pre-incident plans with a focus on high risk buildings by occupancy code** - pre-incident planning is one of the most effective tools a fire department has in controlling or reducing the damage caused by fire. Planning for fire in industrial, commercial and high risk occupancies increases the confidence and ability of the fire service in handling the fires and reduces the risk to the life safety of the fire fighters involved.
 - In the recently completed Fire Underwriters Survey, BFES scored very low in this category.
 - A pre-incident planning program has been developed, however to receive additional credit within fire insurance grading and to help improve fire fighter effectiveness during emergency events, the number of completed pre-incident plans should be increased.

- As the fire department continues to develop its pre-incident planning program, additional credit up to the maximum can be achieved.
 - It is strongly recommended that the pre-incident plan continue to expand and should be developed in accordance with NFPA 1620, Recommended Practice for Pre-Incident Planning, or a similar standard/guideline.
- **Land acquisition and design for a station in the south-east quadrant consistent with the Genivar Station Location Study (2013)** – The Genivar Station Location Study is attached in Appendix “E” and sets variable modelling that was conducted to reach the preferred station modelling with an outlook to 2031.
 - The preferred model combined with projected roadway geometry and projected population demographics forecasting demonstrate a need for a station in the south-east quadrant as the area is developed. The need to have services available during development is a Council approved direction with proposed development in the annexed lands.
 - The Genivar report was published in 2013 and recommended that Station 6 be operable by 2016. The short term objectives in the 2014 Fire Master Plan recommended operational in 2017. Since then reviews and revisions to the timing and development in the south-east now lead to the recommendation that consideration be given to operational in late 2018, or early 2019.
 - The preferred model shows the best location to be in the Prince William Way and Mapleview Drive area.
 - The proposed new fire station should be operational in late 2018 or early 2019 in order to accommodate projected growth in this area. Station 6 is the first expansion of current coverage that BFES should implement due to the need to ensure proper coverage. As 2018 is fast approaching, the fire service must secure the land and start planning for construction in the short term.
 - As population grows on the eastern side of the annexed lands, Station 3 will be covering too many residents and workers for the station to offer proper response times and the new Station 6 is required. The industry standard is one pumper for every 20,000 – 25,000 population based on response times and other variables.
 - The Fire Station Location Study takes into account that the proposed location will be available for implementation in 2018. Construction and planning of the new location should be planned accordingly. Construction could take 12 or more months depending on the site and design.
- **Renovations and alterations to Stations 3 and 4 to increase functionality of both stations** – Both stations need renovations to increase the functionality and increase capacity for apparatus, meet legislative requirements for accessibility and health and safety requirements.

- Add a third apparatus bay to the east of the existing structure at Station 3 and remove the existing hose tower which is cosmetic. Also increase the kitchen and lounge area to accommodate 2 crews of up to 10 firefighters including the appropriate accommodations for male and female firefighters.
 - For Station 4 renovate and expand existing structure for female quarters and the ability to house 2 crews of up to 10 firefighters including the appropriate accommodations for male and female firefighters.
- **Develop an inspection schedule where the frequency of inspections is appropriately suited to the risk profile of each occupancy/target group** – In conjunction with the above mentioned comprehensive risk assessment, an inspection schedule based on the outcomes of the evidence based risk assessment should be developed to reduce the risk or impacts of incidents.
 - This will lead to improved fire code compliance by targeting occupancies or target groups that have been identified through a risk assessment as being non-compliant or lacking knowledge of the regulations.
 - There will be improved risk-to-resource allocation focusing on the occupancies or target groups where we can make a larger difference.
 - This is a recommendation of the Fire Underwriters Survey and could lead to higher rating, thus reducing insurance premiums for citizens and businesses in Barrie.
 - The Fire Protection and Prevention Act require inspections based on “complaint and request”, which take up a considerable amount of current resources of the Branch. The development of an inspection schedule will assist in directing available remaining resources to concentrate on the targets with the most significant life safety and hazards first then each occupancy of the same type should be inspected to remain fair and consistent. Thus, leading to results based accountability.
 - An aggressive routine inspection schedule may result in reduced complaints and improved fire safety in our highest risk occupancies.
- **BFES, the Engineering Department, Corporate Asset Management and Water Operations recently concluded a Fire Protection and Water Supply Survey in conjunction with Fire Underwriters Survey** – The value of a Fire Protection and Water Supply Survey is multi-functional and will assist the departments listed and the residents and businesses in Barrie.
 - A Fire Protection and Water Supply Survey are used by the named departments to plan new infrastructure and improve existing infrastructure that needs replacing and upgrading. The survey considers; fire service delivery, fire prevention, and water delivery for firefighting operations and communications.

- The last survey was conducted in 2004 by Fire Underwriters Survey (FUS). Since that time there have been major changes to the fire service and water supply throughout the city. As a result of the 2009 Fire Master Plan, some work was completed on certain areas of the city where there is under-sizing of the current watermains.
 - The water supply for fire protection has increased dramatically since the 2004 Survey. The upgrade in watermains, the addition of the Surface Water Treatment Plant and the recently commissioned Sunnidale Reservoir are some of the improvements over the years.
 - The 2004 FUS noted on the lack of growth of the fire service compared to the growth of the city. Recent growth of the fire service in staffed apparatus and the addition of Station 5 will no doubt bring the service to a more sustainable position in going forward with a current survey.
 - The results of a Fire Protection and Water Supply Survey are communicated to insurance companies in Canada and are used to base the fire insurance premiums on residential and business insurance ratings. A positive report could result in lower fire insurance premiums for the City of Barrie taxpayers.
 - The report contained several recommendations for the City of Barrie to consider in an effort to improve its overall ratings.
- **Explore partnerships with other municipalities to provide technical rescue disciplines on a total cost recovery basis and possible source of revenue through response and/or training initiatives** – A joint objective of Council and City departments is to try and reduce the dependency on tax based revenue through increased revenue and cost recovery.
 - There is a growing trend in the fire service to look at regionalization for certain services, to try and help reduce fire service costs of providing an ever increasing number of disciplines that can tax the service with expensive training and equipment costs.
 - Barrie Fire and Emergency Service is the largest fire service in the geographical area of Simcoe County. The current full-time staff exceeds the total full-time staff of all fire services in the county. Barrie currently has more full-time staff than any municipality to the north of Barrie.
 - BFES has the ability to provide those services to other municipalities that do not have the ability to provide those technical rescue services. The Municipal Act and the Fire Protection and Prevention Act allow municipalities to enter into agreements for this type of service delivery. This is based on full recover costs of response and contributing to the ongoing training requirements to maintain annual training requirements and certification.
 - BFES currently has an agreement with the County of Simcoe and all municipalities to provide Hazardous Materials response to life threatening

situations on a cost recovery basis, some ongoing annual training requirements and equipment purchasing for the delivery of the service.

- BFES should continue looking at entering into legal agreements to provide technical rescue capabilities with other municipalities on a cost recovery basis for delivery of services and an annual contribution to the ongoing training and maintenance of training and equipment.

- **Implement a sustainable back-up communications location consistent with best practices and standards** – With today’s technology, there is always an inherent risk of failure, system slow-downs, cyber-attacks, natural disaster, or human caused interruptions to the technology. The one most effective resolve is to create dynamic redundant systems.
 - Current, redundancy in the Communications Centre is being addressed by BFES and IT.
 - Currently, the back-up location in case of failures or the need to evacuate BFES Headquarters is located at the Barrie Police Facility on Sperling Drive. BFES Headquarters could need to be evacuated for any number of reasons.
 - The capability of the back-up location is primitive considering today’s technology and available redundant solutions. Even a system failure of the Barrie phone exchange would create an outage in both locations. Consideration must be given to have outside Barrie exchange capabilities to ensure all emergencies services can continue to operate at a desired level of service.
 - With the pending new Police Facility in the plans, strategic planning for the requirements for both services and the costs associated with a sustainable back-up for both agencies should be undertaken as part of the process.
 - The Police Back-up is at Headquarters and is basically in the same condition as Fire’s. A viable alternative might be to consider a joint back-up location that could serve both services at another location. With the planned construction of Station 6 or the permanent Station 5, these may have additional space added to them to accomplish this.

- **Explore partnership opportunities with academic institutions, organizations and government agencies where BFES can contribute to relevant and current projects** – there are partnership opportunities that exist that can help BFES in becoming more effective and efficient and contribute to advancements of new and improved methods of service delivery.
 - There is an ever increasing reliance on the fire service to become more results based accountable and make evidence based decisions. The best way to achieve this is through data collection and analysis. This can be extremely time consuming and would be based on the expertise level in

- the fire service to determine the accuracy of the results. Partnership with other experienced organizations would lead to more accurate and accountable results.
- There is a vast array of “industry best practices” in the fire service and are for the most part generalized. Partnerships would be tailored to the local needs and circumstances in Barrie and reflect a more contextual result based on the City of Barrie.
 - Partnerships can lead to improved research and knowledge in BFES and also the possibility of external funding to assist.
- **Review the service levels provided to maintain and repair the growing fleet balanced against capital costs of replacement** – One of the biggest capital outlays for BFES is apparatus, whether it be new fleet or fleet replacement. Combined with significant maintenance and repair costs, there needs to be a systematic approach to weighing the cost of repair against the value and replacement cost of apparatus.
 - The size of the department’s fleet is going to increase with the growth of the city and the fire service. The cost of apparatus has increased significantly with new legislated emission controls in Canada, the technological advancements of the apparatus and new requirements under the National Fire Protection Association Standards.
 - A fleet replacement schedule should be developed based on the criteria established by both the Capital Asset Management criteria and industry standards for replacement or refurbishment. Although the fleet for the most part is considered adequate, there are a number of apparatus that are well past life cycle and costly to repair. The 75ft ladder truck is in need of being replaced, the Technical Rescue truck needs replacing and the Command Centre (decommissioned in 2013) is well beyond its life cycle and is all but unreliable to operate.
 - The Fleet Services Technicians that maintain and repair the fire apparatus need to be Emergency Vehicle Technician Certified. The increasing size and complexities of the fleet is creating a strain on Fleet Services to maintain, repair and schedule regular maintenance of apparatus. Fleet Services should review current staffing levels, services levels and training combined with the required facilities to maintain the apparatus. The current Fleet Services Branch location is in an older building that may require renovations or replacement to be able to properly maintain the fire fleet.
 - **Begin implementation of a Computer Aided Dispatch, Automated Dispatch, Automated Vehicle Locator and GPS traffic pre-emption link project to enhance response times throughout the city** – traffic pre-emption is the ability of responding fire apparatus to change the traffic lights to respond and allow for the ability to make changes to traffic lights to speed up response times.

- The current system employs 1970's technology that uses line of sight opticom process to see the apparatus coming and then turns the traffic signal green as the apparatus approaches. There is considerable cost and upkeep to this system for every set of traffic lights in Barrie.
 - This is problematic with current road design and the geographical nature of the City of Barrie, often pre-emption is not successful by the time the apparatus reaches the intersection because of curves, hills and apparatus turning onto roads in close proximity to the traffic signals. The pre-emption system must receive the signal from the responding apparatus and then go through a full cycle of turning lights in the opposite direction, yellow then red and allow for pedestrians to clear the intersection.
 - The new system links the Computer Aided Dispatch system (CAD), automated vehicle locator (AVL) and GPS to determine the route the apparatus is going to take and enhance pre-emption thereby decreasing response times and does not rely on line of sight. This would allow for a safer cycling as referred to above and allow the traffic signal to be green when the apparatus reaches the intersection.
 - Some of the systems are already in place such as the CAD and AVL. This modern technology is actually cheaper to install and operate than the current system and will increase firefighter and public safety.
 - This project will require a coordinated project involving BFES, Roads, Roads Engineering and IT.
- **Work with the Building Department and IT to develop a bidirectional antenna strategy** – bidirectional antennas are antennas built into new or existing buildings to increase firefighter and public safety by enhancing firefighter communications in buildings.
 - The need for adequate and reliable in-building communication in emergency situations has gained momentum across the nation in recent years. It requires new buildings to adequately ensure first responder communications.
 - First responders, including fire, police and emergency medical services often cannot effectively use their radios in larger structures. It is crucial to implement properly designed fire repeater systems; improperly installed systems can create interference either to the fire department channels or to other public safety radio systems.
 - With the anticipated intensification that will occur in Barrie there is a need to ensure Barrie enacts by-laws that require builders ensure radio communications in these buildings meet the requirements of emergency service agencies. The use of modern building components and construction methods are limiting communications in these buildings.

- Georgian College agreed to install a bidirectional antenna in their newly built Sadlon Centre for Health and Wellness. Testing has confirmed great radio communications within the complex.
 - In 2015, Royal Victoria Regional Health Care Centre installed a bi-directional antenna that serves both BFES and Barrie Police for radio communications within the hospital.
 - Some U.S. cities have passed a by-law requiring newly constructed buildings, or buildings modified affecting the fire alarm system with levels below grade shall be tested for fire department radio signal strength. Any building that is two stories or greater below grade or greater than 70 feet in height will automatically be required to have a BDA.
- **Review staffing levels consistent with an organizational review of service delivery needs and anticipated growth in conjunction with the annual business planning process** – the City of Barrie is posed to experience substantial growth in the next decade with development of the south-end lands and future intensification in the established growth nodes.
 - In the past few years, the province has changed several pieces of legislation and downloaded responsibility on the municipalities without any funding and limited support. Changes to the Propane Handling Act, the Fire Prevention and Protection Act, and Vulnerable Occupancies have added workload to the municipal fire services. This trend is expected to continue.
 - As the City of Barrie enters into another anticipated growth expansion, one of Councils directions is to develop city services in conjunction with the growth.
 - A review of the anticipated future service delivery needs should be conducted considering the anticipated growth of the department and the city and possible efficiencies. Business cases should be developed to be considered during the annual business planning process.
- **Annually review and revise as necessary the Fire Master Plan** – Master Plans are living documents and must be reviewed on a constant and consistent basis to guide the department in reaching its strategic priorities.
 - Every year the department builds its business case for both operating and capital projects and processes. The Business Plan sets the direction and objectives for the upcoming year. After Council passes the Business Plan, it would be an opportune time to review and revise the Fire Master Plan based on what has been accomplished over the past year and review expectations for the coming year.
 - Changes must also be reviewed that affect the department and include but not limited to:
 - Growth

- Changes in Legislation
- Increased demands on the department
- Efficiencies and effectiveness initiatives
- Technology advancements
- Fiscal responsibility
- Any major changes to the Fire Master Plan should be presented to Council for review and acceptance before implementation.

Intermediate Term Objectives (3 -5 Years) 2018 – 2020

- **Construction of Station 6 in the South-East** – construction of a station could take as long as 12 - 16 months to completion, depending on site and design. The population growth expectations and preferable station location are contained in the Genivar Station Location Study attached in Appendix “E”.
 - The current population and employment density expectations in 2017 show that the current Station 3 would be required to protect a population density of 47,445 and employment of 12,991. This far exceeds the industry best practice of 20,000 – 25,000 population (dependent on geography, building type, age of the buildings and response times) for each responding apparatus.
 - By 2021, Station 6 would be responding to a population of 25,938 and employment of 2,964. This again is pushing limits as there are several growth nodes that this station would respond to.
 - The need to have services available during development is a Council approved direction with proposed development in the annexed lands. This station will also provide secondary coverage to Station 3 and provide coverage when Station 3 is on a call or backing up other Stations at multiple Station response calls.
 - All new stations in Barrie should be constructed to house a minimum of two apparatus, have facilities for at least two operating crews and provisions for additional Fire Prevention Officers to work out of reducing the travel requirements and lead to efficiencies in the future.
- **Hire staff for Station 6 based on service delivery standards and legislated requirements** – with the construction of Station 6, there needs to be the additional staffing required operating the station and ensuring staffing requirements for the entire city meet with best industry practices.
 - It is anticipated that a pumper will be located in the new Station 6, which will require the recruitment of an additional 20 firefighters.
 - Lead time before the station opens is required to allow for 12 weeks of training for the recruits. The recruits would be blended into the existing staff complement to ensure the new Station is staffed with a blend of experienced firefighters.

- A recruit class of 20 firefighters has been a challenge in the past for the Training Branch. As previously discussed, the anticipated retirement and recruitment could exceed 20 firefighters adding increased demand on the Training Branch.
 - A review should be conducted to determine if a phasing of recruitment can benefit the Training Branch and the department by splitting the recruitment over two years and the benefits of possible overtime avoidance, pre-opening of the new Station.

- **Acquisition of a Pumper for Station 6** – a pumper is the basic apparatus utilized by the fire service to respond to a variety of incidents that require multiple disciplines and is staffed with a Captain, Driver and 2 Firefighters.
 - With the opening of Station 6, there will be the additional need for an additional pumper apparatus for the station.
 - Currently, BFES has a sole source agreement passed by Council for specific body type and manufacturer of apparatus in order to enhance the safety of firefighters by all apparatus being the same.
 - Pumpers are custom built according to the specifications desired by each department and can take 12- 14 months to build.
 - There will also be the need to equip the apparatus with the appropriate supplementary equipment carried on BFES pumpers.

- **Review staffing levels consistent with an organizational review of service delivery needs and anticipated growth in conjunction with the annual business planning process** – the City of Barrie is posed to experience substantial growth in the next decade with development of the south-end lands and future intensification in the established growth nodes.
 - In the past few years, the province has changed several pieces of legislation and downloaded responsibility on the municipalities without any funding and limited support. Changes to the Propane Handling Act, the Fire Prevention and Protection Act, and Vulnerable Occupancies have added workload to the municipal fire services. This trend is expected to continue.
 - As the City of Barrie enters into another anticipated growth expansion, one of Councils directions is to develop city services in conjunction with the growth.
 - A review of the anticipated future service delivery needs should be conducted considering the anticipated growth of the department and the city and possible efficiencies. Business cases should be developed to be considered during the annual business planning process.

- **Upgrade communications equipment and associated systems consistent with current and advanced technology** – a dispatch centre is only as effective and efficient as the equipment and systems allow it to be.
 - Firefighter and public safety are reliant on this communications equipment and systems to operate fully, and be technically advanced to allow for the department to meet Council’s and legislated service delivery standards.
 - The technology surrounding communications is in a constant state of advancements and upgrades that requires constant monitoring and research. Failure to stay current with technological advancements and upgrades could jeopardize and increase the chance of system failures.
 - A life-cycle analysis should be conducted by BFES and the IT Department on all systems in communications to assist with future asset management and plan for capital and operating expenditure that will be required during the business planning process.
 - Service Level Agreements should be reviewed to stay current with upgrades to the communications equipment and associated systems both with internal and external business partners.

- **Land acquisition and design for a Permanent Training Facility to meet fire department training requirements and support other city and regional requirements** – constant training is not only a necessity for firefighter and public safety, but is legislated through the Occupational Health and Safety Act.
 - Under the Occupational Health and Safety Act is the Section 21 Fire Service Advisory Committee with representation from the Ministry of Labour and the various fire service stakeholders. This committee produces guidelines for the fire service that deal with the overall health and safety of the firefighters and the public. Although these are guidelines, they are considered regulations under the OH&S Act by inspectors and the courts. They also set certain requirements for firefighter training.
 - The National Fire Protection Association Standards also has requirements for annual training to maintain certification in multiple disciplines both for firefighting operations and the specialty rescue disciplines. Some with minimum requirements that require 40 or more hours of annual training in order to remain current. These require props and facilities designed specifically for the desired outcomes
 - The 2003 inquest into the death of Barrie Fire Fighter Bill Wilkins recommended the development of a training facility in Barrie, and would enhance the health and safety of the firefighters and the public. This realistic training is irreplaceable for this profession as was determined by the Coroner’s Inquest into Bill Wilkins death.
 - The solution would be for Barrie Fire and Emergency Service to a permanent facility in the city limits, where on-duty crews could train

without the reliance on bringing in overtime staffing. There would also be the benefit of BFES revenue by offering the facility when not in use to other municipalities or agencies. The goal would be to have a multi-purpose, multi-scenario station concept that could be used by various City of Barrie Departments and could be used simultaneously by different users.

- **BFES, the Engineering Department, Corporate Asset Management and Water Operations recently concluded a Fire Protection and Water Supply Survey in conjunction with Fire Underwriters Survey** – The value of a Fire Protection and Water Supply Survey is multi-functional and will assist the departments listed and the residents and businesses in Barrie.
 - A Fire Protection and Water Supply Survey are used by the named departments to plan new infrastructure and improve existing infrastructure that needs replacing and upgrading. The survey considers; fire service delivery, fire prevention, and water delivery for firefighting operations and communications.
 - The last survey was conducted in 2004 by Fire Underwriters Survey (FUS). Since that time there have been major changes to the fire service and water supply throughout the city. As a result of the 2009 Fire Master Plan some work was completed on certain areas of the city where there is under-sizing of the current watermains.
 - The water supply for fire protection has increased dramatically since the 2004 Survey. The upgrade in watermains, the addition of the Surface Water Treatment Plant and the recently commissioned Sunnidale Reservoir are some of the improvements over the years.
 - The 2004 FUS noted on the lack of growth of the fire service compared to the growth of the city. Recent growth of the fire service in staffed apparatus and the addition of Station 5 will no doubt bring the service to a more sustainable position in going forward with a current survey.
 - The results of a Fire Protection and Water Supply Survey are communicated to insurance companies in Canada and are used to base the fire insurance premiums on residential and business insurance ratings. A positive report could result in lower fire insurance premiums for the City of Barrie taxpayers.
 - The report contained several recommendations for the City of Barrie to consider to improve its overall ratings.
- **Review and revise the Fire Master Plan** - Master Plans are living documents and must be reviewed on a constant and consistent basis to guide the department in reaching its strategic priorities.
 - Every year the department builds its business case for both operating and capital projects and processes. The Business Plan sets the direction and

objectives for the upcoming year. After Council passes the Business Plan, it would be an opportune time to review and revise the Fire Master Plan based on what has been accomplished over the past year and review expectations for the coming year.

- Changes must also be reviewed that affect the department and include but not limited to:
 - Growth
 - Changes in Legislation
 - Increased demands on the department
 - Efficiencies and effectiveness initiatives
 - Technology advancements
 - Fiscal responsibility
- Any major changes to the Fire Master Plan should be presented to Council for review and acceptance before implementation.

Long Term Objectives (5 -10 Years) 2020 – 2025

- **Phased construction (Phase 1) of the Fire Training Facility based on balancing demand and the Business Planning Process** – as previously recommended there is a need for the Training Facility in the City of Barrie to train and maintain the required training for members of the department.
 - It is proposed to construct a number of buildings and props, over a three year period, which will facilitate the training of firefighters to meet current recommended standards for firefighter certification and NFPA 1402 – Guide to Building Fire Service Training Centres.
 - It is suggested that the acquisition of an appropriately sized property of 12 -14 acres would meet the requisite needs of a Fire Training Facility and provide for possible future expansion.
 - It is proposed that if a site can be found in a location appropriate for the proposed permanent Station 5, the two projects could be linked on one site to reduce financial costs by co-habiting the two projects.
 - It also recommended that this facility contain areas for all fire attack classes including Class A and Class B burns, as well as other training props including a Driver Training Course, all of which have the possibility of being used to generate on-going income to recover operating costs.
 - Phase 1 would consist of:
 - Driver Training Course
 - Fire Tower (Class B burns – natural gas or propane)
 - Residential Burn House (Class A burns – wood, combustible materials)
 - Auto Extrication Area
 - Storage and Ancillary Shelter plus Parking and Road Facilities

- **Construction of the permanent Station 5 in the south-west quadrant** – the current Station 5 is in a leased commercial facility with a lease agreement that expires in 2021.
 - There was a demonstrated need in 2010 to proceed with a temporary Station 5 to enhance response times in the south-west quadrant of the existing boundaries and infrastructure at that time.
 - As the city develops the annexed lands and consistent with the Genivar Station Location Study conducted in 2012, a permanent Station 5 should be constructed in the recommended area.
 - As stated above, it is proposed that if a site can be found in a location appropriate for the proposed permanent Station 5 and the Training Facility, the two projects could be linked on one site to reduce financial costs by co-habiting the two projects.
 - Construction of a station could take as long as 12 - 16 months to complete, depending on site and design. All new stations in Barrie should be constructed to house a minimum of two apparatus, have facilities for at least two operating crews and provisions for additional Fire Prevention Officers to work out of, reducing the travel requirements and lead to efficiencies in the future.

- **Upgrade communications equipment and associated systems consistent with current and advanced technology** – as reflected in the Intermediate Objectives, advancing technology plays an important aspect of a modern Communications Centre.
 - One notable and evident aspect of today's technology is the shortened life cycle expectancy of the technology and the manufacturers support for these systems once newer systems and hardware are developed.
 - As new technology is launched, there will be increased dependency on the city to keep abreast of the changes and the effects on current operating systems.
 - Along with the above, will be the requirement to review and amend the service level agreements with all stakeholders.

- **Review staffing levels consistent with an organizational review of service delivery needs and anticipated growth in conjunction with the annual business planning process** – the City of Barrie is poised to experience substantial growth in the next decade with development of the south-end lands and future intensification in the established growth nodes.
 - In the past few years the province has changed several pieces of legislation and downloaded responsibility on the municipalities without any funding and limited support. Changes to the Propane Handling Act, the Fire Prevention and Protection Act, and Vulnerable Occupancies have

added workload to the municipal fire services. This trend is expected to continue.

- As the City of Barrie enters into another anticipated growth expansion, one of Councils directions is to develop city services in conjunction with the growth.
 - A review of the anticipated future service delivery needs should be conducted considering the anticipated growth of the department and the city and possible efficiencies. Business cases should be developed to be considered during the annual business planning process.
- **BFES, the Engineering Department, Corporate Asset Management and Water Operations completed Fire Protection and Water Supply Survey in conjunction with Fire Underwriters Survey in 2014** – The value of a Fire Protection and Water Supply Survey is multi-functional and will assist the departments listed and the residents and businesses in Barrie.
- A Fire Protection and Water Supply Survey are used by the named departments to plan new infrastructure and improve existing infrastructure that needs replacing and upgrading. The survey considers; fire service delivery, fire prevention, and water delivery for firefighting operations and communications.
 - The last survey was conducted in 2004 by Fire Underwriters Survey (FUS). Since that time there have been major changes to the fire service and water supply throughout the city. As a result of the 2009 Fire Master Plan some work was completed on certain areas of the city where there is under-sizing of the current watermains.
 - The water supply for fire protection has increased dramatically since the 2004 Survey. The upgrade in watermains, the addition of the Surface Water Treatment Plant and the recently commissioned Sunnidale Reservoir are some of the improvements over the years.
 - The 2004 FUS noted on the lack of growth of the fire service compared to the growth of the city. Recent growth of the fire service in staffed apparatus and the addition of Station 5 will no doubt bring the service to a more sustainable position in going forward with a current survey.
 - The results of a Fire Protection and Water Supply Survey are communicated to insurance companies in Canada and are used to base the fire insurance premiums on residential and business insurance ratings. A positive report could result in lower fire insurance premiums for the City of Barrie taxpayers.
 - The report contained several recommendations for the City of Barrie to consider to improve its overall ratings.
 - A business case needs to be developed to recommend an updated Fire Underwriters Survey be conducted to upgrade the ratings for the City of Barrie.

- **Develop a deployment strategy based on service delivery standards and legislative requirements with a full review scheduled for 2020** – a full review should be conducted in 2020 of the department’s deployment based on realistic population growth, intensification, building stock and legislative changes.
 - This current Fire Master Plan is based on assumptions of growth and intensification projections in 2013. A full review should be conducted every 5 years to keep the plan current and sustainable.
 - A comprehensive risk and gap analysis should be conducted to ensure effectiveness and efficiencies in the department branches are current and realistic.
 - Adjust the objectives consistent with the deployment strategy using current data and report to Council.

- **Continued phased construction of the Fire Training Facility** - as previously recommended there is a need for the Training Facility in the City of Barrie to train and maintain the required training for members of the department.
 - It is proposed to construct a number of buildings and props, over a three year period, which will facilitate the training of firefighters to meet current recommended standards for firefighter certification and NFPA 1402 – Guide to Building Fire Service Training Centres.
 - Phase 2 would consist of:
 - Drafting Pond and ponds for settlement and storm management
 - Trench Rescue Prop
 - Structural Collapse Prop
 - Confined Space Prop
 - Storage plus Road and Parking Facilities
 - Stretched Fabric Covered Structure
 - Tanker/Railcar Prop
 - Spill Containment Prop
 - Ring Road and Fire Hydrant Loop

- **Review and Revise the Fire Master Plan** - Master Plans are living documents and must be reviewed on a constant and consistent basis to guide the department in reaching its strategic priorities.
 - Every year the department builds its business case for both operating and capital projects and processes. The Business Plan sets the direction and objectives for the upcoming year. After Council passes the Business Plan, it would be an opportune time to review and revise the Fire Master Plan based on what has been accomplished over the past year and review expectations for the coming year.
 - Changes must also be reviewed that affect the department and include but not limited to:
 - Growth
 - Changes in Legislation

- Increased demands on the department
- Efficiencies and effectiveness initiatives
- Technology advancements
- Fiscal responsibility
- Any major changes to the Fire Master Plan should be presented to Council for review and acceptance before implementation.

Outlook to 2031

- **Continued phased construction of the Fire Training Facility** - as previously recommended there is a need for the Training Facility in the City of Barrie to train and maintain the required training for members of the department.
 - It is proposed to construct a number of buildings and props, over a three year period, which will facilitate the training of firefighters to meet current recommended standards for firefighter certification and NFPA 1402 – Guide to Building Fire Service Training Centres.
 - Phase 3 would consist of;
 - Teaching and Administrative Centre
- **Upgrade communications equipment and associated systems consistent with current and advanced technology** - as reflected in the Intermediate and Long Term Objectives, advancing technology plays an important aspect of a modern Communications Centre.
 - One notable and evident aspect of today’s technology is the shorten life cycle expectancy of the technology and the manufacturers support for these systems once newer systems and hardware are developed.
 - As new technology is launched there will be increased dependency on the city to keep abreast of the changes and the effects on current operating systems.
 - Along with the above, will be the requirement to review and amend the service level agreements with all stakeholders.
- **Replacement of Station 2 – Bell Farm Rd.** – end of life cycle for this facility.
 - This facility was built in 1972 and underwent a renovation in the early 2000s. This facility will be 50 years old in 2022 and is not considered the best design for a fire station.
 - Built under the building code of the day, it does not meet modern day building code requirements for fire stations, that are required to meet post-disaster building standards and requirements.
 - A review should be conducted at that time on possible relocation or rebuild on the current site.

SECTION 8 – SUMMARY

Barrie Fire and Emergency Service has been successful in maintaining a reasonable pace with the development of the community and improved fire protection capabilities, as is witnessed in its accomplishments to date since the 2009 Fire Master Plan. With any organization faced with rapid changes and subject to fiscal pressures not only in the municipality but also provincial, federal and globally, the challenges and successes must be reviewed regularly to ensure resources are being used effectively and efficiently.

The Fire Master Plan indicates a number of areas that will require attention in the future, however, it should be noted that no serious unexpected risk to the citizens exists currently. The City of Barrie is expected to undergo rapid growth starting in the next few years. One of the challenges will be for BFES to keep pace with the growth and maintain the current service levels. Incident call volumes will rise and simultaneous responses will increase proportionately adding pressure.

The Fire Prevention/Public Education Branch will see an increase in workload as a result of anticipated legislative changes coming and certainly experience more legislated request and complaint inspections as the city enters this rapid growth mode.

Barrie Fire and Emergency Service is a well-respected fire service in the Province of Ontario, recognized by its peers for its innovative approach to service delivery to its citizens. BFES, through its month citizen surveys of individuals who require our service consistently rate the service as high (32%) and Medium (51%).

Adoption of the recommendations will improve existing service levels for the future and provide better use of existing resources to meet the expectations of Council and the citizens of Barrie.

John Lynn, Fire Chief

APPENDIX A

Acronyms and Glossary

Index of Acronyms

O AFC	Ontario Association of Fire Chiefs
CCPA	Canadian Chemical Protection Association
CBRNE	Chemical, Biological, Radiological, Nuclear and Explosive
CIC	Coordination and Information Centre
CSA	Canadian Standards Council
DDS	Director of Disaster Services
DND	Department of National Defense
DSS	Disaster Social Services
EMS	Emergency Medical Services
ESPC	Emergency Services Planning Committee
EOC	Emergency Operations Centre
EUB	Energy and Utilities Board
EPWS	Early Public Warning System
ERCC	Emergency Response Communications Centre
ERD	Emergency Response Department
FCO	Fire Commissioner's Office
FUS	Fire Underwriters Survey
IC	Incident Commander
ICP	Incident Command Post
ICS	Incident Command System
MCI	Mass Casualty Incident
MCR	Medical Co-Respondent
MEP	Municipal Emergency Plan
MOH	Medical Officer of Health
MVC	Motor Vehicle Collision
NGO	Non-Governmental Organization
OFCA	Ontario Fire Chiefs Association
OH&S	Occupational Health and Safety
OOFM	Office of the Ontario Fire Marshal
PIO	Public Information Officer
PSEPC	Public Safety and Emergency Preparedness Canada
RCMP	Royal Canadian Mounted Police
REOC	Regional Emergency Operations Centre
SOG	Standard Operating Guidelines
SOP	Standard Operating Guidelines

Glossary of Terms

Alert	Is a phase of emergency response in which there is a possibility of an emergency situation occurring within the near future? During the 'Alert' phase of the response, selected Emergency Operations Centre personnel monitor the situation and provide informational and instructional bulletins to department, agencies, and the general public, as appropriate.
Council or Councils	The Councils of the City of Barrie
Declaration of a State of Local Emergency	A resolution of the Disaster Services Committee to create a Temporary legal state in which extraordinary action may be taken to address a major emergency or disaster.
Director of Disaster Services	The Director of Disaster Services who assumes the position of EOC Director upon activation.
Disaster	An occurrence of a natural catastrophe, technological accident, or human caused event that has resulted in severe property damage, deaths, and/or multiple injuries. Beyond the capability of the Town to handle with its resources.
Emergency Operations Centre (EOC)	The protected sites from which civil officials coordinate, monitor, and direct emergency response activities during an emergency or disaster.
Emergency	Any occasion or instance that warrants action to save lives and to protect property, public health and safety. A situation is larger in scope and more severe in terms of actual or potential effects.
Emergency Services Planning Committee	Emergency Services Planning Committee made up of representatives of all Regional Partners and Stakeholders
Evacuation	Organized, phased, and supervised dispersal of people from dangerous or potentially dangerous areas.

Evacuees	All people removed or moving from areas threatened or struck by a disaster.
Fire Chief	Fire Chief who is responsible for a designated area within the Municipality
Governance Body	Council members of the City of Barrie and Stakeholders
Hazard Analysis	A document which identifies the local hazards that have caused, or possess the potential to adversely affect public health and safety, public and private property, or the environment.
Hazard	A potential threat to the health or life of individuals, to property and/or to the ability of individuals to maintain their livelihoods and regular daily activities. Hazards could include natural forces (such as wind, drought, earthquakes etc.) or technologically induced threats (such as aircraft and highway mishaps, industrial accidents, explosions etc.)
Impact	The effect that each hazard will have on people such as injury and loss, adverse effects on health, property, the environment and the economy.
Incident	A situation that is limited in scope and potential effects.
Incident Commander (IC)	The individual responsible for making operational decisions to manage an incident.
Incident Command Post (ICP)	A location from which the Incident Commander directs the site response to the emergency. Incident objectives, strategies and tactics for the site are formulated and directed from the ICP
Incident Command System (ICS)	A standardized organizational structure used to command control, and coordinate the use of resources and personnel that have responded to the scene of an emergency.
Interface Fire	A fire in an area where combustible wildland fuels are found adjacent to houses and other structures.

Level of Service Bylaw	Defines service and identifies roles and responsibilities
Local Authority	Councils of the Regional Partnership
Mass Care	The actions that are taken to protect evacuees and other disaster victims from the effects of the disaster. Activities include providing temporary shelter, food, medical care, and other essential life support needs to those people that have been displaced from their homes because of a disaster or threatened disaster.
Response	Those measures undertaken immediately after an emergency has occurred, primarily to save human life, treat the injured, and prevent further injury and losses. They include response plan activation, opening and staffing the EOC, mobilization of resources, issuance of warnings and direction, provision of aid, and may include the declaration of a State of Local Emergency.
Risk	The chance or likelihood of an occurrence based on the vulnerability and known circumstances of a community.
Standard Operating Guidelines	A set of instructions constituting a directive, covering those (SOG) features of operations which lend themselves to a definite, step-by-step process of accomplishment.
Wildland Fire	A wildfire, also known as a wildland fire, forest fire, vegetation fire, grass fire, peat fire, bushfire, or hill fire, is an uncontrolled fire often occurring in wildland areas, but which can also consume houses or agricultural resources.

APPENDIX B

Legislation Affecting the Fire Service

Fire Protection and Prevention Act (new Carbon Monoxide Regulations added)

Occupational Health and Safety Act

OH&S Section 21 Fire Service Committee Guidelines

Municipal Act

Propane Handling Act

Environmental Protection Act

Emergency Management and Civil Protection Act

Employment Standards Act

Labour Relations Act

Municipal Freedom of Information and Protection Act

Ontario Fire Code (new regulations for vulnerable occupancies)

Ontario Building Code

Coroners act

Workplace Insurance Safety Act

Ontario Fire Marshal's – Public Fire Safety Guidelines

Highway Traffic Act

Canadian Safety Association

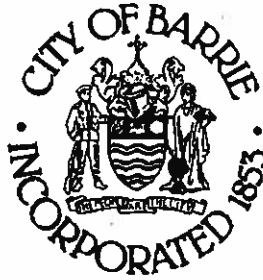
National Fire Protection Association Standards

New Legislation before Parliament

- Changes to the FPPA Labour Relations Amendments
- WSIB Presumptive Legislation - PTSD

APPENDIX C

Establishing and Regulating By-law



BY-LAW NUMBER 2012-200

A By-law of the Corporation of the City of Barrie to establish and regulate the Barrie Fire and Emergency Service and to repeal By-law 2002-264 as amended.

WHEREAS the Municipal Act, R.S.O. 1990, c. M45, paragraph 2210.31 and the Fire Protection and Prevention Act, 1997, S.O. 1997, c.4 as amended provides that the Council of a local municipality may by by-law establish and regulate a fire department;

AND WHEREAS on October 28, 2002 City Council passed By-law 2002-264 to establish and regulate the Barrie Fire and Emergency Service;

AND WHEREAS by motion 12-G-293, the Council of the Corporation of the City of Barrie deems it expedient to repeal By-law 2002-264 and amending By-law 2008-119 and to pass a new By-law establishing and regulating the Barrie Fire and emergency Service;

NOW THEREFORE, the Council of the Corporation of the City of Barrie enacts as follows:

DEFINITIONS:

1. In this By-law, unless the context otherwise requires,
 - a) "Approved" means approved by council;
 - b) "Branch" means a subdivision of the Department. The Branches of Barrie Fire and Emergency Service are;
 - Administration,
 - Operations,
 - Fire Prevention/ Public Fire and Life Safety,
 - Training,
 - Communications;
 - c) "Collective Agreement" means;
 - A collective labour agreement between the Corporation and the Fire Fighters Association made under the Fire Protection and Prevention Act, R.S.O. 1997 c.4;
 - Any other collective labour agreement between the Corporation and the certified bargaining agent representing other members of the department.
 - d) "Corporation" means The Corporation of the City of Barrie;
 - e) "City of Barrie" means the land within the geographical boundaries of the City;
 - f) "Council" means the Council of The Corporation of the City of Barrie;
 - g) "Chief Administrative Officer" means the Chief Administrative Officer of the Corporation appointed by by-law of Council;
 - h) "Department" means the Barrie Fire and Emergency Service;
 - i) "Deputy Fire Chief" means the person(s) appointed by by-law of Council to act in the place of the Fire Chief in the Fire Chief's absence, or in the case of a vacancy in the position of Fire Chief;
 - j) "Designate" means a member of the Department who is designated as an Assistant to the Fire Marshal in accordance with the Fire Protection and Prevention Act, R.S.O. 1997, c.4, part 2, 6 (6);
 - k) "Fire Chief" means the person appointed by by-law of the Council to act as Head of the Department; and, "is ultimately responsible to the council of the municipality that appointed him or her for the delivery of fire protection services" through the General Manager of Community Operations in accordance with the Fire Protection and Prevention Act, R.S.O. 1997, c.4, part 2, 6(3);

- l) "Fire and Emergency Service" means the emergency services provided by the City of Barrie including fire suppression, fire prevention, public education, communications, preservation of property and the environment, public assistance, technical rescue, hazardous materials response, tiered medical response, fire investigations and training of persons involved in the provision of those services;
- m) "Fire Fighters Association" means the Barrie Professional Fire fighters Association;
- n) "Fire Prevention Officer" means a person appointed to the Fire Prevention Branch for the provisions and delivery of Fire Prevention Services;
- o) "Full-time Fire Fighter" means a person regularly employed in the Department on a full-time salaried basis and assigned exclusively to a role or duty under the department mandate and the Fire Protection and Prevention Act;
- p) "Member" means any employee of the Corporation who is employed in the Department;
- q) Simcoe County Mutual Aid Agreement(s)" means a reciprocal agreement entered into between the Fire Departments within the municipalities of Simcoe County whereby one or more municipalities would, upon request, provide fire and/or emergency support service to another to combat any emergency if it could not be handled by the one municipality alone. This does not include special technical services that municipalities may enter into agreements under authority of the Municipal Act or provisions contained in the Fire Protection and Prevention Act.

ENACTMENT:

- 2. This by-law recognizes the formation of the Barrie Fire Department on October 28, 1957 by the passing of By-law 2880 and all subsequent relevant by-laws and by the passing of this by-law the continuation of the Barrie Fire and Emergency Service.
- 3. The Department for the City of Barrie to be known as the Barrie Fire and Emergency Service is hereby established and the head of the Department shall be known as the Fire Chief.
- 4. The Department shall be structured in conformance with the approved Organizational Chart, attached as "Schedule A", forming part of this by-law or as amended from time to time by Council.

MISSION, VISION AND VALUES:

- 5. The Department's Mission is to protect the lives, well being and property of the people of Barrie through dedication to life safety, commitment to community service and the preservation of the environment.
- 6. The Department's Vision is to be a dynamic organization recognized and respected by the community as being on the leading edge of service provision.
- 7. The Department's Values are; Safety, Professionalism, Commitment, Accountability, Efficiency, Integrity, and Innovation.

MANDATE:

- 8. The mandate of the Department includes provision of the following services:
 - a) Fire Prevention
 - b) Public Education
 - c) Fire Suppression – Preservation of Life, Property and the Environment
 - Technical Rescue
 - Control of Hazardous Materials Incidents
 - Extrication and Rescue
 - Land and Vessel Based Ice/Water Rescue
 - High/Low Angle and Confined Space Rescue
 - Tiered Medical Response
 - Trench Rescue
 - Elevator Rescue
 - d) Public Assistance
 - e) Fire Cause and Origin Investigation
 - f) Training

- g) Communications/Dispatching Services
- h) Any other mandate or amended mandate as approved by Council

CLASSIFICATION AND TASK OBJECTIVE OF THE MANDATED SERVICES:

9. The classification and task objectives of the mandated services shall be as generally described in "Schedule B", attached and forming part of this by-law.

APPOINTMENTS:

10. The following appointments require the passing of a by-law:

- a) Fire Chief

The Fire Chief is ultimately responsible to Council through the General Manager of Community Operations and the Chief Administrative Officer for the proper administration and operation of the Department and shall carry out the duties of the Fire Chief as outlined in the by-law appointing the Fire Chief, as required by the Fire Protection and Prevention Act, 1997.

- b) Deputy Fire Chief(s)

In the absence of the Fire Chief, the Deputy Fire Chief(s) shall assume responsibility for the administration and operation of the Department. Otherwise, the duties of the Deputy Fire Chief(s) shall be as outlined in the by-law appointing the Deputy Fire Chief.

ENFORCEMENT:

11. The Fire Chief, or designate, shall be authorized pursuant to the Fire Protection and Prevention Act to enforce, and/or shall comply with:

- a) The provisions of the Fire Protection and Prevention Act, R.S.O. 1997 c. 4;
- b) All Corporation by-laws relating to fire services;
- c) The provisions of the Department mandate;

12. The Fire Chief shall take all proper measures for the prevention, control and extinguishment of fires and the protection of life and property and shall exercise all powers mandated by Fire Protection and Prevention Act, and the Fire Chief shall be empowered to authorize:

- a) Board up, barricade or otherwise protect any building, structure or property, in order to guard against fire, accident or other danger or risk; and
- b) Pull down or demolish any building or structure, in order to prevent the spread of fire, accident or other danger or risk. The Corporation may recover expenses incurred as a result of such necessary action in a manner provided by the Municipal Act, the Fire Protection and Prevent Act and/or municipal by-laws, and
- c) Enter and inspect any building or premises in the City of Barrie and direct such alterations to be made and such precautions to be taken as they deem necessary or the purpose of complying with any Statues or Regulations made for the better protection of life and property.

13. The Fire Chief shall implement all approved policies and shall develop such standard operating guidelines, general orders and departmental rules as necessary to implement the approved policies and to ensure the appropriate care and protection of all department personnel and department equipment.

14. The Fire Chief shall review periodically all policies, orders, rules and operating guidelines of the department and may establish an advisory committee consisting of such members of the department as the Fire Chief may determine from time to time to assist in these duties.

15. The Fire Chief shall submit to the General Manager of Community Operations, the Chief Administrative Officer and Council for approval, the annual budget estimates for the department; an annual report and any other specific reports requested by the General Manger of Community Operations, the Chief Administrative Officer or Council.

16. Each branch of the Department is the responsibility of the Fire Chief and is under the direction of the Fire Chief or a member designated by the Fire Chief. Designated members shall report to the Fire Chief on branch activities under their supervision and shall carry out all orders of the Fire Chief.

17. Where the Fire Chief designates a member to act in the place of an officer in the department, such member, when so acting, has all of the powers and shall perform all duties of the officer replaced.

DISCIPLINE:

18. The Fire Chief, may reprimand, suspend or recommend dismissal of any member for non compliance with any of the provisions of any applicable legislation, by-law, any of the Department's policies or standard operating guidelines, rules and regulations or standing orders, or with any of the Corporation's rules, regulations or code of conduct subject to the current Collective Agreement with the Fire Fighters Association, and the Fire Protection and Prevention Act.

HIRING:

19. The complement of the Department shall be determined by Council and the hiring practices, without discrimination, shall be those hiring practices as determined by the Corporation as they apply to the department.

REMUNERATION AND WORKING CONDITIONS:

20. Working conditions and remuneration for all firefighters defined in Part IX of the Fire Protection and Prevention Act shall be determined by Council in accordance with Part IX of the Fire Protection and Prevention Act.

MUTUAL AID:

21. The Department shall not respond to a call with respect to a fire or other emergency outside of the City of Barrie except with respect to a fire or emergency that:
- a) In the opinion of the Fire Chief or designate, threatens property in the City of Barrie or property that is outside the City of Barrie and that is owned or occupied by the Corporation;
 - b) Is in a municipality or on other property with which an approved agreement has been entered into to provide fire protection or technical rescue services;
 - c) At the discretion of the Fire Chief, to a municipality authorized to participate in the Simcoe County Mutual Fire Aid Agreement established by a fire coordinator appointed by the Fire Marshal or any other similar reciprocal plan or program, to provide fire protection or technical rescue services;
 - d) Is on property outside the City of Barrie, if the Fire Chief or designate determines that immediate action is necessary to preserve and protect life and/or property and the correct department is notified and/or assumes command. The Fire Chief shall subsequently inform the Chief Administrative Officer of such response.

EMERGENCY FIRE DISPATCH AGREEMENTS:

22. The Mayor and City Clerk in consultation with the Fire Chief be authorized to enter into Emergency Fire Dispatch Agreements with other municipalities, or extend current agreements, allowing the Department to dispatch another municipality's emergency vehicles.

EXTERNAL MUNICIPAL AND AGENCY AGREEMENTS:

23. The Fire Chief may negotiate and the Mayor and City Clerk execute agreements with other municipalities or agencies to provide or receive services that contribute to the protection of life, property and the environment on a reciprocal or pay for service basis where such agreements contain terms and conditions that are to the satisfaction of the Director of Legal Services and the Director of Finance (and other terms in FES003-10).

RISK AND SAFETY MANAGEMENT PLANS – PRPROPANE OPERATORS:

24. That the Fire Chief, Deputy Fire Chief, or their authorized representative/designate of Barrie Fire and Emergency Service be delegated the authority to approve Risk and Safety Management Plans (RSMP) submitted by propane operators related to the storage and handling of propane, with approval of such plans to be subject to the satisfaction of the Planning Services Department, Building Services Department and the Community Emergency Planner.

BY-LAWS REPEALED:

25. By-law 2002-264 and all amendments thereto is repealed
26. **THAT** this By-law shall come into force and have effect immediately upon the final passing thereof.

READ a first and second time this 19th day of November, 2012.

READ a third time and finally passed this 19th day of November 2012.

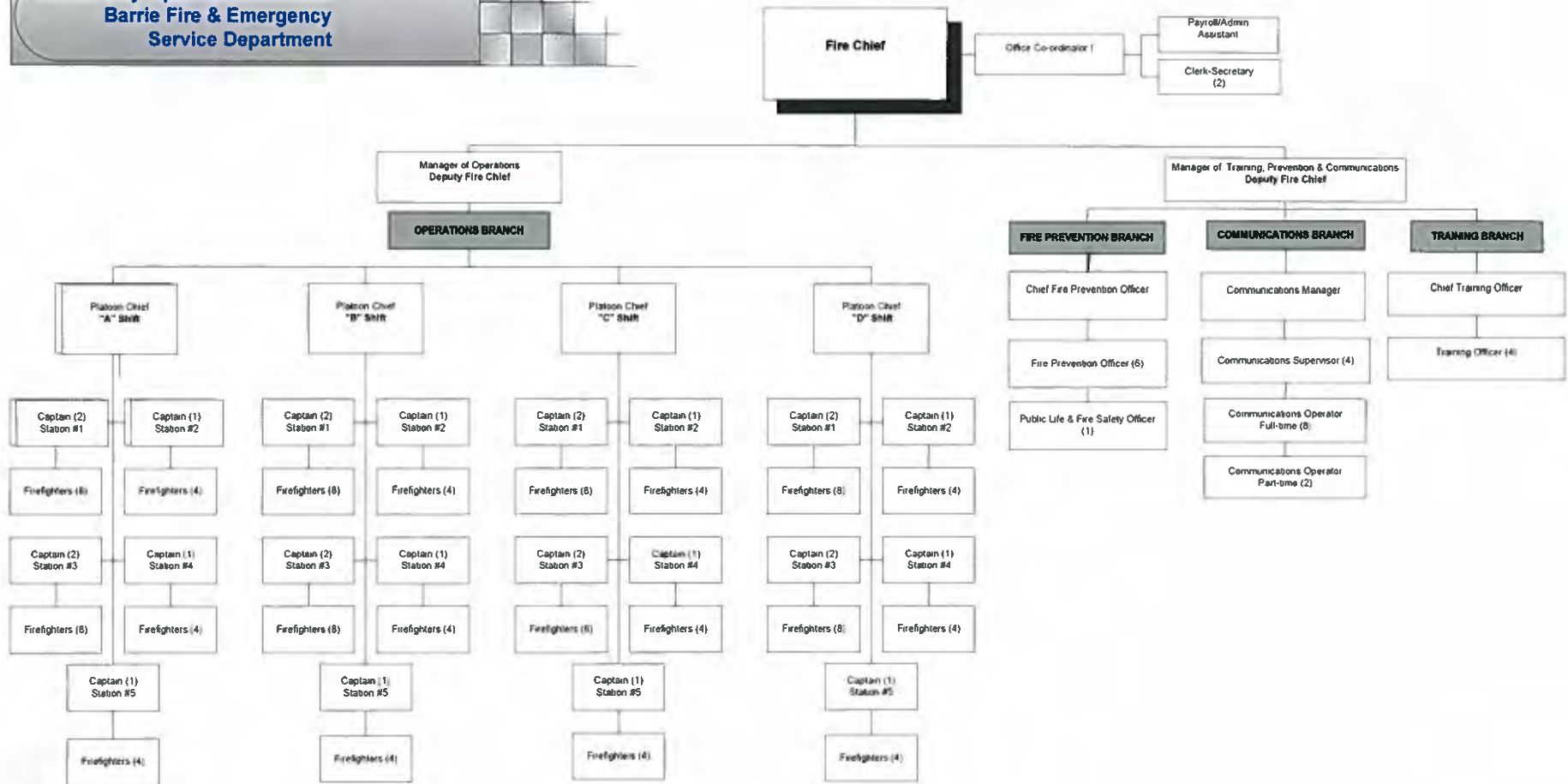
THE CORPORATION OF THE CITY OF BARRIE

MAYOR - J.R. LEHMAN

CITY CLERK - DAWN A. MCALPINE

6
SCHEDULE "A"

Bill No. 207



SCHEDULE "B"**CLASSIFICATION AND TASK OBJECTIVES OF THE MANDATED SERVICES****1. FIRE PREVENTION:**

Is the enforcement of the Provincial Statutes, Municipal Codes and By-laws with the sole purpose of reducing the risk of serious fires and life threatening incidents. The primary code to be enforced is the Ontario Fire Code which is a maintenance code to be used in existing or new buildings to cover:

- a) All of the fire protection features built into modern buildings at the time of construction such as sprinkler systems, standpipe systems, access facilities for emergency vehicles, fire separations, flame spread ratings, storage of flammable and combustible materials, industrial processes, etc., are all part of plans review and building permit at the time of construction;
- b) Continued enforcement to ensure maintenance throughout the building's life, otherwise, an occupancy can be rendered totally useless in respect to protection features;
- c) Enforcing legislation covering propane dispensing locations, day care facilities, nursing homes, plan approvals, material storage and use, basically any process followed or used which has a fire potential;
- d) Use of powers to enter upon property without warrant as granted under legislation to an Assistant to the Fire Marshal, in this case a Fire Prevention Officer. This power can be used with and/or without a complaint and is used to inspect all buildings and premises within the jurisdiction of the municipality and for such purpose may, at all reasonable hours, enter into and upon the building and premises for the purpose of examination, taking with him/her, if necessary, a constable or other police officer or such other assistants as he/she considers proper;
- e) Review plans for planned/proposed development to ensure compliance with the Ontario Fire Code and other relevant legislation ensuring the building life safety, fire detection and prevention systems meet codes and by-laws within the municipality.
- f) Comply with legislative statutes and regulations, by-laws and City of Barrie policies governing the delivery of service.

2. PUBLIC EDUCATION

Public Education is the first line of defence of the department. Public awareness to life and fire safety reduces the potential of an incident happening. Public Education is mandated by the Fire Protection and Prevention Act (FPPA), Section 2.1:

- a) Every municipality shall, establish a program in the municipality which 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.
- b) Responsible for interpreting fire loss statistics and a simplified fire risk assessments to develop fire safety programs, initiatives and resources that will inform and direct the general public on fire safety, fire hazards, smoke alarms and escape planning;
- c) Responsible for identifying and outreach to high risk groups and creating special fire safety programs to meet their specific needs.
- d) Coordination of media enquiries, interviews, news conferences, media advisories and news releases for the public regarding fire safety;
- e) Develop public service announcements on public fire safety issues for distribution to all Barrie newspapers, radio stations and television stations

3. FIRE OPERATIONS

Preservation of life, property and the environment is the primary function of the Operations Branch:

- a) Intervene as soon as feasible so as to protect life, property and the environment from all perils arising within the area of jurisdiction, through education, training, containment, rescue and suppression activities;
- b) Establish a desired standard of a 6 minute road response to emergency incidents 90% of the time;
- c) Respond to all emergency incidents within sufficient staff and apparatus to contain, perform rescue and mitigate the incident in a timely fashion as may be determined by industry best practices or guidelines;
- d) Comply with legislative statutes and regulations, by-laws and City of Barrie policies governing the delivery of service.

4. TECHNICAL RESCUE:

Hazardous Materials Response

Provide rescue, initial control, containment and mitigation of hazardous materials incidents, to NFPA 473 Operations Level, to alleviate any possibility of further contamination, ignition or explosion. This is done through intervention with proper personal protective equipment and training to NFPA 473 to minimize the possible contamination of the public, operating personnel and the environment. These situations could involve chemical, biological, radioactive, nuclear and explosive agents (CBRNE).

Extrication and Rescue

Essentially, is the removal of victims from a place of entrapment to an area of safety. Primarily used during vehicle accidents, but also includes farm and industrial accidents or where a person is entangled in a piece of equipment or machinery. The prime function is to extricate the victim by removing the entrapment from around them so they may be transported to a hospital by paramedics. There are circumstances where paramedic personnel may have to stabilize victims prior to extrication.

Land and Vessel Based Ice/Water Rescue

This involves fire fighters entering onto the ice or into the water secured to land or a vessel to provide surface ice/water rescue. Water rescue is limited to surface rescue. Personnel wear protective equipment as prescribed in Standard Operating Guidelines and only personnel trained to perform or operate a vessel are allowed to perform this type of rescue.

High/Low Angle and Confined Space Rescue

This combines the use of rope and associated equipment to rescue persons either in high-angle or low angle situations. This can be either descent or ascent. Confined space rescue is the use of rope rescue in areas of confinement and has the added possibility of potential toxic or hazardous environments.

Tiered Medical Response

Is an agreement with Paramedic Services to provide response and treatment to a predetermined criteria of patient signs and symptoms. Patient treatment includes first aid, Cardio Pulmonary Resuscitation, Automatic External Defibrillation, oxygen therapy and delegated medications prior to the arrival of paramedic services, or transfer to a health care facility.

Trench Rescue

Trench rescue is a technical rescue that involves the rescue of persons from a trench collapse that has entrapped the person. This includes the removal of the spoil pile, shoring of the trench using specialized equipment and entering the trench to rescue the person.

Elevator Rescue

Rescuing persons trapped in elevators due to malfunction or power outage.

5. PUBLIC ASSISTANCE:

Is a catch-all for any assistance offered to the public which doesn't fall into a definitive category (branches down over wires, water leaking into electrical panels, etc.), anything which requires the Department to respond, offer advice or assistance and assist with life, environment and property preservation.

6. FIRE CAUSE AND ORIGIN INVESTIGATIONS:

To ascertain the origin and cause of all fires which occur within the municipality and report such findings to the Fire Marshal within 48 hours. Under specific conditions, gaseous explosions, fire deaths, large loss fires of \$500,000 or over, suspicious fires, fire crimes, fires of unusual circumstance, fires of public interest, fires involving grow ops or drug labs, fires in buildings containing vulnerable occupants or multi-residential occupancies, the Investigative Branch of the Fire Marshal's Office is called to carry out a complete investigation. During such an investigation, the investigators try to determine the source of ignition, cause, interview witnesses, lay charges in court, or follow any other procedure required to bring the matter to a successful conclusion. Such an investigation could include a full task force approach that may involve personnel from many agencies, i.e. Fire Marshal, Police, Insurance Investigators, Crown Attorneys, etc.

7. TRAINING:

The Training Branch is responsible for the development and implementation of educational programs for department personnel, so as to assist them in acquiring the knowledge, skill and experience necessary to do their jobs safely. Training is responsible for ensuring training is to legislated requirements, standards and best practices, under the various legislations and accepted standards relating to the fire service.

8. COMMUNICATIONS/DISPATCHING SERVICES:

The Communications Branch is responsible for the receipt of fire & emergency related calls for the Barrie Fire and Emergency Service and for those municipalities or agencies with which agreements are in effect. The Branch is responsible for dispatching personnel, units, apparatus and equipment as required. Performs 911 related functions as assigned in both call taking and dispatching capacities. Monitors all emergency and non-emergency radio communications between Fire Department units; confirms the accurate transmission of information between these units and other communication centers or agencies. Provides information regarding buildings, building contents, building occupants, hazardous materials, etc. to dispatched units and/or personnel.

9. OTHER:

Any other mandate or amended mandate as approved from time to time by Council.

APPENDIX D

Financial Matrix

2014 FIRE MASTER PLAN - FINANCIAL MATRIX

OPERATING BUDGET:											
Facility	Fire Master Plan Financial Item	Notes	2014 Approved Budget	2015 Proposed Budget	2016 Proposed Budget	2017 Proposed Budget	2018 Proposed Budget	2019 Proposed Budget	2020 Proposed Budget	2021 Proposed Budget	2022 Proposed Budget
Fire Operations Annual Operating Budget:			23,140,918	23,835,146	24,601,700	25,494,251	28,682,926	30,339,861	31,250,057	32,187,559	33,230,436
	Hire 1 Public Education Officer	Pro-rated to 1/2 year for 2015		50,000	50,000						
	Outfit Public Education Officer			4,000							
	Hire 2 Fire Prevention Officers	Pro-rated to 1/2 year for 2016			100,000	100,000					
	Outfit Fire Prevention Officers				8,000						
	Support Staff	Hire 1 Equipment Coordinator			100,000						
	Administration Staff	1 additional FT Clerk Secretary			60,000						
Station 6	Hire 20 Fire Fighters	To staff the new station fire apparatus *Annual salaries pro-rated for 3/4 for 2017				1,500,000	500,000				
Station 6	Facility Operating Costs	Pro-rated to 1/2 year for 2017				33,250	33,250				
	Hire 8 District Chiefs	2 District Chiefs per shift (North and South) pro-rated to 3/4 year for 2017				720,000	240,000				
	Outfit 28 New Hires					154,000					
Training	Facility Operating Costs									75,000	
Training	Training equipment									50,000	100,000
Station 1	Hire 20 Fire Fighters										2,000,000
	Outfit 20 New Hires										110,000
Development Charges for Outfitting New Hires				-2,640	-5,280	-101,640					-72,600
Revised Fire Operations Annual Operating Budget:			23,140,918	23,886,506	24,914,420	27,899,861	29,456,176	30,339,861	31,250,057	32,312,559	35,367,836
Impact of Fire Master Plan on Fire Operations Annual Operating Budget:			0.0%	0.2%	1.3%	8.6%	2.6%	0.0%	0.0%	0.4%	6.0%

Operating Budget Notes:

- Annual financial budgets beyond 2013 have been prepared for the master plan financial matrix exercise and have not been formally approved.
- Annual projection assumptions: Fire salaries will increase 3% based on history of contract rate increases. As salaries and benefits are 85% of the annual gross expenditures the annual increase projection will be 3% overall.

CAPITAL BUDGET:											
Facility	Fire Master Plan Financial Item	Notes	2015 Proposed Budget	2016 Proposed Budget	2017 Proposed Budget	2018 Proposed Budget	2019 Proposed Budget	2020 Proposed Budget	2021 Proposed Budget	2022 Proposed Budget	
	Public Education Van	Addition - Growth	35,000								
	Fire Prevention Cars (2)	Addition - Growth		70,000							
	District Chief Cars (2)	Addition - Growth				120,000					
	Marine Boat	Addition		250,000							
	Traffic Pre-emption Link	Replacement & upgrade	100,000								
Station 4	Renovate and Expand existing structure	Add female quarters and expand to accommodate 2 crews of up to 10 firefighters	325,000								
Station 3	Expand existing structure	Addition of third apparatus bay and expand to accommodate 2 crews of up to 10 firefighters		575,000							
Station 6	Pumper for fire station in south-east	Addition - Growth - Includes cost of apparatus equipment		300,000	425,000						
	Construction of new fire station in the south-east quadrant of the City	Land acquisition	600,000								
		Design		1,500,000							
		Construction			3,000,000						
	Communications infrastructure				90,000						
	Communications radios	Radios, hall alerting and other related equipment			40,000						
Training	Construction of a training facility	Land acquisition				2,000,000					
		Construction Yr 1				2,500,000					
		Construction Yr 2					9,600,000				
Training	Communications infrastructure					150,000	150,000				
						600,000					
							1,500,000				
Station 5	Construction of a permanent station 5 in the south-west quadrant of the City								3,000,000		
										7,000	
Radio Growth Coverage	Upgrade SWTP tower	Upgrade voting receiver to full simulcast site					200,000				
Station 1	Purchase pumper	To address growth to maintain service delivery needs - includes cost of apparatus equipment							300,000	425,000	
Total Capital Budget			1,060,000	2,695,000	3,555,000	2,120,000	3,250,000	11,450,000	3,307,000	425,000	27,862,000
Projected Development Charges			-400,574	-1,179,642	-2,065,950	-1,337,348	-1,955,556	-7,002,151	-2,081,721	-173,477	-16,196,417
Total Funding \$ Required			659,426	1,515,358	1,489,050	782,652	1,294,444	4,447,849	1,225,279	251,523	11,665,583

Notes:

- 2014 to 2022 capital budgets based on growth capacity and expansion coverage

May-14

APPENDIX E

Genivar Station Location

City of Barrie Fire Station Location Study

Project No. 121-20497-00

FINAL

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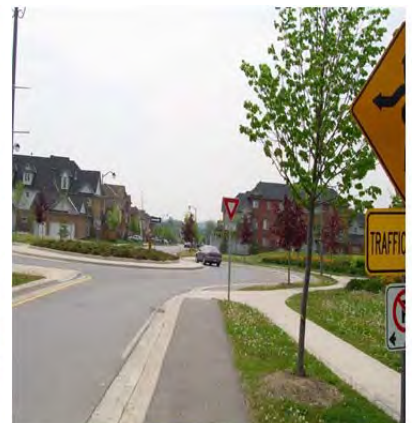


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1. Introduction

In 2009, the City of Barrie reviewed their Fire Master Plan in order to draft a vision for 10-years into the future on how the Fire Department should proceed in completing its goals. Since this latest revision the City of Barrie has annexed lands from the Town of Innisfil, which has resulted in a modification to the service area of the Fire Department and these lands will also represent important new residential and employment lands. As part of the planning effort being undertaken to integrate the Annexed Lands the City retained GENIVAR to undertake a Fire Station Location Study.

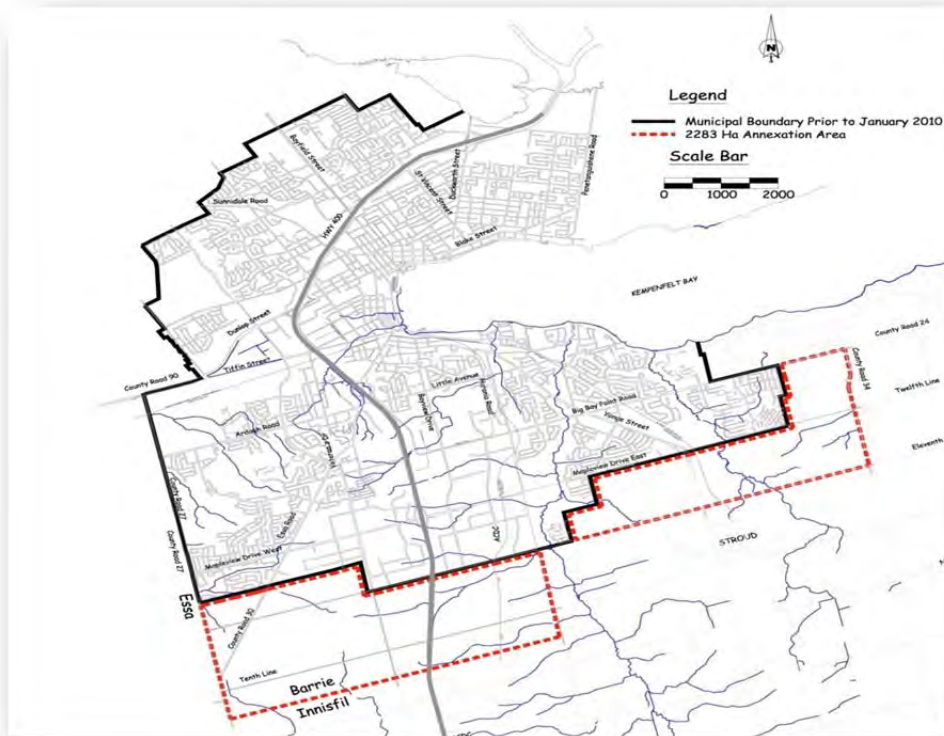
This Fire Station Location Study includes the following tasks:

- Review of the 2009 Fire Master Plan
- Development of a spatial network analysis model
- Identification of the number and locations of required fire stations for 2031
- Provide location of future training center based on the needs required by the 2009 Fire Master Plan

On January 1, 2010, after passage and adoption of the Barrie-Innisfil Boundary Adjustment Act, Barrie annexed 2,293 hectares of land from the Town of Innisfil, expanding the City to the south and east. This was done because Barrie had a limited supply of developable residential and employment lands within its pre-2010 boundaries. Therefore the 2009 Fire Master Plan will be amended to take into account these Annexed Lands. The purpose of this Study is to better serve the growing community of pre-2010 Barrie, as well as the Annexed Lands regarding fire safety and drive time for fire trucks. This technical memorandum will serve as an input to the Fire Master Plan amendment and will be used to update the development charges.

Exhibit 1-1 shows the Annexed Land acquired by the City of Barrie in 2010.

Exhibit 1-1 City of Barrie and the Annexed Land of 2010



Source: Adapted from Figure 1 of Request for Proposal: 2010-061P Annexation Lands Secondary Planning Studies.pdf.

2. Methodology

In order to complete this Study, the following tasks were accomplished:

- Collect all available data from City with respect to incidents that required Fire Department intervention.
- Determine major factors contributing to demand for Fire Department Intervention.
- Identify current coverage deficiencies in pre-2010 Barrie and in the Annexed Lands.
- Identify possible fire station locations in order to offer good coverage of the territory (respecting current policies) while minimizing costs. Coverage is based on population and employment, considers the current and future road network and physical barriers such as Highway 400.
- Develop a phasing of the proposed interventions.

The coverage of current fire stations and the examined scenarios were modeled using the “Network Analyst” module of ArcGIS in order to determine actual coverage areas taking into account the possible routings.

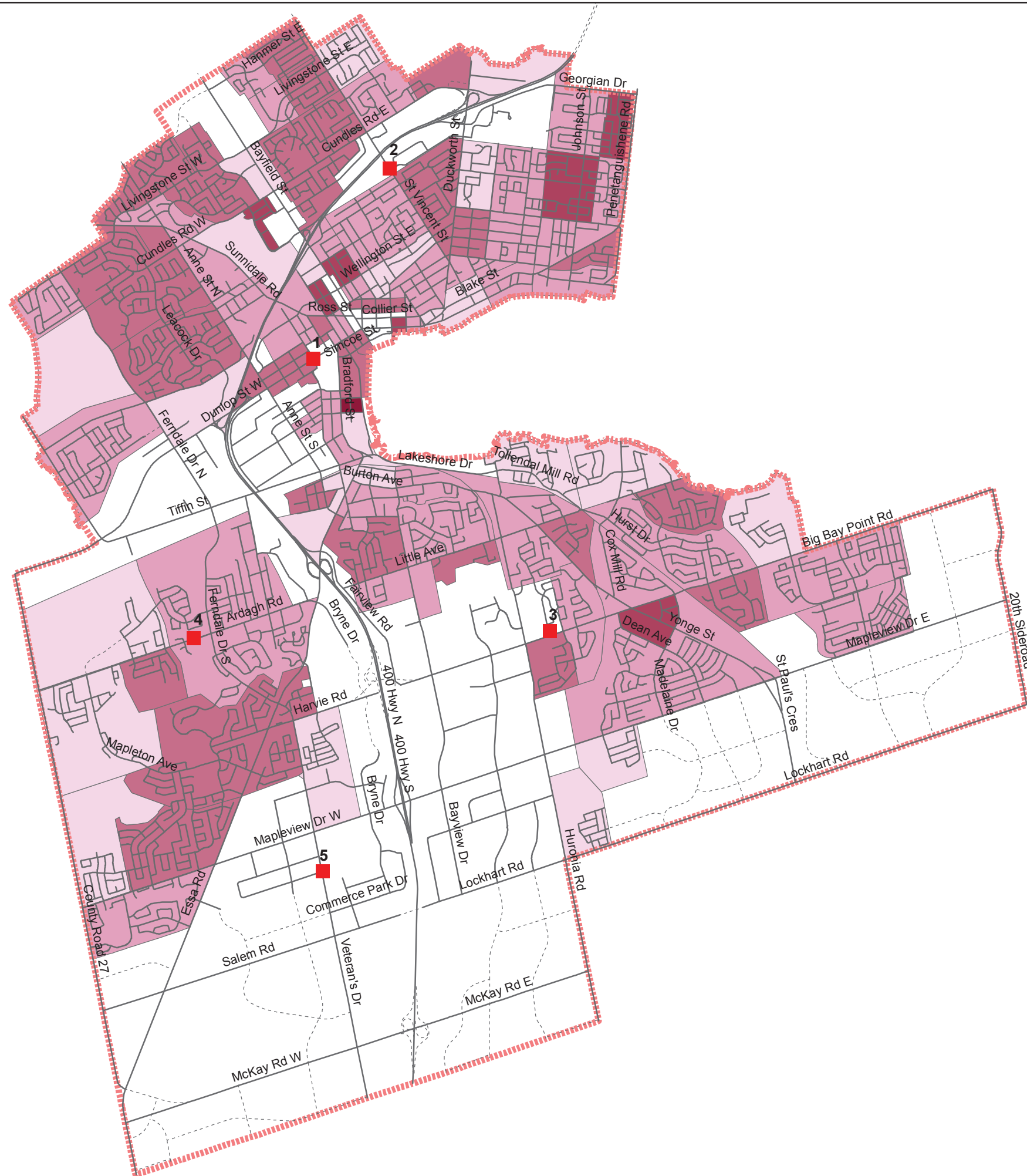
These tasks were accomplished in collaboration and communication with the City of Barrie and the Fire Department and were developed to be in line with previous analyses undertaken by the Fire Department.

3. Demographics

Barrie was one of the fastest growing census metropolitan areas (CMA) in Canada between 2001 and 2006. Employment has also been on the increase within the City. This trend is projected to continue and Barrie's population is expected to reach 210,000 residents by 2031 (an additional 69,000), making it one of the fastest growing cities in the Country. This includes an increase of nearly 20,000 residents within the pre-2010 boundary and a further 41,000 residents within the Annexed Lands. Employment growth is expected to be more considerable within pre-2010 Barrie (an additional 22,000 employees) than the Annexed Lands (an additional 10,000 employees). The majority of this growth will occur in the Annexed Lands and the Intensification Areas located within the pre-2010 boundary.

Exhibit 3.1 shows the actual population density (2011) within the City of Barrie's new boundary along with the proposed arterial and collectors roads.

Exhibit 3.2 shows the actual employment density (2011) within the City of Barrie's limits.



Legend

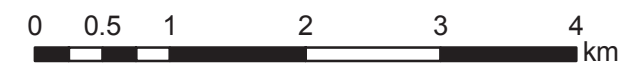
- Fire Stations
- Streets
- - - Proposed Arterial and Collectors
- City of Barrie Boundary

Population Per Sq Km (2011)

- 0.477524 - 15.482574
- 15.482575 - 31.179751
- 31.179752 - 54.011502
- 54.011503 - 92.294242
- 92.294243 - 169.616666

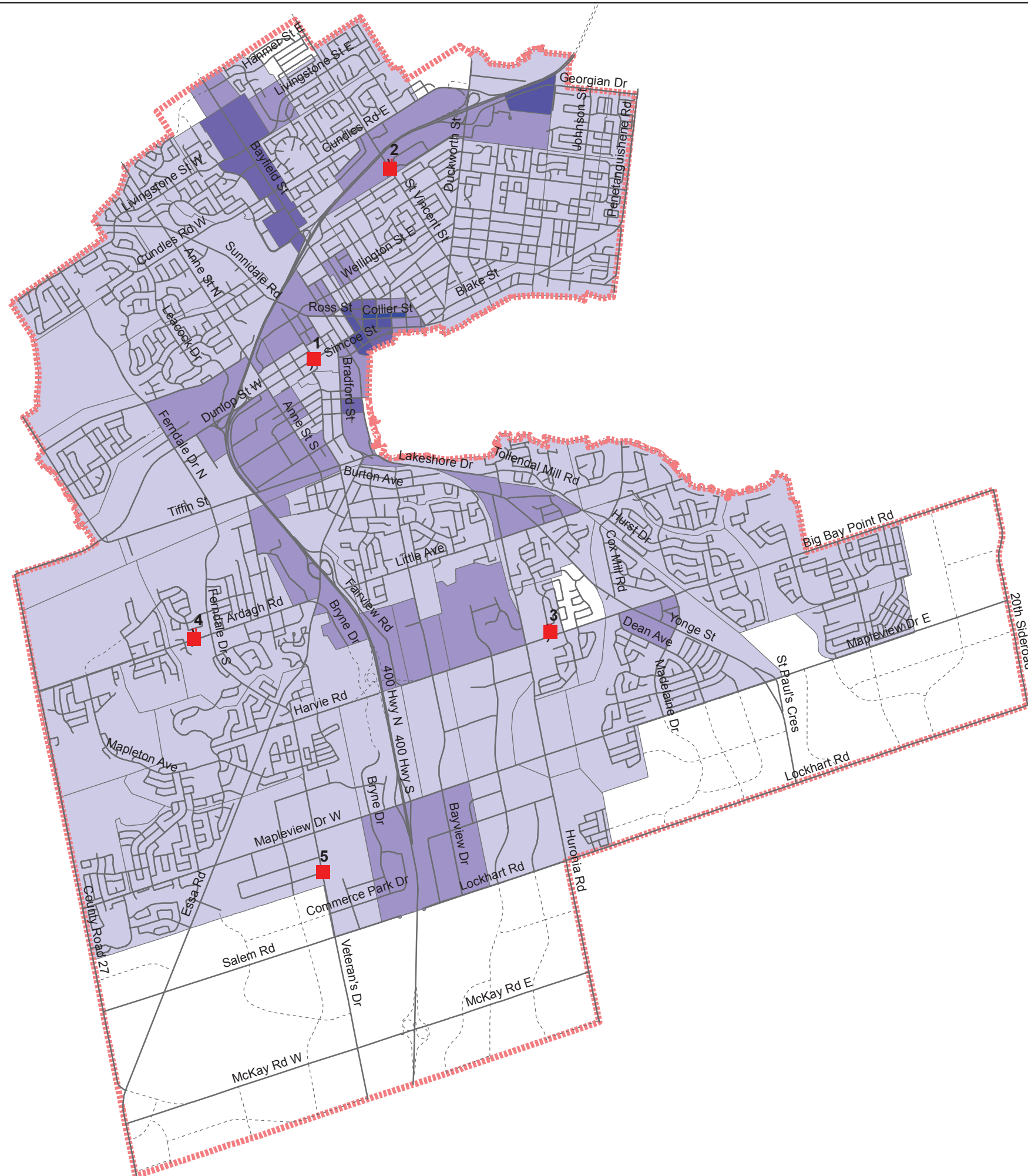
Exhibit 3.1

2011 Population Density
(Population per sq km)



Barrie Fire Station Location Study





Legend

- Fire Stations
- Streets
- - - - Proposed Arterial and Collectors
- City of Barrie Boundary

Employment Per Sq Km (2011)

- 0.022237 - 13.513628
- 13.513629 - 42.088117
- 42.088118 - 88.200666
- 88.200667 - 242.072665
- 242.072666 - 752.401711

Exhibit 3.2

2011 Employment Density
(Jobs per sq km)



**Barrie Fire Station
Location Study**



Project 121-20497

4. Existing Conditions

This section examines the existing conditions in order to determine what is the existing reality and if any deficiencies exist.

4.1 Road Network

The road network is an extremely important component in for fire response times and coverage and will be one of the major factors in considering where to place new or relocated fire stations.

4.1.1 Roadway Geometry

Just like many other cities, Barrie is divided by a major freeway (Highway 400) with, currently, five interchanges. This highway feeds the arterial and collector network which is made up of mostly 2-lane per direction roadways with some roads segments located next to the highway interchanges having 3 lanes per direction. Most of the local streets offer traffic in both directions with one lane in each direction. One-way streets are almost non-existent in Barrie except for some short street sections in Downtown.

Exhibit 4.1 shows the current available traffic lanes in each direction.

Exhibit 4.2 shows the roads by current direction of travel.

4.1.2 Speeds

In order to model the actual response time of emergency vehicles, the following assumptions were made, which are consistent with the assumptions already used by the Fire Department in their past analyses:

- Local streets: 40 km/h
- Arterial and collectors: 50 km/h
- Freeway: 88 km/h

These assumptions were developed according to road hierarchy and the total number of traffic lanes available. If the total number of lanes is smaller or equal to 3 lanes (one-lane per direction and a left-turn lane), then the travel speed used is 40 km/h. All roadways presenting a wider cross-section were estimated at a travel speed of 50 km/h. For freeways, the speed is estimated at 88 km/h which takes account of acceleration and deceleration and the short distance travelled to reach the destination. Some areas along Mapleview Road are presently congested during certain periods of the day. The analysis undertaken for this report does not take these short periods into account, since emergency calls take place during all hours and are not at all concentrated during the peak periods. It is felt that the average speeds used are representative of most periods of the day and are adequate for the purposes of this study.

Exhibit 4.3 shows the theoretical speed assumptions for the current road network.

4.2 Fire Station Location

The City of Barrie currently has five fire stations spread over its territory:

- Station 1 is located in the central business district near the Lake. This station cannot be moved as it is central and newly implemented. Station 1 has a Pumper with 4 staff, an Aerial with 3 staff and a Platoon Chief's car staffed with 1.

- Station 2 is located off the highway in the northern section of town. The station operates one pumper with 4 staff.
- Station 3 covers the eastern limit on Big Point Rd. The station operates two vehicles: a pumper with 4 staff and an aerial with 3 staff.
- Station 4 is located west of the highway on Ardagh Rd. This station operates a pumper with 4 staff.
- Station 5 is the station that actually covers the southern part of the City on Veteran's Drive. The lease for this location will expire in 2021 and the City envisions moving the Station to a location that will better cover the municipality. Currently, this station operates a pumper with 4 staff.

4.3 Response Time

The current road network, population and employment data were used to model the current coverage of the existing fire stations. Four different response times ranges were used to evaluate emergency response efficiency. Exhibit 4.4 shows the existing drive time analysis of the current fire stations.

Currently, the coverage is good for most areas but improvements are required in these areas:

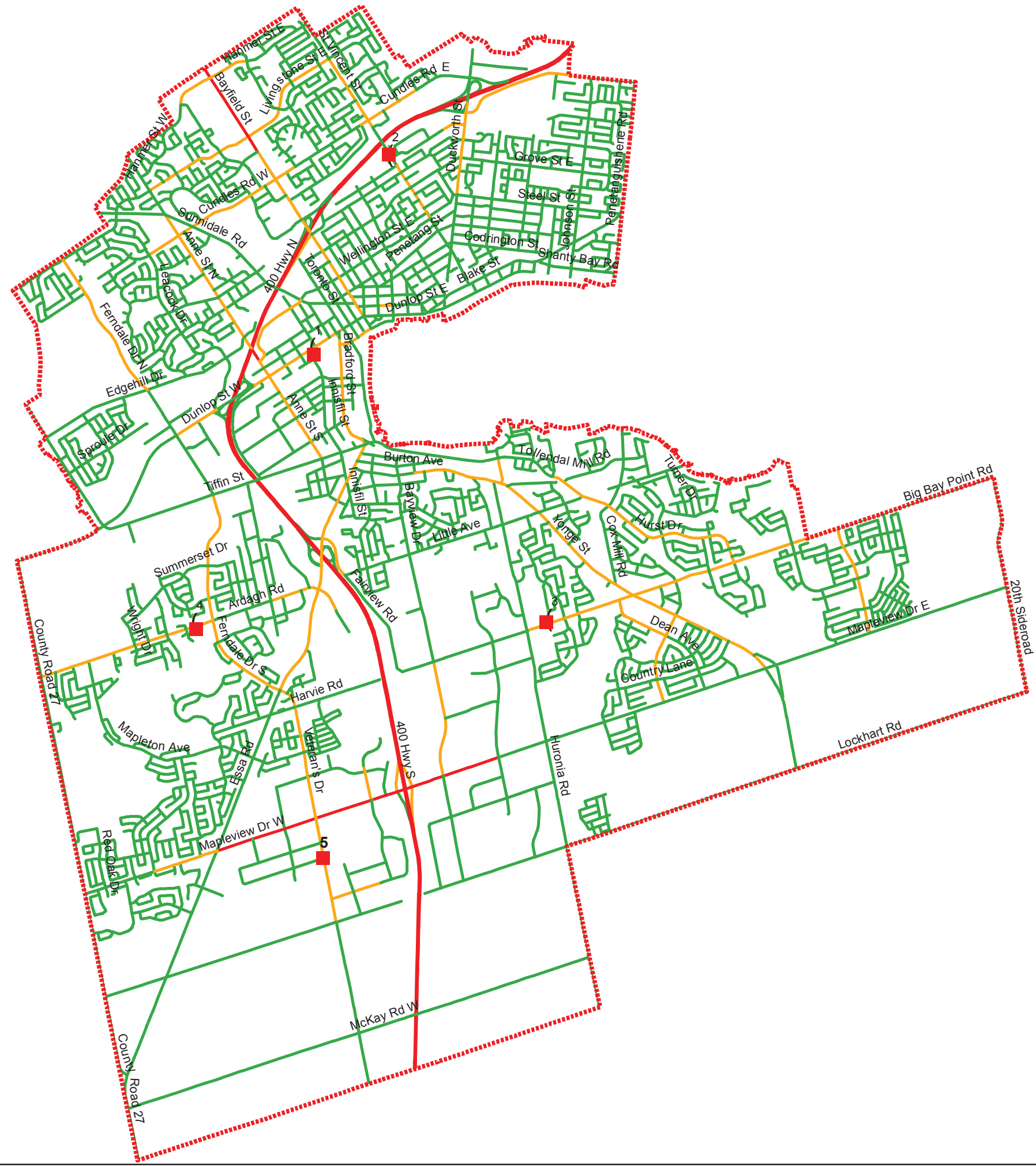
- Northern part: the current location of Station 2 covers efficiently most of its coverage area. However, there is a small area that isn't covered for projected residential development to the northwest. Station 1 also offers a good coverage of its area, except for a small existing residential area located at the western extremity of the station coverage area.
- Eastern part: currently, within the pre-2010 City limits, some areas need a 6-8 minute access time. As development continues, more and more residents will fall within this response time as well. This region is covered by Station 3.
- Western area: covered by Station 4, this area is well covered by its emergency response time from the Fire Department.
- Southern area: covered by Station 5, this area covers the current residential areas but the projected road network shows some areas that some future development areas will not be offered proper coverage. There is also an overlap with Station 4 to the north.
- The Annexed Lands are clearly lacking coverage with the existing location of the fire stations; however this is normal since when the stations were implemented the Annexed Lands were not considered.

4.4 Incidents

From July 2011 to June 2012, the Fire Department were required to respond to multiple incidents located throughout the City. These responses fall under the following different categories:

- Burning (controlled)
- False calls
- Medical (resuscitator) calls
- Pre fire conditions / no fire
- Property fires and explosions
- Public hazards
- Rescue
- Other responses

These responses were mapped and are illustrated in Exhibit 4.5. This exhibit shows that overall; these incidents are distributed over the entire territory of Barrie. As the level of population and employment rises, the calls are more frequent. The downtown area shows many incidents and as you move to the limits of the City, the demands are more and more spread out. Also, the map shows that emergencies are more frequent along arterial and collector roads as there are more activities and higher densities along these corridors. Generally it was determined that there is a direct correlation between the densities of population and employment and the need for fire services. This observation will be used to determine the future location of fire stations within the City.

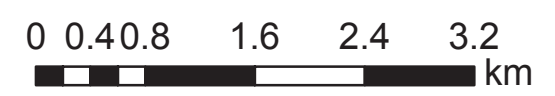


Legend

- Fire Stations
- Current City Boundary
- Road Infrastructure - 2011**
- 1 lane per direction
- 2 lanes per direction
- 3 lanes per direction

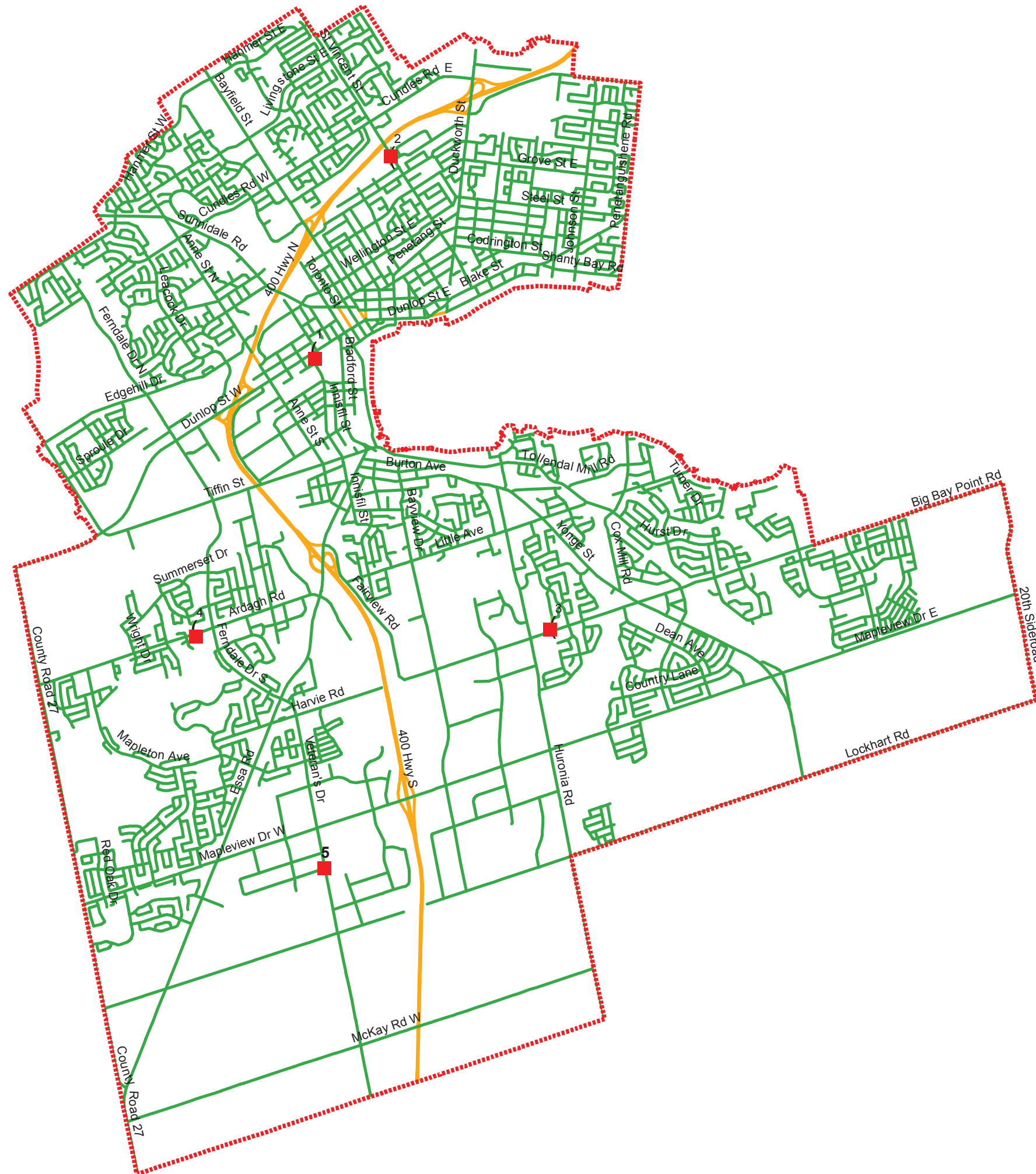
Exhibit 4.1

Number of Lanes Per Direction
2011



Barrie Fire Station Location Study





Legend

- Fire Stations
- Current City Boundary

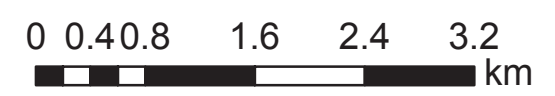
2011 Roads

Roads by Direction of Travel 2011

- Both Directions
- One Direction Only

Exhibit 4.2

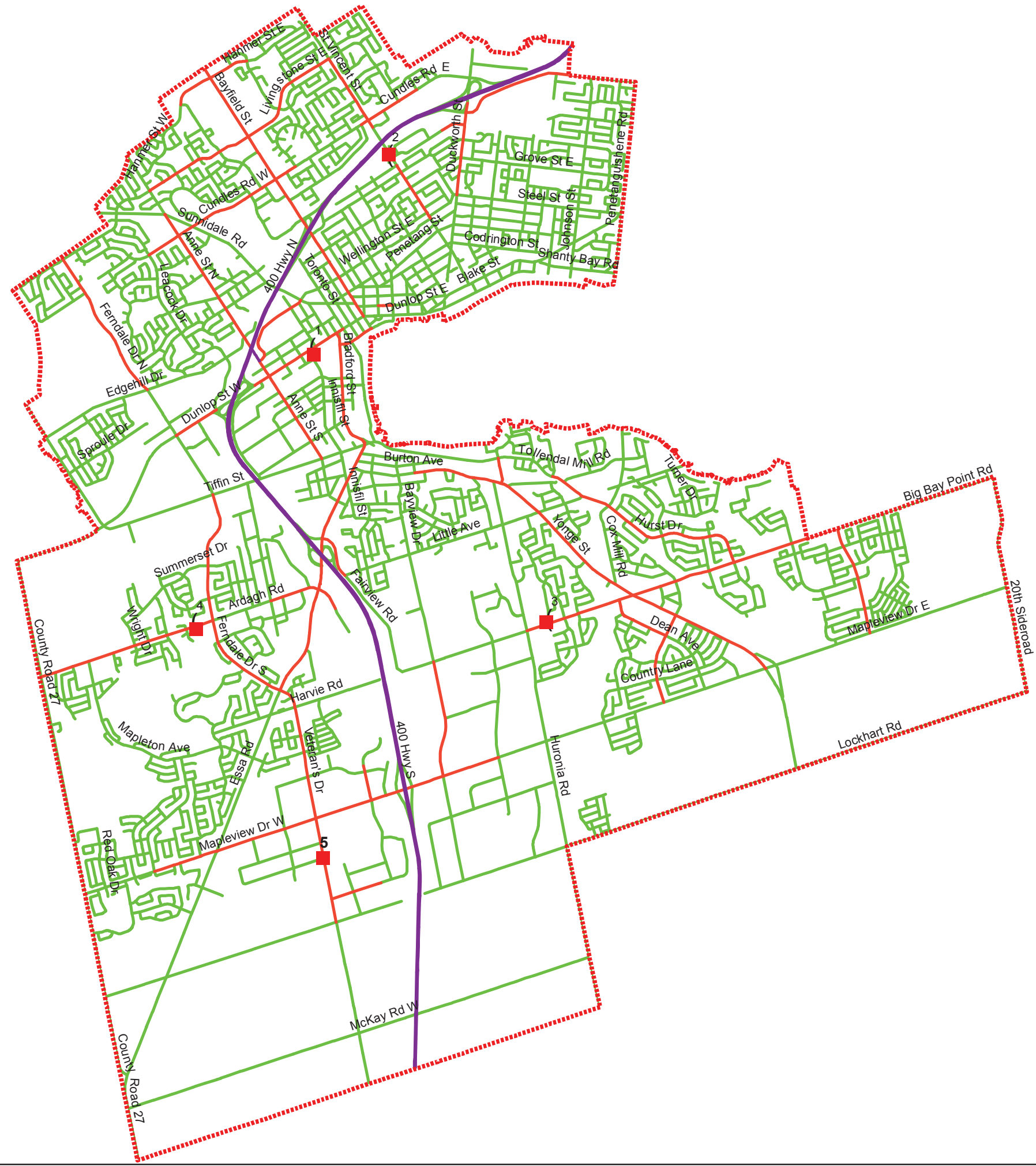
Roads by Direction of Travel
2011



Barrie Fire Station Location Study



Project 121-20497



Legend

- Fire Stations
- Current City Boundary

Theoretical Speed Assumptions - 2011

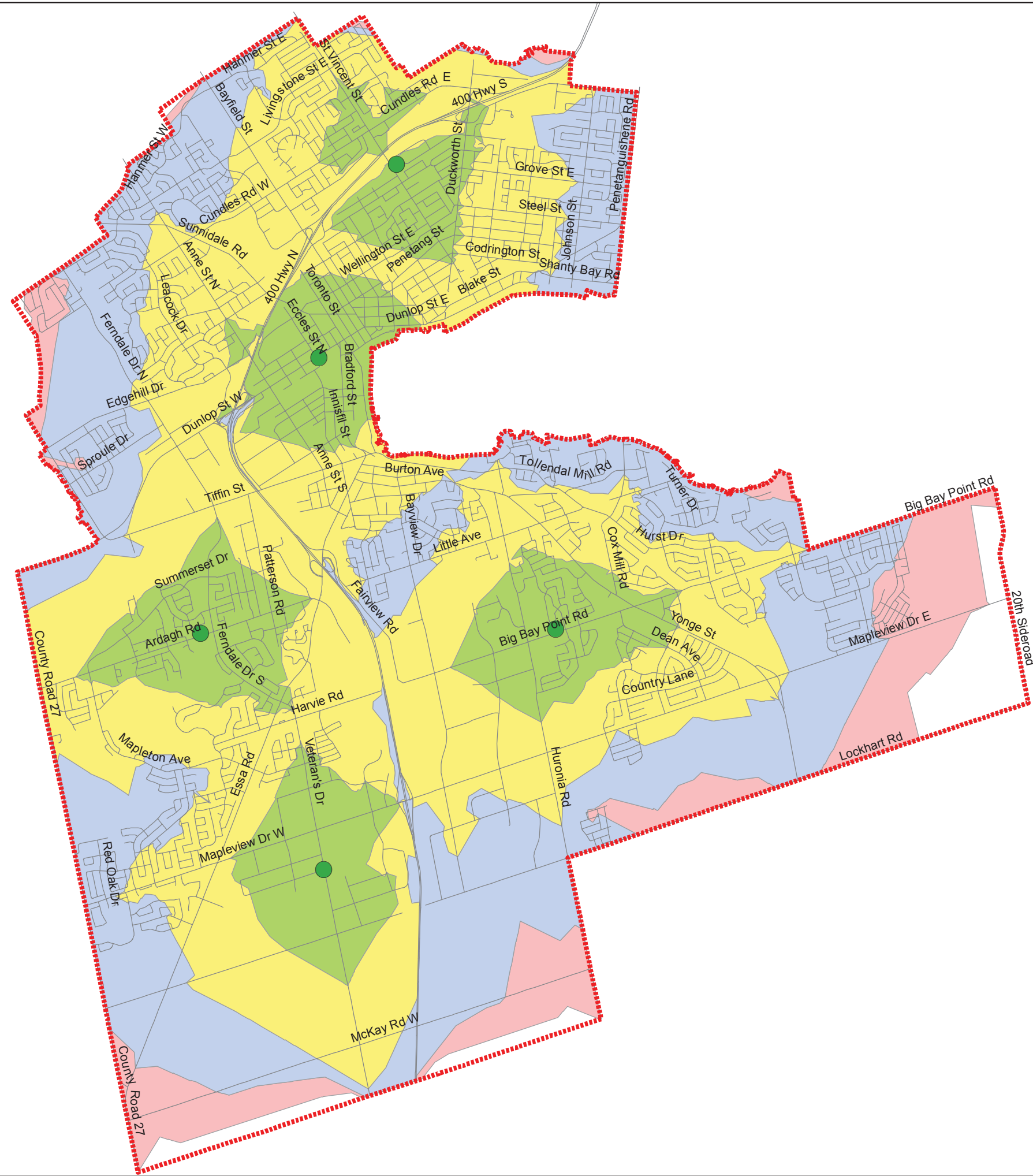
- 88 km/h
- 50 km/h
- 40 km/h

Exhibit 4.3

Theoretical Speed Assumptions
2011



Barrie Fire Station Location Study



Legend

- Fire Stations
- Current City Boundary
- Former City Boundary
- Roads

Modelled Response Time

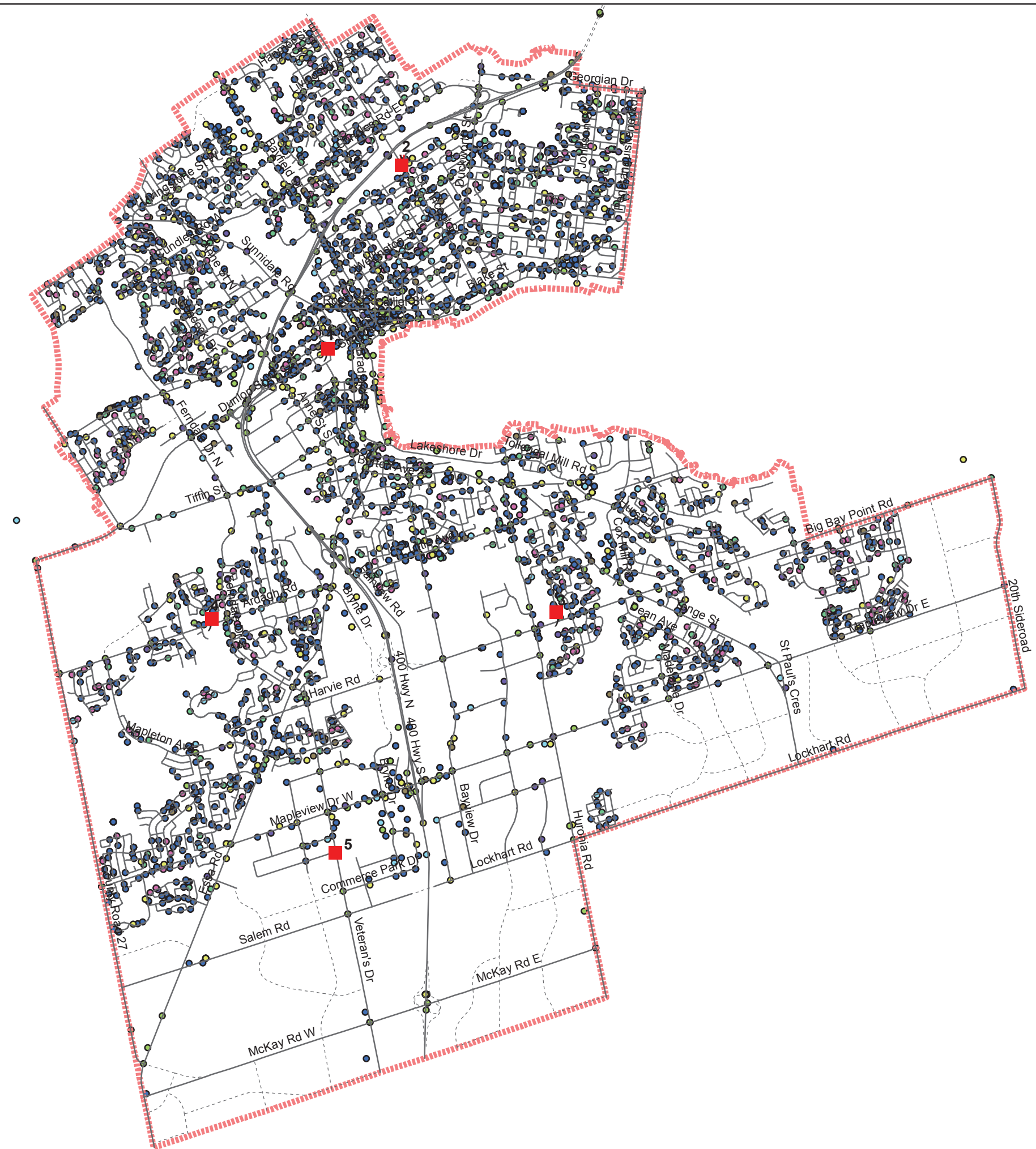
- 0 to 2 minutes
- 2 to 4 minutes
- 4 to 6 minutes
- 6 to 8 minutes

Exhibit 4.4

Theretical 2, 4, 6, 8
Drive Time Analysis
2011
Based on 5 Stations



**Barrie Fire Station
Location Study**

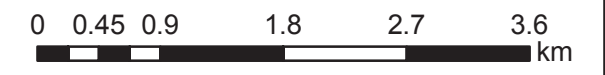


Legend

- Fire Stations
- Streets
- - - Proposed Arterial and Collectors
- City of Barrie Boundary
- Incidents Requiring Fire Response**
- Burning (controlled)
- CO False calls
- Medical/resuscitator call
- Other response
- Pre fire conditions/no fire
- Property fires/explosions
- Public Hazard
- Rescue

Exhibit 4.5

Incidents Requiring Fire Response
July 2011 to June 2012



Barrie Fire Station Location Study



5. Existing Policies, Objectives and Assumptions

The 2009 Fire Master Plan provides guidance, policies and objectives regarding all aspects of fire safety and prevention. This section states the elements key to the location of future fire stations.

The 2009 Fire Master Plan states that the Council would “provide 10 firefighters on the scene of a single family residential fire within 10 minutes, 90% of the time and a first apparatus arrival within 6 minutes, 90% of the time by separate motion”. It is also noted that this motion should be contained in the Establishing and Regulating By-law.

According to the best practices of the National Fire Prevention Association (NFPA), it takes a minimum of 4 firefighters to staff an aerial. To maximize its efficiency, an aerial requires 1 at the pump panel, 1 on the turn table controls and 2 in the platform operating 2 – 1000 GPM nozzles. The stations must be staffed in order to meet those requirements.

6. Projected Situation

In order to achieve the goals of the Fire Master Plan, the projected road network and future population and employment of the City of Barrie need to be taken into account. These assumptions cover the proposed road network and population and employment projections for 2031.

6.1 2031 Projected Road Network

6.1.1 Roadway Geometry

The Mutli-Modal and Active Transportation Master Plan (TMP) proposes many projects in terms of augmenting roadway capacity in the City of Barrie. Furthermore, the MTO in their plans for Highway 400 have identified that it should be upgrade to four lanes per direction while having up to five lanes per direction in the central part of Barrie.

The TMP proposes two new highway interchanges to be located in the southern portion of the City at Harvie Rd/Big Bay Point Rd and at McKay Rd. Also, a new east-west crossing of Highway 400 is proposed between Salem Rd/Lockhart Rd. Furthermore, some arterials will be widened to accommodate higher projected traffic volumes, especially in the southern portion of the City.

The model also takes into account the projected “road diet” projects on certain corridors as identified in the TMP. “Road diets” remove unused travel lanes in order to provide better facilities for cyclists and pedestrians. These road improvements have very little impact on the overall response time, but are taken into account in order to ensure the coverage area projections are as accurate as possible. If these projects were to be abandoned, there might be a small improvement in response time overall in the northern Bayfield areas.

The eastern portion of the City sees the most new local streets with projects located south of Mapleview Drive on each sides of Yonge Street.

West of Veteran’s Drive, a major residential project will require many new local streets.

The Fire Station Location Study is based on the proposed road network of 2031. In order to be representative, the response time assumes that the proposed road network will be in place, including the new interchange on Highway 400, by the time of the new station's implementation.

Exhibit 6.1 shows the projected road network for 2031.

Exhibit 6.2 shows the updated travel direction for 2031.

6.1.2 Speeds

Following the widening of many streets, the speed assumptions were modified to better reproduce the travel behavior of emergency vehicles. Some corridors are now more efficient for quicker response. The Maplevue Dr. is now 50 km/h on most of its length and so are McKay Rd and some section of Lockhart Rd. The new interchange at Harvie Rd./Big Bay Point Rd. provides for quicker response along the corridor and will likely improve response time of adjacent fire station.

Exhibit 6.3 shows the updated speed assumptions for 2031.

6.2 Projected Demographics

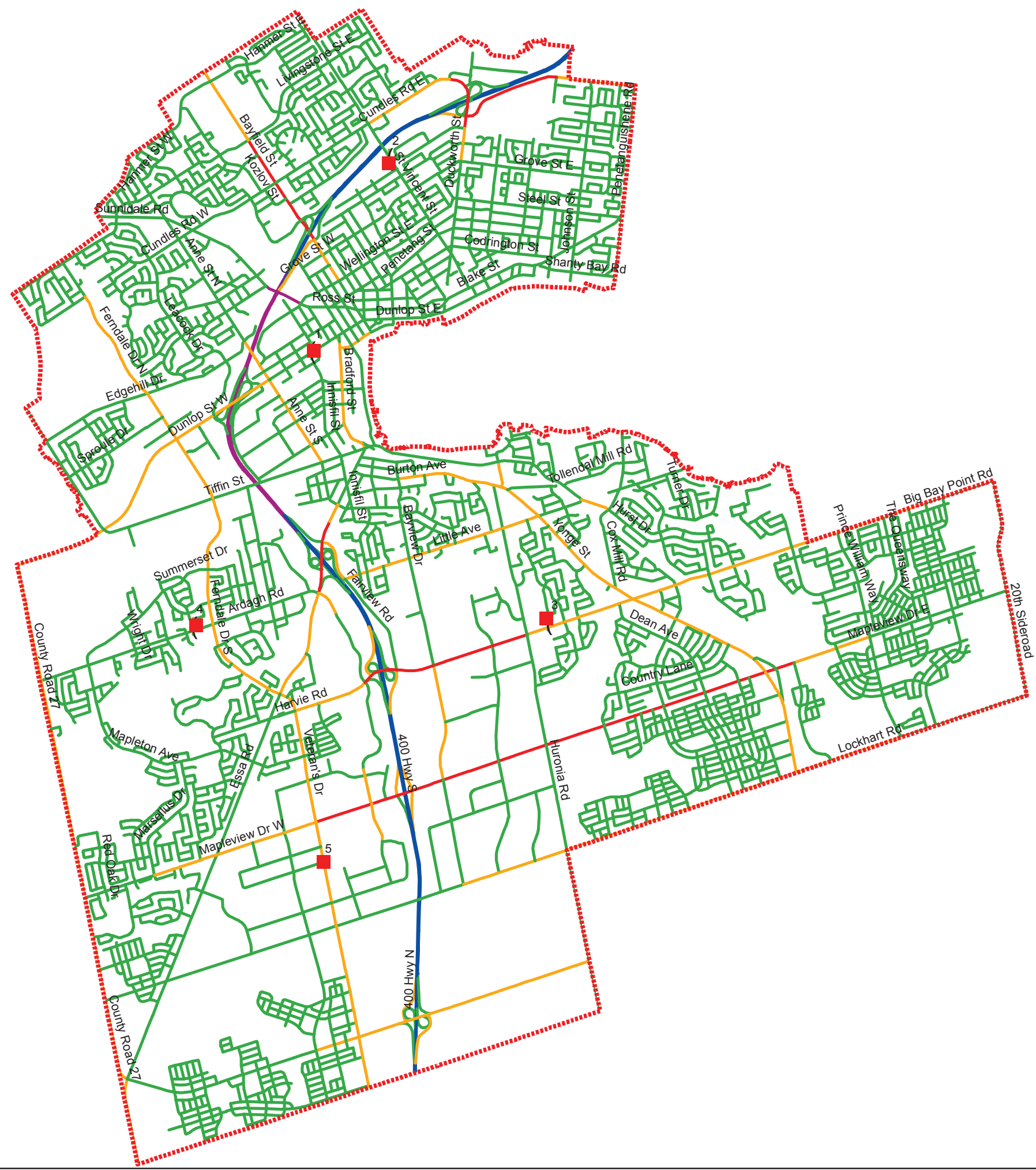
Following the inclusion of the Annexed Lands, the new road network and residential projects will provide for an increase in population in these areas. The two major expansion areas, where an increase in population is forecasted, are located on the southwestern part of the city and the eastern limits. The downtown area will see an increase in density with various condos and high-rise residential projects near the waterfront.

Exhibit 6.4 shows the forecasted population density in 2031.

In the next 20 years, employment will be on the rise as well with many employers locating their businesses on both sides of the highway 400 corridor between Essa Rd. and McKay Rd. These polls will offer quick access to the freeway and will also be nearby residential areas.

A new employment pole is also projected along Yonge St.'s below Maplevue Dr.

Exhibit 6.5 shows the employment density for 2031.

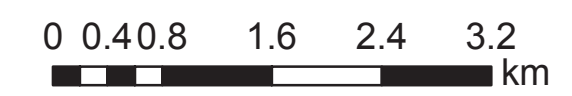


Legend

- Fire Stations
- Current City Boundary
- Road Infrastructure - 2031**
- 1 lane per direction
- 2 lanes per direction
- 3 lanes per direction
- 4 lanes per direction
- 5 lanes per direction

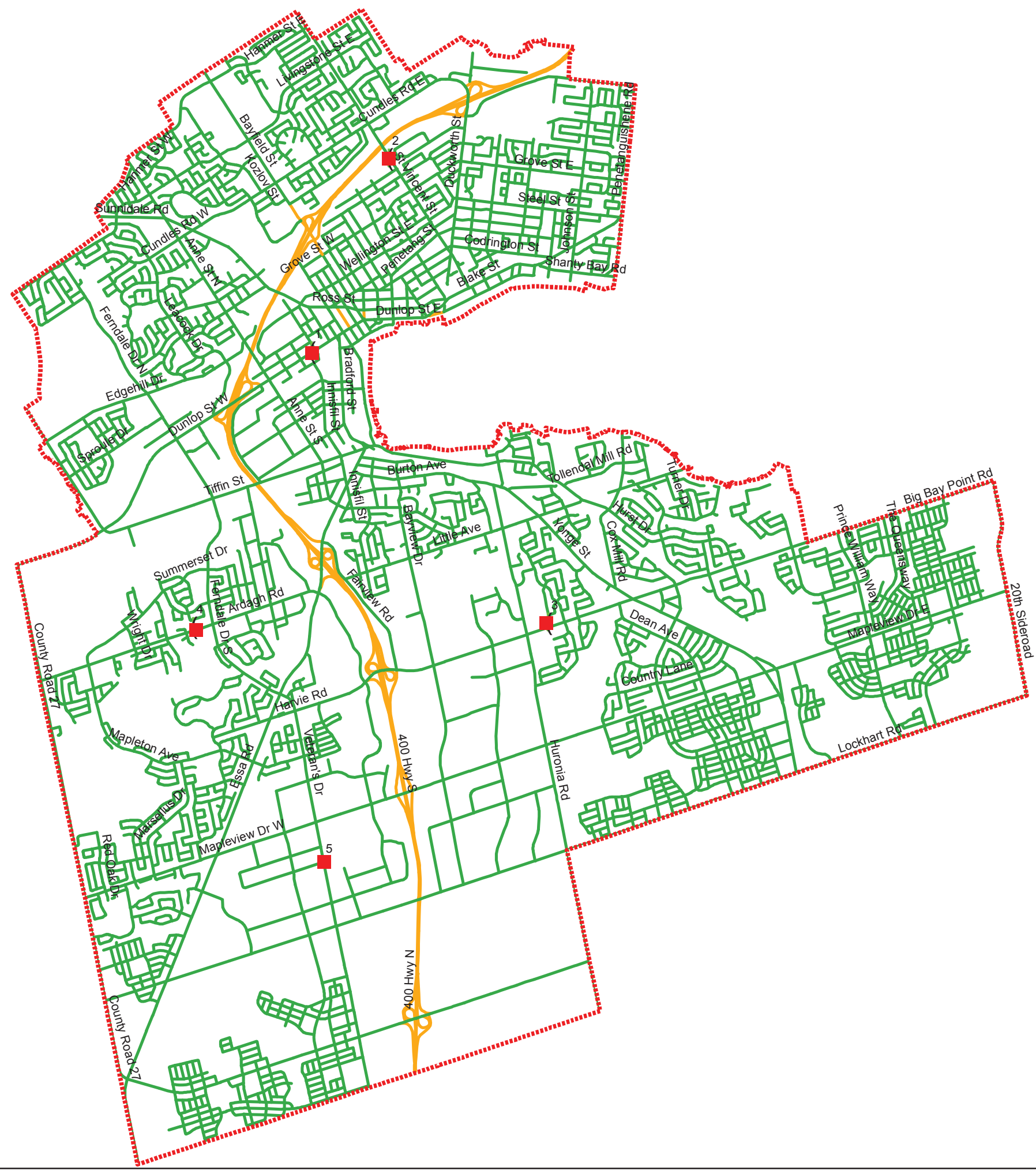
Exhibit 6.1

Number of Lanes Per Direction
2031



Barrie Fire Station Location Study





Legend

- Fire Stations
- Current City Boundary

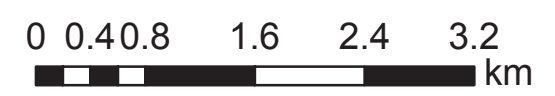
2031 Roads

Roads by Direction of Travel 2031

- Both Directions
- One Direction Only

Exhibit 6.2

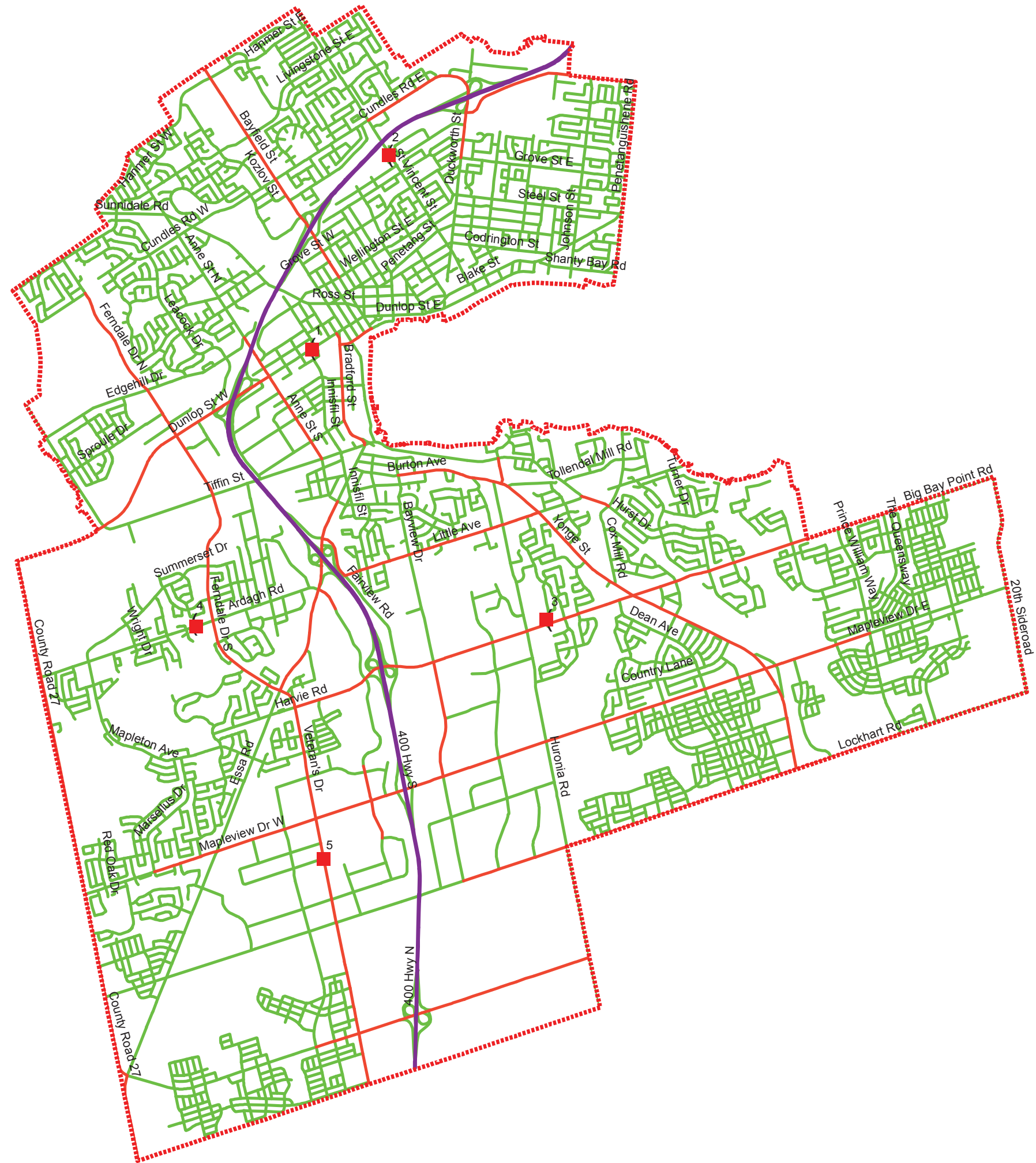
Roads by Direction of Travel
2031



Barrie Fire Station Location Study



Project 121-20497



Legend

■ Fire Stations

⋯ Current City Boundary

Theoretical Speed Assumptions - 2031

— 88 km/h

— 50 km/h

— 40 km/h

Exhibit 6.3

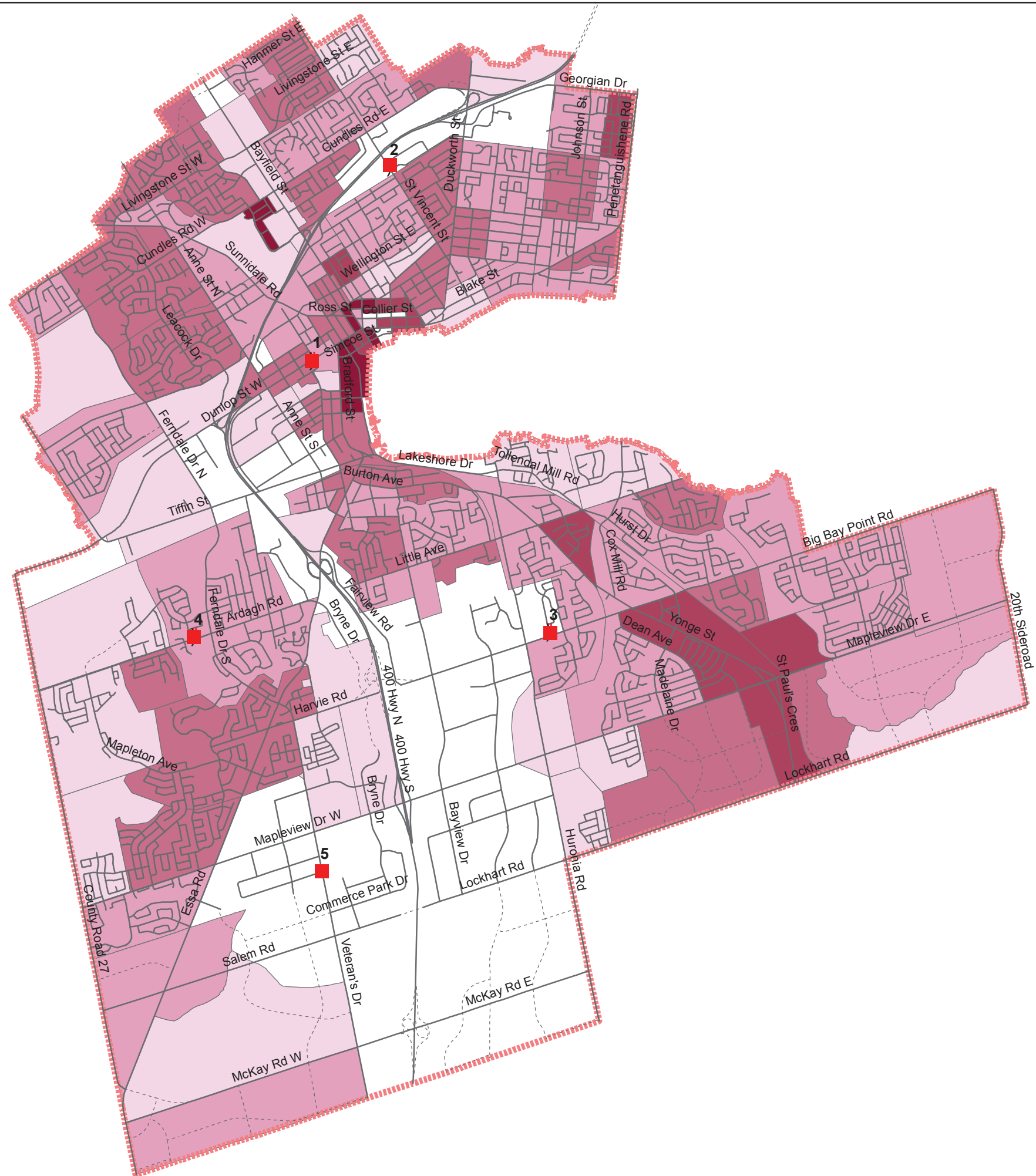
Theoretical Speed Assumptions
2031



**Barrie Fire Station
Location Study**



Project 121-20497

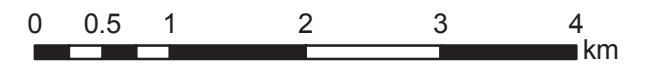


Legend

- Fire Stations
- Streets
- - - - Proposed Arterial and Collectors
- City of Barrie Boundary
- Population Per Sq Km (2031)**
- 0.577973 - 15.482574
- 15.482575 - 31.179751
- 31.179752 - 54.011502
- 54.011503 - 92.294242
- 92.294243 - 169.616666

Exhibit 6.4

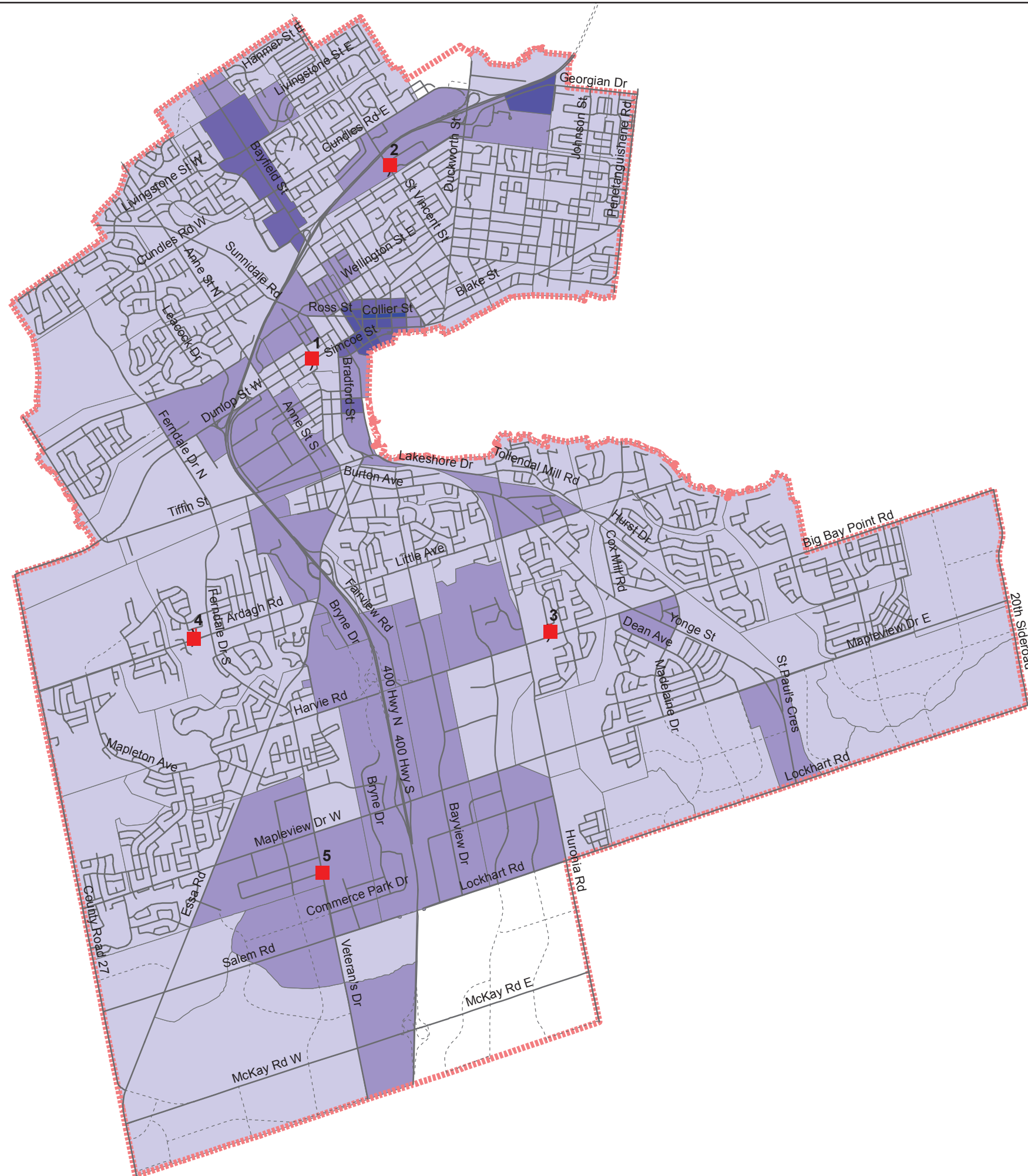
2031 Population Density
(Population per sq km)



Barrie Fire Station Location Study



Project 121-20497



Legend

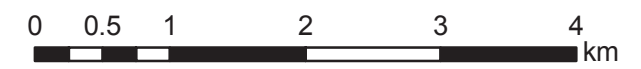
- Fire Stations
- Streets
- - - - Proposed Arterial and Collectors
- City of Barrie Boundary

Employment Per Sq Km (2031)

- 0.022237 - 13.513628
- 13.513629 - 42.088117
- 42.088118 - 88.200666
- 88.200667 - 242.072665
- 242.072666 - 752.401711

Exhibit 6.5

2031 Employment Density
(Jobs per sq km)



Barrie Fire Station Location Study



Project 121-20497

7. Scenarios and Recommendations

This section outlines the scenarios that were analysed and the various recommendations of the study.

7.1 Base Scenario

This scenario takes the 5 current fire stations and models the drive time analysis with the 2031 road configuration. This scenario is used as the base to compare the impact of relocating and implementing various station configurations. Exhibit 7.1 shows the coverage of the existing stations in 2031. It should be noted that coverage weaknesses exist in the northwestern quadrant, the southern section in the Annexed Lands.

7.2 7 Station Scenarios

These scenarios were generated with the hypotheses that there would be a need for seven stations. Three scenarios were developed and drive time analyses were modeled for 2031.

7.2.1 7 Stations with no Station Relocations

This scenario takes the five current stations and doesn't relocate them. The coverage is improved by implementing two new stations: In the south on Veteran's Drive to cover the new development to the west and one on the east side near Yonge Street south of Mapleview Drive.

Exhibit 7.2 shows the location and coverage of this scenario. This scenario improves drive times for most of the southern portions of the City by adding the two new facilities. There is also some overlap with Station 5.

7.2.2 7 Stations with Station Relocations

The previous scenario proved to offer good coverage on the southern part of Barrie, but had some overlap with Station 5. This scenario moves Stations 4 and 5 in order to reduce drive time and improve efficiency by reducing overlap.

Station 4 is moved to Tiffin Street where it will improve coverage of the northwestern quadrant. Station 5 is moved to Harvie Road and Essa Road to eliminate the overlap with the new station and to better serve the central part of this large employment area. This station's location is also located in proximity to the freeway.

Exhibit 7.3 shows the new station locations and their coverage of the City.

7.2.3 7 Stations with Anchor at Big Bay Point

For this scenario, only Stations 1 and 2 remain unchanged. Station 3 is moved closer to Highway 400 on Big Bay Point Road and would offer better coverage at this central location. Station 4 is moved to Tiffin Street to cover the northwestern part of the City. Station 5 is moved to Essa Road to serve the southwestern area. This first new station is located on Lockhart Rd. where it will serve future development (beyond 2031) while serving the actual southern limit of pre-2010 Barrie. The second new station is located on the eastern part of Mapleview Drive, which significantly improves coverage of this portion of the City.

Exhibit 7.4 shows the coverage of this 7 station scenario with anchor at Big Bay Point Road. Moving Station 3 closer to Highway 400 impacts residents of Tollendal Mill Road area and reduces their coverage and response time. Many residents located east of Yonge Street will

also see their coverage diminish. Locating Station 3 near Highway 400 would provide ineffective coverage in south Barrie.

7.3 6 Station Scenarios

Two scenarios were developed with 6 fire stations and then modeled using the 2031 road network, population and employment projections.

7.3.1 Relocation of 2 Stations and 1 New Station

This scenario relocates Station 2 to the other side of Highway 400 in order to give better coverage of the northwestern tip of the City. Stations 1, 3 and 4 remain unchanged. The relocated Station 5 is proposed to be located south on Veteran's Drive, same as in the previous scenario, to better serve the new developments along the western border. The proposed new station is located on Yonge Street south of Mapleview Drive. This improves the coverage of the southeastern portion of the City.

Exhibit 7.5 shows the station locations and the coverage for this 6 station scenario. Moving Station 2 to the other side of Highway 400 diminishes the coverage of residents on Penetanguishene Road and many residents near the waterfront now fall in the 4-6 minutes response time. The location of the new station isn't as optimal as in the previous scenario and there is some overlap with Station 3 along Yonge Street.

7.3.2 Relocation of 1 Station and 1 New Station

This scenario doesn't allow for Station 1, 2, 3 and 4 to be moved. Since Station 5's lease is expired, this scenario examines where best to relocate it. The relocated station is proposed to be located south on Veteran's Drive to better serve the western portions of the Annexed Lands. A new station is proposed to be located on Prince William Way, South of Mapleview Drive. This improves the coverage of the southeastern portion of the City that was previously in the 6-8 minutes range.

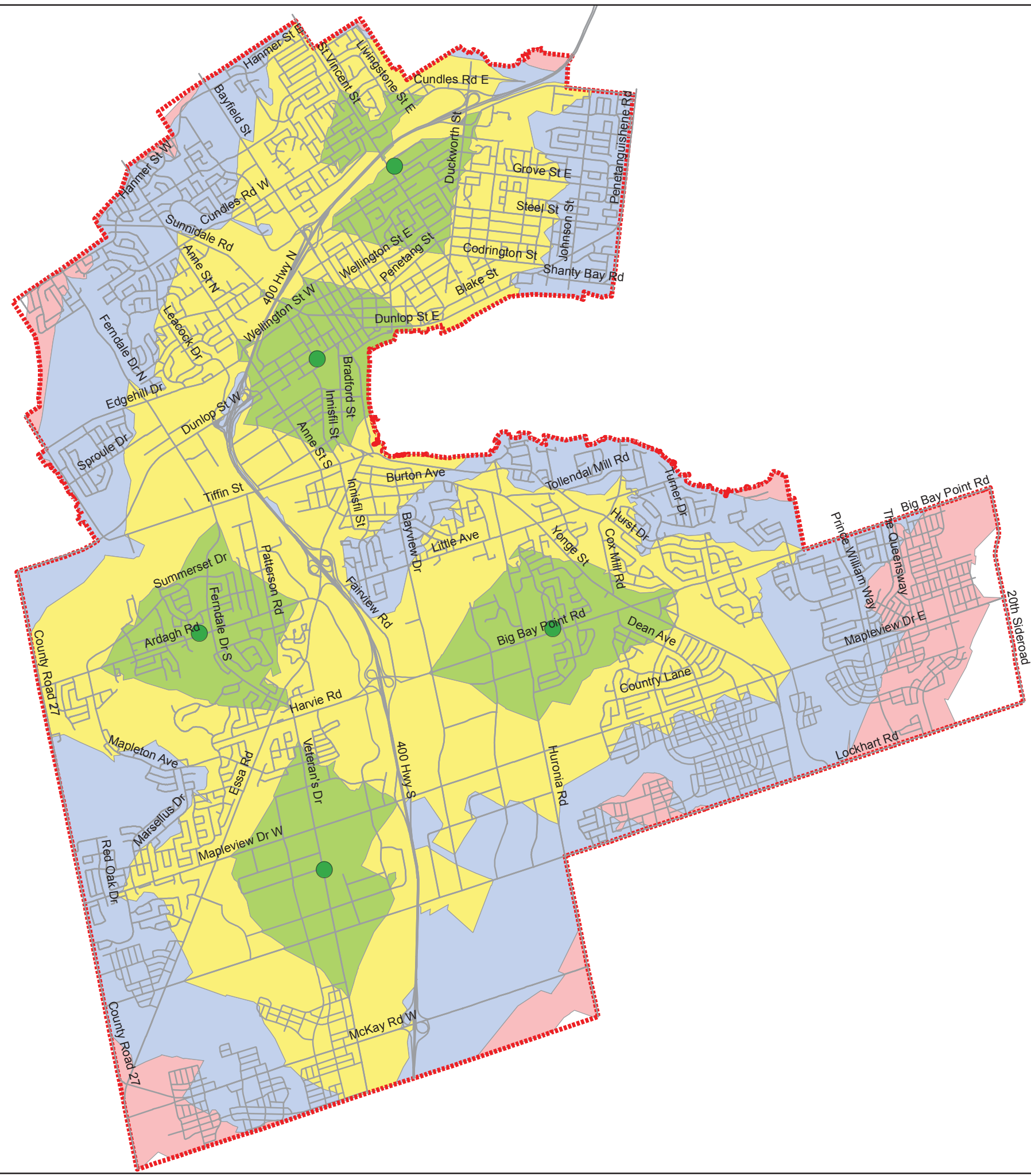
Exhibit 7.6 shows the coverage of this scenario. Overall, this scenario offers great coverage to most of the areas in Barrie.

7.4 Analysis of Proposed Station Location

Most scenarios with 7 stations offer only a slightly better coverage of Barrie's territory but result in an important additional capital and operating costs. The scenarios proposed with 6 stations offer a similar coverage without the added costs of building and operating a 7th fire station. Out of these 2 scenarios, the "Relocation of 1 Station and 1 New Station" offers the best coverage by better serving residents East of Prince William Way and not proposing overlap in coverage between stations.

7.5 Location of a Training Facility

A training facility for the emergency personnel is planned as a multi-phase construction project. The new facility will be adjacent to Fire Station 5, once the station has been relocated. A total of 15 acres of land is needed to accommodate the training facility. Further analysis is needed to assess the availability of land near the future site of station 5. The cost of the training facility has been evaluated to 14M\$.



Legend

- Fire Stations
- Current City Boundary
- Former City Boundary
- RoadBarrie2031

Modelled Response Time To Break

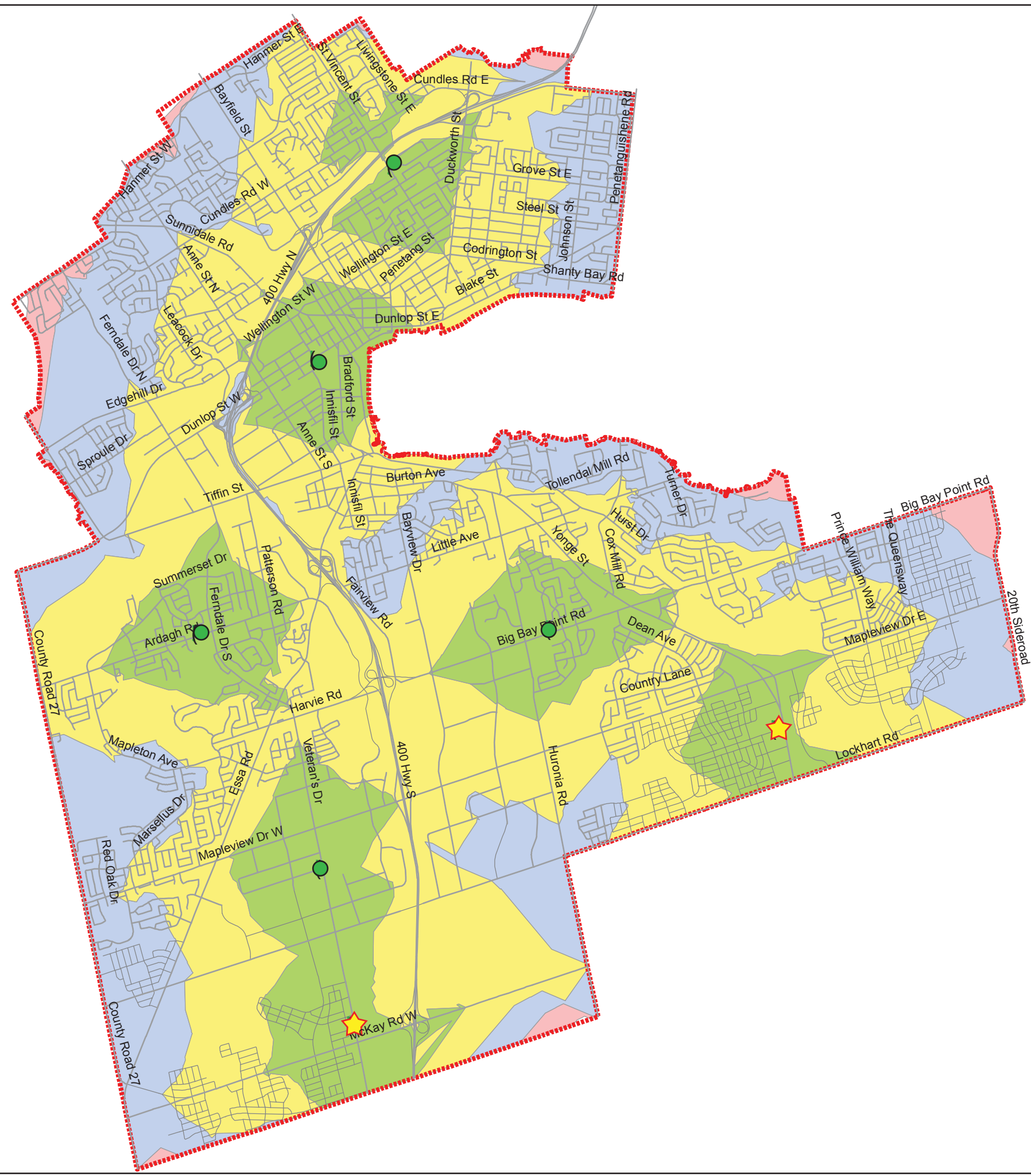
- 0 to 2 minutes
- 2 to 4 minutes
- 4 to 6 minutes
- 6 to 8 minutes

Exhibit 7.1

Theretical 2, 4, 6, 8
Drive Time Analysis
2031
No New Stations Option



**Barrie Fire Station
Location Study**



Legend

● Fire Stations ★ New Fire Stations

● Old Location of Fire Stations

— Roads

⋯ Current City Boundary

⋯ Former City Boundary

Modelled Response Time

0 to 2 minutes

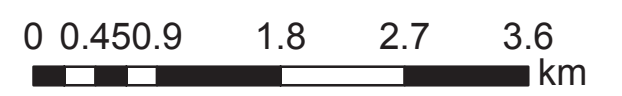
2 to 4 minutes

4 to 6 minutes

6 to 8 minutes

Exhibit 7.2

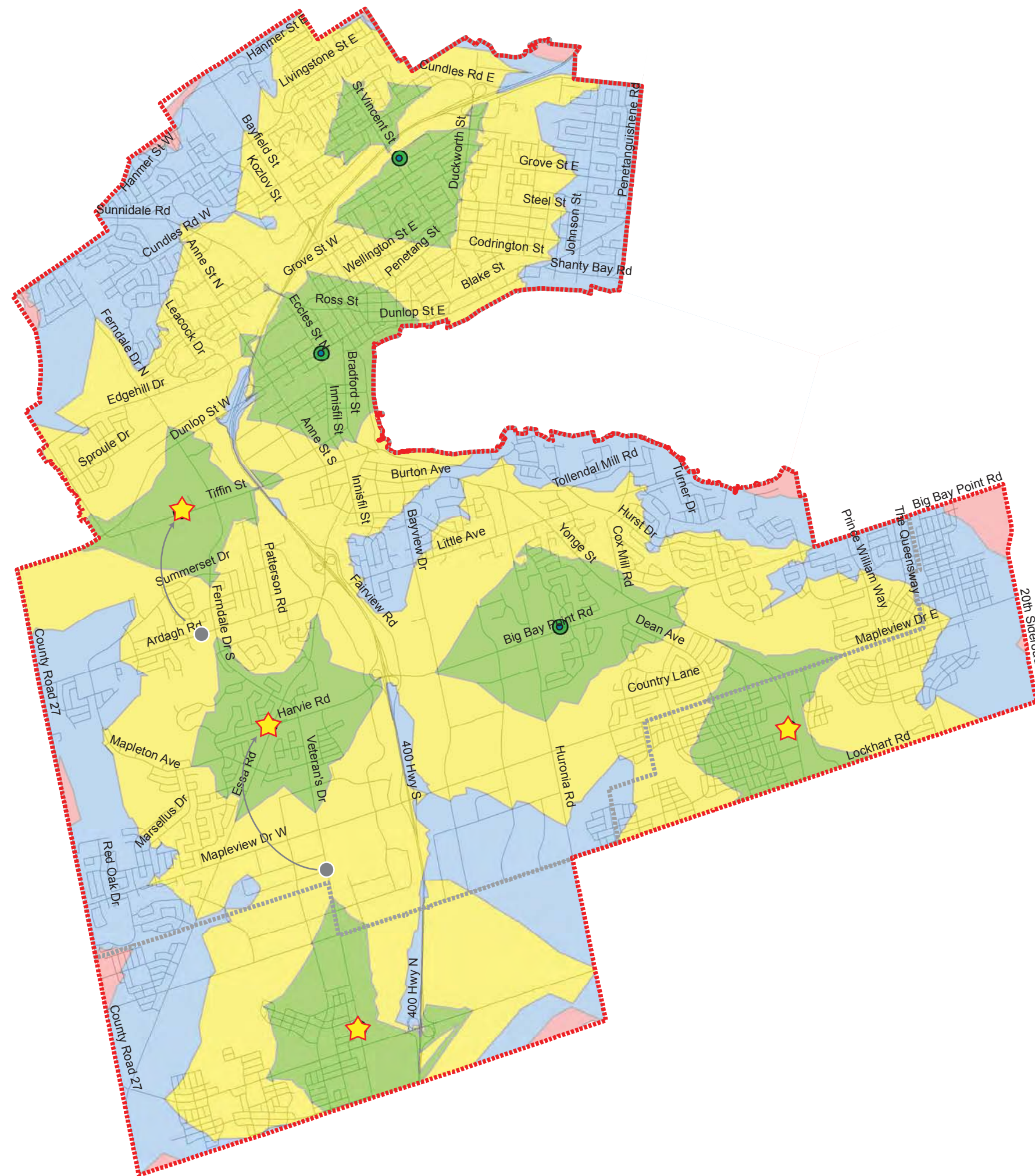
Theoretical 2, 4, 6, 8
Drive Time Analysis
2031
7 Stations, No Station Move Option



Barrie Fire Station Location Study



Project 121-20497



Legend

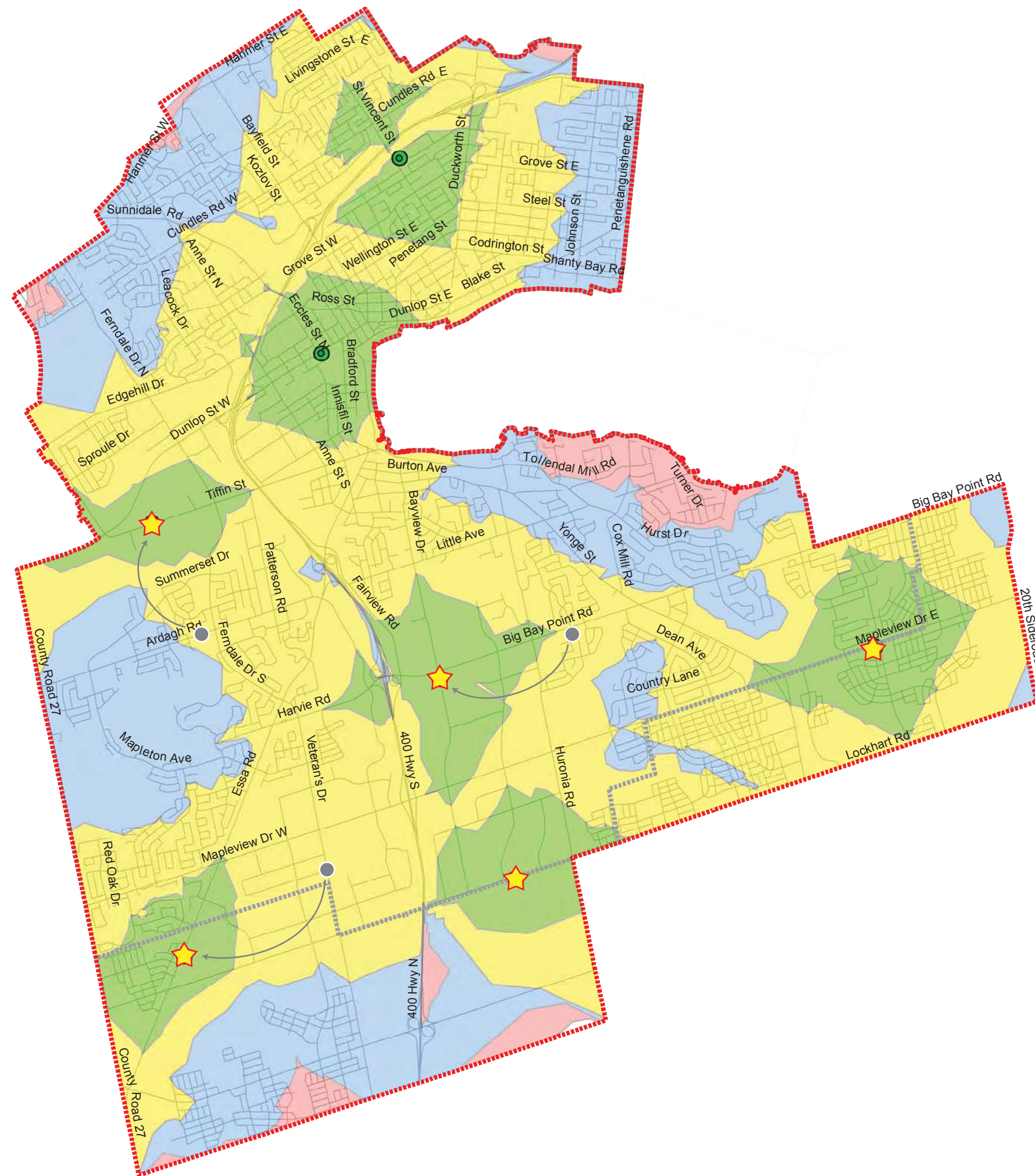
- Fire Stations ★ New Fire Stations
- Old Location of Fire Stations
- Roads
- Current City Boundary
- Former City Boundary
- Modelled Response Time**
- 0 to 2 minutes
- 2 to 4 minutes
- 4 to 6 minutes
- 6 to 8 minutes

Exhibit 7.3

Theoretical 2, 4, 6, 8
Drive Time Analysis
2031
7 Stations, Moving Stations Option



Barrie Fire Station Location Study



Legend

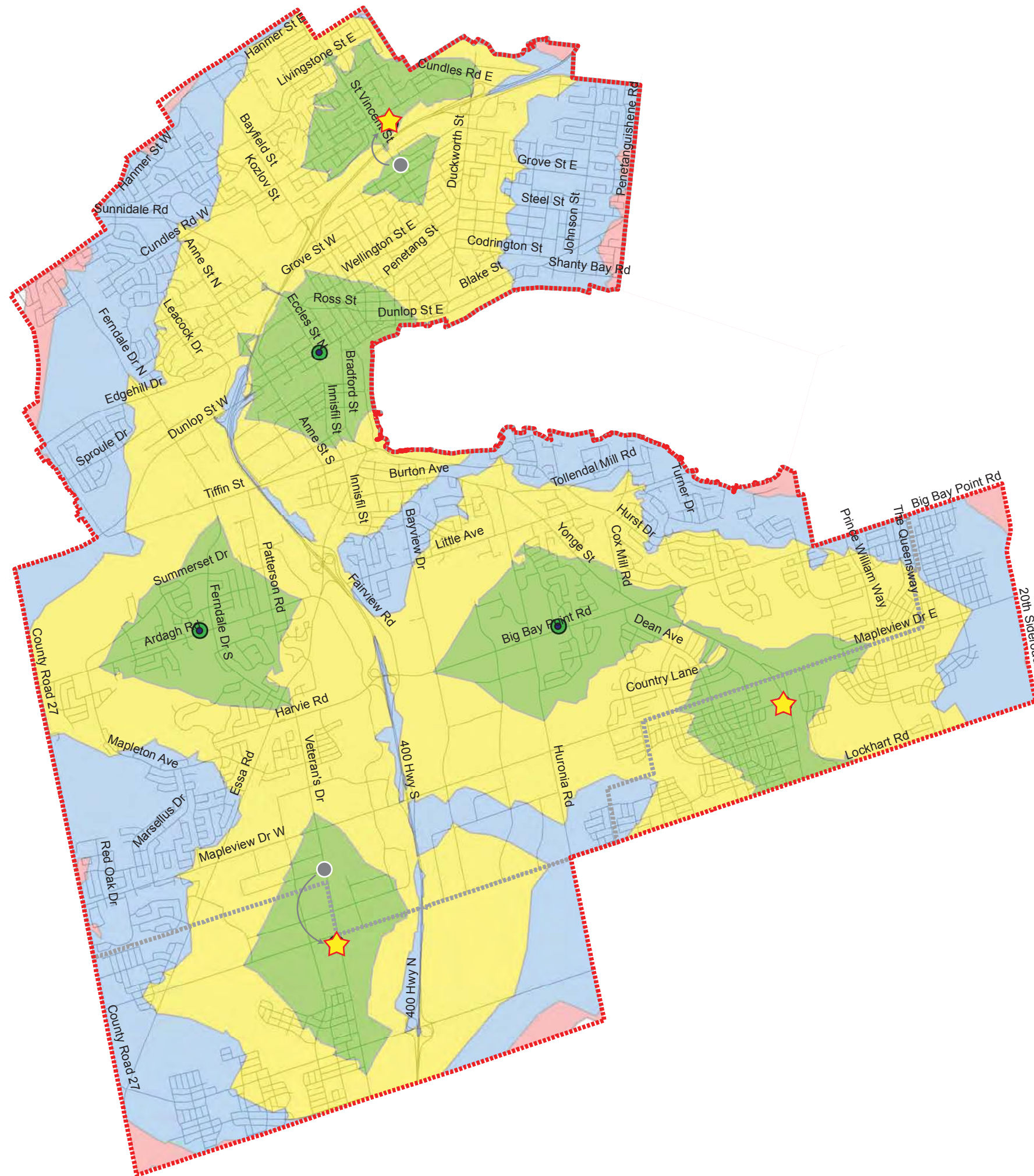
- Fire Stations ★ New Fire Stations
 - Old Location of Fire Stations
 - Roads
 - Current City Boundary
 - Former City Boundary
- Modelled Response Time**
- 0 to 2 minutes
 - 2 to 4 minutes
 - 4 to 6 minutes
 - 6 to 8 minutes

Exhibit 7.4

Theoretical 2, 4, 6, 8
Drive Time Analysis
2031
7 Stations, Anchor at Big Bay Point Option



Barrie Fire Station Location Study



Legend

- Fire Stations ★ New Fire Stations
- Old Location of Fire Stations
- Roads
- ▭ Current City Boundary
- ▭ Former City Boundary
- Modelled Response Time**
- 0 to 2 minutes
- 2 to 4 minutes
- 4 to 6 minutes
- 6 to 8 minutes

Exhibit 7.5

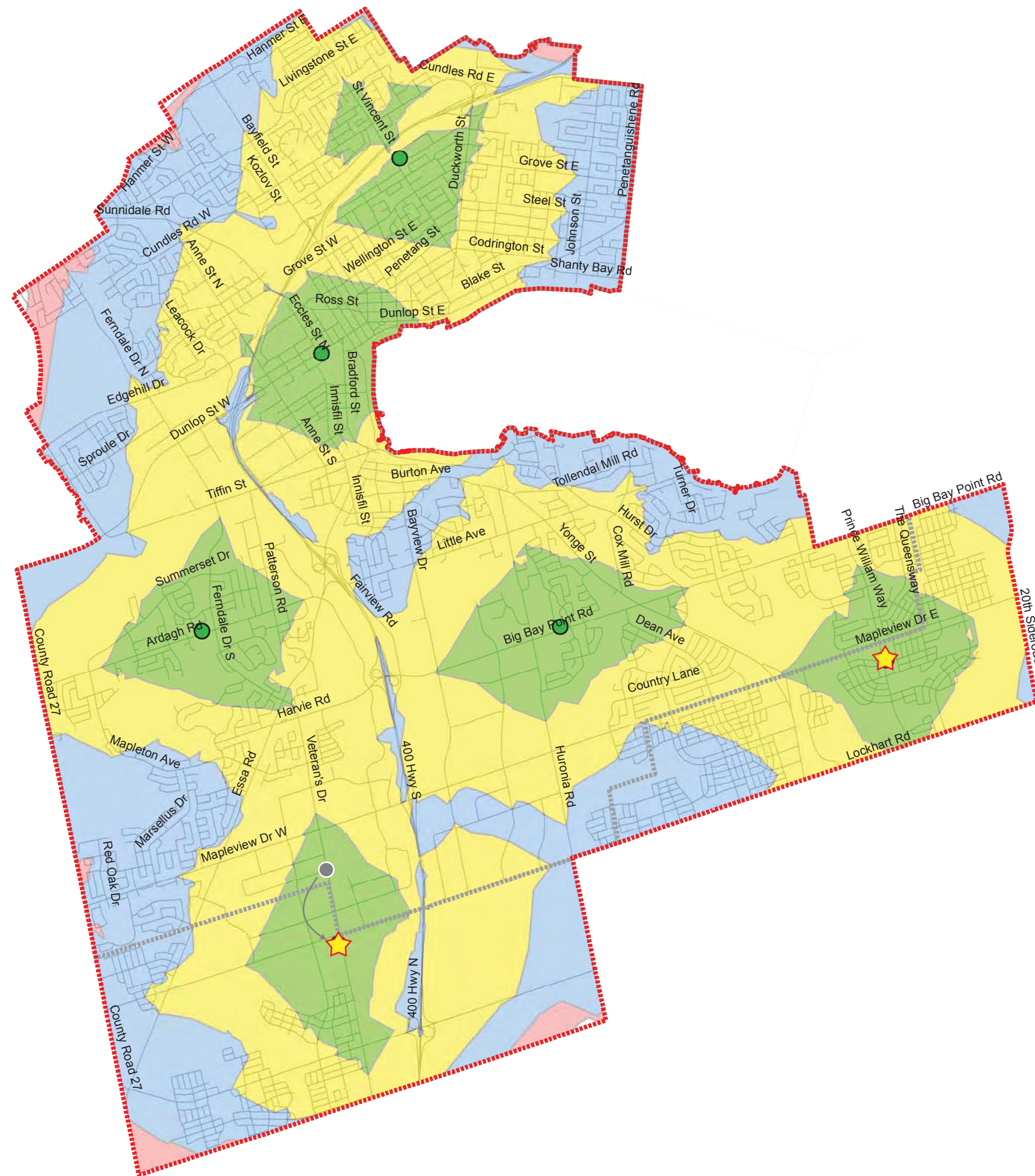
Theoretical 2, 4, 6, 8
Drive Time Analysis
2031
6 Stations, Moving Stations Option



Barrie Fire Station Location Study



Project 121-20497



Legend

- Fire Stations
 - ★ New Fire Stations
 - Old Location of Fire Stations
 - Roads
 - Current City Boundary
 - Former City Boundary
- Modelled Response Time**
- 0 to 2 minutes
 - 2 to 4 minutes
 - 4 to 6 minutes
 - 6 to 8 minutes

Exhibit 7.6

Theoretical 2, 4, 6, 8
Drive Time Analysis
2031
6 Stations, 1 Station Move Option



**Barrie Fire Station
Location Study**

8. Growth and Action Plan

8.1 Population and Employment Coverage

Table 8.1 shows the coverage of each fire station for the different development horizons. As the population evolves and Station 5 is relocation and the new station (Station 6) is implemented, there is a more even distribution in coverage ensuring better response times for all citizens of Barrie.

The table shows the importance of implementing Station 6 by 2016 as population grows in the area covered by Station 3. This would allow for the redistribution of coverage after Station 6 is built and brought online. Then, as the lease on Station 5 expires, it will need to be moved by 2021 in order to accommodate the new residents and development in the area to the southwest.

Table 8.1 highlights that Station 3 sees a significant increase in population in 2016 but dips in 2021 as Station 6 is implemented.

Response times from the different stations are dependent on the roadway network and future roadway projects. The Transportation Master Plan (TMP) includes the following road improvement projects in Barrie:

- 2016: Harvie / Big Bay Crossing
- 2021: Mackay Interchange
- 2021: Harvie / Big Bay Point interchange
- 2026: Salem/Lockhart crossing

8.2 Station 6 Implementation

As previously mentioned, the proposed new fire station on Prince William Way should be operational by 2016 in order to accommodate projected growth in this area. Station 6 is the first project that the Fire Department should implement due to the need to ensure proper coverage. As 2016 is fast approaching, the Fire Department must secure the land and start planning for construction in the very short term. As population grows on the eastern side of the Annexed Lands, Station 3 will be covering too many residents and workers for the station to offer proper response times and the new Station 6 is required. The Fire Station Location Study takes into account that the proposed location will be available for implementation in 2016. Construction and planning of the new location should be planned accordingly.

8.3 Station 5 Relocation

As mentioned earlier, Station 5 will have to be moved and operational by 2021 as the lease extension expires at this time and it would be required at this new location shortly thereafter. This will permit different phases of growth to happen while the existing station is under operation, while at the same time the various planning stages and construction happen. The new Station 5 will be adjacent to the proposed training facility, which can be phased separately from the station. For this purpose, it is recommended that land acquisitions are secured so that the land is available to construct both the fire station and the training facility.

8.4 Development Charges

Currently, development charges (DC) for all emergency services (fire, EMT and police) in the City of Barrie are assessed together. Therefore funds for capital costs are often treated on a “first come, first served” basis. It is recommended to separate DCs for the Fire Department from those for the Police Department and EMTs in order to have a stable source of funding for planned projects. It is clear from this analysis that the relocation and construction of a new fire station is required to ensure minimal coverage of the Annexed Lands and that funds must be available to accommodate these investments in a timely manner.

Table 8-1 : Population and employment in the coverage area of the fire station

Station	General Location	2011		2016		2021		2026		2031	
		Pop	Emp	Pop	Emp	Pop	Emp	Pop	Emp	Pop	Emp
Station 1	Dunlop St & Eccles St	32 228	19 119	32 657	19 561	36 191	19 382	38 948	21 928	43 523	21 928
Station 2	St Vincent St & Bell Farm Rd	38 513	15 450	38 866	16 056	38 461	18 885	39 140	20 826	40 271	20 826
Station 3	Big Bay Point Rd & Legott Av	35 114	11 289	47 445	12 991	32 275	15 103	33 374	17 707	34 836	17 707
Station 4	Ardagh Rd & Ferndale Dr	19 440	4 373	20 388	5 038	20 994	4 738	22 991	5 497	24 463	5 497
Station 5 (Current)	King St & Reid Dr	9 679	8 369	14 060	12 099	19 489	16 467				
Station 5 (New)	Veterans Dr & Salem Rd							22 363	18 861	24 605	18 861
Station 6	Prince William Wy & Mapleview Dr					25 938	2 964	36 496	3 467	37 022	3 467
Total		134 974	58 600	153 416	65 745	173 348	77 539	193 312	88 286	204 720	88 286

9. Conclusion

The City of Barrie mandated GENIVAR to undertake an analysis of the location of fire stations within the City. On January 1, 2010, after passage and adoption of the Barrie-Innisfil Boundary Adjustment Act, Barrie annexed 2,293 hectares of land from the Town of Innisfil, expanding the City to the south and east. This was done because Barrie had a limited supply of developable residential and employment lands within its pre-2010 boundaries. These areas, referred to as the Annexed Lands, will need to be serviced by the Fire Department. The current Fire Master Plan (2009) doesn't include coverage of the Annexed Lands, since this occurred after the adoption of the previous Master Plan.

The 2009 Fire Master Plan states that the Council would "provide 10 firefighters on the scene of a single family residential fire within 10 minutes, 90% of the time and a first apparatus arrival within 6 minutes, 90% of the time by separate motion". It is also noted that this motion should be contained in the Establishing and Regulating By-law. This was the service standard used in developing the current fire station locations as part of this study.

Examining the current demand for fire services it became clear that population and employment were the principal drivers. Furthermore, the street network was also critical since it dictated the routings and travel speeds. A network analysis model was developed using the road network, roadway hierarchy and one-way streets in order to determine driving response times. Therefore, a future model was developed for 2031 using the proposed road network and future population and employment projections within pre-2010 Barrie and the Annexed Lands.

In all, six different scenarios were studied including various variables: total number of stations, number of new stations and station relocation. Service coverage was estimated with using the projected population and employment. During the analyses it was determined that the costs of implementing and operating a seventh fire station couldn't be justified due to the marginal difference in response times as compared to a scenario with six stations. Therefore six stations were found to be the optimal number needed to provide coverage of the City of Barrie

The retained scenario retains Stations 1, 2, 3 and 4 in their current locations. Station 5 will move to a new location in the vicinity of the corner of Veteran's Drive and Salem Road by 2021. A training facility of 15 acres is planned to be adjacent to the site, however this facility can be phased and does not need to be fully operational in 2021. Further analysis must be undertaken by the City to identify and acquire the site for this facility. Station 6 will need to be implemented and operational by 2016 in order to accommodate and the projected growth in the Annexed Lands. Station 6 is projected to be constructed along Prince William Way, south of Mapleview Drive. The proposed scenario is represented on exhibit 7.6 as the preferred configuration.

In order to avoid the current "first come, first served" approach to funding of emergency services projects (police, fire, EMT) it is recommended to have a separate DC the Fire Department. It is clear from this study that the measures proposed in this study are time sensitive and are needed to ensure minimal coverage of the Annexed Lands and that funds must be available to accommodate these investments.

APPENDIX F

Fire Underwriters Survey 2014

2014-03-21 – Barrie

FIRE UNDERWRITERS SURVEY

A Service to Insurers and Municipalities



Barrie Fire Protection
Services Review

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1. SCOPE OF OUR ENGAGEMENT

The City of Barrie contracted the services of SCM Opta Information Intelligence Inc. to evaluate the City of Barrie's fire protection programs. The purpose of the assessment is to determine if the Fire Department can apply specific service level changes aimed at reducing costs, with consideration given to the City's Public Fire Protection Classification. Additionally, the assessment will determine whether the community's current fire insurance grading classifications are representative of the fire protection programs and fire protection resources currently in place within the community. A fire insurance grading review is a key part of the assessment process.

A report outlining the significant findings of the Opta Information Intelligence fire protection review was requested. The report will provide an update on the City of Barrie fire insurance grading assignments and make recommendations aimed at maintaining fire insurance grading classifications of the City of Barrie.

1.1. Acknowledgement

OPTA wishes to thank the City of Barrie, the Barrie Fire and Emergency Service, the Water Operations Department for their valuable assistance in conducting this survey and preparation of this report.

1.2. Distribution of Use

This report, along with the findings and conclusions, contained herein, is intended for the sole use of the City of Barrie to assist in the public fire protection planning needs of the community.

Judgments about the conclusions drawn and opinions presented in this report should be made only after considering the report in its entirety. This report is Private and Confidential and is intended for the exclusive use of the City of Barrie.

You may not copy, sell, reproduce, distribute, retransmit, publish, modify, display, prepare derivative works based on, re-post or otherwise use any of the Report Content, in any way for any public or commercial purpose without the express written consent of Opta Information Intelligence and Fire Underwriters Survey.

1.3. Reliance and Limitation

We have relied on the general accuracy of information provided by stakeholders including the City of Barrie, the Barrie Fire and Emergency Service, and the Public Works Department without independent verification. However we have reviewed this information for consistency and reasonableness. The accuracy of our conclusions is dependent upon the accuracy and completeness of this underlying data. Therefore, any discrepancies discovered in this data by the reader should be reported to us and this report amended accordingly, as warranted.



2. EXECUTIVE SUMMARY

This report outlines the most significant findings of the Fire Underwriters Survey review of the City of Barrie. The City of Barrie requested SCM Opta Information Intelligence Inc. (OPTA) to conduct a survey to evaluate the current fire protection programs and fire protection resources within the City for the purposes of updating the fire insurance grading classifications. A second objective of the study was to provide an analysis of the impacts that may be seen if specific service level changes are made within Barrie Fire and Emergency Service and throughout the City of Barrie.

The most recent Fire Underwriters Survey of the City of Barrie was completed in 2005. Since the time of the last survey, the community has experienced growth with respect to the built environment as well as changes to the service levels provided by Barrie Fire and Emergency Service and other City departments that play a role in public fire protection. It is likely that continued growth will impact the needs and benchmarks to which the City's fire protection facilities will be measured against.

In order to determine the fire protection needs in the City of Barrie, a fire hazard and life safety assessment was undertaken. The purpose of this review was to identify and quantify fire risk, fire hazard and life safety issues related to fire protection.

The four areas of protection/preventative facilities that were measured each have an assigned relative classification on a scale of 1 to 10, with 1 representing the highest standard of protection and 10 representing no protection. The four areas are: Water Supply (30%); Fire Department (40%); Fire Safety Control (20%); Emergency Communication (10%). The conclusions and recommendations of our assessment are described throughout this report.

The fire insurance grades for the city of Barrie have been updated to reflect the service levels throughout the City. The Dwelling Protection Grade (DPG) classification has been maintained at DPG Class 1 for each fire station reviewed. The Public Fire Protection Classification (PFPC) has been updated to more accurately reflect the service levels provided throughout each area of the community and each area served by the fire stations. Each fire station is now assigned an individual PFPC, which is a recent change from the past wherein the entire City was provided with a single PFPC. Fire Station No. 4 has improved and now has PFPC Class 3 assigned, while Fire Station No. 1 and Fire Station No. 3 have maintained PFPC Class 4. The review showed that the service level provided by Fire Station No. 2 and Fire Station No. 5 is no longer commensurate with PFPC Class 4. Fire Station No. 2 and No. 5 now have PFPC Class 5 assigned.

The report is supplied with key recommendations which have been developed to assist in future planning of fire protection programs, as well as achieving PFPC Class 3, and Class 4.

Table 2-1 summarizes the recommendations that have been made throughout this report. The City of Barrie has made and continues to make significant improvements in public fire protection. As the City continues to grow Fire Underwriters Survey strongly encourages the City to continue to make investments in public fire protection to help minimize property insurance rates.



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Various options for improvements have been included and are intended to be used as a road map to maintain and improve service levels throughout. These options include varying levels of improvements in fire prevention tools and operations, improved ladder response throughout the City and increased pre-incident planning.



3. TERMS OF REFERENCE

Term	Definition
Ladder Fire Apparatus.	A vehicle equipped with an aerial ladder, elevating platform, aerial ladder platform, or water tower that is designed and equipped to support fire fighting and rescue operations by positioning personnel, handling materials, providing continuous egress, or discharging water at positions elevated from the ground.
Aid - Automatic Aid	A plan developed between two or more fire departments for immediate joint response on first alarms . This process is accomplished through simultaneous dispatch, documented in writing, and included as part of a communication center's dispatch protocols.
Aid - Mutual Aid	Reciprocal assistance by emergency services under a prearranged plan. This is part of the written deployment criteria for response to alarms, as dispatched by the communications center.
Basic Fire Flow	The benchmark required fire flow for a community, typically the fifth highest calculated required fire flow of all areas within the community. The Basic Fire Flow is the benchmark against which all protective facilities are measured.
Building	Any structure used or intended for supporting or sheltering any use or occupancy.
Building Area	The greatest horizontal area of a building above grade within the outside surface of exterior walls or within the outside surface of exterior walls and the centre line of firewalls.
Building height	The number of storeys contained between the roof and the floor of the first storey.
Built Environment	Buildings and structures: human-made buildings and structures, as opposed to natural features.
Combustible	A material fails to meet the acceptance criteria of CAN4-S114, "Determination of Non-Combustibility in Building Materials."
Commercial Lines Insurance	A distinction marking property and liability coverage written for business or entrepreneurial interests (includes institutional, industrial, multi-family residential and all buildings other than detached dwellings that are designated single family residential or duplex) as opposed to Personal Lines.
Community - Major or Large	An incorporated or unincorporated community that has: <ul style="list-style-type: none"> • a populated area (or multiple areas) with a density of at least 400 people per square kilometre; AND • a total population of 100,000 or greater.
Community - Medium	An incorporated or unincorporated community that has: <ul style="list-style-type: none"> • a populated area (or multiple areas) with a density of at least 200 people per square kilometre; AND/OR • a total population of 1,000 or greater.
Community - Small	An incorporated or unincorporated community that has: <ul style="list-style-type: none"> • no populated areas with densities that exceed 200 people per square kilometre; AND



	<ul style="list-style-type: none"> • does not have a total population in excess of 1,000.
Company	<p>A group of members that is</p> <ol style="list-style-type: none"> (1) under the direct supervision of an officer or leader; (2) trained and equipped to perform assigned tasks; (3) usually organized and identified as Pumper companies, ladder companies, rescue companies, or squad companies; (4) usually operates with one piece of fire apparatus (Pumper, ladder truck, elevating platform, rescue, squad, ambulance); and (5) arrives at the incident scene on fire apparatus or assembles at the scene prior to assignment. <p>The term company, is synonymous with company unit, response team, and response group.</p>
Demand Zone Levels	<p>An area used to define or limit the management of a risk situation. A demand zone can be a single building or a group of buildings. It is usually defined in terms of geographical boundaries, called fire management areas or fire management zones.</p>
Detached Dwelling	<p>Buildings containing not more than two dwelling units in which each dwelling unit is occupied by members of a single family with not more than three outsiders, if any, accommodated in rented rooms. aka. One- and Two-Family Dwelling</p>
Dwelling Protection Grade (DPG)	<p>The fire insurance grade or grades utilized by Personal Lines Insurers in Canada. The DPG is a number between 1 and 5 that is calculated by comparing the fire risk in terms of required fire flows to available resources. Unlike the PFPC system, within the DPG system, the benchmark required fire flow is a constant, and is typical for a Detached Dwelling. The DPG for communities across Canada is determined from a basic survey of the available resources related to fire risk reduction and fire protection capacity.</p>
Dwelling, Typical	<p>Refers to One- and Two-Family Detached Dwellings:</p> <ul style="list-style-type: none"> - with no structural exposures (buildings with an area exceeding 9.3 sq.m) within 3 m; - with no unusual fire risks (such as wood shake roofs); AND - with an effective area (all storeys excluding basements) not exceeding 334 sq.m (3600 sq.ft).
Emergency Dispatch Protocol	<p>A standard sequence of questions used by telecommunicators that provides post-dispatch or pre-arrival instructions to callers.</p>
Emergency Incident	<p>Any situation to which the emergency services organization responds to deliver emergency services, including rescue, fire suppression, emergency medical care, special operations, law enforcement, and other forms of hazard control and mitigation.</p>
Emergency Response Facility (ERF)	<p>A structure or a portion of a structure that houses emergency response agency equipment or personnel for response to alarms.</p> <p>Examples of ERFs include a fire station, a police station, an ambulance station, a rescue station, a ranger station, and similar facilities.</p>
Emergency	<p>A condition that is endangering or is believed to be endangering life or property; an event that requires the urgent response of an emergency</p>



	response agency.
Pumper	A fire department Pumper having a rated capacity of 2840 L/min (625 lgpm) or more.
Exposing building face	That part of the exterior wall of a building which faces one direction and is located between ground level and the ceiling of its top storey or, where a building is divided into fire compartments, the exterior wall of a fire compartment which faces one direction.
Exposure	The heat effect from an external fire that might cause ignition of, or damage to, an exposed building or its contents.
Fire Apparatus	A fire department emergency vehicle used for rescue, fire suppression, or other specialized functions.
Fire Department Vehicle	Any vehicle, including fire apparatus, operated by a fire department.
Fire Department	A fire department is a group of persons formally organized as an authorized service of a municipal or other local government having a sustainable source of funding, which could include taxation, fees for services provided, contracts, permit fees or other reliable sources of revenue which will support the cost of services provided. A minimum number of trained persons able and equipped to respond with motorized fire fighting apparatus to extinguish fires or to respond to other classes of circumstances which may occur within a designated geographical area.
Fire Department. - Public Fire Department	A legally formed organization providing rescue, fire suppression, emergency medical services, and related activities to the public.
Fire Force, Available	A measure of the human resources that are available to participate in fire fighting operations on the fire ground or an equivalent measure.
Fire Force, Required	A measure of the human resources that are needed to participate in fire fighting operations on the fire ground (or an equivalent measure) for an ideal response based on the required fire flow, number of companies and average response time as specified in the Table of Effective Response.
Fire Flow	The flow rate of a water supply, measured at 20 psi (137.9 kPa) residual pressure that is available for fire fighting.
Fire Growth Potential	The potential size or intensity of a fire over a period of time based on the available fuel and the fire's configuration.
Fire Hall	An "emergency response facility" where fire department apparatus and equipment are housed, protected against harm, and made readily accessible for use in emergencies. The fire hall is normally the location where fire fighters respond from. Other primary purposes include training and administration of the fire department.
Fire load	(as applying to an occupancy) The combustible contents of a room or floor area expressed in terms of the average weight of combustible materials per unit area, from which the potential heat liberation may be calculated based on the calorific value of the materials, and includes the furnishings, finished floor, wall and ceiling finishes, trim and temporary and movable partitions.
Fire Protection	Methods of providing fire detection, control, and extinguishment.
Fire Suppression	The activities involved in controlling and extinguishing fires. Fire suppression includes all activities performed at the scene of a fire or



	training exercise that expose fire department members to the dangers of heat, flame, smoke, and other products of combustion, explosion, or structural collapse.
First Responder (EMS)	Functional provision of initial assessment (airway, breathing, and circulatory systems) and basic first aid intervention, including CPR and automatic external defibrillator (AED) capability. A first responder assists higher level EMS providers.
First Storey	The uppermost storey having its floor level not more than 2 m above grade
Grade	(as applying to the determination of building height) The lowest of the average levels of finished ground adjoining each exterior wall of a building, except that localized depressions such as for vehicle or pedestrian entrances need not be considered in the determination of average levels of finished ground.
Hazard	The potential for harm or damage to people, property, or the environment. Hazards include the characteristics of facilities, equipment systems, property, hardware, or other objects, and the actions and inactions of people that create such hazards.
Hazardous Material	A substance (solid, liquid, or gas) that when released is capable of creating harm to people, the environment, and property.
Incident Commander.	The person who is responsible for all decisions relating to the management of the incident and is in charge of the incident site.
Incident Management System (IMS)	An organized system of roles, responsibilities, and standard operating procedures used to manage emergency operations. Such systems are also referred to as incident command systems (ICS).
Initial Attack	An aggressive suppression action consistent with fire fighter and public safety and values to be protected.
Initial Attack Apparatus	Fire apparatus with a permanently mounted fire pump of at least 250 gpm (950 L/min) capacity, water tank, and hose body whose primary purpose is to initiate a fire suppression attack on structural, vehicular, or vegetation fires, and to support associated fire department operations.
Ladder Company	A fire department company that is provided with an aerial fire apparatus and is trained and equipped to support fire fighting and rescue operations by positioning personnel, handling materials, providing continuous egress, or discharging water at positions elevated from the ground.
Ladder Truck	An alternate name for Aerial Fire Apparatus.
Master Stream	A portable or fixed fire fighting appliance supplied by either hose lines or fixed piping and that has the capability of flowing in excess of 300 gpm (1140 L/min) of water or water based extinguishing agent.
Member	A person involved in performing the duties and responsibilities of a fire department, under the auspices of the organization. A fire department member can be a full-time or part-time employee or a paid or unpaid volunteer, can occupy any position or rank within the fire department, and can engage in emergency operations.



Mobile Water Supply (Tanker)	A vehicle designed primarily for transporting (pickup, transporting, and delivery) water to fire emergency scenes to be applied by other vehicles or pumping equipment.
Non-combustible	A material that meets the acceptance criteria of CAN4-S114, "Determination of Non-Combustibility in Building Materials."
Non-combustible construction	The type of construction in which a degree of fire safety is attained by the use of non-combustible materials for structural members and other building assemblies.
Non-combustible Material	A material, as defined in NFPA 220, Standard on Types of Building Construction, that, in the form in which it is used and under the conditions anticipated, will not ignite, burn, support combustion, or release flammable vapours when subjected to fire or heat. Materials reported as non-combustible, when tested in accordance with ASTM E 136, Standard Test Method for Behaviour of Materials in a Vertical Tube Furnace at 750°C, are considered non-combustible materials.
Officer - Company Officer	A supervisor of a crew/company of personnel. This person could be someone appointed in an acting capacity. The rank structure could be either sergeant, lieutenant, or captain.
Officer - Incident Safety Officer	An individual appointed to respond or assigned at an incident scene by the incident commander to perform the duties and responsibilities of that position as part of the command staff.
Officer - Supervisory Chief Officer	A member whose responsibility is above that of a company officer, who responds automatically and/or is dispatched to an alarm beyond the initial alarm capabilities, or other special calls. In some jurisdictions, this is the rank of battalion chief, district chief, deputy chief, assistant chief, or senior divisional officer (UK fire service). The purpose of their response is to assume command, through a formalized transfer-of-command process, and to allow company officers to directly supervise personnel assigned to them.
One- and Two-Family Dwelling	Buildings containing not more than two dwelling units in which each dwelling unit is occupied by members of a single family with not more than three outsiders, if any, accommodated in rented rooms.
Optimum Level of Fire Protection	The combination of fire fighting staff and apparatus that delivers a suppression effort commensurate with the fire demand faced, yet representing the most efficient use of resources in a safe and effective manner.
Peak Fire Flow	All buildings and building groups within a District or Municipality, the highest calculated required fire flow.
Personal Lines Insurance	Insurance covering the liability and property damage exposures of private individuals and their households as opposed to Commercial Lines. Typically includes all detached dwellings that are designated single family residential or duplex.
Personal Protective Clothing	The full complement of garments fire fighters are normally required to wear while on emergency scene, including turnout coat, protective trousers, fire-fighting boots, fire-fighting gloves, a protective hood, and a helmet with eye protection.
Personal Protective	Consists of full personal protective clothing, plus a self-contained breathing



Equipment	apparatus (SCBA) and a personal alert safety system (PASS) device.
Public Fire Department	An organization providing rescue, fire suppression, emergency medical services, and related activities to the public.
Public Fire Protection Classification	The fire insurance grade or grades utilized by Commercial Lines Insurers in Canada. The PFPC is a number between 1 and 10 that is calculated by comparing the fire risk in terms of required fire flows to available resources. The PFPC for communities across Canada is determined from an extensive survey and analysis of the fire risk in the built environment and the available resources related to fire risk reduction and fire protection capacity.
Public Fire Service Communications Center	The building or portion of the building used to house the central operating part of the fire alarm system; usually the place where the necessary testing, switching, receiving, transmitting, and power supply devices are located.
Public Safety Answering Point	A facility in which 9-1-1 calls are answered.
Pumper	Fire apparatus with a permanently mounted fire pump of at least 750 gpm (2850 L/min or 625 lpm) capacity, water tank, and hose body whose primary purpose is to combat structural and associated fires.
Quint	Fire apparatus with a permanently mounted fire pump, a water tank, a hose storage area, an aerial ladder or elevating platform with a permanently mounted waterway, and a complement of ground ladders. The primary purpose of this type of apparatus is to combat structural and associated fires and to support fire-fighting and rescue operations by positioning personnel-handling materials, providing continuous egress, or discharging water at positions elevated from the ground.
Required Fire Flow	The rate of water flow, at a residual pressure of 20 psi (138 kPa) and for a specified duration, that is necessary to confine and control a major fire in a specific building or group of buildings which comprise essentially the same fire area by virtue of immediate exposure. This may include as much as a Town block.
Storey	That portion of a building which is situated between the top of any floor and the top of the floor next above it, and if there is no floor above it, that portion between the top of such floor and the ceiling above it.
Wildland/Urban Interface	The line, area, or zone where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuels.



4. FIRE UNDERWRITERS SURVEY

Fire Underwriters Survey is a national organization that represents more than 85 percent of the private sector property and casualty insurers in Canada. Fire Underwriters Survey provides data to program subscribers regarding public fire protection for fire insurance statistical and underwriting evaluation. It also advises municipalities if they desire to review the current levels of fire defence in the community and provide direction with recommendations where improvements will enable them to better deal with fire protection problems.

Fire Underwriters Survey offices maintain data from surveys on fire protection programs throughout all municipalities across Canada. The results of these surveys are used to establish the Public Fire Protection Classification (PFPC) and Dwelling Protection Grade (DPG) for each community. The PFPC and DPG is also used by underwriters to determine the amount of risk they are willing to assume in a given community or section of a community.

The overall intent of the grading systems is to provide a measure of the ability of the protective facilities within a community to prevent and control the major fires that may be expected to occur by evaluating in detail the adequacy, reliability, strength and efficiency of these protective facilities.

4.1. Fire Insurance Grading Classifications

Public Fire Protection Classification

The PFPC is a numerical grading system scaled from 1 to 10. Class 1 is the highest grading possible and Class 10 indicates that little or no fire protection is in place. The PFPC grading system evaluates the ability of a community's fire protection programs to prevent and control major fires that may occur in multifamily residential, commercial, industrial, and institutional buildings and course of construction developments.

Fire Underwriters Survey also assigns a second grade for community fire protection, referred to as the Dwelling Protection Grade (DPG), which assesses the protection available for small buildings such as single-family dwellings.

Dwelling Protection Grade

The DPG is a numerical grading system scaled from 1 to 5. One (1) is the highest grading possible and five (5) indicates little or no fire protection is provided. This grading reflects the ability of a community to handle fires in small buildings such as single family residences.

4.2. Public Fire Protection Classification System

The Public Fire Protection Classification grading system is a measure of a community's overall programs of fire protection. The ability of a community's fire defences are measured against recognized standards of fire protection relative to fire hazard and fire / life safety risk present within the community. The following areas of fire protection are reviewed in the survey and have the following weights within the PFPC grading system:



Fire Department	40%
Water Supply	30%
Fire Safety Control	20%
Fire Service Communications	10%

The fire insurance classifications are conveyed to subscribing companies of Fire Underwriters Survey. FUS subscribers represent approximately 85-90% of the fire insurance underwriters in Canada. Subscribers use this information as a basis in their fire insurance underwriting programs to set limits to the amount of risk they are willing to assume within a given portion of a community, and to set fire insurance rates for commercial properties. Improved fire protection grades may result in increased competition for insurance underwriting companies to place their business within a community. Our analysis indicates that an improved fire protection grade has a positive effect on fire insurance rates.

In addition, PFPC classifications are a measure of the fire protection within a community. Many progressive communities use the classification system to assess the performance of their fire protection programs, and to plan the direction of fire protective services for the future of the community.

Improvements that would have a cumulative positive effect in fire insurance grading classifications and fire protection ability are discussed within this report. The intent of identifying areas where improvements can be made is to provide the City of Barrie direction in their community fire protection planning – if so desired and supported by the community.

Table 4-1 outlines the credit score or percentage criteria for each PFPC. To receive PFPC 4, the total credit points should be no less than 60 points of credit. If the total credit points are less than 10, then PFPC 10 applies and the area is considered unrecognized and do not meet the minimum criteria for fire insurance grading purposes. PFPC 9 applies when the area has received between 10-19 points of credit; however, PFPC 9 also applies in the absence of a recognized water system. This situation occurs very commonly throughout Canada and can apply to urban fire departments that have areas without hydrant protection.

Table 4-1 Credit Score Criteria for PFPC

PFPC Class	Score or Percentage Range
1	90 - 100
2	80 - 89
3	70 - 79
4	60 - 69
5	50 - 59
6	40 - 49
7	30 - 39
8	20 - 29
9	10 - 19
10	> 10



4.3. Dwelling Protection Grading System

Dwelling Protection Grades are based on a 1 to 5 grading system; DPG 5 indicates little or no fire protection available. Most small and midsize communities that have a gradable emergency water supply are assigned a DPG 3A rating, which the insurance industry has termed fully protected. DPG 3B refers to communities, or portions of communities, that have a recognized fire department but are not protected with a recognized water supply. The insurance industry has termed this ‘semi-protected’. Within the Fire Underwriters Survey grading, a grade of 3B indicates that the fire department is equipped, trained, prepared and adequately staffed to provide “Standard Shuttle Service” to a fire event within a reasonable response time (i.e. utilize a Pumper, tender and various related equipment to deliver water to a fire site and provide structural firefighting at the fire event).

The protected assignment refers to DPG 1 to DPG 3A. An unprotected designation refers to DPG 5. DPG 3B and 4 are given the semi-protected designation. The lower the DPG assignment is, the larger the discount given in fire insurance rates. The discounts given for an identical property considered fully-protected over those considered unprotected can be approximately 60%. Where there is sufficient population and sufficient taxation base, the savings generated can more than offset the operating and capital costs of an effective fire service.

A summary of the requirements for the Dwelling Protection Grade system is provided in Appendix A.

Many insurers have simplified the Dwelling Protection Grading system to a simple three tier system. This is typical for setting insurance premium rates for detached single family residences only.

Each insurer utilizes the Dwelling Protection Grades differently to set their own rates based on the marketplace and their own loss experiences. The three tier system that is typically used by many insurers is shown in Table 4-2 FUS Grades Correlation to Commonly used Insurance Terminology and Simplified Grades.

Table 4-2 FUS Grades Correlation to Commonly used Insurance Terminology and Simplified Grades

Fire Underwriters Survey Dwelling Protection Grades.	System Used by Many Insurance Companies “3 tier” system.	Insurance Companies typically refer to this grade as :
1	Table I	Fully Protected, Career
2	Table I	Fully Protected, Composite
3A	Table I	Fully Protected, Volunteer
3B ¹	Table II	Semi-Protected, Volunteer (Shuttle)
4	Table II or III	Limited-Protection, Volunteer
5	Table III	Unprotected

The fire insurance industry has minimum requirements that communities must meet in order for their fire protection program to receive recognition. The insurance industry sets benchmarks for:

- Fire Department Organization
- Membership

¹ Note that communities qualifying for Dwelling Protection Grade of 3B may also be able to achieve and equivalency to 3A through Superior Tanker Shuttle Service Accreditation.



- Training
- Apparatus Requirements
- Fire Suppression Capability, and
- Alarm Notification

4.4. Measuring Fire Risk in This Review

The strength of fire defence within a community depends largely on the will and financial ability of the community to support this emergency service. Fire Underwriters Survey and the National Fire Protection Association statistics indicate that the larger the population of a community, the higher the level of fire protection when measured against the risk of fires within the community. The best scenario for the level of fire protection occurs when expectations of fire suppression and prevention match the community's willingness to pay for this expectation.

Community growth resulting from capital developments increases the level of fire risk; however, the development of fire protective services often falls behind the developments, particularly in communities where growth happens quickly. If the fire protection services provided to the community remain unchanged as the fire risk level increases, the expectation for a reasonable level of fire protection for the community may no longer be met.

Optimum Level of Fire Protection

The combination of firefighting staff and apparatus that delivers a suppression effort commensurate with the fire demand faced, yet representing the most efficient use of resources in a safe and effective manner.

4.5. Overview of the Assessment Process

There is no one universal model of fire defence that can be applied to all situations or to a community requiring this emergency service. Ideally, the strength of a fire protection program is balanced between the risk of serious fire and the community's fire loss experience. Fire defences should be tailored with these issues in mind. To gauge the needs of the fire service based on experience alone would be to ignore perils that have not yet occurred. Ignoring experience and focusing on risk alone may tend to build-up a fire department force beyond the financial acceptability of the community paying for the service.

Fire Underwriters Survey measures the ability of a fire department against the risk of fire likely to occur within a community. This measurement is not usually determined by the most significant risk, nor is it based on the average fire risk. Our measurement focuses on structures where there is a considerable risk to fire and life safety, and where total or temporary loss of a particular structure would have a significant impact on a community's tax base and economy. A fire department should be structured and supported to effectively deal with everyday emergencies while at the same time be capable of controlling and extinguishing most fires that may occur.

In the case of the City of Barrie, the fire protective service was measured by its ability to provide public fire protection to the typical risks found in the community. These risks included but are not limited to: single family residential; commercial buildings, industrial buildings, and public buildings.



Fire Underwriters Survey examines the entire program of the community's fire defence in order to assess and grade the overall program. There are some areas within a FUS grading that carry substantial weight such as:

- Type of, and number of apparatus
- The condition and age of fire apparatus and fire suppression equipment
- The type of apparatus and ancillary equipment for the hazards present
- Pumping capacity (Apparatus)
- The type of Staffing (i.e. career fire fighters vs. volunteers)
- The distribution of companies relative to fire risk
- Response to alarm protocols
- Response times to critical risks
- Management of emergency services
- The quality of training programs for the fire fighter including specialized training
- The availability, adequacy and reliability of emergency water supplies.
- Fire prevention inspections
- Public education programs
- Building controls (application of Building Codes and related standards; plan review process; effective construction inspection and permit process)Automatic fire protection systems
- Emergency communication systems
- Available Fire Flows
- Reliability of Pumps (water system)
- Adequacy of Water System
- Hydrant Distribution



5. PROJECT SCOPE AND METHODOLOGY

5.1. Project Objectives

The scope of this assignment was to conduct an assessment of the City of Barrie fire protection program, for the following purposes:

- To evaluate whether the City's fire insurance grading classifications need updating based on the current level of public fire protection available to the City.
- Provide options and recommendations where improvements can be made in the area(s) of, but not limited to:
 - Fire prevention and public education programs and initiatives
 - Scheduled annual fire prevention inspections
 - Pre-incident planning
 - Increased requirements for built in safety of existing and new construction
 - Distribution and type of firefighting apparatus and available crews (enhanced response of ladder, quint, pumpers as needed)
 - Increased company unit strength (additional fire fighters assigned to firefighting apparatus)
 - Fire fighter training and training facilities
 - Available water supplies for firefighting including (improving redundancy, available storage, available fire flow, etc.)
- To evaluate future projected growth and discuss potential needs of future fire protection for improving or maintaining fire insurance grades
- Provide commentary, from the perspective of the fire insurance grading, of existing master fire plan and fire station location studies already accepted by the City.
- Estimate costs associated with implementing service level improvements described above. This discussion is intended to provide City officials with an estimate of the investments in fire protection associated with improving fire insurance grades.
- Provide a cost benefit analysis of the estimated costs of insurance that can be saved through the fire insurance grading.

A supplementary objective was to provide direction to the City of Barrie as to where improvements to the City's public fire protection programs could be made should fire insurance grading classifications remain status quo or be subject to downgrading.

The evaluation is intended to consider both current and future fire protection needs. The tasks and methodology used to conduct the assessment are listed below:

- *Community Risk and Hazard Assessment including*
 - Assessment of community profile
 - Required Fire Flow Calculations
 - Profile and quantify hazard and risk
- *Fire Department Assessment of*
 - Fire Department Profile
 - Apparatus and equipment



- Distribution of resources
- Pumping capacity
- Maintenance programs
- Staffing and personnel
- Training programs
- Administration
- Pre-Incident Planning Program
- *Water Supplies for Public Fire Protection Assessment*
 - Compare available water supplies to combined domestic demand and calculated fire flow needs
 - Evaluate emergency water supplies capacity and storage
 - Analyze water system for weaknesses and lack of redundancy
 - Test water supplies at various representative points throughout system
- *Fire Safety Control Assessment*
 - *Fire Service Communications Assessment*
 - *Complete a Fire Insurance Grading Review of the City of Barrie*
 - *Develop a Report that Includes Findings and Recommendations*

The City of Barrie completed a Water Master Plan; however, the scope of this project does not include a review or commentary of this document.

The following key contacts were made and provided information throughout the survey and development of report.

- John Lynn, Fire Chief
- Dave Forfar, former Deputy Fire Chief
- Rick Monkman, Deputy Fire Chief
- Tracey Stevenson, Chief Fire Prevention Officer
- Sandra Brunet, Manager of Water Operations
- Lloyd Spooner, Senior Water Technologist
- Jamey Adams, Supervisor of Surface Water Supply



6. CITY OF BARRIE

6.1. General Description

The City of Barrie is located in Simcoe County and is approximately 100 km north of the City of Toronto. The City covers an area of approximately 77 km² and has a population of 143,000. The population density per square kilometer is 1,753.6. With these characteristics, the City of Barrie is considered a major city. A major city is as an incorporated or unincorporated community that has:

- a populated area (or multiple areas) with a density of at least 400 people per square kilometre; AND
- a total population of 100,000 or greater.

The majority of the building stock within the City is primarily single family residential; however, there is a variety of commercial (mercantile, shops and stores, businesses, schools, industrial, hotels, community center, restaurants) and multi family residential buildings.

The Barrie Fire and Emergency Service operates from 5 stations distributed throughout the City with a total of 13 fire fighting and rescue apparatus. These stations and apparatus are staffed by 150 career personnel dedicated to various duties and tasks such as senior management, training, fire prevention, public education, fire fighting and more.

The City's Water Operations Department is responsible for providing domestic and emergency water supplies for public fire protection. This includes treatment of water from source, distribution throughout the system as well as system maintenance. There are approximately 4300 hydrants (public and private), 5 reservoirs, 12 wells, 8 pumping stations (boosters, high lifts, low lifts), and 5 pressure zones.



7. COMMUNITY RISK AND HAZARD ASSESSMENT

7.1. Background

A fire hazard and risk assessment was conducted throughout the City of Barrie to aid in determining the community's fire protection needs and to assist in assessing the adequacy of the Water Supply and Fire Department. A risk and hazard assessment, along with a response distance review, community growth assessment and assessment of trends of emergency responses, lays the groundwork to determine fire protection needs within a community. This assessment is important in determining organizational structure, personnel requirements, training requirements, fire apparatus and fire equipment needs, response time requirements and adequacy of fire station location.

The "Risk and Hazard Assessment" is an evaluation of the life safety risks, fire loading and risk of fire that is present in a given area.

7.2. Measuring Fire Risk

Adequate response to a fire emergency is generally measured by the speed with which a responding firefighting crew(s) can arrive at the fire emergency with the correct type and amount of resources, to have a reasonable degree of opportunity to control or extinguish a fire. Simply put, the response provided by a fire fighting crew should equal the potential severity of the fire or fire emergency. The required response from a fire fighting crew is greater if life safety is a factor in a fire event and the expected response time is shorter.

The potential severity of a fire event is generally associated with the fuel load present and exposures to the fire. Factors such as building construction materials; quality of construction; building renovation history; building size, height and age; occupancy and hazards associated with the occupancy, will all contribute to the potential severity of a fire. In addition, other buildings sufficiently exposed to a burning building can contribute to the magnitude of a fire and, the resources necessary to be in place to control or extinguish a given fire. Alternatively, building controls and automatic fire protection systems (both active and passive) that limit fire spread will reduce the potential severity of a fire. For building controls to be considered effective, their design, installation and maintenance must also be reviewed as any weak link may result in the system being ineffectual.

Much of the research into fire protection requirements for individual buildings and communities and the corresponding number of "Pumper companies" and response times has been conducted by Fire Underwriters Survey and the National Fire Protection Association. Fire Underwriters Survey evaluates adequacy of response by comparing the potential severity of fires that may occur with a rating of the ability of fire crews and their resources responding within a specified time period relative to the fire and life safety risk potential that may be needed.

Table 7-1 Fire Underwriters Survey - Table of Effective Response illustrates various sectors commonly found in most communities, and indicates a range of risk ratings that are commonly applied to these sectors. The Table of Effective Response also indicates a range of fire flows that are normally associated with each community sector profile. Additionally, Table 7-1 indicates the number of Pumper and ladder companies that are expected



to be needed to control and suppress fires occurring within representative building zones throughout the community.

The number of fire companies that will be measured against is correlated to fire loading within the community's building stock and to life safety risks present. Fire flow requirements are determined by construction characteristics, occupancy, size and exposures to representative buildings throughout the community.



Table 7-1 Fire Underwriters Survey - Table of Effective Response

The following Table aids in the determination of Pumper and Ladder Company distribution and total members needed. It is based on availability within specified response travel times in accordance with the fire potential as determined by calculation of required fire flows, but requiring increases in availability for severe life hazard.

RISK RATING	FIRE FLOW		INITIAL RESPONSE TO ALARMS		1 st DUE	2 nd DUE	1 st DUE	TOTAL		AVAILABILITY
	L/min X1000	Approx. lgpm Range	Pumper Companies	Ladder Companies	Pumper Company, Minutes	Pumper Company, Minutes	Ladder Company, Minutes	Pumper Companies, No.	Ladder Companies, No.	Min.
1 (a)	2	400	1	0	7.5	-	*9	1	7.5	*1 9
(b)	3	600	1	0	6	-	*7.5	1	6	*1 7.5
2	4-5	800-1,000	2	0	4	6	*6	2	6	*1 6
3 (a)	6-9 10-13	1,200-2,000 2,200-2,800	2 2	1 (if required by Hazards)	3.5 3.5	5 5	*4 *4	2 3	5 6	*1 *1 4 4
3 (b)	14-16 17-19	3,000-3,600 3,800-4,200	2 2	1 1	3.5 3.5	5 5	4 4	4 5	7 7	1 **1 4 4
4 (a)	24-23 24-27	4,400-5,000 5,200-60,00	2	1	2.5 2.5	4 4	3.5 3.5	6 7	7.5 7.5	2 2 5 5
4 (b)	28-31 32-35	6200-6800 7000-7600	3	1	2.5 2.5	3.5 3.5	3.5 3.5	8 9	8 8	3 3 7 7
5	36-38 39-42 43-46	7,800-8,400 86,00-9,200 9,400-10,000	3	3	2 2 2	3.5 3.5 3.5	2.5 2.5 2.5	10 12 14	8 9 9	4 5 6 7.5 8 9

Notes to Table of Effective Response

* A ladder company is required here only when exceptional conditions apply, such as 3 storey heights, significant life hazards.

** For numerous or large single buildings over three stories use two ladder companies in 5 minutes.



When unsprinklered buildings over six stories have fire flow requirements less than Group 4, the number of Pumper and Ladder Companies under “Total Availability Needed” should be increased at least to the next group to provide the additional manpower required except where this additional manpower regularly responds in the time allotted, as occurs in some volunteer or composite fire departments.

The table gives travel times for apparatus AFTER dispatch and turn-out. Under very exceptional conditions affecting total response time, these nominal figures should be modified.

From the perspective of insurers, the level of fire risk is a function of several key factors (each of which are influenced by a number of sub-factors) that include:

- **Likelihood** of fire event occurring
 - o Influenced by many risk factors
 - o Occupancy type (industrial, commercial, multi-family residential)
 - o WUI - wild land urban interface exposures and Climatic conditions
 - o Presence of combustibles, presence of ignition sources
 - o Quantity of area protected, number of buildings/risks
 - o Population demographic
- **Consequence** of fire event occurring
 - o Loss of life
 - o Density of population
 - o Number of persons expected to be affected
 - o Loss of property and property values
 - o Loss of business, employment, tax revenue, economic impacts
- **Controls** in place to prevent fire event from occurring
 - o Codes, Bylaws and enforcement measures
 - o Fire Prevention Program
 - o Community and building design
- **Controls** in place to reduce impact of fire event that occurs
- Quality and availability of fire department
- Number of staff and quality of training program
- Number of apparatus and quality/reliability of equipment
- Availability and reliability of adequate water supplies for fire fighting

When there is an increase in the quantity of values that are being protected by a fire protective service organization, the level of fire protective service typically must increase to meet the increased risk levels. If the level of fire protective service remains a constant during the rise of protected property values, then the rated overall level of risk increases and the fire insurance grade typically reflects this.

7.3. Fire Risk Assessment in the City of Barrie

The City of Barrie building stock consists of:

- Single family homes
- Multi-family apartments and town homes
- Commercial and Mercantile space, such as
 - o Restaurants



- Hotels and Motels
- Shopping Malls
- Retail Plaza's
- University and College Campus
- Schools
- Industrial
- Hospital's and care facilities

The City of Barrie has been reviewed from the perspective of life safety, fire loading, fire risk and response characteristics. The City was assessed on three levels.

The first level Occupancy Risk is defined as the assessment of the relative risk to life and property resulting in a fire inherent in a specific occupancy or in generic occupancy class. For fire insurance grading purposes this is known as Required Fire Flows.

The second level Fire Flow Demand Zones, which are areas used to define or limit the management of a risk situation. A Fire Flow Demand Zone can be a single building or a group of buildings. It is usually defined with geographic boundaries and can also be called fire management areas or fire management zones.

The third level is known as Community Risk, which is defined as the overall profile of the community based on the unique mixture of individual occupancy risks and the level of service provided to mitigate those risk levels. For fire insurance grading purposes this is better known as the Basic Fire Flow.

7.3.1. Required Fire Flows

To develop the Required Fire Flows within the boundary of the City of Barrie, the methodology described in the Fire Underwriters Survey 1999 Guideline "Water Supply for Public Fire Protection" was used. Refer to Appendix B.

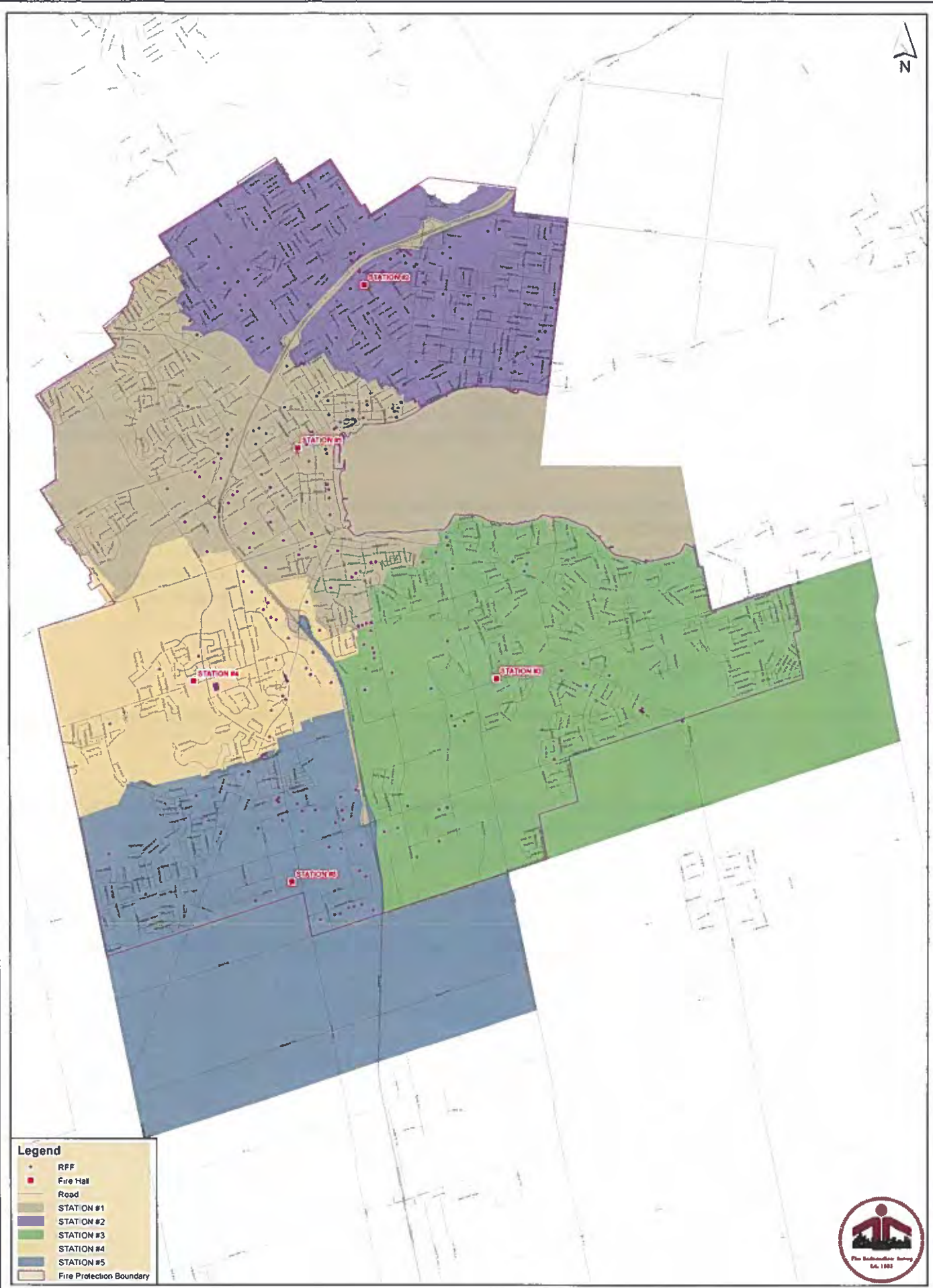
Required Fire Flows may be described as the amount and rate of water application required in firefighting to confine and control the fires possible in a building or group of buildings which comprise essentially the same fire area by virtue of immediate exposures.

It should also be noted that the Required Fire Flows determined by the Fire Underwriters Survey are then used to set the benchmark (Basic Fire Flow) that the community will be measured against. These fire flows are intended to be adequate to fight fires offensively, and to provide property protection (including exposure protection) in addition to life safety protection.

Required Fire Flows were calculated throughout the City of Barrie to provide an accurate idea of the level of fire risk that is within the City. Figure 7-1 shows where required flows were calculated throughout the City. Details regarding the calculation of each Required Fire Flow can be viewed in Appendix C.

Required Fire Flows ranged from 800 IGPM to 1,300 IGPM for single family residential and duplex buildings. Required Fire Flows for commercial risks (everything that is not single family residential or duplex) ranged from 1,500 IGPM to as high as 6,600 IGPM pm.

Figure 7-1 Barrie Fire and Emergency Services Fire Protection Service Area and RFF Points





7.3.2. Basic Fire Flow

The Basic Fire Flow is determined from the analysis of the required fire flows. It is important to stress that the Basic Fire Flow assigned is not the peak required fire flow and is intended to be adequate for 90% of the typical structure fires that are expected to occur based on the Required Fire Flows calculated during the risk assessment. Notably, Required Fire Flows were not calculated for all buildings throughout the community and specialized risks with high fire flows should be reviewed on an ongoing basis.

The City has five distinct developed areas or response zones throughout the community. Each response zone has unique risks making each response zone distinctly different from one another, with exception to single family residences. Single family residences were determined to be homogenous throughout the City.

Risks located in Fire Station No.1 Response Zone include mercantile, business services, industrial, hotels, schools, multi-unit residential apartments and condominiums, townhomes or row housing, single family residential dwellings and a downtown commercial district with densely spaced structures and virtually no distance between exposures. The varying type and size of the risks considered resulted in required fire flows varying from 1,800 IGPM to 6,400 IGPM. The key factors in determining a required fire flow are: building area and construction, occupancy, presences of automatic sprinklers and exposures. A total number of 77 required fire flows were calculated for the Fire Station No.1 Response Zone.

Risks located in Fire Station No.2 Response Zone were similar to risks found in Fire Station No.1's Response Zone; however, there are some distinctions.. Each area has a mercantile, business services, industrial, schools and multi-family residential and single family residential; however, University and College Campus' reside in Fire Station No.2 Response Zone, as well as large consumers outlets such as Georgian Mall. The varying type and size of the risks considered resulted in required fire flows ranging from 1,100 IGPM to 6,400 IGPM. Eighty required fire flows were calculated within Fire Station No.2 Response Zone.

Risks located in Fire Station No.3 Response Zone were measured once again using Required Fire Flows. The varying types of occupancies and buildings yielded a lower range of Required Fire Flows from 1,500 IGPM to 4,800 IGPM. Although, the range of Required Fire Flows calculated for Response Zone 3 did not surpass the 5,000 IGPM mark, as is seen in Zones 1 & 2, the Basic Fire Flow was measured at similar levels. Fire Station No.3's Basic Fire Flow was calculated at 4,400 IGPM. Peak Required Fire Flows were not nearly as high a Required Fire Flows in Zones 1 & 2. A total of 35 Required Fire Flows were calculated for Response Zone 3.

Risks located in Fire Station No.4 Response Zone yielded a Basic Fire Flow of 3700 IGPM. This was the lowest Basic Fire Flow calculated for all five response zones. The varying types of occupancies and buildings presented a lower range of Required Fire Flows from 1,500 IGPM to 4,800 IGPM. The Basic Fire Flow for Fire Station No.4 was significantly less than the Basic Fire Flow for the other four (4) Response Zones. A total of 35 Required Fire Flows were calculated within Response Zone No.4.

Required Fire Flows calculated for Fire Station No.5 Response Zone range from 2200 IGPM to 4800 IGPM. A total of 30 Required Fire Flows were calculated as representatives of the varying building stock being protected. A significant number of industrial occupancies and commercial outlets make up the majority of risks reviewed within the response zone. The area has experienced growth from the last survey; however, the growth has not added to peak Required Fire Flow. Many of the structures comprising the building stock of



Response Zone 5 have sprinkler system protection, which allows for a possible 50% reduction in Required Fire Flow values calculated.

The City of Barrie has been evaluated with six (6) separate Basic Fire Flows, one for the entire City boundary (used for the water supply assessment) and one each first response zone throughout the city.

The Basic Fire Flows applied throughout the City of Barrie are as follows:

- City of Barrie: 5,700 IGPM**
- Fire Station No.1: 4,800 IGPM**
- Fire Station No.2: 4,200 IGPM**
- Fire Station No.3: 4,400 IGPM**
- Fire Station No. 4: 3,700 IGPM**
- Fire Station No.5: 4,200 IGPM**

Our analysis indicates that fire loading has increased since the City was last surveyed. The City of Barrie was last assessed in 2004, wherein the Basic Fire Flow was measured at 4,000 IGPM. It was customary at the time to develop the Basic Fire Flow for the entire City; today however each individual Fire Station is measured against the risks present in their own Response Zone. Water supplies and Fire Department will be graded using the Basic Fire Flows applicable to each area of the City.

Required Fire Flows calculated that were higher than the Basic Fire Flow are not excluded from fire insurance grading. They are still utilized under specific items of the grading. Additional resources and planning may be required to adequately provide protection to peak Required Fire Flow risks.

7.4. Future Fire Risk in City of Barrie

The Basic Fire Flows throughout the City are not expected to change significantly in the next 10 years. However, if a significant number of developments with Required Fire Flows higher than the Basic Fire Flow were to be built, there is the possibility that the current Basic Fire Flow would have to be adjusted to reflect the change for fire insurance grading. Development areas that have the most potential to increase the Basic Fire Flow of the City are located near the airport and include the industrial park servicing airport industry.

It is advisable that the Fire Department, Engineering Infrastructure and Building Department calculate Required Fire Flows for new developments to ensure they can be adequately be protected by the Fire Department and water supply.



8. FIRE DEPARTMENT ASSESSMENT

8.1. Barrie Fire and Emergency Service Profile

The Barrie Fire and Emergency Service (BFES) is operated and funded by the City of Barrie. The Fire Department is a career fire department with a career Fire Chief, Deputy Fire Chief of Operations, Deputy Fire Chief of Training, Fire Prevention and Communications², Chief Training Officer and four (4) Training Officers (one assigned to each platoon), Chief Fire Prevention Officer and five (5) Fire Prevention Officers, a Plans Examiner and, a Fire and Life Safety Officer. The suppression division is supported by four (4) Platoon Chiefs overseeing a fire fighting roster of approximately 112 Fire Fighters and 28 Captains totalling 140 Fire Fighters. The 140 Fire Fighters comprise 28 crews with a Captain and Acting Captain assigned to each crew.

The Barrie Fire and Emergency Service provides structural firefighting and rescue services that include but are not limited to: confined space rescue, aircraft rescue and fire fighting, motor vehicle extrication and emergency medical response, trench rescue, high angle technical response, water/ice rescue, technical rope rescue, hazmat operations, for the City of Barrie. Fire Prevention and Public Education staff are involved in conducting Fire Code Inspections throughout the City, assisting in the development of Fire Safety Plans and introducing the concepts of fire and life safety to constituents through various public education mediums. Inspections are completed on a request and complaint basis.

The Fire Department currently operates from five (5) fire stations located within the City limits. The current in service apparatus for BFES that have been reviewed for fire insurance grading purposes are as follows.

Table 8-1 Barrie Fire and Emergency Service Fire Apparatus Summary

Unit #	Year	Fire Station	Vehicle Type	Pump (IGPM)	Tank (L.GAL)	Duty Status (viewed by FUS)	Age in 2013
Pump 1	2005	Fire Station No.1	Pumper	1,050	600	Active Duty	8
Brush 1	2006	Fire Station No.1	Wildland	500	300	Active Duty	7
Tower 1	2005	Fire Station No.1	Platform	1,500	300	Active Duty	8
Tank 1	2010	Fire Station No.1	Tanker	250	2,750	Active Duty	3
Rescue 2	2008	Fire Station No.2	Rescue Pumper	1,050	625	Active Duty	5
Ladder 11	1996	Fire Station No.2	Reserve - Ladder	1,050	500	Reserve	17
Tank 3	2003	Fire Station No.3	Pumper Tanker	1,050	1,000	Active Duty	10
Quint 10	2002	Fire Station No.3	Spare Quint	1,050	600	Reserve	11
Tower 3	2009	Fire Station No.3	Platform	2,000	300	Active Duty	4
Rescue 4	2007	Fire Station No.4	Pumper Rescue	1,050	625	Active Duty	6
Reserve 9	2002	Fire Station No.4	Reserve Pumper	1,050	625	Reserve	11
Reserve 8	2000	Fire Station No.4	Reserve Pumper	1,050	625	Reserve	13
Rescue 5	2012	Fire Station No.5	Pumper Rescue	1,400	625	Active Duty	1

² At the time of the survey, this position was filled; however, over the course of this study the position has since become vacant. An Administration Review is currently taking place which will ensure that this position is filled.



8.2. Fire Department Grading Items

The Fire Department Grading consists of 19 items. Forty percent of the Public Fire Protection Classification of the City of Barrie comes from the grading of the Fire Department.

Areas reviewed in the assessment of the Fire Department are as follows:

- FD 1 – Pumper Service
- FD 2 – Ladder Service
- FD 3 – Distribution of Companies
- FD 4 – Pumper and Ladder Pump Capacity
- FD 5 – Design, Maintenance and Condition of Fire Apparatus
- FD 6 – Number of Line Officers – Fire Suppression
- FD 7 – Total Fire Force Available
- FD 8 – Pumper and Ladder Company Unit Manning
- FD 9 – Master and Special Stream Devices
- FD 10 – Equipment for Pumpers and Ladder Apparatus, General
- FD 11 – Fire Hose
- FD 12 – Condition of Fire Hose
- FD 13 – Training and Qualifications
- FD 14 – Response to Alarms
- FD 15 – Fire Ground Operations
- FD 16 – Special Protection Required
- FD 17 – Miscellaneous Factors and Conditions
- FD 18 – Pre-Incident Planning
- FD 19 – Administration

8.2.1. Pumper Service

Fire departments are evaluated for the number of Pumper companies in service relative to the overall fire potential and the area being protected. Pumper apparatus are required to be adequately housed and staffed in order to receive full credit.

The Pumper service grading item refers to the amount of credit received for each of the department's Pumpers. Recognition and credit for Pumpers may be reduced or withheld based upon the measured reliability of the pumps and the apparatus upon which they are installed (ex. factors such as age, listing, testing, etc.).

Fire apparatus that serve dual purposes are evaluated based on the primary duty it serves on the fire ground. For example, a ladder apparatus with a fire pump may be credited in one of two ways.

- 100 percent credit as a ladder apparatus and 50 percent credit as a Pumper, or
- 100 percent credit as a Pumper apparatus and 50 percent credit as a ladder apparatus.

This depends upon the number of apparatus a department has available and where credit should be distributed properly in the grading depending on the primary use of the fire apparatus.

The maximum acceptable age of apparatus specified in the fire insurance grading index is 20 years. Refer to Appendix E for Insurance Grading Recognition of Used and Rebuilt Fire Apparatus.



The benchmark number of Pumper companies that the Barrie Fire and Emergency Service can receive credit for is based on the Basic Fire Flows for each of the Fire Station Response Districts. Values are cross referenced with the Table of Effective Response.

Additionally, credit can be received for one reserve Pumper company in this grading item. For fire insurance grading, a fire department should have one reserve Pumper for each eight Pumpers in service. A fire department even with a single Pumper company should also have a reserve Pumper.

Support Pumper credit was not factored in to this grading of the Barrie Fire and Emergency Service. Support Pumper credit considers rescue apparatus.

Table 8-2 Credited in Service Pumper Summary

Fire Station No.1			
Unit #	Vehicle Type	Pumper Credit	Reserve Pumper Credit
Pump 1	Pumper	1	0
Tower 1	Platform	0.5	0
Rescue 2	Rescue Pumper	0.73	0
Tank 3	Pumper Tanker	1	0
Tower 3	Platform	0	0
Rescue 4	Pumper	1	0
Reserve 9	Reserve Pumper	0	1
Reserve 8	Reserve Pumper	0	1
Rescue 5	Rescue Pumper	0.74	0
Quint 10	Quint – Reserve	0	1
Credit Received:		4.97	3
Maximum Credit Permitted (BFF 4,800 IGPM):		6	2

Fire Station No.2			
Unit #	Vehicle Type	Pumper Credit	Reserve Pumper Credit
Pump 1	Pumper	0.73	0
Tower 1	Platform	0.25	0
Rescue 2	Rescue Pumper	1	0
Tank 3	Pumper Tanker	0.55	0
Tower 3	Platform	0	0
Rescue 4	Rescue Pumper	0.73	0
Reserve 9	Reserve Pumper	0	1
Reserve 8	Reserve Pumper	0	1
Rescue 5	Rescue Pumper	0.15	0
Quint 10	Quint – Reserve	0	1
Total Pumper/Reserve Pumper Credit Received:		3.41	3
Maximum Credit Permitted (BFF 4,200 IGPM):		5	1

Fire Station No.3			
Unit #	Vehicle Type	Pumper Credit	Reserve Pumper Credit
Pump 1	Pumper	0.25	0



Tower 1	Platform	0	0
Rescue 2	Rescue Pumper	0.55	0
Tank 3	Pumper Tanker	1	0
Tower 3	Platform	0.5	0
Rescue 4	Rescue Pumper	1	0
Reserve 9	Reserve Pumper	0	1
Reserve 8	Reserve Pumper	0	1
Rescue 5	Rescue Pumper	1	0
Quint 10	Quint – Reserve	0	1
Total Pumper/Reserve Pumper Credit Received:		4.3	3
Maximum Credit Permitted (BFF 4,400 IGPM):		6	1

Fire Station No.4

Unit #	Vehicle Type	Pumper Credit	Reserve Pumper Credit
Pump 1	Pumper	1	0
Tower 1	Platform	0.27	0
Rescue 2	Rescue Pumper	0.62	0
Tank 3	Pumper Tanker	0.94	0
Tower 3	Platform	0	0
Rescue 4	Rescue Pumper	1	0
Reserve 9	Reserve Pumper	0	1
Reserve 8	Reserve Pumper	0	1
Rescue 5	Rescue Pumper	1	0
Quint 10	Quint – Reserve	0	1
Credit Received:		4	3
Maximum Credit Permitted (BFF 3,700 IGPM):		4	1

Fire Station No.5

Unit #	Vehicle Type	Pumper Credit	Reserve Pumper Credit
Pump 1	Pumper	0.64	0
Tower 1	Platform	0	0
Rescue 2	Rescue Pumper	0	0
Tank 3	Pumper Tanker	1	0
Tower 3	Platform	0.13	0
Rescue 4	Pumper	1	1
Reserve 9	Reserve Pumper	0	1
Reserve 8	Reserve Pumper	0	1
Rescue 5	Rescue Pumper	1	0
Quint 10	Quint – Reserve	0	1
Total Pumper/Reserve Pumper Credit Received:		3.77	3
Maximum Credit Permitted (BFF 4,200 IGPM):		5	1

Apparatus within the response distance criteria shown in Table 8-5 receive 100% credit for the response level they are considered within. Apparatus that are beyond the specified distances receive credit however, credit is reduced based on increased distances which is referred to by FUS as the “distance deficiency”. Distance



deficiency is a method that credits apparatus responding beyond the response distance criteria corresponding to the Basic Fire Flow.

Fire Station No.1 received credit for 4.97 pumper companies out of the maximum 6 Pumper companies that can be credited.

Fire Station No.2 received credit for 3.41 pumper companies out of the maximum 5 Pumper companies that can be credited.

Fire Station No.3 received credit for 4.3 pumper companies out of the maximum 6 Pumper companies that can be credited.

Fire Station No. 4 received credit for 4 pumper companies out of the maximum 4 Pumper companies that can be credited. Calculation results in total credit of 4.83. Because not more than 100% credit is permitted in any single item, 4 pumper companies were credited.

Fire Station No. 5 received credit for 3.77 pumper companies out of the maximum 5 pumper companies that can be credited.

It is important to note that within the fire insurance grading, apparatus over 15 years receive reduced level of credit as first line apparatus, however if the apparatus and pump undergoes annual service testing and passes those associated tests extended credit can be granted under specific criteria. Apparatus that are over 15 years in age and pass associated service tests should be held as second line or reserve status. Additionally, for these apparatus to continue to receive recognition within the fire insurance grading, a signed letter of intent should be submitted to the office of Fire Underwriters Survey. The letter should indicate that the community and Fire Department will replace the apparatus within a reasonable and an agreed upon amount of time. Should the apparatus not pass the annual service testing, credit cannot be awarded for second line or reserve status.

<p>The Barrie Fire and Emergency Service received the following credit in this grading item:</p> <p>Fire Station No.1: 85.42%</p> <p>Fire Station No.2: 62.08%</p> <p>Fire Station No.3: 72.50%</p> <p>Fire Station No.4: 100%</p> <p>Fire Station No.5: 72.50%</p>

8.2.2. Ladder Service

Fire departments are evaluated for the number of ladder companies in service relative to the overall fire potential and the area being protected. Ladder apparatus are required to be adequately housed and staffed in order to receive full credit.

The ladder service grading item refers to the amount of credit received for each of the department's ladder apparatus. Recognition and credit for ladders may be reduced or withheld based upon the measured reliability of the apparatus upon which they are installed (ex. factors such as age, listing, testing, etc.).



Fire apparatus that may serve dual purposes are evaluated based on the primary duty it serves on the fire scene. As previously stated, a ladder apparatus with a fire pump may be credited in one of two ways.

- 100 percent ladder credit as a ladder apparatus and 50 percent credit as a Pumper, or
- 100 percent credit as a pumper apparatus and 50 percent credit as a ladder apparatus.

This all depends upon the number of apparatus a department has available and where credit should be distributed properly in the grading depending on the primary use of the fire apparatus.

Response areas with five buildings that are 3 storeys or 10 m (35 ft) or more in height, or districts that have a Basic Fire Flow greater than 3,300 IGPM, or any combination of these criteria, should have a ladder company. The height of all buildings in the community, including those protected by automatic sprinklers, is considered when determining the number of needed ladder companies for fire insurance grading to receive maximum credit. Refer to Appendix F for Requirements for Ladder Apparatus.

Based on the Basic Fire Flow for each fire station response zone, each area is measured against the ability to provide ladder service. Table 8-3 summarizes the ladder service credit for each fire station response zone.

Ladder apparatus responding from neighbouring stations receive credit based on the “distance deficiency”. Distance deficiency is the method that credits apparatus responding beyond the response distance criteria corresponding to the Basic Fire Flow and the Table of Effective Response.

For instance, Fire Station No.2 does not have a ladder apparatus at its location; however credit is received based upon the distance between the nearest ladder apparatus and Fire Station No.2. Fire Station No.2 would receive maximum credit for a ladder apparatus if a ladder was located within 2.7 km of the fire station. As can be seen below, Fire Station No.2 did receive partial credit.

Table 8-3 Credited in Service Ladder Summary

Fire Station No.1			
Unit #	Vehicle Type	Ladder Credit	Reserve Ladder Credit
Tower 1	Tower	1	0
Tower 3	Tower	0.33	0
Ladder 11	Ladder - Reserve	0	1
Credit Received:		1.33	1
Maximum Credit Permitted (BFF 4,800 IGPM):		2	1

Fire Station No.2			
Unit #	Vehicle Type	Ladder Credit	Reserve Ladder Credit
Tower 1	Tower	0.51	0
Tower 3	Tower	0	0
Ladder 11	Ladder - Reserve	0	1
Total Pumper/Reserve Pumper Credit Received:		0.51	1
Maximum Credit Permitted (BFF 4,200 IGPM):		2	1

Fire Station No.3			
Unit #	Vehicle Type	Ladder Credit	Reserve Ladder Credit



Tower 1	Tower	0.65	0
Tower 3	Tower	1	0
Ladder 11	Ladder - Reserve	0	1
Total Pumper/Reserve Pumper Credit Received:		1.65	1
Maximum Credit Permitted (BFF 4,400 IGPM):		2	1

Fire Station No.4

Unit #	Vehicle Type	Ladder Credit	Reserve Ladder Credit
Tower 1	Tower	0.54	0
Tower 3	Tower	0	0
Ladder 11	Ladder - Reserve	0	1
Total Pumper/Reserve Pumper Credit Received:		0.54	1
Maximum Credit Permitted (BFF 3,700 IGPM):		1	1

Fire Station No.5

Unit#	Vehicle Type	Ladder Credit	Reserve Ladder Credit
Tower 1	Tower	0	0
Tower 3	Tower	0.25	0
Ladder 11	Ladder - Reserve	0	1
Total Pumper/Reserve Pumper Credit Received:		0.25	1
Maximum Credit Permitted (BFF 4,200 IGPM):		2	1

Recommendation 1 Improve Ladder Service and Ladder Distribution

The City of Barrie and BFES can receive additional credit if an additional ladder apparatus is acquired and placed into service with a fire fighting crew. Both Fire Station No.2 and Fire Station No.5 can receive significantly more credit if they are equipped to provide ladder response. Depending on which fire station the Fire Department decides to place the apparatus, the impacts on the fire insurance grades for each fire station vary slightly. It is important to note that adding a ladder and fire fighting crew to either of the fire stations mentioned above will have a positive impact in other areas of the calculated fire insurance grades such as Distribution of Companies, Number of Line Officers – Fire Suppression, Total Fire Force Available and Response to Alarms.

A new ladder and fire fighting crew placed in Fire Station No.2 will improve the total credit scored and PFPC for this station’s fire response boundary. Additionally, this change will award Fire Station No.1 with slightly more credit and assist both stations improve their calculated PFPC. Outfitting Fire Station No.2 with a ladder and crew does not impact the fire insurance grades for Fire Station No.3, No.4 or No.5.

A new ladder and fire fighting crew placed in Fire Station No.5 will improve the total credit scored and PFPC for this station’s fire response boundary. Additionally, this change will award Fire Station No.4 with slightly more credit and assist both stations improve their calculated PFPC. Outfitting Fire Station No.5 with a ladder and crew does not impact the fire insurance grades for Fire Station No.1, No.2 or No.3.

Section 13.2 provides details and summarizes the impacts on the fire insurance grades throughout the City of Barrie by adding a ladder and fire fighting crew at either Fire Station No.2 or Fire Station No.5.



The Barrie Fire and Emergency Service received the following credit in this grading item:

Fire Station No.1: 93.53%
Fire Station No.2: 55.29%
Fire Station No.3: 93.53%
Fire Station No.4: 75.29%
Fire Station No.5: 47.06%

8.2.3. Distribution of Companies

There are two sets of response distances to be considered within the fire insurance grading; one set being the benchmark response distance which the Fire department is graded against (Table 7-1) and the second set being response distances used by the insurance industry when applying the Dwelling Protection Grade and Public Fire Protection Classification as indicated in the following table.

Table 8-4 Response Distance Standards when Applying DPG and PFPC

	Personal Lines - DPG Response distance by road (km)	Commercial Lines - PFPC Response distance by road (km)
Ideal	5	2.5
Maximum	8	5

Fire departments are evaluated based on the response distances for pumper and ladder companies from the fire hall to a risk. Apparatus should be located such that response distances are not excessive.

Fire department companies are analyzed based on three levels of response, first due, second due and total concentration. The Table of Effective Response is used in the determination of Pumper and ladder company distribution. The recommended response distances for the first due, second due and total concentration for Pumper and ladder companies for fire insurance grading is based off the following formula:

$$D(km) = \frac{[T(\text{min}) - 0.65(\text{min})]}{1.065(\text{min}/ km)}$$

Where:

D = total distance in kilometres

T = time in minutes

Fire hall effective response areas for Pumper and ladder companies were developed to illustrate first due, second due, and total concentration response within the City boundary. The Basic Fire Flow benchmark and the corresponding response times from the Table of Effective Response were utilized in developing the maps. The maps illustrate the Basic Fire Flow requirements that are used in the distribution analysis of the Fire department's apparatus.

The benchmark requirements of the Basic Fire Flow from Table 7-1 Fire Underwriters Survey - Table of Effective Response are as shown in. The Barrie Fire and Emergency Service is measured against these benchmarks in establishing the fire insurance grading classification. Where the term "available" is shown, this does not refer



to the available resources BFES currently has; rather, it refers to the total available that is being measured against. For example, Station No.1 indicates Total Pumper Companies available as 6. The benchmark to receive 100% for total available is 6. This does not refer to actual number of apparatus in service.

Table 8-5 Summary of Benchmark Requirements for Basic Fire Flow

Area	Basic Fire Flow (IGPM)	1 st Due Pumper	2 nd Due Pumper	1 st Due Ladder	Total Pumper Companies available	Minutes for all to arrive	Total Ladder Companies available	Minutes for all to arrive
Station No.1	4,800	2.5 minutes (1.7 km)	4 minutes (3.1 km)	3.5 minutes (2.7 km)	6	7.5 minutes (6.4 km)	2	5.0 minutes (4.1 km)
Station No.2	4,200	2.5 minutes (1.7 km)	4 minutes (3.1 km)	3.5 minutes (2.7 km)	6	7.5 minutes (6.4 km)	2	5.0 minutes (4.1 km)
Station No.3	4,400	2.5 minutes (1.7 km)	4 minutes (3.1 km)	3.5 minutes (2.7 km)	6	7.5 minutes (6.4 km)	2	5.0 minutes (4.1 km)
Station No.4	3,700	3.5 minutes (2.7 km)	5 minutes (4.1 km)	4.0 minutes (3.1 km)	4	7 minutes (6.0 km)	1	4.0 minutes (3.1 km)
Station No.5	4,200	2.5 minutes (1.7 km)	4 minutes (3.1 km)	3.5 minutes (2.7 km)	6	7.5 minutes (6.4 km)	2	5.0 minutes (4.1 km)

Pumper Company Response

The Barrie Fire and Emergency Service was evaluated for first due Pumper response, second due Pumper response and total concentration Pumper response for Pumper companies. The analysis determined that the Barrie Fire and Emergency Service has a reasonable distribution of resources for first due and second due Pumper response based on the locations of fire stations.

Ladder Company Response

The Barrie Fire and Emergency Service was evaluated for first due ladder response, and total concentration ladder response for ladder companies. The analysis determined that the Barrie Fire and Emergency Service has a reasonable distribution of resources for first due and total concentration Ladder response based on the locations of fire stations.

Insurance Industry Response Recognition

When insurers review the fire insurance grading index, they are provided with the grade details for either Commercial or Personal Lines insurance. The grades displayed indicate what level of service is provided by the



Fire Department and the water supply that is available to them (if any). One of the key factors affecting a property's insurance rates is the distance from the responding fire station. From the perspective of the fire insurance grading, Commercial Lines risks beyond 5 road km of the responding fire station are considered unprotected, regardless of the distance from the nearest hydrant. Personal Lines insured risks beyond 8 road km of the responding fire station are also considered unprotected, regardless of the nearest hydrant.

For those Commercial Lines and Personal Lines risks within the recognized response distance from the responding fire station (5 and 8 road km), depending on company policy, insurers sometimes provide an additional discount if:

- The Commercial Lines insured risk is within 2.5 road km of the fire station
- The Personal Lines insured risk is within 5 road km of the fire station.

Figure 8-1 through Figure 8-8 illustrates the general areas throughout the City of Barrie within the pumper and ladder response criteria associated with each of the Basic Fire Flow benchmarks. Most built up areas of the City of Barrie are within first due and second due response.

Figure 8-9 illustrates the general areas throughout the Barrie fire protection service area that are within 2.5/5/8 road km of the fire station.

Within the fire insurance grading, Fire Station No.1, No.3 and No.4 each graded well. Fire Station No. 2 and No.5 can receive significantly more credit with the addition of a ladder company. This is a result of an increased Basic Fire Flow and the need for more fully staffed responding apparatus, when measured against the Table of Effective Response and fire insurance grading benchmarks. With the existing fire station locations there are areas beyond response distances prescribed by the Table of Effective Response and beyond recognized fire insurance coverage requirements of 8 km for Personal Lines property and 5 km of Commercial Lines property.

The Barrie Fire and Emergency Service received the following credit in this grading item:	
Fire Station No.1:	88.00%
Fire Station No.2:	59.50%
Fire Station No.3:	79.50%
Fire Station No.4:	93.50%
Fire Station No.5:	57.50%

BFES can improve its overall credit for ladder service distribution if an additional ladder apparatus is placed into service with a fire fighting crew as mentioned in Recommendation 1. Implementing this recommendation will have a positive impact in this portion of the fire insurance grading in addition to others such as Number of Line Officers – Fire Suppression, Total Fire Force Available and Response to Alarms. See section 13.2 for details of the impacts on the fire insurance grades.

Figure 8-1 Fire Station 1 Effective Pumper Coverage

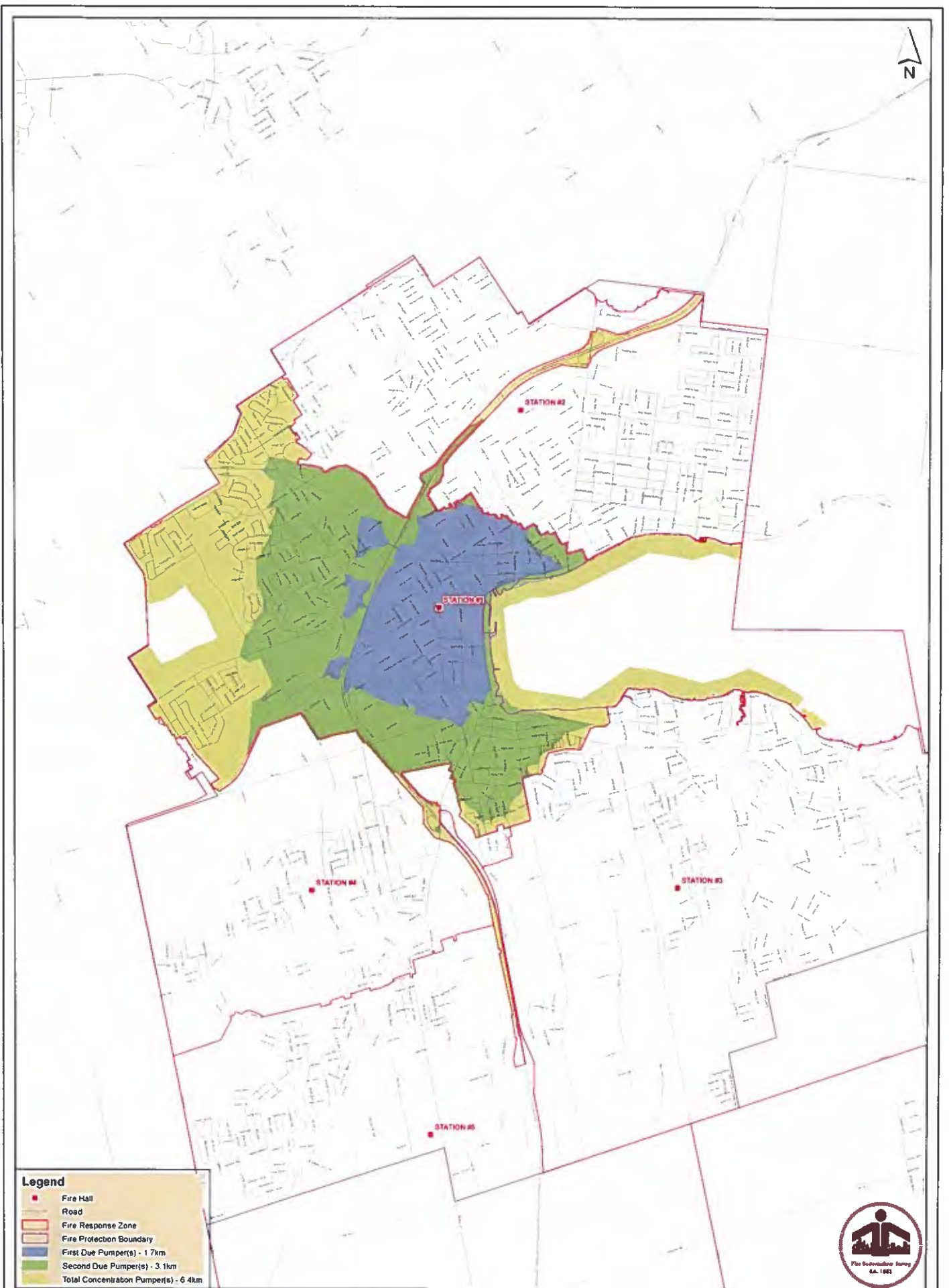


Figure 8-2 Fire Station 2 Effective Pumper Coverage

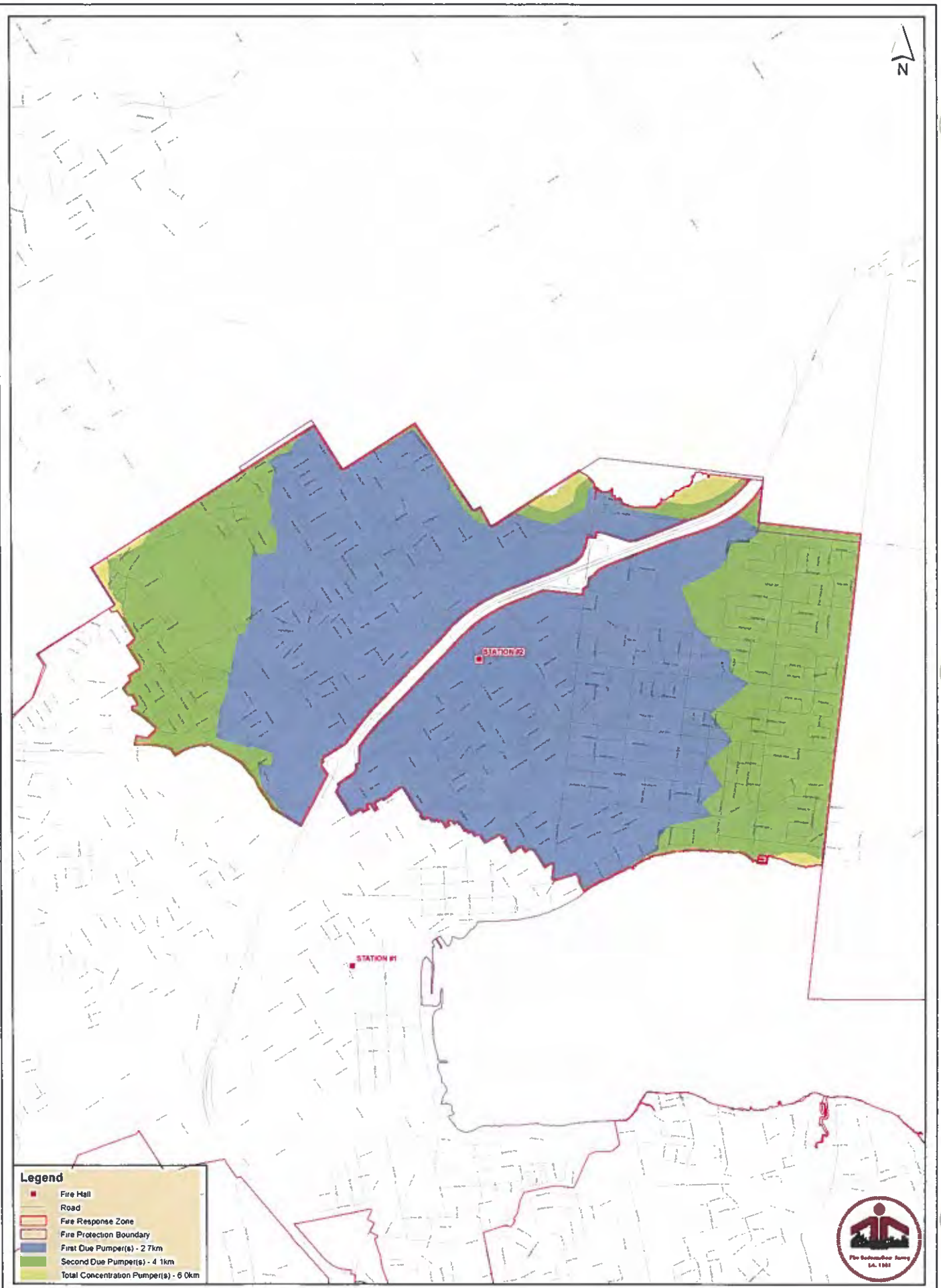


Figure 8-3 Fire Station 3 Effective Pumper Coverage



Figure 8-4 Fire Station 4 Effective Pumper Coverage

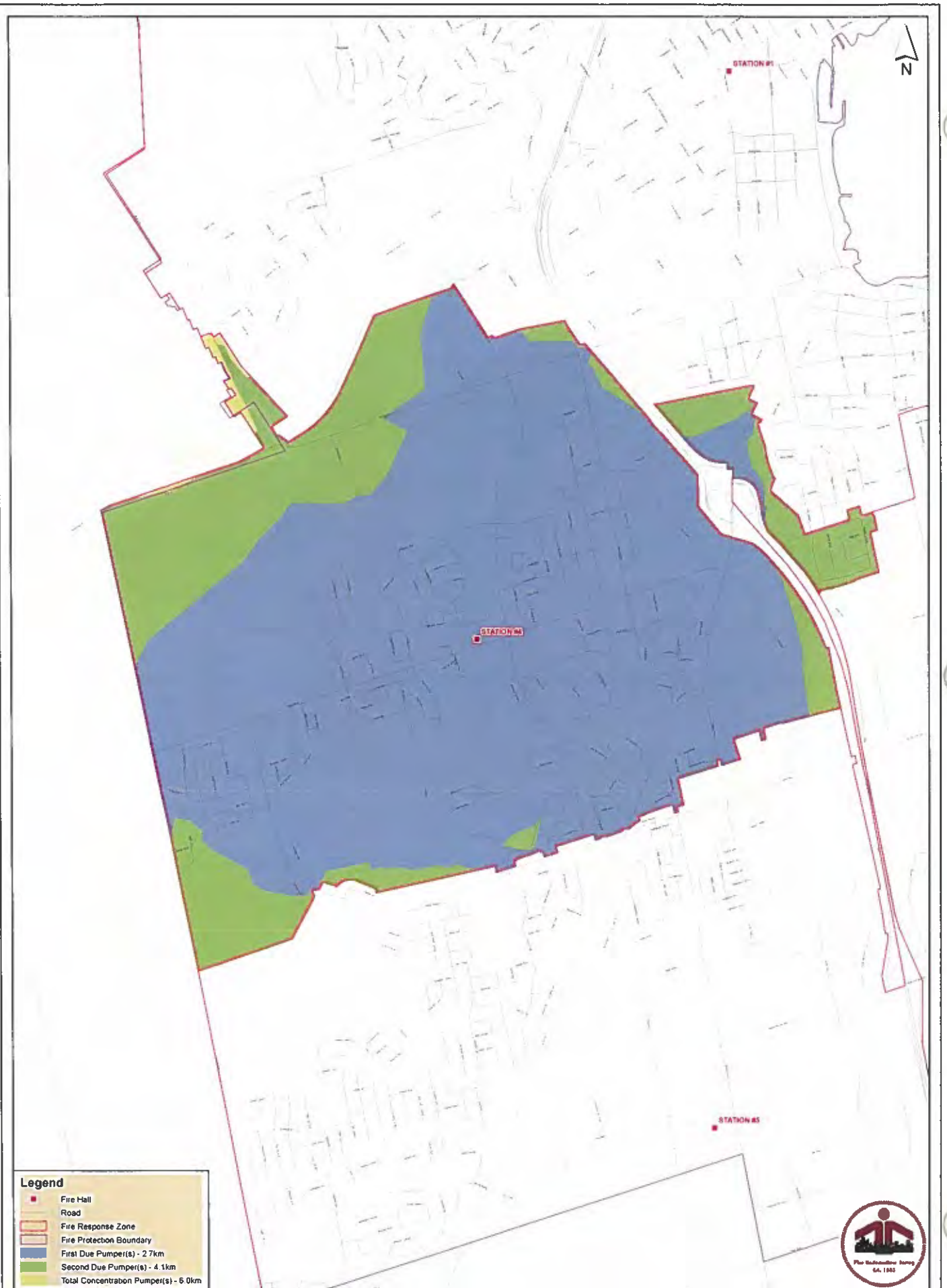
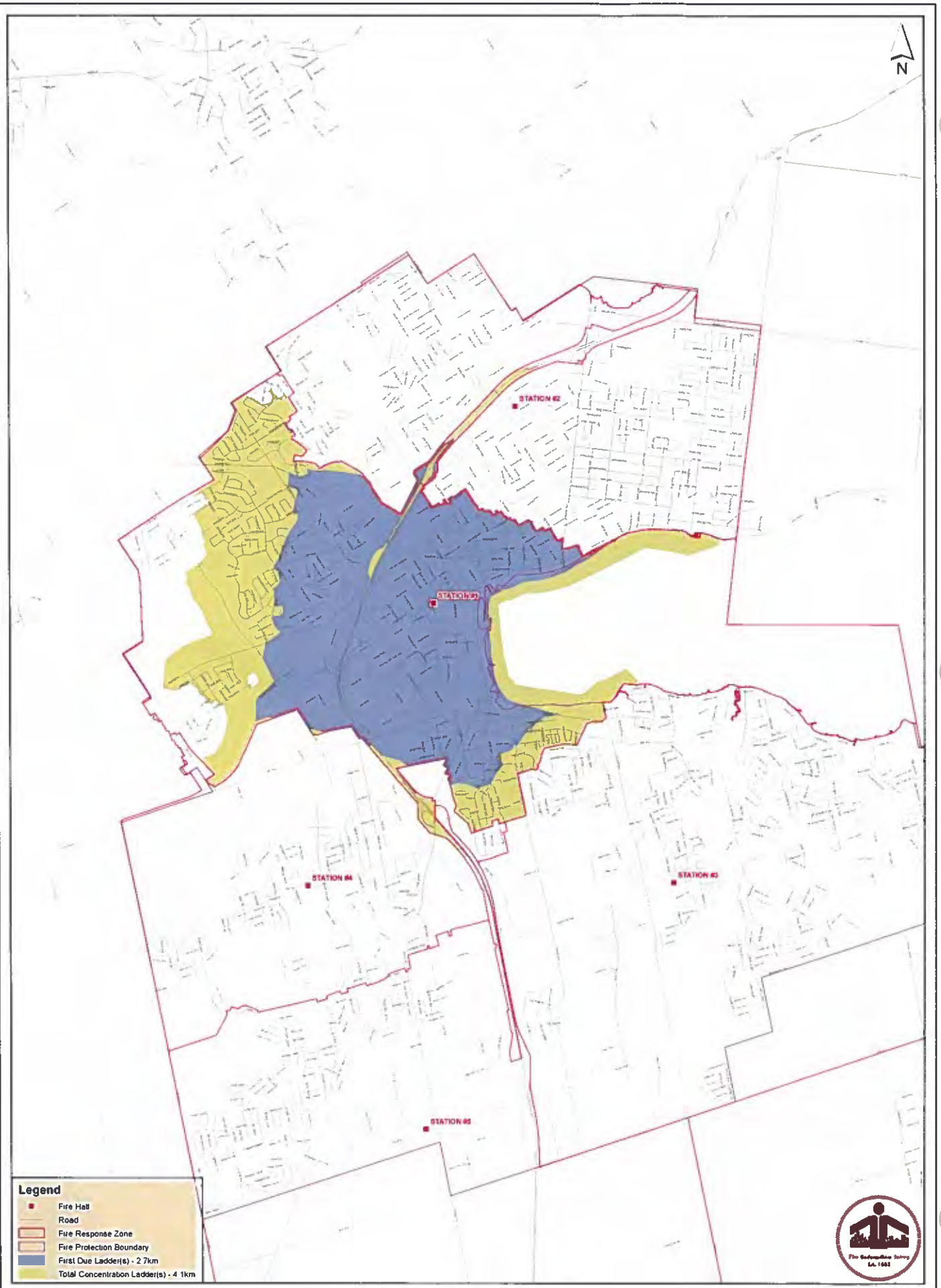


Figure 8-5 Fire Station 5 Effective Pumper Coverage



Figure 8-6 Fire Station 1 Effective Ladder Coverage



Legend

- Fire Hall
- Road
- ▭ Fire Response Zone
- ▭ Fire Protection Boundary
- ▭ First Due Ladder(s) - 2.7km
- ▭ Total Concentration Ladder(s) - 4.1km



Figure 8-7 Fire Station 2 Effective Ladder Coverage (from Fire Station 1)

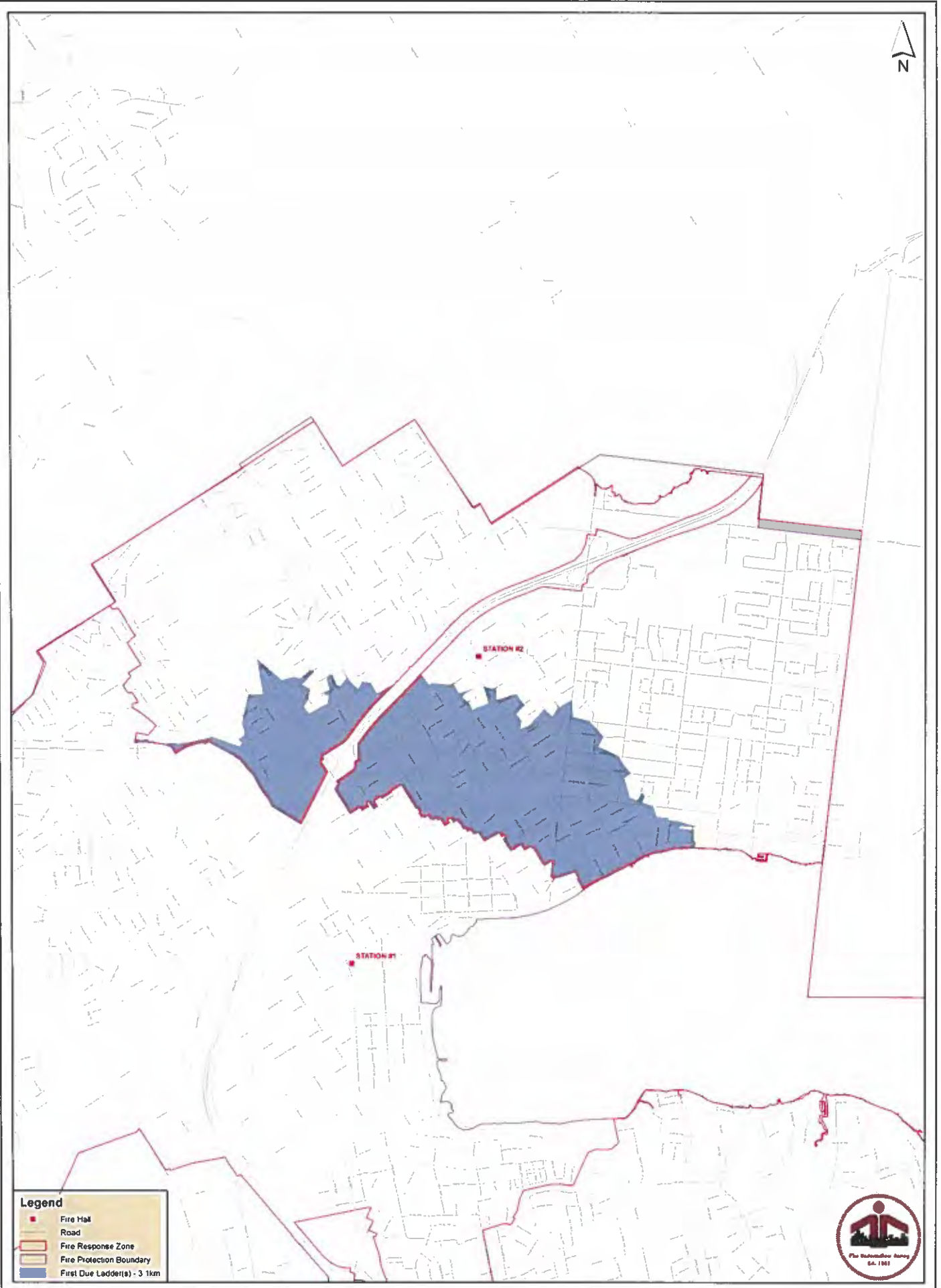


Figure 8-8 Fire Station 3 Effective Ladder Coverage

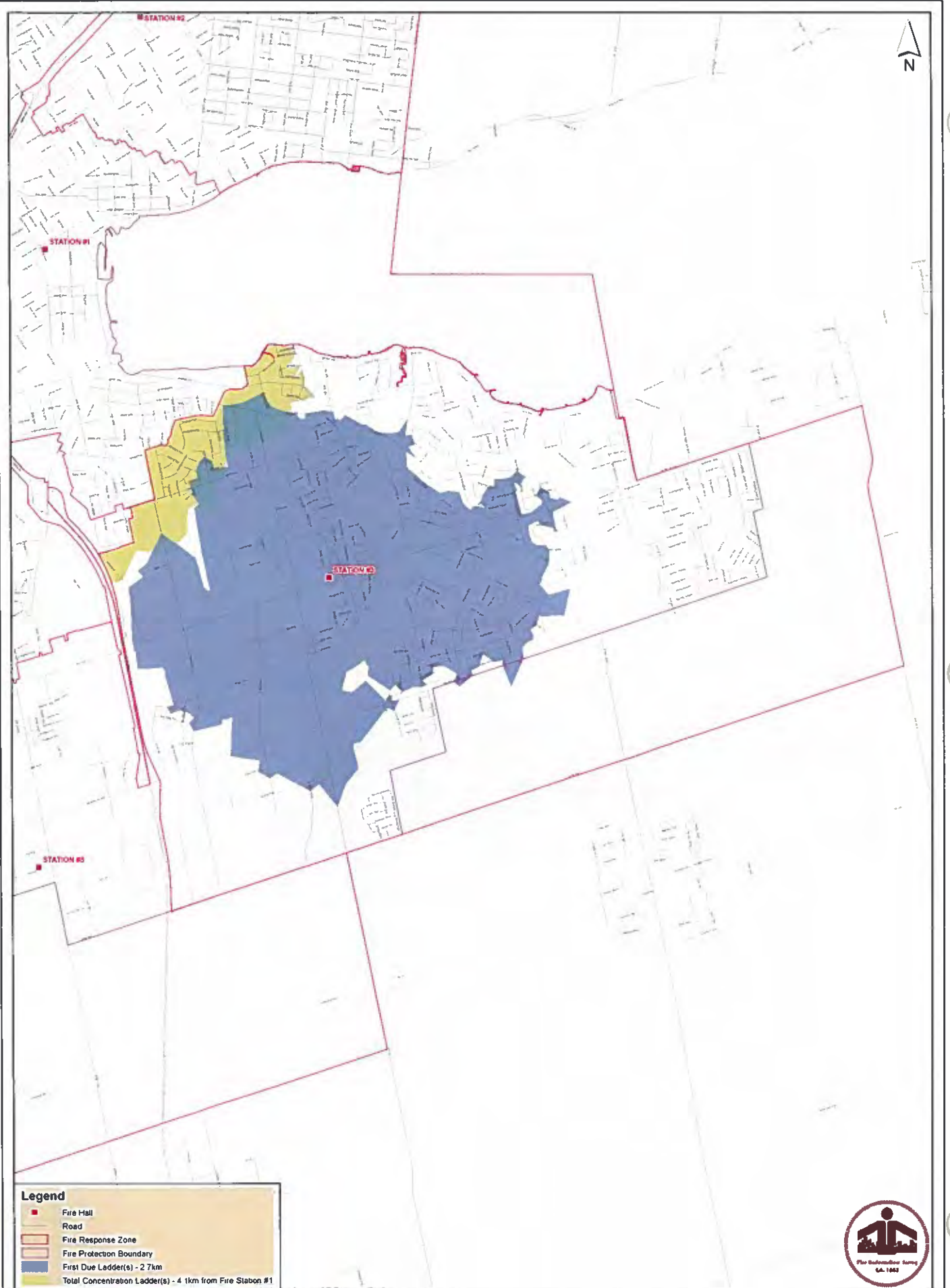
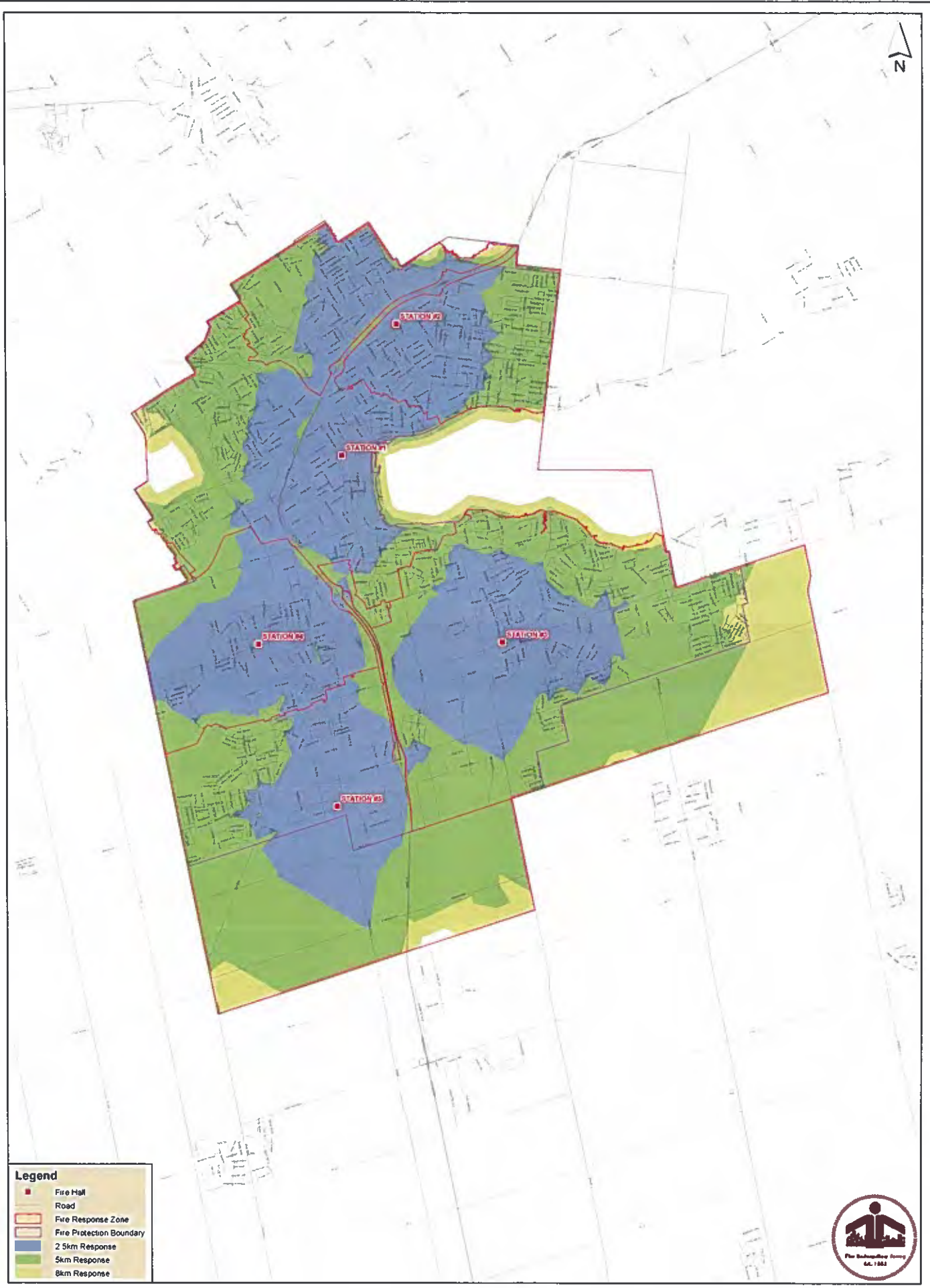


Figure 8-9 Insurance Industry Response Distance (2.5/5/8 km)



Legend

- Fire Hall
- Road
- Fire Response Zone
- Fire Protection Boundary
- 2.5km Response
- 5km Response
- 8km Response





8.2.4. Pumper and Ladder Pump Capacity

The Pumper and Ladder Pump Capacity grading item refers to the capacity of credited, recognized pumps located on fire apparatus. Recognition and credit for pumps on fire apparatus may be reduced or withheld based upon the measured reliability of the pumps and the apparatus upon which they are installed (ex. factors such as age, listing, testing, etc.).

Fire apparatus that may serve dual purposes are evaluated based on the primary duty it serves on the fire scene. As previously stated, a ladder apparatus with a fire pump may be credited in one of two ways.

- 100 percent credit as a ladder apparatus and 50 percent credit of the pump on the apparatus, or
- 100 percent for the pump on the ladder and 50 percent credit as a ladder apparatus.

This all depends upon the number of apparatus a department has available and where credit should be distributed properly in the grading depending on the primary use of the fire apparatus.

Table 8-6 summarizes the pump capacity credit for each fire station response zone. The maximum credit permitted for each fire station response zone is the Basic Fire Flow for each area as discussed in subsection 7.3.2

Table 8-6 Pumping Capacity Credit Summary

Fire Station No.1					
Unit #	Vehicle Type	Pump Capacity (IGPM)	Tank Capacity (IGAL)	Pump Capacity Credit	Credited Pump Capacity (IGPM)
Pump 1	Pumper	1,050	600	26%	273
Brush 1	Wildland	500	300	0%	0
Tower 1	Platform	1,500	300	50%	750
Tank 1	Tanker	250	2,750	0%	0
Rescue 2	Rescue Pumper	1,050	625	73%	765
Ladder 11 ³	Reserve - Ladder	1,050	500	100%	1,050
Tank 3	Pumper Tanker	1,050	1,000	100%	1,050
Quint 10	Spare Quint	1,050	600	100%	1,050
Tower 3	Platform	2,000	300	33%	660
Rescue 4	Pumper Rescue	1,050	625	100%	1,050
Reserve 9	Reserve Pumper	1,050	625	100%	1,050
Reserve 8	Reserve Pumper	1,050	625	100%	1,050
Rescue 5	Pumper Rescue	1,400	625	74%	1,036
Credit Received:					9,784
Maximum Credit Permitted:					4,800

Fire Station No.2					
Unit #	Vehicle Type	Pump Capacity	Tank Capacity	Pump Capacity Credit	Credited Pump Capacity (IGPM)

³ During course of this study, replacement apparatus has been purchased and was in the build process. The Fire Department did not accept delivery of this apparatus during the time of this study.



Pump 1	Pumper	1,050	600	73%	765
Brush 1	Wildland	500	300	0%	0
Tower 1	Platform	1,500	300	25%	379
Tank 1	Tanker	250	2,750	0%	0
Rescue 2	Rescue Pumper	1,050	625	28%	294
Ladder 1	Reserve - Ladder	1,050	500	100%	1,050
Tank 3	Pumper Tanker	1,050	1,000	55%	582
Quint 10	Spare Quint	1,050	600	100%	1,050
Tower 3	Platform	2,000	300	0%	0
Rescue 4	Pumper Rescue	1,050	625	73%	761
Reserve 9	Reserve Pumper	1,050	625	100%	1050
Reserve 8	Reserve Pumper	1,050	625	100%	1050
Rescue 5	Pumper Rescue	1,400	625	15%	210
Credit Received:					7,191
Maximum Credit Permitted:					4,200

Fire Station No.3

Unit #	Vehicle Type	Pump Capacity	Tank Capacity	Pump Capacity Credit	Credited Pump Capacity (IGPM)
Pump 1	Pumper	1,050	600	25%	264
Brush 1	Wildland	500	300	0%	0
Tower 1	Platform	1,500	300	33%	488
Tank 1	Tanker	250	2,750	0%	0
Rescue 2	Rescue Pumper	1,050	625	55%	582
Ladder 11	Reserve - Ladder	1,050	500	100%	1,050
Tank 3	Pumper Tanker	1,050	1,000	20%	210
Quint 10	Spare Quint	1,050	600	100%	1,050
Tower 3	Platform	2,000	300	50%	1,000
Rescue 4	Pumper Rescue	1,050	625	100%	1,050
Reserve 9	Reserve Pumper	1,050	625	100%	1,050
Reserve 8	Reserve Pumper	1,050	625	100%	1,050
Rescue 5	Pumper Rescue	1,400	625	100%	1,400
Credit Received:					9,193
Maximum Credit Permitted:					4,400

Fire Station No.4

Unit #	Vehicle Type	Pump Capacity	Tank Capacity	Pump Capacity Credit	Credited Pump Capacity (IGPM)
Pump 1	Pumper	1,050	600	100%	1,050
Brush 1	Wildland	500	300	0%	0
Tower 1	Platform	1,500	300	27%	403
Tank 1	Tanker	250	2,750	0%	0
Rescue 2	Rescue Pumper	1,050	625	62%	656



Ladder 11	Reserve - Ladder	1,050	500	100%	1,050
Tank 3	Pumper Tanker	1,050	1,000	94%	991
Quint 10	Spare Quint	1,050	600	100%	1,050
Tower 3	Platform	2,00	300	0%	0
Rescue 4	Pumper Rescue	1,050	625	87%	914
Reserve 9	Reserve Pumper	1,050	625	100%	1,050
Reserve 8	Reserve Pumper	1,050	625	100%	1,050
Rescue 5	Pumper Rescue	1,400	625	100%	1,400
Credit Received:					7,513
Maximum Credit Permitted:					3,700

Fire Station No.5

Unit #	Vehicle Type	Pump Capacity	Tank Capacity	Pump Capacity Credit	Credited Pump Capacity (IGPM)
Pump 1	Pumper	1,050	600	64%	674
Brush 1	Wildland	500	300	0%	0
Tower 1	Platform	1,500	300	0%	0
Tank 1	Tanker	250	2,750	0%	0
Rescue 2	Rescue Pumper	1,050	625	0%	4
Ladder 11	Reserve - Ladder	1,050	500	100%	1,050
Tank 3	Pumper Tanker	1,050	1,000	100%	1,050
Quint 10	Spare Quint	1,050	600	100%	1,050
Tower 3	Platform	2,000	300	13%	260
Rescue 4	Pumper Rescue	1,050	625	100%	1,050
Reserve 9	Reserve Pumper	1,050	625	100%	1,050
Reserve 8	Reserve Pumper	1,050	625	100%	1,050
Rescue 5	Pumper Rescue	1,400	625	40%	560
Credit Received:					5,698
Maximum Credit Permitted:					4,200

The credited pump capacity was determined with a methodology referred to as "distance deficiency". Distance deficiency is a method that credits assets and resources (fire apparatus and fire fighters) responding from neighbouring station and then awards credit based response distances and area covered into the fire station that is reviewed. A fire station that has a response distance that is less than or equal to the benchmarks described in Table 8-5 Summary of Benchmark Requirements for Basic Fire Flow, max credit is awarded. When the response distance is greater than the benchmarks in Table 8-5, credit is reduced and at a certain distance, no credit is given. The purpose here is to grant more credit where shorter response distances are present.

Fire Station 2 did not receive 100% credit because this item not only considers the Basic Fire Flow but also determines the available pump capacity against the peak required fire flow which is greater than the Basic Fire Flow.



The Barrie Fire and Emergency Service received the following credit in this grading item:

Fire Station No.1: 100%

Fire Station No.2: 99.41%

Fire Station No.3: 100%

Fire Station No.4: 100%

Fire Station No.5: 100%

8.2.5. Design, Maintenance and Condition of Fire Apparatus

Fire Department apparatus should be of suitable design and well maintained for the emergency service that is to be performed. A breakdown en route to, or on the fire ground could result in loss of life and greater damage to property. Maintenance facilities, quality of maintenance programs, qualifications of maintenance personnel, apparatus suitability and apparatus age are considered in this item.

Maintenance Facilities

Maintenance (major or minor) on fire apparatus is conducted at the City Public Works yard by the Emergency Vehicle Technician's (EVT) and certified mechanics. The pumps undergo regular scheduled maintenance through a third party contractor. Each apparatus undergoes annual servicing and commercial vehicle inspection certification. The fire department maintains maintenance records at Road Parks Fleet Office for each firefighting apparatus.

Fire fighters perform daily and weekly checks on each apparatus. Check sheets for each of apparatus are kept in the fire stations.

Maintenance Personnel

The qualifications of maintenance personnel that conduct regular maintenance on fire apparatus is reviewed under this portion of the grading item. To receive maximum credit in this portion of the grading item for fire insurance grading, individuals conducting preventive maintenance on fire apparatus should be certified Emergency Vehicle Technicians.

Currently, the City of Barrie maintains a thorough fleet management program that maintains all City vehicles. There are seven (7) full time heavy mechanics, one (1) of which EVT dedicated to fire apparatus repairs and maintenance. The six (6) other mechanics are able to complete repairs in the absence of the EVT. On site assistance is provided by the apparatus manufacturer.

Pumper and Ladder Testing

All pump tests are completed by a third party fire apparatus service company under the supervision of the City's EVT. Any concerns or mechanical issues that may arise are immediately repaired. In this case, the spare apparatus remains in active duty until repairs are complete.

Pumper and ladder service tests including but not limited to pump testing are valuable in assessing the effectiveness of the preventive maintenance program. Service tests of pumps and ladders on apparatus are generally conducted to show whether the equipment is working correctly.



The Barrie Fire and Emergency Service contracts a third party organization to test the pumps on the apparatus on an annual basis to ensure pumps on fire apparatus are still meeting the rated capacity listed on the pump. Records of testing are kept on file.

Age, Obsolescence and Condition of Apparatus

The age of fire apparatus is reviewed within the fire insurance grading system relative to age benchmarks of 15 years. The BFES apparatus age vary from 3 to 18 years in age, this includes mobile water supply (tankers), second line or reserve Pumpers and/or ladders. Front line response apparatus (Pumpers) are of reasonable age and kept in good working order.

Fire fighting apparatus design specifications have been standardized including ULC listing for each apparatus. Overall, the Barrie Fire and Emergency Service maintenance program and condition of fire apparatus graded well in this grading item.

The Barrie Fire and Emergency Service received 98.50% credit in this grading item.

8.2.6. Number of Line Officers – Fire Suppression

The number of Chief Officers and Company Officer positions is reviewed and graded under this item. The number of Chief Officers and Company Officers required to receive maximum credit for this grading item is determined from the Basic Fire Flow and the resulting number of Pumper and ladder companies associated with the benchmark.

Chief Officers

For fire insurance grading the maximum credit the Barrie Fire and Emergency Service can receive for Chief Officers is four (4). Max credit is received for each career Chief or career Deputy Chief on the department. The Barrie Fire and Emergency Service have a career Fire Chief, two (2) Deputy Fire Chief's and a Platoon Chief designated to each platoon.

Company Officers

The number of Company Officers that the Barrie Fire and Emergency Service can receive maximum credit for fire insurance grading is determined by the total number of Pumper and ladder companies based on the Basic Fire Flow benchmark and an on duty shift factor. Full credit is received for each career officer on the department.

The Barrie Fire and Emergency Service received the following credit in this grading item:

- Fire Station No.1: 87.50%**
- Fire Station No.2: 73.75%**
- Fire Station No.3: 53.50%**
- Fire Station No.4: 100%**
- Fire Station No.5: 75.75%**

Credit under this item is based on the apparatus credit received using distance deficiency. Where neighbouring stations' response distances met the response distance benchmarks described in Table 8-5, 100% credit was



awarded to those responding personnel. Where the response distance was greater than the benchmarks, reduced credit was awarded.

The number of Company Officers was determined to be adequate considering the demographics of the City and the Fire Department. To receive additional credit in this grade item, additional career Chief Officers and Company Officers would need to be available. Each station is measured against the number of in service apparatus required with regard to the Basic Fire Flow of each response area. Therefore, to receive additional credit under Number of Line Officers, additional companies and the associated apparatus would need to be added to the departments' current composition. As previously mentioned, credit received is appropriate for the composition and staffing compliment currently provided to the City of Barrie.

The addition of an additional ladder apparatus with the associated full company compliment and Company Officer assigned to the company would increase the amount of credit received per Recommendation 1 and Recommendation 2.

8.2.7. Total Fire Force Available

A fire department under this grading item is measured in its ability to meet the staffing requirements as determined by the Basic Fire Flow benchmark from the Table of Effective Response. For the grading of this item the fire department is measured against six competent fire fighters available and assigned to respond to fire for duty with each required Pumper and ladder company. The number of these fire fighters that should be on-duty with the apparatus of these companies at all times should be appropriate to the fire risk and fire incidence load.

As previously discussed in section 7, the benchmark number of Pumper companies that each fire station can receive credit for is based on a Basic Fire Flow for each of the response areas referenced in Table 7-1 Fire Underwriters Survey - Table of Effective Response. Credit is applied based on having the required number of apparatus respond within the specified time under Total Availability Needed referenced from the Table of Effective Response (credit is also applied where part of a response area is covered by neighbouring stations)

Credit for available fire force may be received according to the:

- minimum career fire fighters on duty,
- minimum regular vol. and off shift response of career fire fighters on 1st alarms ,
- minimum automatic aid response,
- minimum mutual aid response, and
- minimum response of off-shift career fire fighters on multiple alarms.

Note that probationary fire fighters (incomplete training) and junior fire fighters (under age) are not credited due to lack of active fire ground duties.

Minimum Career Fire Fighters on Duty

The minimum number of career fire fighters on duty is determined by reviewing the fire departments records. Records are reviewed to determine the number of fire fighters on duty as during normal vacation periods less average details and sick leaves, but not the absolute minimum that may occur only one or two days a year. This includes career company officers and fire fighters. For fire insurance grading, one career fire fighter on duty is equal to one Fire Fighter Equivalent Unit (FFEU).



Minimum regular vol. and off shift response of career fire fighters on first alarms

Fire departments having off duty career members or auxiliary members responding on first alarm may receive credit. Typically three off duty or auxiliary members responding on first alarm are considered as one FFEU for grading purposes. Consideration for credit is based on records being available indicating response statistics. If no records are kept of response, credit for FFEU is limited to one FFEU for each six off duty or auxiliary members claimed to respond.

Credit was not given under off shift response of career fire fighters because they are not provided on first alarm assignments.

Automatic Aid

Fire departments that have formal contracts for automatic aid response may receive credit for the personnel responding for this grading item. For personnel to be credited for automatic aid the responding fire department should be within 8 km in road travel distance to built-up areas of the municipality. Each career fire fighter from the responding fire department may be credited as one FFEU and each volunteer fire fighter from the responding fire department may be credited as 0.33 FFEU.

Mutual Aid

Fire departments that have formal contracts for mutual aid response may receive some credit for the personnel responding for this grading item. Each career fire fighter from the responding fire department may be credited as one FFEU and each volunteer fire fighter from the responding fire department may be credited as 0.33 FFEU.

BFES are members of the Simcoe County Mutual Fire Aid System (adopted by by-law). BFES does not employ the assistance of neighbouring fire departments through mutual aid. As such, no credit was given for fire fighters responding for mutual aid.

Off shift Response on Multiple Alarms

Fire departments that have formal agreements for career members to respond off shift on multiple alarms may receive credit for members responding within this grading item. Career members responding on multiple alarms are credited on the basis of four off duty career members being equal to one FFEU. Auxiliary members are credited the same as on first alarm as 1/3 if statistical records of response are available or 1/6 if no records of response are available.

Note The total number of auxiliary members that can be credited towards the available fire force cannot be more than 50% of the maximum available fire force. For example, if the max credit available fire force was 24 (4 Pumper companies x 6 fire fighters) the maximum FFEU credit that can be rewarded for available fire force other than career fire fighters is 12.

The following table indicates that amount of credit the Barrie Fire and Emergency Service received towards its available fire force for this grading item. In determining the Total credited FFEU, credit for each responding neighbouring crew is based on the credit awarded with the distance deficiency method discussed in subsection 8.2.1.



Table 8-7 Fire Fighter Equivalent Units Credit Summary

Fire Station	Available Fire Force	Total Credited FFEU
Station No.1	8	21.50
Station No.2	4	12.85
Station No.3	8	18.62
Station No.4	4	23.66
Station No.5	4	13.17

The Total Credited FFEU for each fire station is the total fire fighting effective units that is credited when considering neighbouring fire stations and fire fighters.

The available fire force grading item is weighted heavily within the fire insurance grading of the fire department. It is important to note that the amount of credit that was awarded is very common for communities and departments of similar size and scope. It should be stated, the increase of staffing will have a positive impact on a number of subsequent grading items within the fire insurance grading.

The Barrie Fire and Emergency Service received the following credit in this grading item:

- Fire Station No.1: 49.50%**
- Fire Station No.2: 34.00%**
- Fire Station No.3: 43.00%**
- Fire Station No.4: 86.50%**
- Fire Station No.5: 35.00%**

Recommendation 2 Improve Total Available Fire Force

As discussed in Recommendation 1, the City of Barrie can receive additional credit by improving its ladder service throughout by outfitting Fire Station No.2 or No.5 with a ladder apparatus and fire fighting crew. Making this improvement will have positive impact in the total number of fire fighters and officers that can be credited throughout the City of Barrie.

The number of fire fighters that should be considered is the number of staff needed to perform ladder operations in accordance with BFES’s accepted practices and SOG’s. Section 13.2 provides details and summarizes the impacts on the fire insurance grades throughout the City of Barrie by adding a fire fighting crew with the additional ladder apparatus discussed in Recommendation 1.

8.2.8. Pumper and Ladder Company Unit Manning

This grading item measures the company unit strength of on-duty paid personnel responding on in-service apparatus. A maximum manning of six can be credited for each in service Pumper and ladder company.

The number of members credited on-duty and on first alarm response determined from section 8.2.7 is used in the analysis of this grading item. The number of in-service Pumpers and ladder apparatus is determined from sections 8.2.1 and 8.2.2.



The amount of credit received in this grading item is as follow:

Average Company Staffing	Credit
6 members	
5 members	
4 members	
3 members	
2 members	
1 member	
0 members	

Overall, the Barrie Fire and Emergency Service graded well within this grading item. If additional apparatus are provided and company manning is not adjusted accordingly, credit may be reduced in this grading item. Likewise, if staffing of apparatus is decreased, credit may be reduced in this grading and the previous grading item. Fire Underwriters Survey should be notified of any significant changes to the firefighting roster or in service apparatus.

The Barrie Fire and Emergency Service received the following credit in this grading item:
 Fire Station No.1: 90.63%
 Fire Station No.2: 93.96%
 Fire Station No.3: 90.00%
 Fire Station No.4: 95.42%
 Fire Station No.5: 93.13%

8.2.9. Master and Special Stream Devices

This grading item considers the equipment fire fighters would use to be effective in combating large fires, flammable fire and fires in upper storey’s or hard to reach locations. Equipment considered under this grading item are fixed and portable turrets, large spray nozzles, distributing nozzles, foam equipment, and elevated master stream devices.

The Barrie Fire and Emergency Service graded very well in regards to being equipped with the necessary equipment to provide effective structural fire protection to large fires, flammable fire and fires in upper storey’s or hard to reach locations.

The Barrie Fire and Emergency Service received 100% credit in this grading item:

8.2.10. Equipment for Pumpers and Ladder Apparatus, General

This grading item considers the general equipment for Pumper and ladder apparatus. Equipment includes, but is not limited to, rope, cutters, fire extinguishers, nozzles, first aid equipment, wrenches, generators, salvage tarps, etc.



Inventories have been developed by the fire department to keep track of equipment stored on each of its fire apparatus. Inventory sheets were provided for review, and spot checks were conducted on apparatus to ensure equipment listed was located on apparatus.

General Equipment for Pumpers and Ladder Apparatus

The inventories for each fire apparatus were reviewed for fire insurance grading purposes. The Barrie Fire and Emergency Service has the tools and equipment needed for structural firefighting tactics.

Portable Fire Extinguishers

The number of Class A, B, and C fire extinguishers carried on Pumpers and ladder apparatus is reviewed. At a minimum two Class A extinguishers and a 20 BC dry chemical extinguisher should be carried on Pumpers and ladders.

Personal Protective Clothing and Equipment

The Barrie Fire and Emergency Service appear well equipped with Personal Protective Clothing (PPC) and Personal Protective Equipment (PPE). Each career member of the fire department has a set of PPC and a spare set of turnout gear. The fire department replaces sets of PPC as needed and prior to the PPC reaching ten years of age, which is considered a best practice.

Ground Ladders

The Fire Department was reviewed for the number and length of ground ladders carried on fire apparatus. The Fire department has its ground ladders tested annually by a third party organization, ladders which passed testing are labeled with a sticker indicating the ladder has passed annual testing. Ladders that fail testing are repaired if cost-effective, those ladders that require costly repairs are decommissioned and new ladders are provided in their stead.

Overall, the Barrie Fire and Emergency Service graded very well under this grading item. The fire department is generally very well equipped to handle structural firefighting challenges that may be anticipated. The department also carries a diverse variety of specialty rescue equipment and appurtenances to support the delivery of special response capabilities providing added value to the level of service delivered to the City's constituents.

<p>The Barrie Fire and Emergency Service received the following credit in this grading item:</p> <p>Fire Station No.1: 100% Fire Station No.2: 97.50% Fire Station No.3: 100% Fire Station No.4: 100% Fire Station No.5: 98.50%</p>

8.2.11. Fire Hose

Fire hose used by the Fire department should be distributed so that each Pumper company carries a minimum of at least 360 m (1,200 ft) of 65 mm (2 ½ in) (or larger), 180 m (600 ft) of 38 mm (1 ½ in), and 60 m (200 ft) of 25 mm (1 in) booster hose (or equivalent hose). A fire department should maintain a complete reload or spare hose at the fire hall. Maximum credit for this grading item is given if the Fire department meets or exceeds the minimum hose totals. Larger hose may be credited in the place of smaller hose.



The Barrie Fire and Emergency Service were reviewed for the amount of fire hose carried on in-service apparatus and hose that is kept in reserve. Review indicated the Fire department has an adequate amount of fire hose and received maximum credit for the amount of hose carried on in-service apparatus and hose that is kept in reserve.

The Barrie Fire and Emergency Service received the following credit in this grading item:
Fire Station No.1: 90.00%
Fire Station No.2: 95.11%
Fire Station No.3: 91.78%
Fire Station No.4: 100%
Fire Station No.5: 84.44%

8.2.12. Condition of Fire Hose

This grading item reviews the condition and maintenance of the Fire department’s fire hose. Fire hose should be properly cared for. Fire hose failure on the fire ground can lead to injury or death of building occupants or to fire fighters, and result in unnecessary property damage. Suitable facilities should be provided for washing, drying, and storing of fire hose. Fire hose should be maintained in good condition and tested annually to at least 1,700 kPa (250 psi) pressure.

Testing Program and Age of Fire Hose

A portion of this grading item reviews the testing procedures and frequency of testing of the Fire department fire hose. Fire hose should be maintained in accordance with NFPA 1962, *Standard for the Inspection, Care, and Use of Fire Hose, Couplings, and Nozzles and the Service Testing of Fire Hose*, recent edition.

Fire hose is tested annually and results are recorded. Hose maintenance records are stored in digital file format in the existing fire department data management software.

Receiving maximum credit will require sufficient amounts of spare hose located at each station and all lengths of hose to be tested, with results recorded annually and stored digitally. Currently, efforts are made to test each length of hose annually, however some hose is not tested at the time when testing occurs, because it may be utilized on apparatus at other stations.

The Barrie Fire and Emergency Service received 97.50% credit in this grading item:

8.2.13. Training and Qualifications

Fire department training is commensurate with fire potential in the municipality which facilitates the effective handling of fires through provision of a competent force of personnel. The objective of this grading item is to measure qualifications of the members of the department through the results of the training programs, not simply the programs and facilities themselves. The training and qualifications grading item is separated into five areas for review and grading.



Facilities should be provided, sufficient in size and number and suitably equipped for the proper instruction of all members. There should be a complete, uniform training program under the close supervision of a competent officer; the program should include the study and development of modern practices, including standard operational procedures. There should be a comprehensive schedule of regular classes and drills at the training facility and at fire stations. Special classes for new members, officers, operators, and drivers should be held.

Quality of Basic Recruit Training

This portion of the grading item reviews the basic recruit training program used by the Fire department. The Fire department's probation period is reviewed here. Ideally a fire fighter should serve a probation period of up to one year in training status in which thorough training is provided in safe and efficient firefighting techniques. Additionally the probationer should be assessed in actual fire service performance.

The City of Barrie has seen a large expansion of BFES to meet community growth. The growth in the City resulted in the Fire Department hiring additional fire fighters. To meet growth demands, BFES prefers recruits with fire fighting experience or graduates of college pre-fire service programs.

The prerequisites for BFES fire fighters are:

- New recruits - graduate of a recognized college or institute with pre-service fire fighting
- First Class career fire fighters (pre-service not required) – fire fighter training completed with previous fire department
- Preference is given to candidates with Ontario Fire Marshal (OFM) general fire curriculum (components 1, 2 and 3) and/or NFPA 1001 Levels 1 and 2

The recruit training program consists of a 13 week training schedule comprised of 8 hour days totalling 512 hours total. Topics covered include: PPE and Health and Safety, SCBA, emergency medical first responder, fire behaviour, building construction, pump operations, driver training, ladder operations, rapid intervention and fire fighter survival, trench rescue operations level, forcible entry and saws, auto-extrication, live fire, technical rope and confined space, hazardous materials operations level, fire prevention and public education, high rise operations, ice and water rescue.

Within the fire insurance grading, BFES training program graded very well. The training program is considered advanced and builds upon the basic skills and knowledge recruits have already received from their education background.

Quality of On-going Drills and Training

This portion of the grading reviews a fire department's on-going drill and training program. A fire department training program should include practise evolutions, classroom work, firefighting, prevention and other areas, all to be contained in a department manual; as well as inter-company and building familiarization exercises.

Ongoing drills and training is completed and scheduled using a quarterly training matrix developed by the training division with input from Shift Training Instructors, Training Officers and Training Facilitators. A new component of training includes an online training solution which can deliver over 300 NFPA training programs.

The Barrie Fire and Emergency Service graded well within this portion of the grading item.



Qualifications of Line Officers

A portion of the grading item reviews the Fire department's qualifications of line officers and promotion of its members. Within the fire insurance grading, promotions should be carried out under a documented system providing job related criteria for each rank for internal and lateral entry. Written and oral examinations, in-service training, programs directed toward particular job positions, and evaluation by superiors as well as training ground tests should be used for the selection of candidates for fire suppression officer positions. Career, on-call and auxiliary members of the same fire department should be trained to identical qualification levels. (NFPA Standards for Professional Qualifications, 1001, 1002, 1021, 1031 and 1041 are indicative of good practice.)

Qualification of Specialists

A portion of the grading item reviews the specialized training and qualifications of members of the Fire department. Training and education of members of the department on the job or by outside resources should provide personnel with the abilities to perform their manual rescue firefighting, or specialist functions effectively in a manner commensurate with the size of the fire department and the fire potential of the municipality. This includes pump and ladder operators, mechanics, communications and any other fire suppression specialized personnel.

Facilities for Training

Facilities for drill and training should be readily available for these purposes and include necessary buildings or structures for ladder work, smoke and breathing apparatus training, use of Pumpers and hose lines, lecture space, are all in keeping with the size of the Fire department. Larger fire departments should have training facilities capable of duplicating or simulating a variety of fire types and situations using real fires. Smaller departments may use provincial, regional or cooperative training facilities according to need, but in any case should provide for a broad range of realistic training exercises. Training facilities should always work towards meeting the needs of the potential fires. When a ladder company is required, the tower should be at least 4 stories.

The City of Barrie does not currently have a training facility accessible on a daily basis for fire fighter training. The Fire Department uses Canadian Forces Base Borden for live fire training for new recruits. This arrangement will be discontinued shortly as the original agreement will expire later in 2014. When this agreement expires, the Fire Department will send its new recruits to the Ontario Fire College for live fire training.

Live fire training and other training modules related to structural fire fighting require a significant amount of time to ensure the training material is provided correctly. Often, these modules or subjects require anywhere between 2 and 8 hours of classroom and practical work. With the absence of a local training facility, the Training Division is unable to schedule live fire training and other modules related to structural fire fighting due to the time commitments needed for each fire fighting crew.

The Barrie Fire and Emergency Service received 86.75% credit in this grading item:

Recommendation 3 Develop Facility for Training

It is recommended that BFES develop a fire ground training facility. Ideally, the facility will contain the necessary tools and props needed to practice fire fighting techniques. The training facility should be designed to accommodate live fire training, trench rescue, high angle, confined space, technical rope rescue, RIT and fire fighter survival, auto extrication rescue and, other operation specialities offered by BFES. It is recommended



that an implementation plan be developed to provide the recommended props and facilities ensuring that the development of such facilities is not financially limiting to the City in any given fiscal year.

Also, this can further the level of expertise and possibly develop better mutual aid and/or the adoption of automatic aid with a more homogeneous regional fire protection service. The training expertise and programs developed by BFES can also be provided to other local fire services to strengthen and enhance their capabilities to a level commensurate with that found in Barrie. Enhancing local fire services training could allow for response support within the City of Barrie on a mutual and/or automatic aid basis.

8.2.14. Response to Alarms

An adequate initial response of apparatus and personnel upon receipt of an alarm of fire is essential to provide for prompt control of what is generally an escalating emergency. This is required to be pre-arranged in nature as far as possible to ensure reliability. Efficient advance plans should be made for developing a maximum concentration of forces including reserve apparatus and outside assistance for the largest fires. Response should be commensurate with the hazard of the location responded to, with due consideration for the likelihood of other, simultaneous fires. Minimum responses to fires in buildings considered reasonable are set out in the Table 8-8 Initial Response to Alarm of Fire, which is based off the Table of Effective Response.

Table 8-8 Initial Response to Alarm of Fire

Group	General Description Examples	Fire Flow		Response to First Alarm		Add for Severe Life Hazard: Pumper, Ladder or Rescue Company, at Least
		L/min x 1000	Approx. IGPM range	Pumper Companies	Ladder Companies	
1 (a)	Minor fires not in buildings, very small buildings, widely detached	1 2	200 400	1		
1 (b)	Scattered development (except wood covered roofs)	3	600	1		
2	Typical modern, 1-2 storey residential subdivision, 3-6 m (10-20 ft.) detached.	4-5	800 - 1,000	2		
3 (a)	Close 3-4 storey residential & row housing, small mercantile and industrial	6-9	1,200 -2,800	2	1 (if required by hazards)	



3 (b)	Seriously exposed tenements. Institutional. Shopping Centres. Fairly large areas & fire loads, exposures.	14-19	3,000 - 4,200	2	1	1
4 (a)	Large combustible institutions, commercial buildings, multi-storey and with exposures.	20-27	4,400 -6,000	2	1	1
4 (b)	High fire load warehouses and buildings like 4 (a).	28-35	6,200 - 7,600	3	1	1
5	Severe hazards in large area buildings usually with major exposures. Large congested frame districts.	36-46	7,800 - 10,000	3	2	1

First Alarm Response to Commercial Districts

The Basic Fire Flow for the community is used to determine the response on first alarm to commercial districts. Current response protocols align with the prescribed initial response compliment of 2 Pumpers companies and a ladder. Risks that present severe life hazard concerns should be identified, and an additional company should be deployed where the need is present, such as university and college campus', hospital and other buildings that may pose evacuation difficulties or contain vulnerable occupants.

First Alarm Response to Residential Districts

An average required fire flow for residential districts was determined and used for the first alarm response for residential districts. An average required fire flow of 900 IGPM was determined.

The maximum credit the Barrie Fire and Emergency Service can receive for first response to residential districts is two Pumper companies from Table 8-8. The Barrie Fire and Emergency Service' initial response was deemed adequate, and maximum credit points were awarded.

Suitable Pre-arranged responses (Running Cards)

When a fire department requires the response of more than three Pumper companies determined by the Basic Fire Flow Benchmark, the means of which a fire department has developed pre-arranged responses (running cards) is reviewed.

Running cards should set fourth assignments of specific companies to respond to locations throughout the municipality on first and succeeding alarms, even though specific assistance is frequently specified by the



officer requesting it. Running cards should call for relocation of companies on second alarms and succeeding alarms may be necessary for the purpose of equalizing depleted coverage of the municipality during large fires.

Suitable Covering-in and 2nd Alarm Response

BFES does not deploy all resources to confirmed structures fires under most incident categories. Emergency fire calls typically receive an initial response of a pumper and a tower; however, some call types have increased resources for initial response and typically include an Incident Safety Officer, Platoon Chief, a second pumper or any combination. Based on the needs specific to the emergency event, the incident commander will initial a second or third alarm which includes additional pumpers and resources (pumper, tower, rescue, etc). BFES has identified certain risks where additional resources are needed for initial response due to the complex nature of the building or property (hospital, car homes, etc.)

The addition of an additional ladder apparatus and fire fighting crew as indicated in Recommendation 1 and Recommendation 2 will provide increased credit awarded under this graded item.

<p>The Barrie Fire and Emergency Service received the following credit in this grading item:</p> <p>Fire Station No.1: 90.50%</p> <p>Fire Station No.2: 84.50%</p> <p>Fire Station No.3: 83.50%</p> <p>Fire Station No.4: 92.50%</p> <p>Fire Station No.5: 86.50%</p>

8.2.15. Fire Ground Operations

Within this portion of the grading item all phases of operations at fires are considered. The Fire department is reviewed in its ability to operate effectively at fires both small and large in magnitude, including rescue work when necessary. Good results at the fire scene depend on the use of effective and efficient fire methods and standard operating procedures.

Initial Available Fire Force Response to Commercial Districts

This portion of the grading item reviews fast response call members that includes individuals who are specifically designated to be available for first alarm for a given period and are able to respond immediately by motor vehicle, receiving the alarm call by vehicle radio, personal radio, or pager. These may include off shift career fire fighters, volunteers, ambulance attendants and police officers.

From Table 8-8, the number of Pumper companies and ladder companies based on the benchmark Basic Fire Flow for each fire station district. First alarm response to commercial districts is connected with grading item 8.2.7. Changes in that grading item may affect the amount of credit that is received within this portion of the grading item.

The Barrie Fire and Emergency Service follow a regular training schedule to maintain the adequacy of its members to perform on the fire ground. Operating guidelines as previously mentioned formulate a good portion of the on-going training performed. Fire fighters are mandated to review and make sure they comprehend fully the operating guidelines attributed to training modules as scheduled. The Fire department's operational guidelines are appropriate for a department of its size and scope. It was noted that some



operational guidelines require updating at this time, as they have reached the point of review and possibly amendment.

The Barrie Fire and Emergency Service received 97.00% credit in this grading item:

8.2.16. Special Protection Required

Some municipalities have particular fire hazards within areas they protect requiring specialized apparatus or equipment which should be provided either by the Fire department, individual property owners, or both together. These hazards, including waterfront port and marina facilities, large petrochemical installations, commercial airports or brush and grass fire potentials, should be provided for.

The Fire Department also received maximum credit points for special fire protection needs such as foam capacity, firefighting training and equipment, as well as hazardous materials response. The City is a major transportation hub for the surrounding area and north of the City, maintaining technical capacities to handle potentially hazardous materials travelling through the City transportation routes.

Maintaining training and equipment under the various areas of special protection mentioned is essential to maintaining maximum scoring under this item.

The Barrie Fire and Emergency Service received 99.50% credit in this grading item:

8.2.17. Miscellaneous Factors and Conditions

Records (For Effective Operations, Planning)

Suitable records of fires, fire operations, personnel, training, fire hose and other essential matters should be kept. Records should be maintained as they are essential to effective and responsible management of a fire department. Daily, monthly, and annual reports are useful management tools for the Fire Chief.

Records of fires, training, tests, attendance and activities in the department are available to aid in planning future activity and policy as well as the assessment of performance. Good records of performance evaluations, work record and training are maintained for each member.

The Barrie Fire and Emergency Service maintains records for most aspects of the Department. The Fire Department maintains their records using data management software and includes: fire apparatus, equipment, fire fighter training. This information is also backed up remotely on the City of Barrie servers.

Fire Stations (Suitability)

All stations should be of substantial construction, suitable for the service, and located and arranged for ease and quickness of response. Proper safeguards against internal hazards should be provided. Construction of fire stations should be substantial, non-combustible, preferably fire resistive and protected from exposures, with internal and external hazards minimized. Stations should be equipped with adequate heating and lighting with consideration of the need to dry or thaw wet or frozen equipment and perform maintenance on apparatus.



Barrie Fire and Emergency Service operates out of five fire stations, one located in each developed area of the community. The following provides a brief description of the fire stations.

Fire Station No.1 located at 155 Dunlop Street West is the Fire Department Headquarters and contains administrative offices (management staff, training, emergency communications and fire prevention) in addition to apparatus bay space and living quarters for fire fighters. The construction of the building is considered non-combustible and is protected by an automatic sprinkler system with a monitored fire alarm and security system. Fire extinguishers are located in areas required by Building and Fire Code. Additionally, the fire station was built to Post Disaster Standards.

As this is the new Fire Department Headquarters, there is adequate space for the Fire Department to grow into as additional staff and services are added. Offices for on duty Captains and Platoon Chiefs are provided as well as ample classroom space for fire fighters. These spaces are separate from Fire Prevention and administration including senior management. Emergency back-up power is provided and is located on the roof of the building. The generator undergoes scheduled maintenance and tested monthly under full load by City staff. Access to this area is permitted for designated City and Fire Department staff.

Fire Station No.1 is located near the core of the City near major arterial routes allowing for easy access to major streets and Highway 400.

Fire Station No.2 is a single storey building that was constructed in 1974. The building area is approximately 425m² and is mixed non-combustible and combustible construction. The fire station is not protected by an automatic sprinkler system or fire alarm or security monitoring system; however, portable extinguishers have been provided throughout. Punch code entry locking devices provide access to the facility. The fire station has two single apparatus bays. Space around the fire apparatus within the bays is adequate; however, the fire station does not provide adequate room for growth if further development was to occur. The station is provided with living and sleeping quarters for all on duty fire fighters. A captain's office and sleeping quarters are provided for personnel. Emergency back-up power is provided for the fire station and undergoes regular scheduled maintenance and tested monthly under full load by City staff.

Fire Station No.2 is located near major arterial routes allowing for easy access to major streets and Highway 400.

Fire Station No.3 is a single storey building that was constructed in 1995. The building area is approximately 800m² and is a mix of non-combustible and wood frame construction. The fire station is not protected by an automatic sprinkler system or fire alarm or security monitoring system; however, portable fire extinguishers are provided throughout. Punch code entry locking devices provide access to the facility. The fire station has two single apparatus bays. Space around the fire apparatus within the bays is adequate. The station is provided with living and sleeping quarters for all on duty fire fighters. A captain's office and sleeping quarters are provided for personnel. Emergency back-up power is provided for the fire station and undergoes regular scheduled maintenance and tested monthly under full load by City staff.

Fire Station No. 3 is located near major arterial routes allowing for easy access to other major streets and Highway 400.



Fire Station No.4 is a single storey building that was constructed 2000. The building area is approximately 1000m² and is of non-combustible construction. The fire station is not protected by an automatic sprinkler system or fire alarm or security monitoring system; however, portable fire extinguishers are provided throughout. Punch code entry locking devices provide access to the facility. The fire station has two single drive through apparatus bays. Space around the fire apparatus within the bays is adequate. The station is provided with living and sleeping quarters for all on duty fire fighters. A captain's office and sleeping quarters are provided for personnel. Emergency back-up power is provided for the fire station and undergoes regular scheduled maintenance and tested monthly under full load by City staff.

Fire Station No.4 is located near major arterial routes allowing for easy access to other major streets and Highway 400.

Fire Station No.5 is a single story non-combustible building that is part of a commercial/industrial development unit. The building is protected by a monitored automatic sprinkler system and fire alarm system; additionally, portable fire extinguishers are provided throughout. The fire station is located on an end unit and situated on the southeast corner of Veteran's Drive and King Street. Public access to the units is from King Street; however, the fire station's bay doors front Veteran's Drive. A dedicated private lane way is provided for apparatus response to mitigate any interference from other vehicles that may be on the property. Emergency back-up power is provided for the fire station unit and undergoes regular scheduled maintenance and tested monthly under full load by City staff. The fire station is built to post-disaster standards.

Fire Station No.5 is located near major arterial routes allowing for easy access to other major streets and Highway 400.

Apparatus Refueling

Fuel should be available in sufficient quantities at convenient points within the municipality. Suitable arrangements should be made for delivery of fuel to apparatus at fires of long duration.

The Barrie Fire and Emergency Service maintain its apparatus at full capacity in case of any emergency. Apparatus are refueled after each use. The Fire department has agreements with local distributors in case of emergencies.

Response Delays (Exceptional)

Every fire department may have delays in response for personnel or when on route to an emergency. The possibility of delays due to poor condition of roads, including inadequate snow removal and sanding, steep grades, vehicle parking, traffic, railroad crossing, and other similar features should be considered.

Road ways were in good condition and were not viewed to cause any problems for Fire Department response. Some hills and inclines are present within the City and require heavy braking and caution when descending. Potential issues may arise regarding response along the Trans-Canada Highway, as there is a major railroad crossing and near-by railway station.

The Barrie Fire and Emergency Service received the following credit in this grading item:
Fire Station No.1: 98.50%
Fire Station No.2: 97.50%
Fire Station No.3: 97.50%



Fire Station No.4: 98.00%
Fire Station No.5: 97.00%

8.2.18. Pre-Incident Planning

Pre-incident planning is one of the most effective tools a fire department has in controlling or reducing the damage caused by fire. Planning for fires in industrial and commercial occupancies increases the confidence and ability of the fire department in handling the fires and reduces the risk to the life safety of the fire fighters involved.

This grading item reviews the fire departments pre-incident planning program. Review of this grading item looks at the pre-incident plan inspection program, preparation of plans, quality of data, and the use of pre-incident plans in training.

A pre-incident planning program was recently developed; however, this program is in the early development stage and only approximately 70 pre-incident plans have been completed. The Barrie Fire and Emergency Service currently utilizes information collected in fire safety plans as the data to be used in pre-incident planning. Once final fire safety plans are authorized by the Chief Prevention Officer, they are submitted to suppression and operations for the development of pre-incident planning.

A formal process of reviewing and updating the fire safety plans is in place and requires significant resources and time to implement. BFES scored well under the pre-incident plan inspection program, preparation of plans, and the use of pre-incident plans in training; however the amount of credit received was reduced to the amount of up to date plans currently on file. This grading item will see improved credit if the continual production of pre-incident planning is continued.

Recommendation 4 Continue to Develop Pre-Incident Planning Program

The Barrie Fire and Emergency Service pre-incident planning program has been developed, however to receive additional credit within the fire insurance grading and to help improve fire fighter effectiveness during emergency events, the number of completed pre-incident plans should be increased. As the Fire Department continues to develop its pre-incident planning program, additional credit up to the maximum can be received. It is strongly recommended that the Pre-Incident Plan program continue to expand. Pre-incident plans should be developed in accordance with NFPA 1620, *Recommended Practice for Pre-Incident Planning* recent edition or a similar standard/guideline.

Officers or fire fighters may be trained to develop pre-incidents plans and manage the overall program to ensure pre-incident plans are kept up to date. Personnel charged with the management of the pre-incident planning program may also be utilized to aid in the fire prevention inspections; however, training should be provided to ensure inspections are properly completed.

Developing and implementing a pre-incident planning program has multiple benefits that include but are not limited to:

- Increasing fire fighter familiarity with buildings in the community.
- Planning apparatus staging areas to allow quicker set-up times.
- Determining the overall accessibility for fire apparatus to set up at the risk.
- Identifying hazards in and around the risk that may warrant defensive firefighting tactics.



- Identifying available water resources (example: fire hydrants, ponds, cisterns, dry hydrants, etc).

These pre-incident plans should be kept in the fire station, command vehicles, fire fighting apparatus and should be integrated with the emergency 911 communication center.

Credit within this grading item can be achieved through the regular updating and use in training. This can involve classroom discussions or visiting the site and practicing firefighting or rescue operations and techniques.

Barrie Fire and Emergency Service should objectively aim to maintain up to date pre-incident plans for the following types of occupancies as a minimum:

- Assembly
- Multi-unit residential (occupant load exceeding 10)
- Institutional
- Care or detention
- Commercial (occupant load exceeding 30)
- Industrial
- Hotels/Motels

The Barrie Fire and Emergency Service received 4.50% credit in this grading item.

8.2.19. Administration

Fire departments should be administrated and managed by qualified and progressive leadership with adequate authority to carry out its mandate. Adequate procedures should be established to govern the administration and operation of the organization.

The Fire department should be organized with appropriate staff and line responsibilities assigned for the routine management and operational firefighting and emergency services command. In many cases, especially in smaller fire departments, line and staff functions may be combined, that is, staff duties carried out by line command officers. The fire department should carefully plan its role in the reduction of life and property loss due to fire and its other tasks in emergency rescue, medical assistance, natural and other emergency hazards abatement. This should be in terms of broad approaches including advance planning, fire prevention, public education and involvement of the many public and private agencies that may be helpful towards the life and property loss control goal.

Barrie Fire and Emergency Service have well established and trained individuals capable of running a department of its size and scope. All chief officers have received competent training in leadership, fire command and management. The Fire Department has an excellent blend of formal and on-going training with a wealth of experience among command and administration.

The Barrie Fire and Emergency Service received 97% credit in this grading item.



9. WATER SUPPLY ASSESSMENT

Water supplies for firefighting are a critical component of the community's fire defence systems. Water supplies for firefighting were evaluated for adequacy in several areas including but not limited to:

- Fire Flow Delivery – the ability of the water system to deliver the *Basic Fire Flow* (from Section 7.3 - Fire Risk Assessment in the City of Barrie).
- Storage Adequacy – quantity of stored water reasonable for expected demands and duration of appropriate flows during expected fire events.
- Distribution System Adequacy – layout and arrangement of piping and pump capabilities, looping/grid design of pipe networks for maximum versatility and minimum losses.
- Hydrant Distribution – appropriate spacing and distribution to minimize hose lays and other delays in setting up an initial attack during structure fires.
- System Design and Installation – the overall design of the system with regard to redundancy, and capability to continuously provide full service to all areas during all foreseeable events (including catastrophic events and/or perils).
- Maintenance of System and Components – system and component maintenance meets recognized standards and improved reliability of the system.

This section highlights some of the significant findings of the fire insurance grading of the water supply. Areas where additional credit can be received up to the maximum amount have been noted.

This study includes an assessment the City of Barrie water system but does not include a review or commentary on the Water Master Plan that was recently completed for the City.



9.1. City of Barrie Water Systems Overview

The City of Barrie water distribution system is comprised of 5 pressure zones fed from twelve (12) groundwater wells and treated water from a the Surface Water Treatment Plant. Each pressure zone is supplied with treatment, storage and pumping facilities; the City maintains and operates the entire water supply system. A system schematic has been provided for each excerpt described below. See Appendix H.

The following are excerpts from various documents provided by the City of Barrie, which provide descriptions of the various processes involved in providing water supplies throughout the City.

Excerpt from Barrie Process Schematic, Surface Water Treatment Plant – Overall Process Flow Diagram (Drawing 1 of 8), Dated September 27, 2011:

The Surface Water Treatment Plant draws water from Lake Simcoe through the low lift pumping station located at 23 Camelot Square where raw water is screened and pumped using low lift pumps through to the Surface Water Treatment Plant located at 20 Royal Parkside Drive. The plant has pre-treatment, membrane filtration, granulated activated carbon contactors, disinfection, storage, and then enters into the distribution system feeding Barrie's 2S and 3S pressure zones via the Harvie Rd Reservoir/Booster Station, Big Bay Booster and Maplevue Tower. Plant processes are monitored by a Surface Water Supply section dedicated SCADA system and a 2 MW generator provides emergency back-up power in the result of a power fail to ensure the uninterrupted delivery of safe drinking water.

Excerpt from Barrie Process Schematic, Surface Water Treatment Plant – Low Lift Pump Station (LLPS) (Drawing 2 of 8), Dated September 27, 2011:

The Surface Water Treatment Plant Low Life Pumping Station has a 1,500mm diameter raw water intake running a distance of 750 m into Lake Simcoe, which supplies water to the low lift pump station. The intake structure is situated at a depth of approximately 22 m, constructed of HDPE and fitted with screens to prevent wildlife and debris from entering the pipe. Zebra mussel control is carried out by pre-chlorination at the entrance of the intake pipe when temperatures rise above 12°C. Two sample pumps draw from a sample inlet line that is located on the outside of the raw water intake in order to sample raw water before and after the chlorine injection point. Upon entering the pumping station, the raw water passes through a manually operated sluice gate and an automatic travelling screen with 9.5 mm mesh openings. A manually operated standby screen is present should the automatic screen require maintenance. If required, chlorine can also be injected into the raw water as it enters into the clear well. Four (4) low lift vertical turbine pumps (two 15.75ML/d capacity pumps and two 31.5ML/d capacity pumps) transport the raw water through a 900 mm diameter raw water main to the pre-treatment stage of the surface water treatment plant.

Excerpt from Barrie Process Schematic, Surface Water Treatment Plant – Pre Treatment Stage (Drawing 3 of 8), Dated July 20, 2012:

The pre-treatment stage of the surface water treatment plant consists of an in-line rapid mixer with associated chemical injection points and 0.5 mm membrane strainers that are located along the raw water header. Sulfuric acid is injected and used for pH suppression which maximizes the effectiveness of the coagulant and the flocculation process. Coagulant is added to assist in the reduction of dissolved organic carbon DOC and to aid in the flocculation process by binding particulate together. The raw water is then distributed equally between two parallel flocculation tanks that are designed to provide



gentle mixing and maximize contact between coagulant and water. This builds filterable floc particles and pulls dissolved compounds out of solution.

Excerpt from Barrie Process Schematic, Surface Water Treatment Plant – Primary Membrane Filtration (Drawing 4 of 8), Dated July 20, 2012:

The primary membrane treatment stage of the plant consists of five (5) primary membrane trains equipped with immersed ultra-filtration membranes that are each capable of treating 20 MLD. Each train will have a dedicated permeate pump (equipped with a VFD) that is used to generate the vacuum required for membrane filtration and to transport permeate filtered water to the Granulated Activated Carbon (GAC) weir box or to the final stage of treatment. Chemical pumps (peristaltic pumps in a duty and standby configuration) are used for dosing the cleaning and neutralization chemicals. Duty/Standby air compressors will provide air for all pneumatically actuated valves and supply air for membrane integrity testing. Two positive displacement blowers will be used for air scour during membrane cleanings for the primary membranes.

Excerpt from Barrie Process Schematic, Surface Water Treatment Plant – Granulated Activated Carbon (GAC) Contactors (Drawing 5 of 8), Dated September 27, 2011:

In this stage of the treatment plant, three (3) Granular Activated Carbon (GAC) Contactor systems remove natural organic compounds to reduce taste and odour. Each GAC contactor has a capacity of 20 ML/d. The natural organic compounds are retained inside the GAC contactors while the water passes through.

Excerpt from Barrie Process Schematic, Surface Water Treatment Plant – Membrane Cleaning Systems (Drawing 6 of 8), Dated September 27, 2011:

The membrane cleaning system consists of a duty and standby heat recirculation pumps that supply heat to the filtered water within the neutralization tanks for cleaning. A separate set of duty/standby pumps re-circulate the water in the membrane tank during a recovery clean, in order to maintain the temperature of the cleaning solution. Both of these sets of pumps are designed to re-circulate water through separate heat exchangers that use hot water from the plant boiler to heat the filtered water. Chemical pumps (peristaltic pumps in a duty and standby configuration) are used for dosing the cleaning and neutralization chemicals.

Excerpt from Barrie Process Schematic, Surface Water Treatment Plant – Secondary Membrane Filtration (Drawing 7 of 8), Dated September 27, 2011:

The secondary membrane filtration system is designed to treat reject and backwash water generated from the primary membrane treatment stage and the GAC backwash cycles. The reject and backwash water is stored in two concrete equalization tanks prior to being pumped to the secondary membrane filtration systems. Two positive displacement blowers will be used for air scour during membrane cleanings for the secondary membranes.

Excerpt from Barrie Process Schematic, Surface Water Treatment Plant – Disinfection Storage & Distribution, Chlorine Contact Tank & High Lift Pumping Station (Drawing 8 of 8), Dated July 20, 2012:

The final stage of treatment consists of two (2) 5 ML chlorine contact tanks and two (2) 5 ML reservoirs run in series. First, water is transported to the chlorine contact tanks (CCT) that are equipped with four concrete baffles to provide sufficient contact time. The water is continuously monitored by online analyzers and SCADA to ensure a sufficient chlorine dosage. The treated water is injected with gas



chlorine once more before the point of entry into the distribution as a means of maintaining disinfection in the distribution system. Six (6) high lift vertical turbine pumps deliver water to Harvie Rd Reservoir/Booster Station and Big Bay Booster based on demand to feed the 2S and 3S pressure zones of Barrie's distribution system.

Overall, the City of Barrie water supply, treatment and distribution systems scored well throughout this section of the fire insurance grading. Improvements from the last assessment are evident as increased capacities to provide water supply for public fire protection within serviced areas of the community were assessed.

9.1.1. Primary System Capacities

The City of Barrie has a number of pumps and reservoirs that are used for providing water supplies throughout the City. Table 9-1 through Table 9-3 lists the capacities associated for each considered.

Table 9-1 Barrie Reservoir Capacities

	Location	Type	Capacity (m ³)	Capacity (IG)
Anne Street North	164 Anne St North	In-Ground Reservoir	15,890.00	3,495,323.30
Harvie Road	70 Harvie Rd	At-Grade Reservoir	27,300.00	6,005,181.00
Bayfield Tower	444 Bayfield St	Elevated Reservoir	4,536.00	997,783.92
Ferndale	434 Ferndale Dr	Elevated Reservoir	5,700.00	1,253,829.00
Mapleview	65 Mapleview Dr	Elevated Reservoir	5,455.00	1,199,936.35

Table 9-2 Barrie Groundwater Well Capacities

Well #	Location	Intake (mm)	Depth (m)	Pump (LPS)	IGPM	Discharge Pipe (mm)
5	217 John St	660	106	75.7	1000	200
7	44 Sarjeant Dr	762	100.7	75.7	1000	200
9	168 Johnson St	610	93	75.7	1000	200
10	294 Huronia Rd	508	93.6	52.6	694	200
11	5 Simcoe St	610	61.2	105.3	1390	250
12	85 Lakeshore Dr	762	84	105.3	1390	300
13	168 Johnson St	610	97.8	75.7	1000	200
14	19 Simcoe St	610	61.1	105.3	1390	300
15	55 Lakeshore Dr	610	61.1	105.3	1390	300
16	101 Brown Wood Dr	600	74.7	90.8	1198	300
17	34 Cross St	600	105.2	130	1716	250
18	34 Cross St	600	106.1	130	1716	250

Table 9-3 Barrie Water System Pumps (High Lifts, Low Lifts and Boosters)

Pumping Station	Location	No.	Pump Capacity (LPS)	Pump Capacity (IGPM)
Anne St North Booster	164 Anne St	1	67	884
		2	67	884
		3	90	1,192
Big Bay Point Booster	20 Big Bay Point Rd	1	100	1,320
		2	100	1,320
		3	150	1,980



		4	150	1,980
Codrington Booster	60 Codrington St	1	63	831
		2	63	831
		3	63	831
		4	63	831
Harvie Rd	70 Harvie Rd	1	133	1,759
		2	133	1,759
		3	133	1,759
		4	133	1,759
Innisfil	380 Innisfil St	1	70	924
		2	70	924
		3	70	924
Leacock Booster	319 Leacock Dr	1	20	264
		2	45	594
		3	75	990
		4	75	990
Surface Water Treatment Plant – High Lift Pumps	20 Royal Parkside Drive	1	336	4,430
		2	336	4,430
		3	81	1,069
		4	168	2,215
		5	168	2,215
		6	168	2,215
Surface Water Treatment Plant – Low Lift Pumps	23 Camelot Square	1	182	2,406
		2	182	2,406
		3	365	4,812
		4	365	4,812

9.1.2. Electric Power Supply to Municipality/Pump Station

Electricity is provided to the City of Barrie by Power Stream. Back-up power is provided for critical components throughout the network and includes the water treatment plant, reservoirs, pump and booster pumping stations.

9.1.3. Water Mains in the Distribution System

Water main construction throughout the distribution system consists of cast iron, ductile iron, concrete and PVC piping. Water main sizes throughout the distribution system range from 100mm to 1,200mm.

9.1.4. Hydrants

Within the distribution systems there are approximately 4,300 hydrants (this includes both private and public hydrants). Fire hydrants are owned and maintained by the City's Water Operations Department.

The City's Water Operations Department conducts inspection and maintenance of City-owned hydrants. Hydrants undergo the following on an annual basis:

- Detailed visual inspection to determine physical defects.
- Flushing hydrants with water flowing for approximately 30 seconds.



- Confirmation that the street valve is open.
- Verification that all necessary gaskets are no leaking.
- Proper lubrication of operating nut/outlet threats to ensure proper operation.
- Verification that each hydrant body drains.

Other items that are included in an inspection, but unable to complete annually are:

- Complete hydrant flow test to determine available flow at 20 psi.
- Clearance of snow/overgrowth around hydrants.

9.2. Barrie Water Supply Grading Items

The sections below cover the 15 grading items that pertain to the Water Supply. Thirty percent of the Public Fire Protection Classification of the City of Barrie comes from the grading of the Water Supply.

Areas reviewed in the assessment of the Water Supply are as follows:

- WS 1 – Normal Adequacy of Supply Works
- WS 2 – Reliability of Sources of Supply
- WS 3 – Reliability of Pumping Capacity (Pumps and Drivers)
- WS 4 – Reliability of Power Supply
- WS 5 – Reliability, Condition, Arrangement, Operation, and Maintenance of System Components
- WS 6 – Fireflow Delivery by Mains
- WS 7 – Reliability of Principal mains
- WS 8 – Installation of Pipes
- WS 9 – Arrangements of Distribution Systems
- WS 10 – Additional Factors and Conditions Relating to Supply and Distribution
- WS 11 – Fire Hose
- WS 12 – Hydrants – Size, Type, and Installation
- WS 13 – Hydrants – Condition and Inspection
- WS 14 – Other Conditions Affecting Adequacy and Reliability
- WS 15 – Management

An adequate and reliable water supply is an essential part of the fire fighting facilities of a municipality. A water supply is considered to be adequate if it can deliver the required fire flow for the appropriate duration while simultaneously providing domestic water supply at the max day demand; if this delivery is possible under certain emergency or unusual conditions, the water supply is also considered to be reliable.

In most municipalities, due to structural conditions in some areas, the possibility exists that a combination of unfavourable factors, such as the delayed receipt of an alarm of fire, high winds, or an explosion, will result in a fire becoming large enough to tax the ability of the fire service to confine the fire using the normally available water supply.

If, at the same time, the water supply is lacking or is considerably curtailed due to the failure of essential equipment (reliability), any fire, even if relatively small upon the arrival of the Fire Department, could rapidly expand and extend to adjoining buildings, becoming a conflagration.



In order to provide reliability, duplication of some or all parts of a water supply system is important, the need for duplication being dependent upon the extent to which the various parts may reasonably be expected to be out of service as a result of maintenance and repair work, emergencies, or some unusual condition. The introduction of storage, either as part of the supply works or on the distribution system, may partially or completely offset the need for duplicating various parts of the system; the value of the storage depends upon its amount, location and availability.

Gravity Systems and Pumping Systems

Gravity systems delivering supply from the source directly to the municipality without the use of pumps is advantageous from a fire protection standpoint because of its reliability, but the reliability of a pumping system can be developed to such a high degree through redundancies and back-up power supplies that no distinction is made between the two types.

Storage

In general, storage reduces the requirements of those parts of the system through which supply has already passed. Since storage usually fluctuates, the total normal daily minimum maintained or 80% of capacity is the amount that is considered as available. Because of the decrease in pressure when water is drawn down in standpipes, only the portion of this normal daily minimum storage that can be delivered at the required residual pressure at the point of use is considered as available.

Pump Capacities

As part of the grading analysis of pumps for fire insurance grading the capacities of pumps are de-rated by 25 percent to factor in age and reliability.

9.2.1. Normal Adequacy of Supply Works

The first grading item of the water system considers the ability of the supply works to deliver water at a rate equal to the maximum day demand plus the Basic Fire Flow rate for the time duration specified in Appendix B under normal conditions. Credit may be given for the permissible overload rate of delivery from a filtration plant. If the supply works, alone or in conjunction with storage, can deliver the needed quantities to the distribution system, maximum credit will be received for this grading item.

This grading item reviews the supply works for possible limitations. Limitations may be in the intake main size(s), low-lift pumping capacity, raw water main size(s), settling capacity, settled water mains, filter capacity (including allowable overload, filtered water main size, high-lift pumping capacity or the transmission main size to the municipality.

The water system supply was analyzed for normal adequacy. Table 9-4 indicates the benchmarks associated for the water system and its max day demand.

Table 9-4 Water System Benchmark Summary

Water System	Max Day Demand (IMGD)	Basic Fire Flow (IGPM)	Duration (Hrs)
City of Barrie	18	5,700	4.5



Overall, the Barrie water system graded very well within the fire insurance grading.

**The Barrie water systems received the following credit in this grading item:
City of Barrie: 100%**

9.2.2. Reliability of Sources of Supply

This grading item considers the effect on adequacy of the source of supply. Factors considered for adequacy may include the frequency, severity, and duration of droughts; physical condition of dams and intakes; danger from earthquakes, floods, forest fires, and ice dams or other ice formations; silting-up or shifting of channels; possibility of accidental contamination on the watershed; absence of watchmen where needed; and injury by physical means.

This item considers the miscellaneous factors in the source of supply, especially those due to natural causes that could result in partial or complete interruption of the delivery.

**The City of Barrie water systems received the following credit in this grading item:
City of Barrie: 96.50%**

9.2.3. Reliability of Pumping Capacity (Pumps and Drivers)

The ability of the water supply system to maintain the maximum day demand concurrently with the Basic Fire Flow with one and two pumps out of service is considered under this grading item. The pumps considered out of service are those which would cause a maximum reduction in service delivery to the system. To receive maximum credit, the remaining system capacity in conjunction with available storage, should be able to provide the Basic Fire Flow for the specified duration of the design fire at any time during a period of 5 days concurrently with consumption at the maximum day demand.

For this grading item a single failure and dual point failure analysis is conducted for the pumps considered as having the greatest impact being out of service. Additionally, the capacity of the pumps has been de-rated by 25%.

**The City of Barrie water systems received the following credit in this grading item:
City of Barrie: 100%**

9.2.4. Reliability of Power Supply

The ability of the system to maintain the maximum day demand concurrently with the Basic Fire Flow for the specified duration at any time when considering power interruption that may affect internal or external lines or devices is considered under this grading item.



Electric power supply should be so arranged that a failure in any power line or the repair or replacement of a transformer, switch, control unit, or other device will not prevent the delivery, in conjunction with available storage, of the Basic Fire Flow for the specified duration of the design fire.

Two situations are considered for the reliability of power supply, one with an internal line or device affected, and the second a full grid outage.

Internal Line or Device Affected:

Under this condition the City of Barrie water system would not be affected as there is back up power supplies for each critical system component.

Power supply failure for area grid:

Under this condition the majority of the City of Barrie water system would not be affected as there is back up power supplies available for all pump stations except for the Anne Street 3A and Perry Street 4A.

Reliability of Fuel Supply (for Normal Operations)

The reliability of fuel supply was deemed to be adequate for fire insurance grading and maximum credit was received for this portion of the grading item.

**The City of Barrie water systems received the following credit in this grading item:
City of Barrie: 100%**

9.2.5. Reliability, Condition, Arrangement, Operation, and Maintenance of System Components

This grading item considers the condition of all necessary equipment that is not evaluated in other items which can also include pumps. This evaluation includes equipment such as pressure regulating valves or altitude valves that may be in the distribution system. The capability of personnel to operate the equipment credited under both normal operation and emergency conditions is also considered.

Back-up Power

Water supply equipment that has been designed and connected to reliable means of back-up power is tested regularly by public works personnel. Where back-up power has been installed to run the necessary equipment there is little interruption of service during the transition from primary to secondary power.

Operating Personnel

The City of Barrie has a sufficient amount of personnel who are qualified to operate and monitor the pump operations across the water system. A SCADA system is used to monitor facilities and processes, and can be accessed by key personnel off site.

Reduction in Filtration Capacity

City of Barrie water system and its grading is not affected by reduction in filtration capacity. The water treatment plant is currently not operating at full capacity and was designed to account for significant growth. The filtration system capacity has the ability to be enhanced if necessary.



Overall, the water system graded well in this grading item.

**The City of Barrie water systems received the following credit in this grading item:
City of Barrie: 97.50%**

9.2.6. Fire Flow Delivery by Mains

This is one of the most significant grading items in the water supply section of the fire insurance grading. It is concerned with the actual rate of delivery of water from hydrants for use in combating fires. Credit is calculated by comparing the Required Fire Flows to Available Fire Flows as determined through actual flow tests conducted in accordance with the procedure specified in NFPA 291, *Recommended Practice for Fire Flow Testing and Marking of Hydrants, recent edition*. Available fire flows are calculated through interpolation of data to determine the capacity of the water system when flows bring the residual pressure in the system to 20 psi which is the minimum pressure that is required within the system for firefighting.

Flow test results may be influenced by various factors that may positively or negatively influence the result such as seasonal fluctuations in demand and time of day demand. For this reason, it is important to regularly test water supplies to calibrate the hydraulic model and realistically predict what flows are actually available.

It is important to note that although in some cases Available Fire Flows may be adequate, if hydrant distribution is inadequate, then it may not be possible to deliver the water at the fire flow rate that is available. Adequate distribution of hydrants is important, particularly when dealing with larger flows. Hydrant distribution is analyzed in section 9.2.11.

Ideally, required fire flows will be measured against available fire flow data derived from actual flow test data; however, this study was completed winter weather conditions and the City does not conduct flow tests during these conditions. In lieu of actual flow test data, hydraulic model data available can be used. The City of Barrie has hydraulic model data; however this information was last updated in 2008.

Commercial Lines Risks

The results from comparing the available fire flows (from hydraulic model data) to the Required Fire Flows indicate there is a fairly consistent level of protection that can be provided through the delivery of fire flows by mains where Commercial Lines insured risks are present. Areas of peak required fire flows did not receive full credit as the water supply system was not able to provide water at the rates required however, this is normal. Improvements in arterial and distribution mains (increased size and looping) would most likely result in greater available fire flows which meet the calculated required fire flows. These improvements are always encouraged by Fire Underwriters Survey.

Personal Lines Risks

The results from comparing the available fire flows (from hydraulic model data) to the required fire flows indicate there is a consistent level of protection that is provided throughout the delivery of fire flows by mains. However, some areas were noted to have low flow result and should be reviewed to determine the cause and corrective measures taken to improve available flows.

Recommendation 5 Calibrate and Update Hydraulic Model



Hydraulic model data available to the City of Barrie is based on information from 2011. As the City continues in growth and infrastructure improvements, it is recommended that the hydraulic model is regularly calibrated with up to date flow tests taken throughout the City, existing demand conditions, pipe roughness (c-factor), existing system characteristics and components (pumps and flow rates, system pressure, reservoir levels, etc). Updating and calibrating the hydraulic model will assist City staff with future development by understanding any new limitations on the system, identifying problematic areas where improvements can be made and, identify the water systems capability in any given portion of the City.

**The Barrie water systems received the following credit in this grading item:
City of Barrie: 92.21%**

9.2.7. Reliability of Principal Mains

This grading item reviews any and all pipe lines, aqueducts, tunnels, or conduits upon which service is dependent. This includes intakes, suction or gravity lines to pumping stations, flow lines from reservoirs, treatment plant piping, force mains, supply and arterial mains, etc.

In this grading item the ability of the supply works or main arteries in the distribution system to deliver the maximum day demand plus the Basic Fire Flow with the most critical length of main shut off due to a break in the pipe, was analysed. The time duration used in this item is 3 days which should normally be sufficient to locate the break, isolate it, excavate to the main, make the necessary repairs, sterilize the main, verify the sanitary condition of the main and return the main to service.

Depending on the complexity of the supply works and distribution, the reliability of principal mains may be analyzed for a single main break or several main breaks across the water system. The mains that are analyzed are typically chosen on the basis of causing the most reduction in service.

For the analysis of this grading item, the following scenarios were considered:

- A break affecting the 1,500mm raw water intake from Lake Simcoe into the Surface Water Treatment Plant.
- A break affecting the 900mm - Asset ID: 104205720 - Low Lift Transmission Main to WTP (asset id labelled from GIS meta data provided by the City).
- A break affecting the 300mm transmission main along Bayfield Street North (north of Livingston Street).
- A break affecting the WTP Discharge Main - Double 1,200mm.

Overall, this grading item indicates that the City of Barrie benefits from redundancies and reliability of principal mains. In the event of a main break or outage, the water system has the ability to move water at lower rates, with reliance on stored water available in each pressure zone. The addition of storage capacities in areas that can be considered vulnerable is always encouraged.

**The City of Barrie water systems received the following credit in this grading item:
City of Barrie: 100%**



9.2.8. Installation of Pipes

The Installation of Pipes grading item reviews the installation of mains throughout the water distribution system. The type of water main used, the provision of proper main appurtenances and the manner of installation is evaluated.

Mains should be in good condition and properly installed. Water mains should be suitable for the service intended. Poly-vinyl chloride (PVC), cast and ductile iron, reinforced concrete and steel pipe manufactured in accordance with appropriate Canadian Standards Association or ANSI/AWWA standards, or any pipes listed by Underwriters' Laboratories of Canada for fire service are considered satisfactory. Normally, water mains rated for a maximum working pressure of 1,000 kPa is required. Service records, including the frequency and nature of leaks, breaks, joint separations, other failures and repairs, and general conditions should be considered as indicators of reliability. When mains are cleaned they should be lined.

A sufficient number of valves should be installed so that a break or other failure will not affect more than 400 metres of arterial mains, 150 metres of mains in commercial districts, or 250 metres of mains in residential districts. Valves should be maintained in good operating condition. The recommended inspection frequency is once a year, and more frequently for larger valves and valves for critical applications.

**The City of Barrie water systems received the following credit in this grading item:
City of Barrie: 95.50%**

9.2.9. Arrangement of Distribution System

The reliability of the arrangement of the mains in the distribution system is reviewed under this grading item. The supply mains, arteries, and secondary feeders should extend throughout the system, should be properly spaced, and looped for mutual support and reliability of service; dependence of relatively large areas upon single mains may constitute a reduction in credit.

This grading item is intended to review the amount of the community that is not serviced by arterial mains and arterial main looping. Also the overall distribution grid is reviewed for dead end mains and the amount of mains that are smaller than 150 mm (6 inch).

The analysis of the water distribution system indicated that main looping is fairly consistent. Credit was reduced in this grading item for areas of the water system that was serviced by mains less than 150 mm. Overall, the water supply system graded well in this grading item.

**The City of Barrie water systems received the following credit in this grading item:
City of Barrie: 95.50%**

9.2.10. Additional Factors and Conditions Relating To Supply and Distribution

Water Supply grading items 1, 3, 4, 5, and 7 consider the adequacy and the reliability of the supply facility to deliver the Max Day Demand concurrently with the Basic Fire Flow. This grading item evaluates, for the same items, the ability of the supply facilities to deliver the Max Day Demand concurrently with the peak Required



Fire Flow obtained from the risk assessment. It also covers any factors or conditions that will occasionally reduce the fire protection credited in the other items. Additional factors that are considered when analyzing the distribution system include built on areas that are not served, localized weakness, and service levels that are not considered.

The peak Required Fire Flow that was determined from the risk assessment was 6,800 IGPM. Each grading item was again analyzed with the Max Day Demand concurrently with the peak Required Fire Flow. The assessment indicates that the water system would have difficulties providing water supplies for firefighting purposes under max day demand and peak required fire flow conditions. This is common for most water systems with peak Required Fire Flows at or near 6,700 IGPM.

There are a number of ways to enable the water system to provide water supplies for the peak required fire flow and during max day demand, they include but are not limited to:

- Increasing the amount of stored water for fire fighting
- Increasing the size of primary and secondary mains
- Replacing existing 100 mm (4") diameter water distribution mains
- Retrofitting large required fire flow buildings with automatic sprinkler systems, etc.

**The City of Barrie water systems received the following credit in this grading item:
City of Barrie: 89.50%**

Recommendation 6 Increased Available Stored Water for Peak Required Fire Flow

Increasing the available stored water for the purpose of enhancing fire suppression capabilities for Peak Required Fire Flows is always encouraged. However, as previously stated the credit received under this item is typical for most communities and water supply networks where Peak Required Fire Flows of 6,700 IGPM exist. Recommendation 10 for existing structures with large Required Fire Flows would decrease peak required fire flows as well as the City's Basic Fire Flow. Lowering Peak Required Fire Flows and the Basic Fire Flow would have a cascading effect on the fire insurance grading of the City, and would likely result in substantial available credit points being awarded.

9.2.11. Distribution of Hydrants

The ability of the distribution system to deliver adequate rates of flow for fire protection to various locations of the municipality does not alone provide good fire protection. There should be sufficient hydrants to allow the required rate of flow to be delivered to Fire Department Pumpers and these hydrants should be well spaced in order to keep the length of Fire Department hose lines short. This grading item compares the existing hydrant spacing with the hydrant spacing needed for the various districts within the municipality. Hydrant distribution was determined using the Standard Hydrant Distribution table a listed in Appendix B.

To determine the average area served by each hydrant, representative districts are selected based on being primarily commercial or primarily residential. As part of the analysis for hydrant distribution three items are used in determining the distribution of hydrants:

- Representative areas are determined by the total area in square meters. Green space, unused land, or undeveloped land (no infrastructure developed ex. water mains or road ways) is subtracted from the total area being considered.



- Fire hydrants within the representative area are counted.
- Required Fire Flows within the representative area used to determine the 90th percentile required fire flow for the area.

Commercial

The analysis of the commercial areas chosen for hydrant distribution indicated a slight weakness. The results indicated that the distribution of hydrants in each of the areas could receive more credit if additional hydrants were added.

Residential

The analysis of the residential areas chosen for hydrant distribution indicated there is a very slight weakness.

Unprotected Areas or Weak Coverage

The water distribution systems are well established for the City of Barrie. There were minor or limited areas within the City that are unprotected or have weak hydrant coverage.

**The City of Barrie water systems received the following credit in this grading item:
City of Barrie: 87.93%**

9.2.12. Fire Hydrants – Size, Type, and Installation

Fire hydrants should conform to American Water Works Standard for Dry Barrel Fire Hydrants or Underwriters' Laboratories of Canada listing. Hydrants should have at least two 65 mm outlets. Where Required Fire Flows exceed 1,100 IGPM (5,000 LPM) or pressures are low there should also be a large Pumper outlet. The lateral street connection should not be less than 150 mm in diameter. Hose threads, operating and cap nuts on outlets should conform to Provincial Standard dimensions. A valve should be provided on lateral connections between hydrants and street mains.

Fire hydrants that open in a direction opposite to that of the majority are considered unsatisfactory. Flush hydrants are considered undesirable because of delay in getting into operation; this delay is more serious in areas subject to heavy snow storms. Cisterns are considered unsatisfactory as an alternative to pressure hydrants.

Majority of hydrants that are installed have two 64 mm (2 ½") outlets and a 100 mm (4 ½") pumper port. Hydrants installed in the City operate in a uniform direction and have the same operating nut size and hose threads. Hydrants in the downtown core have been outfitted with storz connections on the steamer ports. All new hydrants installed in Barrie will have a storz connection on the steamer port. Fire hydrants on the distribution system in the City are not colour coded and marked according to available flow capacities in accordance with NFPA 291, *Recommended Practice for Fire Flow Testing and Marking of Hydrants, recent edition*.

**The City of Barrie water systems received the following credit in this grading item:
City of Barrie: 98.50%**



9.2.13. Fire Hydrants – Condition and Inspection

For fire hydrants to be useful in combating fires, hydrants must be in good operating condition. This grading item considers the condition and inspection of hydrants.

Hydrants should be inspected at least semi-annually and after use. The inspection should include operation at least once a year. Where freezing temperatures occur, the semi-annual inspections should be made in the spring and fall of each year. Hydrants should be kept in good condition and suitable records of inspections and repairs be maintained. Fire hydrants should be painted in highly visible colours so that they are conspicuous and be situated with outlets at least twelve inches above the grade. There should be no obstruction that could interfere with their operation. Snow should be cleared promptly after storms and ice and snow accumulations are removed as necessary.

Inspections are necessary to ensure that all hydrants in the municipality are in good condition. Full operation of the hydrant is necessary during inspections in order to check all features of the hydrant.

Frequency of Inspection

The City's Water Department conducts inspection and maintenance on the City-owned hydrants annually in the summer.

Condition

Fire hydrants are painted uniformly throughout the City of Barrie. During the survey some unsatisfactory conditions were present in addition to the installation of hydrants and the angles of ports in relation to their immediate surrounds.

Snow Clearance and Freezing

The Public Works department of the City maintains snow clearance around fire hydrants if required to do so.

**The City of Barrie water systems received the following credit in this grading item:
City of Barrie: 76.00%**

9.2.14. Other Conditions affecting Adequacy and Reliability

This grading item covers pertinent factors or conditions not considered in other grading items. Specifically this grading item reviews:

- plans and records of the water system
- emergency provisions, and
- construction and hazards of buildings.

Plans and Records

Complete, up-to-date plans and records essential for the proper operation and maintenance of the system should be available in a convenient form, suitably indexed and safely filed. These should include plans of the source as well as records of its yield and a reliable estimate of the safe yield; plans of the supply works



including dams, intakes, wells, pipelines, treatment plants, pumping stations, storage reservoirs and tanks; and a map of the distribution system showing mains, valves, and hydrants.

Detailed distribution system plans, in a form suitable for field use, should be available for maintenance crews. Records of consumption, pressures, storage levels, pipes, valves, hydrants, and of the operations of the supply works and distribution system, including valve and hydrant inspections and repairs should be maintained.

The City of Barrie maintains records pertaining to the maintenance of the system. Maps are available and considered accurate and up to date.

Emergency Provisions

Emergency crews, provided with suitable transportation, tools, and equipment, should be on duty in the larger systems and be readily available. Response of an emergency crew should be made to multiple alarms of fire to assist the fire department in making the most efficient use of the water system, and to maintain the best possible service in the event of a water main break or other emergency.

Emergency crews are provided by the Public Works Department if there is an emergency that requires their assistance to ensure water is available for firefighting purposes.

Construction and Hazards of Buildings

Pumping stations, treatment plants, control centres and other important structures should be located, constructed, arranged, and protected so that damage by fire, flooding, or other causes will be held to a minimum. Structures should be of non-combustible construction and contain no combustible materials.

Structures that house critical components for the operation of the City's water system are of non-combustible construction. The structures are constructed and arranged to provide the system components with some level of protection against fire, flooding, and other causes.

**The City of Barrie water systems received the following credit in this grading item:
City of Barrie: 97.00%**

9.2.15. Management

A water supply system should be well administered and have adequate plans for development to keep pace with the growth of the municipality. Supervisory personnel should be qualified to perform their duties efficiently and should have competent assistants. Credit may be reduced in this grading item if the capability of the water system to provide fire protection is hindered by management.

The water system for the City of Barrie is well managed. The City's Public Works Department have qualified individuals responsible for overseeing their specific area of the water system. The Fire department has good cooperation with the members of the individual water departments that supervise the water system. No serious issues presented themselves during the field survey to indicate otherwise.

**The City of Barrie water systems received the following credit in this grading item:
City of Barrie: 99.00%**



10. FIRE SAFETY CONTROL ASSESSMENT

10.1. Fire Safety Control Grading Items

The sections below cover the four grading items that pertain to Fire Safety Control. Twenty percent of the Public Fire Protection Classification of the City of Barrie comes from the grading of Fire Safety Control. Fire Safety Control has become an increasingly heavily weighted portion of the fire insurance grading system. This is as a result of statistical data showing that communities employing effective programs in these areas have significantly reduced fire related losses.

A substantial degree of safety to life and protection of property from fire should be provided by provincial and municipal control of hazards. Control can be best accomplished by the adoption and enforcement of appropriate codes and standards for manufacture, storage, and use of hazardous materials and for building construction, as well as through training, advisory and education programs for the public.

The City of Barrie and the Barrie Fire and Emergency Service have been reviewed in the effectiveness of their practices with regard to Fire Safety Control and Fire Prevention.

10.1.1. General Program

This grading item reviews the general fire prevention, inspection and investigation activities of the Fire department, and reviews the training level of fire prevention officers and specialists. The official in charge of fire prevention activities, in cooperation with the Fire Chief of the Fire Department, establish an inspection procedure for correction of: obstructions to exits which interfere with emergency egress or with Fire Department operations, inadequate or defective automatic or other fire alarm equipment or fire extinguishing equipment or conditions in buildings or other structures which create a severe life hazard potential. Provisions should be made for the investigation of fires.

The fire prevention program should include visiting and inspecting of dwellings on an occupant voluntary basis and the continuous education of the public. The Fire Department should maintain a highly visible profile in enforcement, education, training, and advisory services. Additionally, fire prevention activities should be managed and tracked using a system that is capable of but not limited to:

- effective assignment and tracking of inspections,
- maintaining previous correspondence with building occupant/owner,
- maintaining inspection records and orders issued by inspectors,
- maintaining past orders issued and records of past inspections including acceptance tests and maintenance records for building and fire protection systems,
- providing summary reports based on annual, quarterly, monthly and inspector performance,
- providing summary reports based on inspection type (inspection by occupancy type, request/complaint, frequency of those inspections),
- maintains building/occupant details (hazards associated with the building/occupancy, contact information, fire safety plans, pre-incident plans, etc),
- maintains risk assessment information,



- assists with planning associated with community growth and changes (population and demographics, Fire Department service levels),

10.1.1.1. Fire Prevention Inspection Program

Within the City of Barrie, Fire Prevention Inspections are completed on a request and complaint basis only. Complaints or requests pertaining to potential Fire Code violations and/or potential fire hazards, and all requests for inspections to assess fire safety are received by the Fire Department and assigned to a Fire Prevention Inspector. There is no formal routine inspection or target hazard program in place.

The Table 10-1 provides a summary of the existing building stock within the City of Barrie (MPAC data) and indicates Fire Underwriters Survey benchmark frequency of inspections. The benchmark shown in this table is the amount of inspections that would be necessary to achieve the optimal scoring under Fire Safety Control within the fire insurance grading. Many communities across Canada are unable to achieve the ideal number of inspections due to the number of available inspectors and the total building stock.

Table 10-1 City of Barrie Building Stock

Occupancy	Approximate Unit Stock	FUS Benchmark
Group A - Assembly	168	6 months
Group B – Institutional	22	12 months
Group C – Single Family Residential	37,632	n/a
Group C – Multi-family Residential	5,329	6 months
Group C – Hotel/Motel	18	6 months
Group C - Other	27	6 months
Commercial (D & E)	968	12 months
Industrial (F)	705	3 to 6 months

The City of Barrie was unable to provide the number of multi-family residential (apartment or high rise) buildings throughout the City. It was assumed that the approximate unit stock listed above for multi-family residential includes semi-detached homes and duplexes. From the perspective of the fire insurance grading, these buildings are considered under Personal Lines insurance.

Within the fire insurance grading, single family residential and other buildings insured under Personal Lines are considered under home smoke alarm programs, home evacuation plans and general fire safety consciences. These buildings are not included in the crediting system for routine risk based inspections. As such, Group C – Single Family Residential and Group C – Multi-family Residential have not been included as part of this assessment. Table 10-2 indicates the revised building stock that has been considered for this review.

Table 10-2 City of Barrie- Revised Building Stock

Occupancy	Approximate Unit Stock	FUS Benchmark
Group A - Assembly	168	6 months
Group B – Institutional	22	12 months
Group C – Hotel/Motel	18	6 months
Group C - Other	27	6 months
Commercial (D & E)	968	12 months



Industrial (F)	705	3 to 6 months
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10.1.1.2. Training and Qualifications

The objective of fire prevention inspector training is to measure the skills, knowledge and qualifications of the members of the fire prevention division through recognized training schools and programs. Fire prevention staff is measured against NFPA 1031, *Standard for Professional Qualifications for Fire Inspector and Plan Examiner* (Level 1 and Level 2), NFPA 1033, *Standard for Professional Qualifications for Fire Investigator* and NFPA 1035, *Standard for Professional Qualifications for Fire and Life Safety Educator* (Level 1 and Level 2). BFES currently has eight (8) staff members assigned to the Fire Prevention Division and are assigned as follows:

- One (1) Chief Fire Prevention Officer
- One (1) Public Fire and Safety Officer
- One (1) Plans Examiner
- Five (5) Fire Prevention Officers

Through the Ontario Fire College courses and curriculum, BFES has five (5) certified fire prevention inspectors, three (3) certified public fire and life safety officers, and three (3) certified fire and explosion investigator. BFES does not have a formal in house training program for its staff. At the request of the individual, they receive training and education through the Ontario Fire College.

Recommendation 7 Improve Fire Prevention Inspection Program

To improve the overall level of safety throughout the community and reduce the risk of fires, it is recommended that the Fire Prevention Inspection program be improved. Ideally, inspections should be completed on an annual basis for all Commercial Lines insured buildings. To receive additional credit in the Fire Safety Control portion of the grading, all assembly, institutional, industrial, commercial and multi-unit residential occupancies and hotel/motels should be inspected annually. A formal plan should be developed to improve the inspection program through a phased approach and may include the addition of trained fire prevention staff to conduct inspections in the community and report to the Chief Fire Prevention Officer.

Single family residential dwellings typically receive requests for inspections, and should be serviced by suppression staff on hand. This will require that fire fighters receive specialized training in residential dwelling inspections and follow strict guidance from the Chief Fire Prevention Officer. Also, a door-to-door program on voluntary inspection of residential dwellings should be developed to provide an opportunity for constituents to meet fire department staff and receive educational information on fire safety. The ability of suppression staff to conduct dwelling inspections will allow Fire Prevention Officers to focus on specialized occupancies beyond the expertise of suppression staff.

Buildings that do not receive an annual inspection should be inspected every two (2) years and then increased to every year as building data becomes more readily available. High risk or special hazards are measured against an inspection frequency of every 6 months. High risk or special hazards include, but not limited to:

- Industrial buildings with hot works,
- Feed mills,
- Spray Paint Booths,
- Combustible or flammable storage,



- Chemical storage,
- Aircraft Hangers
- Bulk Storage Warehouses (hazardous substances)

Appendix G indicates the benchmarks or ideal inspection frequency that should be followed to receive maximum credit within the fire insurance grading.

Recommendation 8 Hire Fire Prevention Inspector(s)

The Fire Prevention Officer position is an important role within the community and is considered a proactive approach to increasing public safety. The Fire Prevention Officer position enforces Fire Code compliance within the community ensuring public safety within buildings and educates the public to take preventative measures to mitigate harm and damage caused by fires.

The current building stock within the City of Barrie provides a significant challenge in meeting annual inspection frequency commensurate with FUS benchmarks and current staffing of the division. In 2012, BFES staff was able to complete 1095 inspections (exclusive of follow up or inspections) with five (5) inspectors. This is also based on a manual, paper based reporting and filing system. If new data management software is acquired, it is likely that the amount of time needed for preparation and development of inspection reports/orders will be greatly reduced. This allows inspectors to increase the amount of time they are available to complete inspections and increase the number of buildings inspected. The total number of additional inspectors that may be needed can be more reasonably determined after better systems are in place for record keeping.

Increasing available fire prevention staff can significantly help reduce the overall level of risk within the community. Ideally, the number of inspectors will be adequate to support an effective routine risk based inspection program that ensures an annual inspection on most occupancies and buildings within the City. To help facilitate the inspectors and manage the workload, it is recommended that data management software be acquired. See Recommendation 9.

Once again, the necessity to provide increased staffing of Fire Prevention Officer is mainly important in maintaining PFPC 4. Although, the City may choose to maintain PFPC 4 by other means, consideration should still be given to providing additional resources for the inspection of the above occupancies to enhance fire and life safety in buildings found throughout the community. Section 13.1 outlines a brief time line of when certain benchmarks for improvements can be made and what should be included as part of those improvements.

10.1.1.3. Public Education

The Barrie Fire and Emergency Service actively participates within the community to raise fire safety awareness as part of the public education initiatives. The Fire department provides public education to the residents and business owners in the City in the following forms:

Learn Not to Burn
Travelling Sparky
Literacy Day
Push the Button
Older and Wiser

Remembering When
TAPP-C
Hi-Rise Fire Safety
Clear to Respond



Media Outreach (social media, local newspapers, cable TV)
 Sparks Ablaze
 Brownies, Girl Guides, Cubs, Scouts,
 Fire Extinguisher Training
 Fire Drills
 Car Seat Clinics

After the Fire Blitz
 Home Escape Night
 Domino's Pizza Program
 Hot Summer Night
 Celebrate Barrie
 Fire Station Tours

In addition to these programs, social service and special interest groups may request fire safety related presentations, demonstrations, tours of fire stations, and other specific fire safety education requests.

Fire Safety Planning is required by legislation under the provisions of the Ontario Fire Code Division B Section 2.8. Fire Safety Planning is an important component of fire and life safety in every community in Ontario. Fire Prevention and Public Education staff of BFES are involved in the program, utilising the opportunity to educate building owners on their requirements in fire safety planning as well as the maintenance and up keep of fire and life safety systems in their building and their responsibilities as a building owner/landlord as defined by the Ontario Fire Code and the Fire Protection and Prevention Act 1997.

Once accepted, fire safety plans are kept at the building and a second hard copy is kept in the archive room used to keep fire prevention inspections.

Fire Safety Plans are required by legislation for the following occupancies:

- Assembly and care or detention occupancy,
- Residential occupancy where occupant load exceeds 10,
- Business and personal services occupancies exceeding 300 occupants,
- Mercantile occupancy where the occupant load exceeds 300,
- Industrial occupancies with varying hazard ratings and occupant loads.

The Barrie Fire and Emergency Service fire prevention program was determined to have weaknesses in this grading item. Though inspections are completed by qualified personnel, additional credit could be received if a routine risk based inspection could be developed so that inspections can be completed on a specified frequency. Additionally, improving record keeping and performance tracking practices would result in additional credit within the fire insurance grading.

City of Barrie received 44.40% credit in this grading item.

10.1.2. Fire Safety Laws and Enforcement

This grading item reviews the fire safety laws in use and the enforcement of those laws within the municipality. Adequate laws or ordinances should be enacted to properly regulate the manufacture, storage, transportation and use of hazardous liquids, gases, and other combustible materials, including the handling of combustible waste, and to properly control building construction and electrical, heating, and ventilating installations. The National Fire and Building Codes of Canada and the Canadian Electrical Codes are accepted as the minimum standard regulation.



For enforcement purposes, inspections shall be made by personnel having specialized knowledge and training of special hazards. Inspections should be made as frequently as may be necessary for the proper enforcement of fire prevention regulations; however inspections should be completed at least annually. See Section 10.1.1.1 for more details regarding details of routine risk based inspections.

Proper records of permits (licenses if required by local regulation), inspections, violations and their correction, and of all other important matters should be kept and analyzed.

Fire inspections are completed by the Fire Prevention Officers. Fire inspections are completed on a request and complaint basis only. Completing inspections on a complaint and request basis is considered a reactive approach to reducing fire risk levels in buildings and throughout the community. Ideally, a Fire Prevention Division will take proactive steps in reducing fire risk by completing routine risk based inspections in buildings and occupancies that have a high risk of fire or have a history of fire related calls. Currently, BFES does not have a formal plan for completing routine risk based inspections.

Additional credit could be received by improving the frequency of inspections for all Commercial Lines insured buildings and improving record keeping practices. See Recommendation 7, Recommendation 8, Recommendation 9.

10.1.2.1. Code Provisions

Review of adopted codes and standards are reviewed in this grade item in addition to any accepted building or construction bylaws that require increased or enhanced construction to reduce fire and life safety in buildings. Within the City of Barrie, the 1997 Ontario Fire Prevention and Protection Act (FPPA), the Ontario Fire Code and supplemented NFPA Standards are the accepted and enforced documents.

These documents continue to reduce or help mitigate fire risk with construction requirements, requirement for sprinklers, limiting distances, building height and size restrictions. However, from the perspective of the fire insurance grading additional credit can be awarded if the City requires buildings to meet more stringent criteria than what is required in Ontario Fire Code.

For example, the FPPA requires fire prevention inspections for complaints and requests with no mention of routine risk based fire prevention inspections. More stringent criteria that would receive additional credit within the fire insurance grading is routine risk based inspections every three (3), two (2) and one (1) year based on major occupancy and associated hazards.

Another example is the requirement for retrofit of existing buildings. Part 9 of the 2007 Ontario Fire Code provides the criteria for retrofit of:

- 9.2 Assembly Occupancies,
- 9.3 Boarding, Lodging, and Rooming Houses,
- 9.4 Health Care Facilities,
- 9.5 Buildings Up To and Including 6 Storeys in Building Height with Residential Occupancies
- 9.6 Buildings Higher Than 6 Storeys in Building Height with Residential Occupancies
- 9.8 Two Unit Residential Occupancies
- 9.9 Hospitals



Each of the above Sections has Subsections that discuss application, containment, means of egress, fire alarm and detection and suppression. There is no discussion regarding retrofit of industrial, commercial or mercantile occupancies. Additionally, sprinklers in retrofitted occupancies mentioned above will only be required if the referenced Ontario Building Code requires. More stringent criteria would require sprinkler protection for any retrofit of any occupancy.

These are examples of how additional credit may be granted in this item of the fire insurance grading. Though the ability to require more stringent criteria is beyond the City or any municipality, the amount of credit that can be awarded is based on what is currently enforced and applied.

10.1.2.2. Record Keeping

BFES currently maintains inspection records and orders in hard copy (paper) format. Inspection records and fire safety plans are kept in a central filing room located in BFES headquarters; however, archiving practices are not consistent.

There is data management software currently in place; however, it has very limited use and analysis that can be derived using available data is limited. The software is primarily used for tracking total number of inspections and date of inspection. BFES does not consistently track the assignment of an inspection to an inspector, the status of an inspection, information regarding the most recent inspection, historical information of past orders issued by an inspector, history of a building/occupant/owner or, building/occupancy details (construction, hazards, contact information, etc.). When a request or complaint for an inspection is received, the inspection is assigned either by the Chief Fire Prevention Officer or Fire Department administration staff. From here, limited information regarding the status or details is available to administration and the CFPO unless they specifically request this information from the inspector directly.

Upon completion of an inspection, the inspector provides their report and order (if any) to administration input inspection completion date for their records. A copy of the inspector's report or order is filed in the central filing room; however, this is not consistently done as the inspector may retain some of these files at their work space for follow up inspections.

With the absence of effective data management software, the Fire Prevention Division will encounter difficulties making proactive steps towards reducing fire and life safety risk levels throughout the City. Some challenges that will be evident are: development detailed analytics to determine trends, track inspection details; track and improve inspector performance; analysis of risk profile; and more.

Recommendation 9 Improve Record Keeping Practices

To improve the effectiveness of BFES and help reduce fire risk within the community, it is recommended that the City acquire data management software that will meet existing and future needs of the Fire Prevention Division.

Data management software will greatly enhance the effectiveness of existing fire prevention staff and help plan for future needs based on growth and changes in population or demographics. Data management software will assist with maintaining inspections records and orders more efficiently for any given occupancy or building within the City, identify BFES's capacity to complete routine risk based inspections and planning for future needs of BFES based on growth projections in the City.



One of the first steps that should be taken, if software is to be acquired, is creating an inventory of existing building/occupancy and stock (this includes all buildings and occupancies that are not single family residential). This inventory will help identify the risks within the community and help form the basis of the development of a routine risk based inspection program. Building details such as: address; contact information; year built; construction and occupancy type; building area; sprinklers; zoning information, etc; are some of the specifics that should be included in the database. Alternatively, this information can be acquired from other sources if other City departments (ex. Planning) currently maintains this information. If so, consideration should be given to data management software that is compatible with multiple City departments. Ideally, the same program will be used, as long as the software meets the needs of BFES.

Another important element of acquiring data management software is the ability to assign, track and review inspections, correspondence and maintenance records pertaining to inspections. This information is important for the inspectors in their planning and preparation of inspections and, review information from past inspections where an order may have been issued. Effective data management software and record keeping practices can specifically identify the number of inspections completed by:

- time frame (annually, quarterly, monthly),
- the type of completed inspections (complaint and request versus routine risk based inspections),
- the number of inspections completed by inspector, occupancy type, area of community,

In addition to the system characteristics and capabilities, consideration should also be given to data management software that is currently in use with other City departments and program(s) ability to share and make available of existing information already in use by those departments. For example, a program that is used by Planning may contain existing building and owner details such as floor plans, occupancy, address, construction, year built etc. The data management software used by the Fire Department should ideally be linked to or have access to the same information used by Planning, and vice versa. As the Planning Department data is updated, the same information is updated and made available to the Fire Department automatically. Additionally, the Fire Department eventually acquire mobile units (laptops or tablet devices) to for each inspector for use during fire prevention inspections.

Finally, the software should have the ability to automatically generate inspection reports and orders based on inspector inputs. This will help ensure consistency, accuracy, reliability and efficiency of the work completed. Additionally, this will be beneficial for existing and future inspectors as they will have detailed information and notes for each inspection that has been completed.

This information will greatly assist supervising staff and the Chief Fire Prevention Officer track and review the performance of inspectors and help improve the overall quality and number of inspections completed.

These are important components and steps for planning for future needs of the community. The ability to identify service levels in comparison with varying benchmarks will help manage expectations of the public and council. Identifying service levels also helps justify certain improvements when considering the cost benefits of the fire insurance grading.



10.1.2.3. Frequency

See article 10.1.1.1 and section 13.1 for details.

10.1.2.4. Compliance

The proof of the effectiveness of the enforcement program is the actual conditions that exist within a municipality. Where good regulations are adopted, inspections are made, and there is evidence of follow up on violations, the charge should not normally be more than the worst conditions in evidence. Field inspections are made of conditions to determine the grading charges. The number of inspections necessary depends on the size and characteristics of the municipality. Inspections should include some occupancies requiring permits to determine actual operation of the permit system. Some check of records versus actual conditions should be made.

Field inspections may not cover all of the specific items graded, but based on those hazards inspected, a general evaluation used in grading this item.

The City of Barrie is currently working towards a corporate solution for applications, permits, licenses and inspections. The City is in the process of formalizing their functional requirements for mobile inspections to feed into the corporate solution. This would support the recommendations for data management, inspections and mobility. Integration is important, and using a corporate solution would ensure integration with Planning and Building as provided by the one unified system.

City of Barrie received 11.71% credit in this grading item.

10.1.3. Building Construction Laws and Enforcement

This grading item reviews the building construction laws in use and the enforcement of those laws within the municipality. An adequate building construction code and enforcement program should be provided in the municipality, using a code equal to or better than the Ontario Building Code.

Automatic fire protection sprinklers are installed in some buildings throughout the City of Barrie. However, automatic sprinkler protection systems are typically only installed where required by the Ontario Building Code. The Ontario Building Code is a minimum standard and does not require sprinkler systems to be installed in many occupancies that contain high occupant densities and increased life safety risks. Additionally, the Ontario Building Code does not require pre-existing buildings to be brought up to meet current code requirements. As such, many buildings throughout the community are not sprinklered, resulting in higher Required Fire Flows requiring a higher demand of suppression capacities.

Where sprinkler systems are required, sprinkler system designs are not reviewed for compliance with NFPA 13. The Barrie Fire and Emergency Service does not inspect sprinkler systems. The Fire department requests that building owners supply the department with up to date sprinkler inspections.

Sprinkler protection (when designed and installed in accordance with NFPA 13 and maintained in accordance with NFPA 25) is widely accepted as one of the most effective methods of reducing fire risk in buildings and



communities. Statistically, properly designed, installed and maintained sprinkler systems have been shown to reduce fire losses significantly and reduce the number of lives lost to fire.

City of Barrie received 70.00% credit in this grading item.

Recommendation 10 Implement Sprinkler Bylaw

Credit can be received in the area of fire safety control through implementing a sprinkler bylaw that requires all buildings other than detached dwellings to be sprinkler protected. Furthermore, additional credit could also be received if the City extended this bylaw to include detached dwellings and/or developed a retrofit requirement for the existing building stock.

Implementing a sprinkler bylaw, positively affects Required Fire Flow calculations by reducing the Required Fire Flow if the sprinkler system is properly designed, maintained and tested according to NFPA 13. This also results in lowering the benchmark Basic Fire Flow of the community if implemented in buildings with high Required Fire Flows, and can be considered a cost effective means of increasing fire protection in the community.

10.1.4. Electrical Code and Inspections

This grading item reviews the extent of electrical code inspections and enforcement. An electrical code should be applicable and equivalent to the Canadian Electrical Code and be enforced by an inspection and permits program.

Electrical code inspections are completed by Electrical Safety Authority (ESA). The Electrical Safety Authority is advised of any inappropriate electrical installations or possible hazards identified during prevention inspections conducted by Barrie Fire and Emergency Service.

City of Barrie received 76.00% credit in this grading item.



11. FIRE SERVICE COMMUNICATIONS ASSESSMENT

11.1. System Description Overview

Emergency 911 calls are first received by OPP CERB. Police transfer fire related responses to Barrie Fire Dispatch Communications Center (BFDCC). BFDCC provides fire dispatch services for:

Adjala-Tosorontio Emergency Services,
 Beausoleil Fire and Rescue Services,
 Bradford West Gwillimbury Fire & Emergency Services,
 Clearview Emergency Services,
 Collingwood Fire Department,
 Innsifil Fire Service,
 Wasaga Beach,

Essa Fire Department,
 Springwater Fire & Emergency Services,
 New Tecumseth Fire Rescue,
 Penetanguishene Fire Department,
 Rosemont Fire Department,
 Tiny Fire Department,
 Tay Fire Department & Emergency Preparedness,
 Georgian Bay Fire Department

11.2. Fire Service Communications Grading Items

The sections below cover the seven grading items that pertain to Fire Service Communications. Ten percent of the Public Fire Protection Classification of the City of Barrie comes from the grading of Fire Service Communications.

11.2.1. Communication Center

This grading item reviews the facility used for emergency communications. Equipment for the receipt and transmission of alarms should be housed securely and be protected against fire or damage from other sources, including flooding, vandalism, and earthquakes. Emergency communication centres should be of non-combustible construction with one to three hour protection from exposures depending on complexity of the installation. Most importantly, there should be protection from ignition sources and rapid initial fire spread through control of such sources as flammable furnishings and building finish materials.

Construction and Fire Protection

The Barrie Fire Dispatch facility is located on the second floor of Barrie Fire & Emergency Service Headquarters. The building is of non-combustible construction and has a fire alarm system with an automatic sprinkler system. Additionally, the radio room containing radio equipment has been provided with a special chemical agent sprinkler system designed as a deluge (total flooding) system. Portable fire extinguishers are provided throughout the building including server rooms and electrical rooms containing critical communications equipment.

Risk of ignition and rapid fire spread is reasonably controlled through limitation of combustibles and flammables including interior finishes and furnishings. Automatic sprinkler protection has been provided throughout the building to help minimize the spread of a potential fire.

The most notable concern is the partition wall between the radio room and the equipment room. Currently, the equipment room is accessible to IT staff only. Fire Department personnel would be granted access to the



room upon request. The partition wall has been installed and separates the equipment room and the radio room. This wall does not have a fire resistance rating and appears to have openings/gaps that can lead to fire spread from one room to the other. This may compromise the design and overall effectiveness of the special chemical agent sprinkler system (if the system has not been designed accordingly).

Exposure Hazards

The communications center and equipment rooms have been reasonably designed to be protected from fires, floods, storms, crime and other possible perils. Hazards from external exposures are considered to be minimal due to zoning, building setbacks and occupancy of neighbouring structures.

Power

Barrie Fire & Emergency Service Headquarters has two independent and reliable power sources. The primary power source is from the commercial utility distribution system. The secondary power source is a diesel powered back-up generator located on the roof of the building. In the event of a power failure the generator starts automatically and can maintain building operations under full load conditions. Appropriate uninterruptable powers supplies (UPS) are provided for the emergency communication equipment in the emergency communication facility.

Recommendation 11 Review Design and Installation of Partition Wall in Equipment Room/Radio Room

To ensure that the fire protection system is capable of meeting design requirements and extinguish a fire in the radio room and adjacent room, it is recommended that the partition wall separating the equipment room and radio room be reviewed by the special agent sprinkler design and installation company. The review should consider the materials used for the partition wall, any penetrations that may exist as well as any gaps or spaces in the wall itself and determine if the design area should be reviewed and updated based on existing conditions.

The City of Barrie received 95.00% credit in this grading item.

11.2.2. Means for Transmitting Alarm by Public

This grading item reviews the means for transmitting alarms by the public. There should be reliable and convenient means for the public to communicate alarms of fire to the fire department, by public telephone or alternative means.

There are reliable and convenient means for the public to communicate alarms of fire to the fire department, by public telephone throughout the City of Barrie. Cellular service and landlines are available in all areas of the City of Barrie.

The City of Barrie received 97.50% credit in this grading item.



11.2.3. Fire Department Telephone Service (Incoming from Public)

This grading item considers the means for the public to contact the fire department. There should be reliable and convenient means for the public to communicate alarms of fire to the fire department, by public telephone or alternative means.

This grading item reviews how the public contacts the emergency response agency. This is usually done by a published fire emergency number or 9-1-1. The primary means for the public to contact the Barrie Fire and Emergency Service is through the use of 9-1-1. The Department also has a non-emergency number for general inquiries.

The number of fire lines available to Public Safety Answering Point and the receiving communication centre has been reviewed. BFDCC has ten (10) emergency lines available for the receipt of alarms. Six (6) lines are dedicated for area code 705, two (2) are lines are dedicated for area code 519 and, two (2) lines are dedicated for area code 905. There are four (4) additional back up lines.

Each shift has a minimum of three (3) staff on duty; one (1) supervisor and two (2) operators. If required, an operator may request a supervisor to call in for an additional staff member to report for duty and assist with either call taking or dispatching.

The City of Barrie received 93.75% credit in this grading item.

11.2.4. Means of Alarm Dispatch

This grading item considers the point of receipt of fire alarms from the public. It is necessary to have reliable and prompt notification of fire fighters to respond. The use of both audible and visual means is considered essential in larger fire departments having more frequent fire calls.

Sufficiency of circuits or radio frequencies for the transmission of alarms to fire stations shall be provided as required by NFPA 1221. Alarm-receiving equipment in fire stations, and elsewhere as may be required, shall be provided and served as specified in NFPA 1221.

The OPP Police 911 Communications Centre was not reviewed as part of this assessment. As such, reasonable assumptions have been made as to the equipment and processes in place for receipt and transfer of emergency fire calls (supervised and alternate means of communication, acknowledgment of receipt of transferred call, emergency calls recorded, emergency lines provided with protective casings, etc).

BFDCC is provided with the equipment and tools required to provide effective emergency dispatch. All calls are recorded and can be played back immediately if required, emergency lines and cables are provided with protective casings, there are adequate systems in place for responding crews to acknowledge alarms.

The City of Barrie received 100% credit in this grading item.



11.2.5. Dispatching Service

This grading item considers the dispatching services in use. Telephone alarms should be received at a point where a competent operator or fire fighter assigned to duty is available to promptly receive and process emergency calls at all times.

Operators should be familiar with the facilities provided and adequate in number for handling all alarms as required by the NFPA 1221 and NFPA 1061. The handling of all calls, including those related to fire and other emergencies is considered in determining the number of operators to be on duty.

Each 911 service is measured against their evacuation plans and ability to maintain dispatch service for emergency response personnel during an evacuation and while operating from the back up facility.

BFDCC operators are trained towards the Ontario Standard for Communications Operator. The training program for new operators consists of a 6-10 week program. The training program is initially delivered by the supervisors and managers however with elements self study and includes review of in house 911 training manual which includes dispatch policies and procedures, call taking and dispatching procedures, mapping exercises, radio communication skills, etc. The operator must pass an in house developed exam. Upon completion of the exam, the operator is placed on shift as a 3rd operator with a platoon where the mentoring process begins. Each shift includes a review with the supervisor indicating where improvements can be made. The operator is on probation for a period of six (6) months and depending on the decision of the shift supervisor permitted to promote to regular shifts and duties.

BFDCC is equipped with four (4) computer aided dispatch (CAD) terminals and two (2) additional stations that can monitor and provide call taking duties. The CAD terminals are multi screen and allow the communications operator to input details regarding the emergency (location, type of emergency, etc.), dispatch the necessary companies and monitor radio communications relating to the emergency situations. Additionally, a map is displayed that shows the real time location of any given company throughout the City, in addition to the location of the emergency.

Each shift is accompanied by three (3) on duty personnel including one (1) supervisor and two (2) operators; however, minimum staffing is two (2) operators to allow for vacation period, sick leave, etc. With current staffing levels and call volume the communications division has been able to achieve the following performance benchmarks:

BFDCC benchmark 1: Call dispatch within 60 seconds 90 percent of the time

BFDCC benchmark 2: Call dispatch within 90 seconds 95 percent of the time.

The key performance benchmarks described in NFPA 1221, Standard for the Installation, Maintenance, and Use of Emergency Services Communications Systems, 2013 edition are:

7.4.2 – With exception of the call types identified in 7.4.2.2, 80 percent of emergency alarm processing shall be completed within 60 seconds and 95 percent of alarm processing shall be completed within 106 seconds.

7.4.2.2 – Emergency alarm processing for the following call types shall be completed within 90 seconds 90 percent of the time and within 120 seconds 99 percent of the time:



- (1) Calls requiring emergency medical dispatch questioning and pre-arrival medical instruction.
- (2) Calls requiring language translation.
- (3) Calls requiring the use of TTY/TDD device or audio/video relay services.
- (4) Calls of criminal activity that require information vital to emergency responder safety prior to dispatching units.
- (5) Hazardous material incidents.
- (6) Technical rescue.

BFDCC benchmarks meet article 7.4.2 and 7.4.2.2. with exception "to alarm processing within 120 seconds 99 percent of the time". Data provided by the communications division does not include data points that would permit this comparison. It is important to note, that the communications division appears to meet the intent of NFPA 1221.

The backup communications center BFDCC is located in the Barrie Police Station. In the event of an evacuation, BFDCC staff are to notify their clients and other Barrie personnel and relocate to the back up facility located in the Barrie Police Station. The current evacuation policy in place is primarily based around call transfer to Barrie Police 911 and contact of fire departments that are dispatched by BFDCC and notify them that an evacuation is in place. While in transit, Barrie Police can only take calls and record data, they cannot dispatch. Upon BFDCC staff arrival at Barrie Police, staff has limited capabilities and operate using limited CAD and phone lines. Barrie Police does not currently have spare or backup CAD terminals for BFDCC. This has been identified by both Police and Fire and CAD terminals will be available to BFDCC staff in the Barrie Police Station in the event of an evacuation.

The City of Barrie received 88.00% credit in this grading item.

11.2.6. Operations Radio

This grading item considers the means of the emergency communication centre to stay in contact with fire stations, apparatus, and personnel during emergency events. Telecommunicators should be able to maintain radio communications, using established procedures, with fire companies and essential personnel away from their quarters, in order to permit more effective and efficient operations, including the recall or re-assignment of companies, passing reports from and between units on the fire ground and contact with units on in-service inspection activity and training.

Hand portable radios should be provided for all operational Chief and Company Officers on duty. The housing of base station equipment should be reliable and facilities preferably duplicated as to transmitter, wire circuits or radio relays. A duplicate transmitter and auxiliary power supply should be provided in fire departments having frequent fire calls.

The Barrie Fire and Emergency Service utilizes permanently mounted and portable radio equipment to receive emergency information and communicate between personnel on the fire ground during an emergency situation. The Department has a sufficient amount of portable radios. Portable radios are provided on each of the department's fire apparatus. Each fire station has a base station and associated UPS. Radios are paging and have operational channels. Each front line apparatus is equipped with mobile base radio and repeater.



The Barrie Fire and Emergency Service received 100.00% credit in this grading item.

11.2.7. Miscellaneous Factors

This grading item considers any factors or conditions, not covered elsewhere, that may adversely affect the receipt and transmission of fire alarms or related emergency calls. These could include, but are not limited to: incompetent or insufficient supervisory and maintenance personnel; insufficient size or physical arrangement of the communication centre such that efficiency of fire alarm operators is decreased; unsuitable location of these operators; improper use of or inadequate testing of existing equipment; inadequate records; inadequate maintenance; possible delays to the handling of non-emergency calls; handling of alarms prior to receipt by the fire alarm operators and other undesirable operating procedures.

The Barrie Fire and Emergency Service received 100% credit for this grading item.

The Emergency Communications system provided by Barrie Fire Dispatch Communication Center graded well under all items considered, as was the case in past surveys. Therefore, the focal point of our assessment was to update the grading attributed to the capabilities of emergency communications.

Technological advancements attributed to providing enhanced emergency communications are always encouraged by Fire Underwriters Survey. Such enhancements include Computer Aided Dispatch (CAD) services and the utilization of Geographical Information Systems (GIS), and should be considered for the future improvement of the existing communications centre.

The Barrie Fire Dispatch Communications Center is a new modern facility equipped with up to date equipment and software. Fire protection systems (both active and passive) are in place and are considered to help reduce the risk of fire or the spread of potential fire, with exception the partition wall between the equipment room and radio room. See Recommendation 11 - Review Design and Installation of Partition Wall in Equipment Room/Radio Room.



12. FIRE INSURANCE GRADING

Fire insurance grades are calculated as a single point in time measurement of fire risk and fire protection. The measurement is intended to be representative of the normal level of fire risk and fire protection resources in a municipality at some given point in time and is reviewed from the perspective of property protection as opposed to life safety. In reality, fire protection capacity changes continuously as does fire risk and dynamic measurements of these are possible but are not the method used for fire insurance grading.

The fire insurance grades have been calculated for the City of Barrie in 2013 based on information acquired throughout the study and described throughout this report.

12.1. Fire Insurance Grading Areas

To determine the final fire insurance grades, four separate relative classifications (with differing weights) have been determined:

- Fire Department (40%)
- Water Supplies (30%)
- Fire Safety Control (20%)
- Emergency Communications (10%)

Each of these areas is further broken down and scored in a number of separate items with differing weights based on the importance of the item with respect to control of losses.

12.2. Fire Department Assessment within the Fire Insurance Grading

The Fire Department Assessment contributes 40 percent to the total Public Fire Protection Classification grade of the municipality. This is the most heavily weighted portion of the grading and as such is considered to be the most significant indicator of a municipality's overall preparedness for dealing with fire emergencies.

Figure 12-1 through Figure 12-5 illustrate each grading item within the Fire Department section, how much credit was received and how much credit is still available for each. The most notable areas where improvements can be made are in items FD 2 (subsection 8.2.2), FD 3 (subsection 8.2.3), FD 7 (subsection 8.2.7) and FD 18 (subsection 8.2.18). Section 13.2 discusses varying levels of improvements based on the Fire Department recommendations made in as part of this study



Figure 12-1 Fire Station No.1 - Fire Department Credit Summary

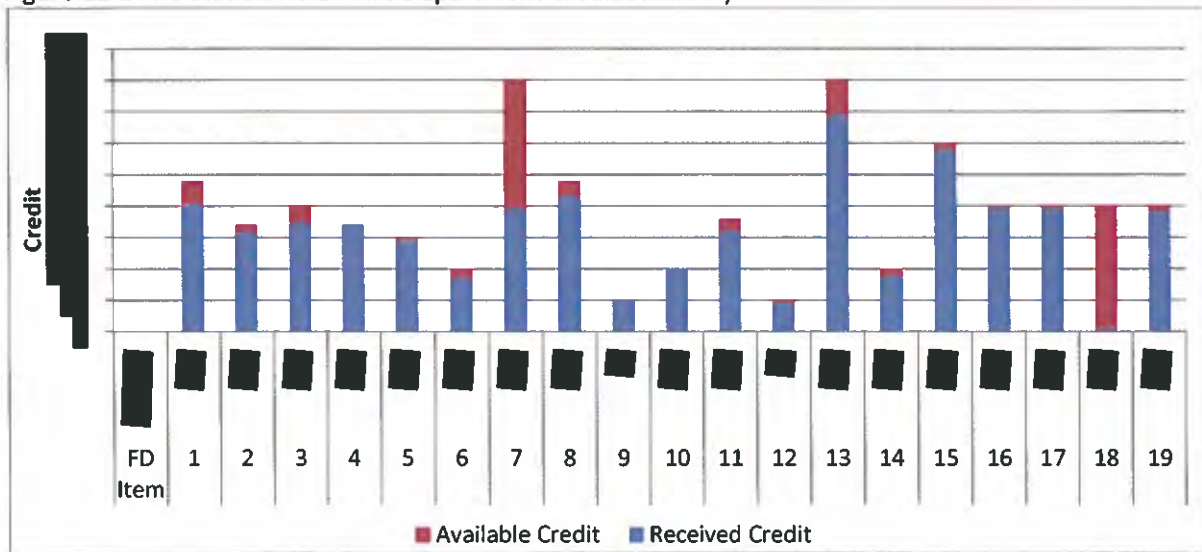


Figure 12-2 Fire Station No.2 - Fire Department Credit Summary

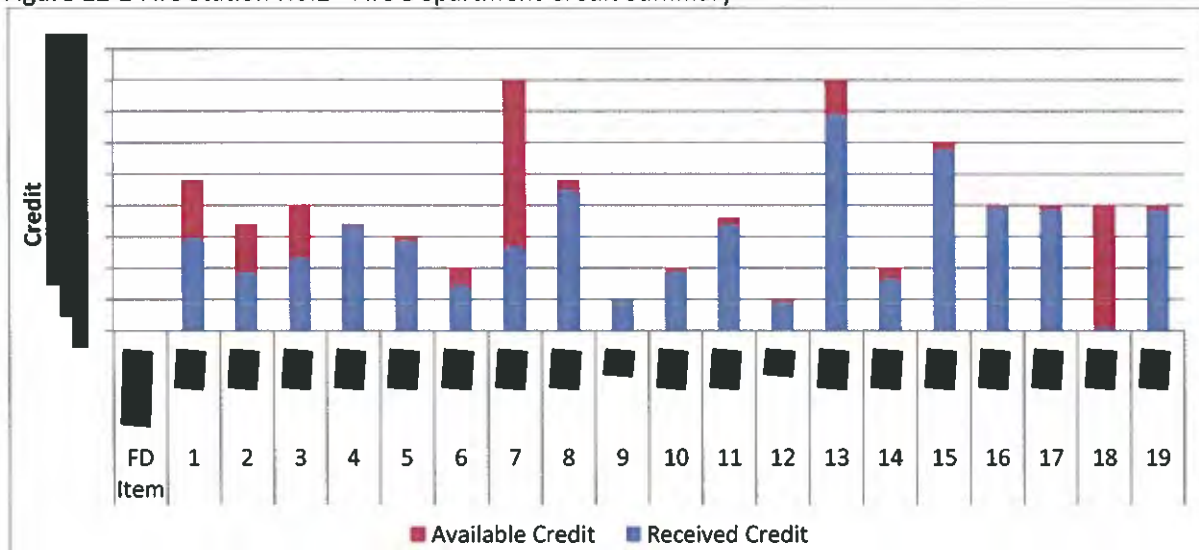




Figure 12-3 Fire Station No.3 - Fire Department Credit Summary

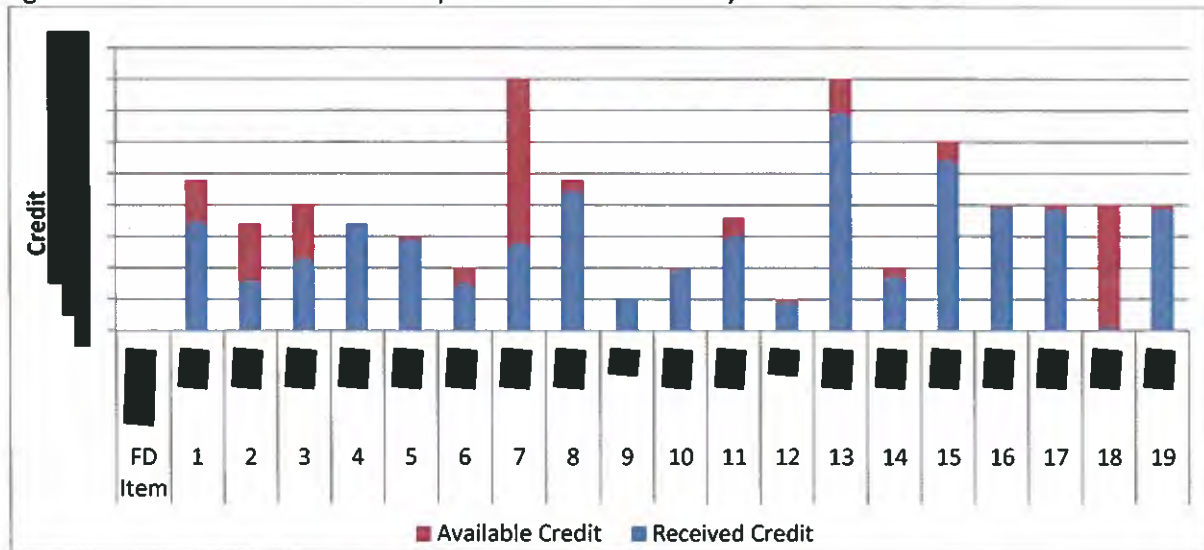


Figure 12-4 Fire Station No.4 - Fire Department Credit Summary





Figure 12-5 Fire Station No.5 - Fire Department Credit Summary



Recommendations have been provided throughout the Fire Department assessment section of the report. These recommendations are provided for BFES to aid the department in improving their relative classification and the fire insurance grades for the City of Barrie. The City of Barrie and BFES are encouraged to review the grading items that received the lowest amount of credit and consider developing specific plans to enable them to receive additional credit in those grading items. Part 13 OPTIONS FOR IMPROVEMENTS provides an analysis of implementing recommendations and their impact on the fire insurance grades for the City of Barrie.

12.3. Water Supplies within the Fire Insurance Grading

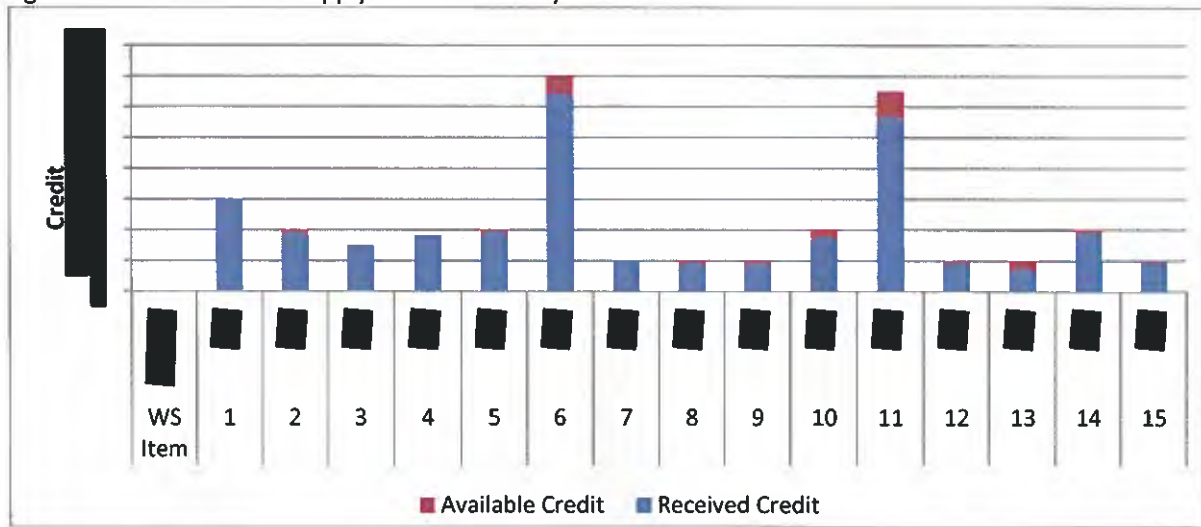
The Water Supply assessment contributes 30 percent to the total Public Fire Protection Classification of the municipality. This is the second most heavily weighted portion of the grading and as such is considered a significant indicator of a municipalities overall preparedness for dealing with fire emergencies.

The Barrie water supply system graded very well within the fire insurance grading. The water system has been well designed and maintained and has been built considering potential capacity of future growth. Each item reviewed received nearly maximum credit and the recommendations made in this section of the study are mainly from the perspective of good engineering practices; however, it is likely that if these recommendations are implemented, additional credit may be received.

Figure 12-6 summarizes the credit score for Barrie’s Water Supply assessment. As shown, each area of the grading received nearly maximum credit with exception to WS 10 (subsection 9.2.10) which considers the water systems ability to provide available fire flows when compared to the peak calculated required fire flow.



Figure 12-6 Barrie Water Supply Credit Summary



Recommendations have been provided throughout the Water Supply assessment section of the report. These recommendations are provided for the management of the City of Barrie’s water system if it wishes to work towards improving the relative classification even further.

12.4. Fire Safety Control within the Fire Insurance Grading

The Fire Safety Control assessment contributes 20 percent to the total Public Fire Protection Classification grade of the municipality. This is the third most heavily weighted portion of the grading and is considered a significant indicator of a municipality’s overall preparedness for dealing with fire emergencies.

The City of Barrie can receive additional credit points within the Fire Safety Control portion of the fire insurance grading. These additional credit points are mainly in the areas of improved data management software and increased fire prevention inspections. See Recommendation 7, Recommendation 8 and, Recommendation 9.

Figure 12-7 summarizes the credit score for Barrie’s Fire Safety Control assessment. The most notable areas where improvements can be made are in FSC 1 (subsection 10.1.1) and FSC 2 (subsection 10.1.2) which include record keeping practices, fire prevention inspection program (number of properties inspected), qualifications of staff, quality of inspections, and other items already discussed in this report. Section 13.1 discusses varying levels of improvements based on the Fire Safety Control recommendations made in as part of this study.

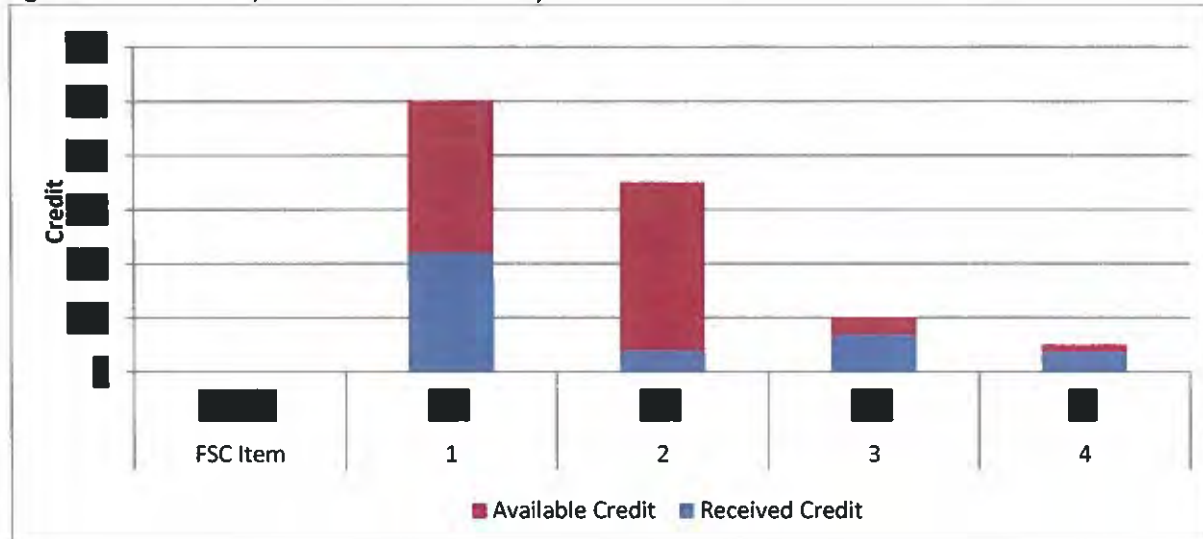
As seen above, significant credit can be awarded with improvements in FSC 1 and FSC 2. The largest gains in credit that can be awarded in these two items are:

- the development and implementation of routine risk based inspections;
- phasing out manual inspection reporting system and phasing in data management software that can generate reports automatically based on inspector inputs, assign and track inspections and includes building stock details;



Additional credit can be awarded if improvements in training of fire prevention staff. This includes inspectors NFPA 1031 Level 1 and Level 2 certified fire prevention inspectors, NFPA 1033 certified fire investigators and NFPA 1035 certified public and life safety educators.

Figure 12-7 Fire Safety Control Credit Summary



12.5. Fire Service Communications within the Fire Insurance Grading

Fire Service Communications contributes 10 percent of the overall grade in the calculation of the Public Fire Protection Classification. As noted above in the sections of the Fire Department, Water Supply, Fire Service Communications is graded similarly with two tiers of weight.

Once each major grading area has a relative classification, the second tier weighting is applied as noted above (Fire Department 40%; Water Supply 30%; Fire Safety Control 20%, Fire Service Communications 10%). The combination of relative classifications with applied weights forms the final Public Fire Protection Classification.

Figure 12-7 summarizes the credit received in each area of the Fire Service Communications portion of the assessment.



Table 12-1 Fire Service Communications Credit Summary



12.6. Summary of Fire Insurance Grading Items

The overall Public Fire Protection Classification grade is determined by summing the credit received per grading item. A summary of the relative classifications and results of each grading area is provided in Table 12-2. Table 12-3 indicates the final credit score assigned to each area of the community. The sum of credit points received for each fire station response zone is also shown in Table 12-3; however, a divergence factor is applied to establish the final credit score. The divergence factor is determined from the difference between the relative credit scores between the fire department and water supply. In the case of Barrie’s 2013 update for each fire station response zone, a divergence factor of as shown in Table 12-3 is applied to each area of the community graded. Note the divergence factor is a function of the difference in relative credit points between the fire department and water supply. Therefore, when options are considered that cause these relative scores to get closer, the divergence factor goes down, conversely when the relative scores get further apart, the divergence factor goes up.

Table 12-2 Relative Classification Score by Major Area Graded

Service Area	Fire Department Relative Score	Water Supply Relative Score	Fire Safety Control Relative Score	Fire Service Communications Relative Score
Fire Station 1	26.64 / 40	26.34 / 30	7.42 / 20	9.56 / 10
Fire Station 2	21.13 / 40	26.34 / 30	7.42 / 20	9.56 / 10
Fire Station 3	24.08 / 40	26.34 / 30	7.42 / 20	9.56 / 10
Fire Station 4	31.22 / 40	26.34 / 30	7.42 / 20	9.56 / 10
Fire Station 5	20.61 / 40	26.34 / 30	7.42 / 20	9.56 / 10



Table 12-3 Credit Score Summary (by Points)

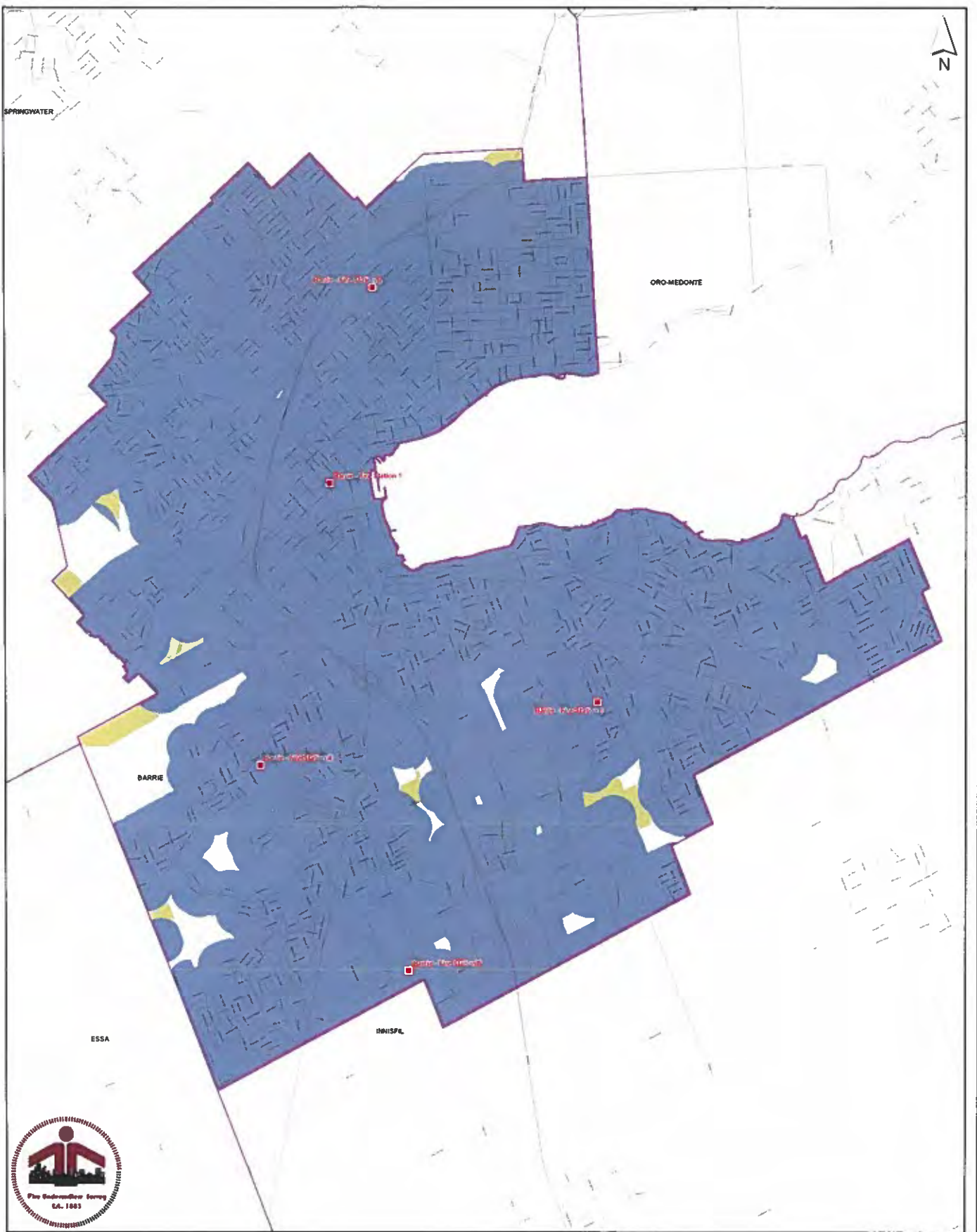
Service Area	Total Credit Score	Divergence Factor	Final Credit Score	PFPC (2005)	PFPC (2013)
Fire Station 1	69.69	3.18	66.79	4	4
Fire Station 2	64.45	5.25	59.21	4	5
Fire Station 3	67.40	4.14	63.26	4	4
Fire Station 4	74.54	1.46	73.08	4	3
Fire Station 5	63.92	5.44	58.48	N/A ⁴	5

In the 2005 update the risk assessment considered more homogenous risk types throughout each major developed area of the community. This assessment in 2013 has more accurately defined the risk profile throughout the City of Barrie. The result of this is slightly varying levels of fire protection and varying levels of risk throughout the City. This is reflected by a different PFPC for each service area. It is important to note, that significant improvements in the Fire Department, Water Supplies and Emergency Communications have significant impact on the fire insurance grades. If these improvements were not made, it is likely that each the PFPC for each service area would be poorer than what has been calculated.

Fire Underwriters Survey strongly encourages improvements in fire protection. The improvements can come in the form of improved water supply systems, fire department response capacity, fire service communications and fire safety control. Throughout this study, recommendations have been made to help improve or maintain the calculated grades. Additionally, these recommendations are also considered good engineering practices. Details regarding the impact of some of the improvements are discussed in Part 13 of this study.

⁴ This fire station was not developed operational during the 2005 assessment and not included in the fire insurance grading index

Figure 12-8 Dwelling Protection Grade Map



City of Barrie

Scale = 1:15,000

Personal Lines Insurance - Dwelling Protection Grades



Date Drawn: 2014-01-17

Drawn By: LZ

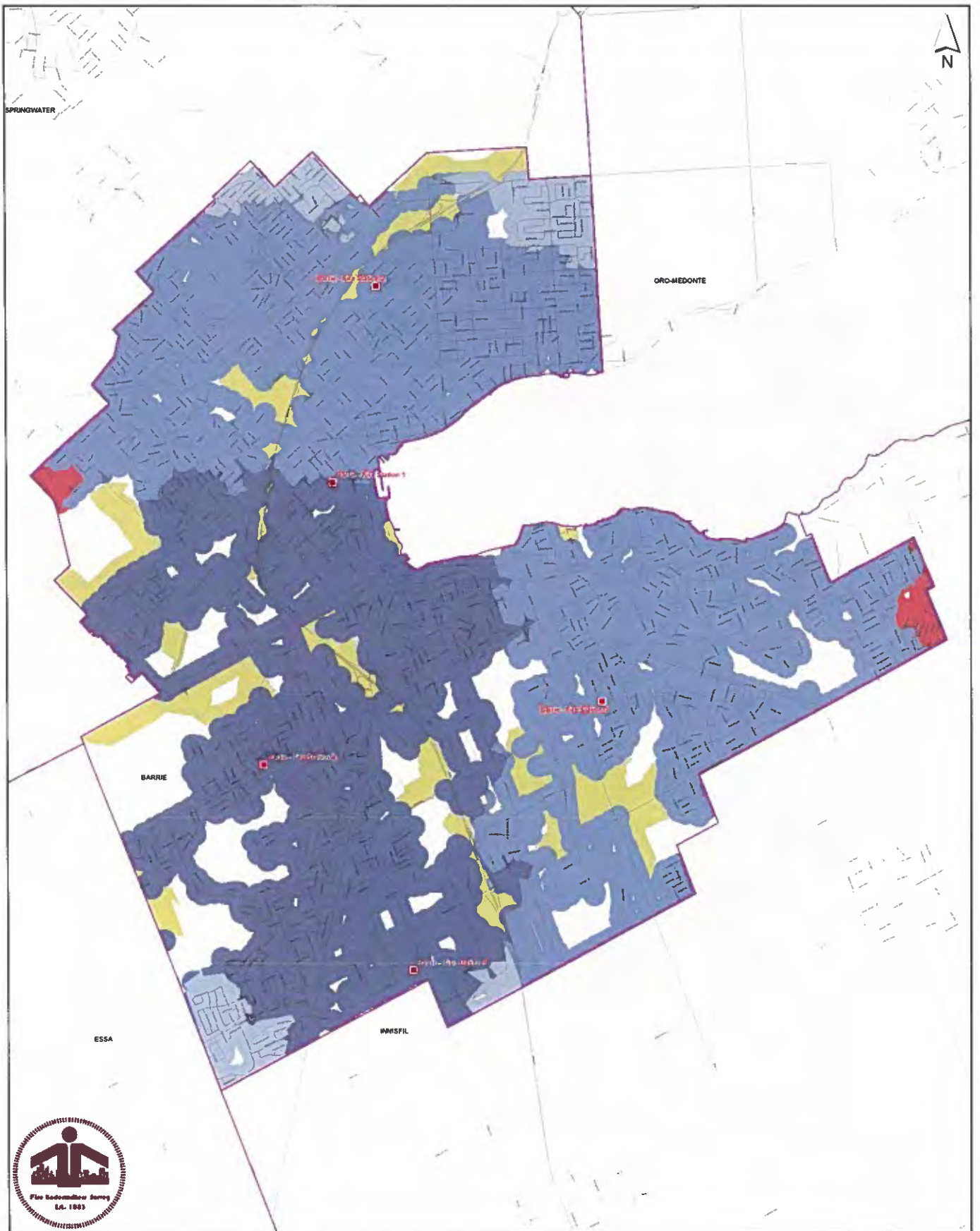
- Preliminary Final
- Commercial Personal

Legend

- Fire Hall
- Road
- Fire Protection Boundary
- 1
- 3B

These maps and figures are not intended to illustrate the exact response distance or fire insurance grade coverage areas but can be used to aid in determining the fire insurance grade that should be applied to the property in question. Fire Underwriters Survey does not warrant or make any representations with respect to the quality, completeness, currency or accuracy of anything contained in this map. The fitness of this map for any purpose or results obtained using information contained in this map and is not responsible for any action taken in reliance on information contained in this map. In all cases, field data should be used to confirm the data and accuracy of these maps, if differences are noted please contact Fire Underwriters Survey at 1-800-665-5661.

Figure 12-9 City of Barrie Public Fire Protection Classification



City of Barrie
Scale = 1:16,000

Commercial Lines Insurance - Public Fire Protection Classification



Legend	
	Fire Hall
	Road
	Fire Protection Boundary
	3
	4
	5
	9
	10

These maps and figures are not intended to illustrate the exact response distance or fire insurance grade coverage areas but can be used to aid in determining the fire insurance grade that should be applied to the property in question. Fire Underwriters Survey does not warrant or make any representations with respect to the quality, completeness, currency or accuracy of anything contained in this map, the fitness of this map for any purpose or results obtained using information contained in this map and is not responsible for any action taken in reliance on information contained in this map. In all cases, field data should be used to confirm the data and accuracy of these maps, if differences are noted please contact Fire Underwriters Survey at 1-800-665-5661.

Date Drawn: 2014-01-17	
Drawn By: LZ	
	Preliminary
	Final
	Commercial
	Personal



13. OPTIONS FOR IMPROVEMENTS

The section provides details regarding the various levels of improvements that can be made to improve public fire protection and help reduce the potential of fire throughout the City of Barrie. The improvements discussed here are those that would result in the largest gains in the fire insurance grade system in addition to good engineering practices that can be expected to greatly reduce the risk of fire throughout the City. These improvements are intended to maintain the existing PFPC Class 4 throughout each fire station response zone; and where possible improve from Class 4 to Class 3.

Some improvements will have a greater a greater impact with lower costs. Based on the results of this update, there are some instances where the total credit received is nearly maximized. Because of this, the amount of resources and investments that may be needed to receive additional credit is significant and may require densification of available resources (ex additional fire fighting crews throughout the City). Investments in these areas would not necessarily yield as many credit points as investing in other areas of public fire protection where there is potential for large gains.

The Barrie Fire & Emergency Service recently accepted a fire station location study and fire master plan completed by a Genivar Incorporated. This study has not factored in the results or implications of the fire station location study or the fire master plan. Completing an assessment based on the fire station location study results is beyond the scope of this project. As such, the options and improvements discussed in this report are based on existing fire station locations and available resources for fire fighting.

13.1. Fire Safety Control Improvements

The recommendations made as part of the Fire Safety Control assessment are intended to improve the effectiveness of BFES operations and increase the overall level of fire safety throughout the City. Each recommendation has varying impacts on the calculated fire insurance grades. The amount of credit that can be awarded from each recommendation is based upon the degree to which each recommendation is implemented. Should the Barrie Fire Department make any changes, Fire Underwriters Survey should be notified to review the changes and update the fire insurance grades as needed.

This section considers the recommendations made throughout the Fire Safety Control assessment. To assist BFES with planning and development, this section provides three (3) levels of improvement that are intended to be used as a "roadmap" for improvement in fire prevention operations within the City of Barrie. It is likely that additional staff may be required to make the improvements and meet the number of routine inspections that are discussed throughout this section.

The City may opt to make improvements in other areas; however, Fire Underwriters Survey should be notified of any changes so that the fire insurance grades can be updated and reflect levels of service provided. The three (3) levels of improvement are described as follows:



Table 13-1 Fire Safety Control Options for Improvements

Option	Description
Level 1	Acquire data management software to assign and track inspections, develop tools to assist inspectors create reports more accurately and efficiently.
	Begin archiving existing fire prevention inspection files.
	Begin developing building stock database (year built, address, construction, occupancy) for data management software.
	Development of routine risk based inspection program. High hazard and other identified buildings and occupancies inspected on a 2 year and 3 year cycle.
Level 2	Further development of data management software. Data will include building details such as pre-incident plans ⁵ , fire safety plans, footprint area, building area, construction, occupancy, sprinkler protection.
	Data management software will have built in code and standard reference tool and ability to generate inspection order based on user inputs and notes.
	Routine risk based inspection program enhanced. Additional buildings and occupancies identified for routine inspections on a 2 year cycle. Begin phasing out 3 year inspections.
Level 3	Data management software well developed and established. Software in place will have building stock data, detailed inspection history for each building within City including working inspections.
	Data management software and staff will have ability to run analytics, determine trends and review past inspections with ease.
	Routine risk based inspection program enhanced. Occupancies and buildings inspected on a 1 year cycle

Table 13-2 provides an outline of when each Level of improvement should be implemented. This table is intended only as a guide to indicate the approximate time that may be needed before the maximum credits can be awarded. For the purpose of this study, Year 1 is considered an implementation period where research and development is required before the actions can be taken to effectively improve. If for example, BFES does not acquire data management software (for fire prevention purposes) until 2015, Year 1 then becomes 2015.

⁵ See Subsection 8.2.18 for details regarding effective pre-incident plans



Table 13-2 Fire Prevention Improvements Over Years

	2014	2015	2016	2017	2018	2019	2020
Improvement Level	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7
Level 1	Implementation period	2 and 3 yr routine					
Level 2		Data management software improvements		2 yr routine			
Level 3		Data management software improvements				1 yr routine	
Level 4		Data management software improvements					1 yr routine

Level 1 Improvements

Improvements discussed here are intended to be the first or initial steps that, if taken, can improve the overall effectiveness of BFES and increase the amount of credit that can be awarded within the Fire Safety Control assessment. The key elements associated with Level 1 Improvements are dependent upon acquiring data management software and building a database that will replace the existing manual reporting and filing systems in place.

As discussed in Article 10.1.2.2, the existing reporting system is almost entirely paper based. BFES is unable to complete detailed analytics or easily review past or current inspections due to the labour intensive nature of the workload involved in collecting the information. See Recommendation 9 for details for improving record keeping practices.

Level 1 improvements are mainly in data management software; however Level 1 improvements will include: *Initial setup and building of database; Begin archiving existing fire prevention inspections files; Identify buildings and occupancies that are high hazard and have high frequency of visits (inspections, call actual or false) to begin routine risk based inspections every two (2) and three (3) years; Training of staff with new systems.*

Table 13-3 Fire Prevention Improvements - Level 1

	2014	2015	2016	2017	2018	2019	2020
Improvement Level	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7
Level 1	Implementation period	2 and 3 yr routine					
Level 2		Data management software improvements		2 yr routine			
Level 3		Data management software improvements				1 yr routine	
Level 4		Data management software improvements					1 yr routine

Initial Setup and Building of Database: This will involve gathering existing building stock and occupancy details for buildings throughout the City. Often, other City staff and Departments will have access to this information and when possible, the Fire Department should import existing data (when considered reliable). Information such as, civic address, major occupancy and other occupancies included within the building should be included. Where possible, additional information such as: building height, building area, footprint area, zoning details, construction, sprinkler protection and, year built, should be collected as well.

Archive Existing Fire Prevention Inspection Files: As the database is being developed, existing fire prevention inspection files (hard copies) should be archived. All relevant information should be archived for reference purposes for any subsequent inspections that may occur. Archiving of existing hard copy files should be an



ongoing task as BFES moves through each Level. Ideally, BFES will have archived 90% of recent fire prevention inspection files available in the data management software.

Identify Buildings and Occupancies That Are High Hazard and Have High Frequency of Visits: To begin the process of completing routine risk based inspections, BFES should identify and target the highest hazard buildings/occupancies and buildings/occupancies that have a high call volume (non medical) or high frequency of request or complaints. High risk buildings/occupancies are those that have a large fire load either from construction or contents and buildings that pose significant challenges for firefighting and rescue operations. Typically, these will include the following building major occupancy classifications:

- Group A,
- Group B (large),
- Group C (multi-family residential buildings, hotels), and
- Group F1 and Group F2.

Certain areas of the community, such as the downtown core, will also be considered high hazard due to the nature of construction, exposures and age of buildings. Often, these buildings are wood frame or heavy timber construction and fire separations or fire walls between occupancies have not been maintained, increasing potential for fire spread and the possibility of large conflagration fires.

With these buildings identified and cataloged, BFES can then start to evaluate the available staffing that may be needed to facilitate routine inspections for these buildings every two (2) and three (3) years. If existing staff levels are insufficient to maintain inspections every two (2) and three (3) years, consideration should be given to hiring additional fire prevention inspectors. See Recommendation 8.

Training of staff with new systems: Integrating new systems requires that staff becomes familiar using the new system(s) that are adopted. Developing the building and occupancy database and archiving existing fire prevention files will assist with staff familiarizing themselves with the new data management software. As BFES staff continues to use the new system, it is expected that assigning and tracking of inspections will become more effective. This will help improve efficiency and begin the process of increasing the number of inspections completed and help reduce the level of fire risk within the community. Additionally, it can be expected that certain level of analytics and reports can be generated as staff become more familiar with the new system.

Level 2 Improvements

Improvements discussed here are intended to build and improve upon the steps taken in Level 1 Improvements. These improvements, if taken, can receive additional credit within the Fire Safety Control assessment. The key elements associated with Level 2 Improvements are dependent on the data management software improvements and developments discussed in Recommendation 9 and Level 1 Improvements.

Level 2 improvements expand and build upon the improvements discussed in Level 1. These improvements are: *Continue database development; Identify additional buildings and occupancies for routine risk based inspections every two (2) years and; Enhancement of fire prevention inspection reports and orders.*



Table 13-4 Fire Prevention Improvements - Level 2

	2014	2015	2016	2017	2018	2019	2020
Improvement Level	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7
Level 1	Implementation period		2 and 3 yr routine				
Level 2	Data management software improvements			2 yr routine			
Level 3	Data management software improvements					1 yr routine	
Level 4	Data management software improvements						1 yr routine

Continue Database Development: Building and occupancy stock information that has been collected should be expanded and improved upon. Continued effort should be placed into the development of the building stock database. Ideally, BFES will have already collected basic information such as civic address, major occupancy and other occupancies included within the building. Additional information that should be collected and included is:

- building height,
- building area,
- footprint area,
- zoning details,
- construction,
- sprinkler protection and,
- year built,
- recent pre-incident plan,
- recent life safety plan (if any),

Identify Additional Buildings and Occupancies for Routine Risk Based Inspections Every 2 Years: With the building stock database continually being developed, BFES should identify and catalogue additional buildings requiring an inspection on a two (2) year cycle. At this level of improvement the following should be included in the routine risk based inspection program:

- Group B (all),
- Group D and,
- Group E

With these buildings identified and cataloged, BFES can then start to evaluate the available staffing that may be needed to facilitate routine inspections for these buildings every two (2) years and begin phasing out the three (3) year inspections. If existing staff levels are insufficient to maintain inspections every two (2) years, consideration should be given to hiring additional fire prevention inspectors. See Recommendation 8.

Enhancement of Fire Prevention Inspection Reports and Orders: The data management software should ideally have a built in tool to complete fire prevention inspection reports and orders based on inspector inputs. The tool should also have relevant Building and Fire Codes imbedded for reference in addition to NFPA, ULC and other standards referenced within the codes. The inspection report and order write up tool will help standardized relevant information and help the inspector with general efficiency. This tool will be of assistance to the Chief Fire Prevention Officer as they will be able to check the status of any inspection (active or completed) by reviewing inspector notes, comments, correspondence (email), provide feedback to the inspector for improvement.



Level 3 Improvements

Improvements discussed here are intended to build and improve upon the steps taken in Level 2 Improvements. These improvements, if taken, can receive additional credit within the Fire Safety Control assessment. The key elements associated with Level 3 Improvements are dependent on BFES staff progress with the details associated with Level 2

Level 3 Improvements expand and build upon the improvements discussed in Level 2. These improvements are: *Annual routine risk based inspections for all buildings; Enhancement of fire prevention inspection analytics; Continued enhancement of fire prevention inspection reports and orders and; Maintain fire prevention inspection file database.*

Table 13-5 Fire Prevention Improvements - Level 3

	2014	2015	2016	2017	2018	2019	2020
Improvement Level	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7
Level 1	Implementation period		2 and 3 yr routine				
Level 2	Data management software improvements			2 yr routine			
Level 3	Data management software improvements					1 yr routine	
Level 4	Data management software improvements						1 yr routine

Annual Routine Risk Based Inspections for All Buildings: With the systems and practices developed and established from Level 1 Improvements and Level 2 Improvements, BFES can further improve upon the routine risk based inspection program by completing annual inspections on all Commercial Lines insured buildings. This includes:

- Group A1, A2, A3, A4
- Group B1, B2, B3
- Group C
- Group D
- Group E
- Group F1, F2, F3

By implementing routine inspections as discussed in Level 1 Improvements and Level 2 Improvements, BFES should have an understanding of the working hours that may be required to complete annual inspections for the buildings described above. If staff levels are insufficient to maintain inspections annually, consideration should be given to hiring additional fire prevention inspectors. See Recommendation 8.

Fire Prevention Inspection Analytics: The ability to develop analytics is an important function a fire department should be capable of performing. When tasked with reporting to council to discuss budget, performance, demographics and growth, these analytics assist the fire departments address any questions or concerns council may have. When expansion or growth within the community is discussed, BFES can more definitively indicate what level of service they can provide as it relates to fire prevention activities. If growth projections are such that current service levels would be inadequate (based on community and council expectations), analytics developed by the fire department can support requests for growth within BFES. Developing analytics becomes more reliable as more data is collected over time. Decisions made from analytics developed after only three or six months of data collection may not be ideal as data may be biased in one direction or the



other. Approximately one to three years of data collection will provide a good working foundation for developing analytics that will assist with future decisions.

Other analytical tools that are valuable to fire departments when reviewing budgets, performance, demographics and development for growth, are:

- performance tracking of inspectors,
- performance tracking of BFES in as a whole,
- identifying weaknesses in
 - o plan review, fire safety plan review,
 - o public education initiatives (home smoke alarm program, mapping locations of where smoke alarms have been installed, etc.)

These tools can be especially useful for public education. The current programs and initiatives in place in Barrie are to be commended; however there is still room for improvement.

The home smoke alarm program can be improved if the location of homes with or without working smoke alarms are identified by BFES and incorporated in the community GIS database and lined to the BFES fire prevention inspection database. Mapping these homes and properties can assist staff determine where there may be higher potential for fire and loss of life. This same applies to other public education program (fire extinguisher training, Domino's Pizza program, fire drills, home escape night).

During public events or other public education initiatives, if permitted, the location of people(s) home or business location can be included to help identify where people are coming from and which areas of the community may see a higher rate of interest in public education.

Continued Enhancement of Fire Prevention Inspection Reports and Orders (Laptops or Tablets): With a tool to complete fire prevention inspection report and orders built into the data management software and in use, the tool itself can be further enhanced. Standardized reports and orders should already be established from Level 2 Improvements. The next step should integrate mobile units (laptops or tablets) for each inspector. The mobile units should be linked to the data management software and the community network allowing inspectors to complete all or the majority of the report or order at the site of inspection. With mobile units and data management software linked together, the inspector will have remote access to reference material and other tools that may be of benefit or support.

Maintain Fire Prevention Inspection File Database: As the fire prevention inspection files expand and contain details such as pre-incident plans, fire safety plans, occupancy details, permits, etc., BFES should continue to ensure that this information is kept up to date. If an inspector or firefighting crew review existing files and see that changes have been made (floor plan, permit, occupancy, hazards, etc.) this information should be updated in the data management software. Additionally, if other City staff or Departments with an interest in the building or occupancy note changes, common points of data should be shared and updated collaboratively to ensure that all City staff have the correct information on file for any given building throughout.

13.1.1. Impact of Fire Safety Control Improvements

Each level of improvement has slightly varying impacts on the calculated fire insurance grade for the City of Barrie. As mentioned, the amount of credit that can be awarded is based upon the degree to which each



recommendation or improvement is implemented. The following outlines the potential credit that can be awarded if BFES is able to completely implement each improvement.

As discussed in Section 4.2, Fire Safety Control is weighted 20 percent or points of credit in the fire insurance grade classification. PFPC 4 is applied when the area graded receives between 60 and 69 points of credits. PFPC 3 applies when the area graded receives between 70 and 79 points of credit. Table 13-6 through Table 13-9 indicate the overall impact each level of improvement has on the fire insurance grade classification for the City of Barrie. As can be seen in the tables, with each level of improvement, the associated calculated credit points increases. In some cases, the improvements result in an improved fire insurance grade from PFPC 4 to PFPC 3.

Table 13-6 Fire Safety Control Credit Points - No Changes

Service Area	FSC Credit Points	Final Credit	PFPC
Fire Station 1	7.42	66.79	4
Fire Station 2	7.42	59.21	5
Fire Station 3	7.42	63.26	4
Fire Station 4	7.42	73.08	3
Fire Station 5	7.42	58.48	5

Table 13-7 Fire Safety Control Credit Points - Level 1 Improvements

Service Area	FSC Credit Points	Final Credit	PFPC	Impact from Original
Fire Station 1	8.88	68.25	4	+1.46
Fire Station 2	8.88	60.67	4	+1.46
Fire Station 3	8.88	64.72	4	+1.46
Fire Station 4	8.88	74.54	3	+1.46
Fire Station 5	8.88	59.94	5	+1.46

Table 13-8 Fire Safety Control Credit Points - Level 2 Improvements

Service Area	FSC Credit Points	Final Credit	PFPC	Impact from Original	Impact from Level 1
Fire Station 1	10.84	70.21	3	+3.42	+1.96
Fire Station 2	10.84	62.63	4	+3.42	+1.96
Fire Station 3	10.84	66.68	4	+3.42	+1.96
Fire Station 4	10.84	76.50	3	+3.42	+1.96
Fire Station 5	10.84	61.90	4	+3.42	+1.96

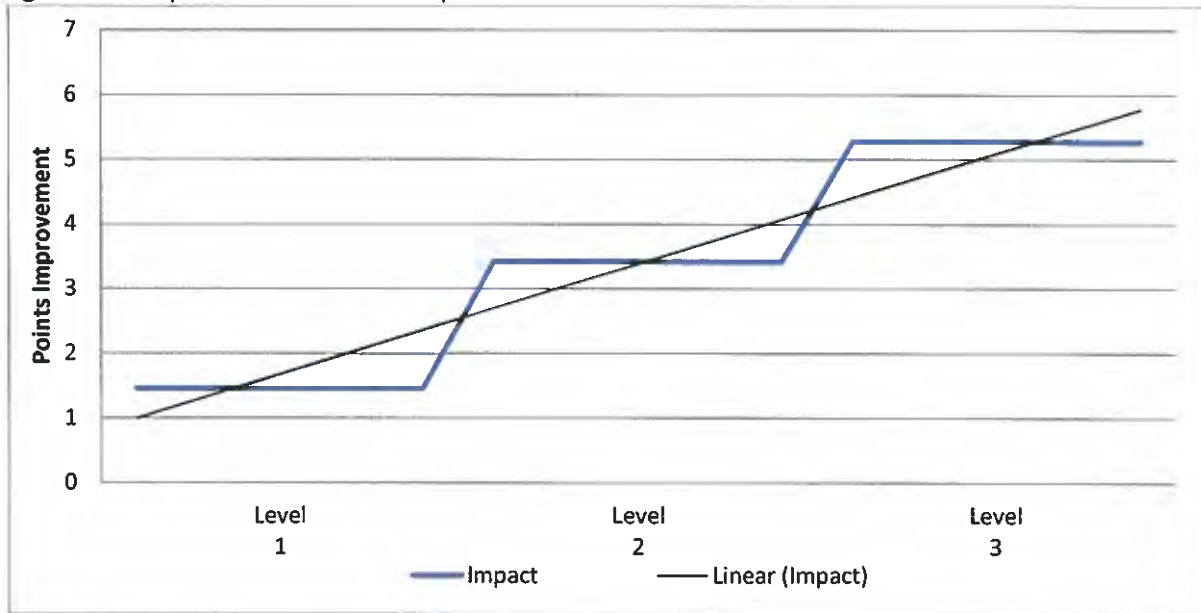


Table 13-9 Fire Safety Control Credit Points - Level 3 Improvements

Service Area	FSC Credit Points	Final Credit	PFPC	Impact from Original	Impact from Level 1	Impact from Level 2
Fire Station 1	12.7	72.07	3	+5.28	+3.82	+1.86
Fire Station 2	12.7	64.49	4	+5.28	+3.82	+1.86
Fire Station 3	12.7	68.54	4	+5.28	+3.82	+1.86
Fire Station 4	12.7	78.36	3	+5.28	+3.82	+1.86
Fire Station 5	12.7	63.76	4	+5.28	+3.82	+1.86

Figure 13-1 indicates the general increase credit point trend with each level of improvement.

Figure 13-1 Impact of Each Level of Improvement



The improvements discussed in this portion of the report only take Fire Safety Control improvements into consideration. Credit points associated with Fire Station 1 shown in Table 13-7 indicate that the area is very close to achieving PFPC 3 after Level 2 Improvements have been implemented. Should the City or Fire Department make improvements in other areas of the fire insurance grade, it is likely that the Fire Station 1 can improve to PFPC 3 before Level 2 Improvements have been implemented.

As shown in Table 13-9, PFPC 3 can be achieved in Fire Station 1 service area with Level 3 Improvements. Fire Station 3 may improve to PFPC 3 if other recommendations made throughout this report are implemented.

Most commonly, communities do not receive an improvement in fire insurance grade by implementing one or two changes. Rather, it is the combination of multiple changes whose cumulative impact results in the improved fire insurance grade. In the case of the City of Barrie, there are opportunities where the areas served by some fire stations can improve their fire insurance grade.



13.2. Fire Department Improvements

The recommendations made as part of the Fire Department assessment are intended to improve the effectiveness of BFES operations and increase the overall level of life safety throughout the City. Each recommendation has varying impacts on the calculated fire insurance grades. This section considers the recommendations made throughout the Fire Department assessment and their impact on the fire insurance grades assigned for each fire station response zone. The amount of credit that can be awarded from each recommendation is based upon the degree to which each recommendation is implemented. Should BFES make any changes, Fire Underwriters Survey should be notified to review the changes and update the fire insurance grades as needed.

Table 13-10 Fire Department Recommendations

Recommendation	Description
Recommendation 1 Improve Ladder Service and Ladder Distribution	Equip Fire Station No.2 or No.5 with ladder and crew.
Recommendation 2 Improve Total Available Fire Force	Increase total available fire force at Fire Station No.2 or No.5
Recommendation 3 Develop Facility for Training	Develop training facility where fire fighters can train and practice their developed specialities offered by BFES
Recommendation 4 Continue to Develop Pre-Incident Planning Program	Develop pre-incident plans that conform to NFPA 1691 for high risk buildings

13.2.1. Impact of Fire Department Improvements

Improve Ladder Service, Distribution of Companies and Total Fire Force Available

When considering a new ladder apparatus and improving the total available fire force, Recommendation 1 and 2 will directly correspond with one another for the purposes of this study. Increasing the number of fire fighters will benefit BFES but only where fire fighters where space permits on front line apparatus (number of seats). Adding a new ladder apparatus but not increasing the number fire fighters may result in less credit that can be awarded. See subsection 8.2.8 Pumper and Ladder Company Unit Manning for details regarding company unit strength credit. For the remainder of this study, the new ladder apparatus discussed in Recommendation 1 and additional fire fighters discussed in Recommendation 2 are referred to as “new ladder company”.

Fire Underwriters Survey reviewed where the new ladder company may have the largest impact on the fire insurance grading. Additionally, a comparison of ladder company strength of three (3) fire fighters and two (2) fire fighters was completed. As discussed in 8.2.2, 8.2.3 and, 8.2.7, Fire Station No.2 and Fire Station No.5 received the least amount of credit for Ladder Service, Distribution of Companies and, Total Fire Force Available. The remaining fire stations can receive additional credit; however, the largest gains in credit can be made in Fire Station No.2 and Fire Station No.5, with regards to a new ladder company. Table 13-11 indicates the existing credit points for the Fire Department section and the Final Credit Points which considers all sections and their relative weights. Table 13-12 summarizes the existing scores that would be impacted for Fire Station No.2 and Fire Station No.5 when considering Ladder Service, Distribution of Companies and, Total Fire Force Available



Table 13-11 Fire Department Existing Credit Scores

Service Area	Existing Credit Score		
	FD Credit Points	Final Credit Points	PFPC
Fire Station 1	26.64	66.79	4
Fire Station 2	21.13	59.21	5
Fire Station 3	24.08	63.26	4
Fire Station 4	31.22	73.08	3
Fire Station 5	20.61	58.48	5

Fire Station No.2 and No.5 both are calculated with Public Fire Protection Classification 5 and with some improvements, can improve to Public Fire Protection Classification 4.

Table 13-12 Fire Station No.2 and No.5 Credit Points

Service Area	FD 2 Score (Ladder Service)	FD 3 Score (Distribution of Companies)	FD 7 Score (Total Fire Force Available)
Fire Station 2	55.29%	59.50%	34.00%
Fire Station 5	47.06%	57.50%	35.00%

Fire Station No.2

A new ladder company located at Fire Station No.2 not only has a positive impact for Fire Station No.2 but also results in additional awarded credit for Fire Station No.1. Fire Station No.3, No.4 and No.5 do not receive additional credit with a ladder company at Fire Station No.2. Table 13-13 summarizes the credit scores considering a company strength of three fire fighters and again for two.

Table 13-13 Credit Improvements with New Ladder Company at Fire Station No.2

3 Fire Fighters	FD Credit Points	Final Credit Points	PFPC	Impact from Original	
				FD Credit Increase	Final Credit Increase
Fire Station 1	27.18	67.53	4	+ 0.54	+ 0.74
Fire Station 2	25.19	64.80	4	+ 4.06	+ 5.59

2 Fire Fighters	FD Credit Points	Total Credit Points	PFPC	Impact from Original	
				FD Credit Increase	Final Credit Increase
Fire Station 1	26.97	67.24	4	+ 0.33	+ 0.45
Fire Station 2	24.91	64.41	4	+ 3.78	+ 5.2

As seen, Fire Station No.1 maintains Public Fire Protection Classification 4 when the ladder company has three or two fire fighters and is located at Fire Station No.2. Fire Station No.2 improves from Public Fire Protection Classification 5 to Classification 4 when the new ladder company has three or two fire fighters.

Fire Station No.5

A new ladder company located at Fire Station No.5 not only has a positive impact for Fire Station No.5 but also results in additional awarded credit for Fire Station No.4. Fire Station No.1, No.2 and No.3 do not receive



additional credit with a ladder company at Fire Station No.5. Table 13-14 summarizes the credit scores considering a company strength of three fire fighters and again for two.

Table 13-14 Credit Improvements with New Ladder Company at Fire Station No.5

3 Fire Fighters	FD Credit Points	Final Credit Points	PFPC	Impact from Original	
				FD Credit Increase	Final Credit Increase
Fire Station 4	32.06	74.22	3	+ 0.84	+ 1.14
Fire Station 5	23.58	62.57	4	+ 2.97	+ 4.09

2 Fire Fighters	FD Credit Points	Final Credit Points	PFPC	Impact from Original	
				FD Credit Increase	Final Credit Increase
Fire Station 4	31.78	73.84	3	+ 0.56	+ 0.76
Fire Station 5	23.2	62.05	4	+ 2.59	+ 3.57

As seen, Fire Station No.4 maintains Public Fire Protection Classification 3 when the ladder company has three or two fire fighters and is located at Fire Station No.5. Fire Station No.5 improves from Public Fire Protection Classification 5 to Classification 4 when the new ladder company has three or two fire fighters.

From the perspective of the fire insurance grading, the placement of a new ladder company will benefit either fire station it is located in addition to a neighbouring fire station. In both cases discussed above, the new ladder company results in an improved Public Fire Protection Classification. This assessment has not considered the number and types of calls where a ladder service has been required for fire fighting operations. For example, if historical data indicates that ladder service and operations are more frequently utilized in Fire Station No.2 response zone then it is reasonable to say that a new ladder company would better serve Fire Station No.2 and vice versa.

There are many factors that must be considered when purchasing a new fire fighting apparatus and increasing staff levels and the fire insurance grading is only one such component. BFES should consider historical data, fire fighting operations and the needs of the rest of the community with regards to service levels and the placement of any new ladder company.

Pre-Incident Plan Program Continued Development

As discussed in subsection 8.2.18, BFES can receive additional credit by increasing the number of pre-incident fire plans currently kept on file and used during training. Of the total building stock considered as part of this study, approximately 70 or five (5) percent of buildings/occupancies have an up to date pre-incident plan. As the pre-incident plan program continues to grow and include additional pre-incident plans, the amount of credit that can be awarded in this grade item will increase. For the purposes of this assessment, the number of completed pre-incident plans was based on an increased percentage of buildings/occupancies having an accepted pre-incident plan.

Table 13-11 indicates the existing credit points for the Fire Department section and the Final Credit Points which considers all sections and their relative weights (and divergence). Table 13-15 summarizes the potential impacts of continuing to develop the pre-incident planning program.



Table 13-15 Credit Improvements with Pre-Incident Planning

Service Area	FD Credit Points	Final Credit Points	PFPC	10% Completed	
				FD Credit Increase	Final Credit Increase
Fire Station 1	26.84	67.07	4	+ 0.2	+ 0.28
Fire Station 2	21.33	59.49	5	+ 0.2	+ 0.28
Fire Station 3	24.28	63.53	4	+ 0.2	+ 0.27
Fire Station 4	31.42	73.35	3	+ 0.2	+ 0.27
Fire Station 5	20.81	58.75	5	+ 0.2	+ 0.27

Service Area	FD Credit Points	Final Credit Points	PFPC	25% Completed	
				FD Credit Increase	Final Credit Increase
Fire Station 1	27.42	67.86	4	+ 0.78	+ 1.07
Fire Station 2	21.91	60.28	5	+ 0.78	+ 1.07
Fire Station 3	24.86	64.33	4	+ 0.78	+ 1.07
Fire Station 4	32.00	74.15	3	+ 0.78	+ 1.07
Fire Station 5	21.38	59.55	5	+ 0.77	+ 1.07

Service Area	FD Credit Points	Final Credit Points	PFPC	50% Completed	
				FD Credit Increase	Final Credit Increase
Fire Station 1	28.4	69.21	4	+ 1.76	+ 2.42
Fire Station 2	22.89	61.63	4	+ 1.76	+ 2.42
Fire Station 3	25.84	65.67	4	+ 1.76	+ 2.41
Fire Station 4	32.98	75.49	3	+ 1.76	+ 2.41
Fire Station 5	22.36	60.89	4	+ 1.75	+ 2.41

Service Area	FD Credit Points	Final Credit Points	PFPC	90% Completed	
				FD Credit Increase	Final Credit Increase
Fire Station 1	29.98	71.38	3	+ 3.34	+ 4.59
Fire Station 2	24.47	63.8	4	+ 3.34	+ 4.59
Fire Station 3	27.42	67.84	4	+ 3.34	+ 4.58
Fire Station 4	34.56	77.66	3	+ 3.34	+ 3.77
Fire Station 5	23.94	63.06	4	+ 3.33	+ 4.58

Some of the values shown for Total Credit Increases are not all equal to one another. The reason for this is the divergence analysis that is completed for any fire insurance grade calculation. Because of the relative score between the Water Supplies and each fire station Fire Department assessment, there is a slightly different divergence value associated with each Public Fire Protection Classification shown. See 12.6 Summary of Fire Insurance Grading Items for details.



As seen, each service area can work towards improving its Public Fire Protection Classification with the continued development of the pre-incident planning program. Fire Underwriters Survey strongly encourages BFES to continue to develop and implement additional pre-incident plans for each building and occupancy throughout the City. These pre-incident plans will greatly assist fire fighters by allowing them to better plan and prepare for emergency situations in and around these buildings.

13.3. Fire Safety Control and Fire Department Improvements Combined

In Sections 13.1 and 13.2, the recommendations and options for improvements have been reviewed independently from one another. This section considers the first steps or initial improvements from Fire Safety Control (Level 1 Improvements); Fire Department (Improve Ladder Service, Distribution of Companies and Total Fire Force Available) and; Fire Department (Pre-Incident Plan Program Continued Development). For the purposes of this assessment; the new ladder company considers a company strength of three (3) fire fighters and; the level of continued development in the pre-incident plan program will included 10% of the City building/occupancy stock. The pre-incident plans should be of equal quality as existing adopted pre-incident plans.

13.3.1. Impact of Fire Safety Control and Fire Department Improvements

Table 13-16 and Table 13-17 summarize the potential credit that can be awarded if the City and BFES implement the improvements described above (new ladder company with three fire fighters, 10% of building/occupancy stock with adopted pre-incident plan, Fire Safety Control Level 1 improvements). The results of these changes and improvements are significant. However, when compared to one another, a new ladder company at Fire Station No.5 results in each service area having a Public Fire Protection Classification of at least 4 which maintains the Classification from the previous assessment in 2005. See Table 12-3 for details.

Table 13-16 Credit Improvement Summary (FS2 New Ladder Company, Pre-Incident Plans, FSC Level 1)

Service Area	FD Credit Points	FSC Credit Points	Final Credit		Impact from Original		
			Points	PFPC	FD Credit Increase	FSC Credit Increase	Final Credit Increase
Fire Station 1	27.38	8.88	69.27	4	+ 0.74	+ 1.46	+ 2.48
Fire Station 2	25.39	8.88	66.53	4	+ 4.26	+ 1.46	+ 7.32
Fire Station 3	24.28	8.88	64.99	4	+ 0.2	+ 1.46	+ 1.73
Fire Station 4	31.42	8.88	74.81	3	+ 0.2	+ 1.46	+ 1.73
Fire Station 5	20.81	8.88	60.21	4	+ 0.2	+ 1.46	+ 1.73

Table 13-17 Credit Improvement Summary (FS5 New Ladder Company, Pre-Incident Plans, FSC Level 1)

Service Area	FD Credit Points	FSC Credit Points	Final Credit		Impact from Original		
			Points	PFPC	FD Credit Increase	FSC Credit Increase	Final Credit Increase
Fire Station 1	26.84	8.88	68.53	4	+ 0.2	+ 1.46	+ 1.74
Fire Station 2	21.33	8.88	60.95	4	+ 0.2	+ 1.46	+ 1.74
Fire Station 3	24.28	8.88	64.99	4	+ 0.2	+ 1.46	+ 1.73
Fire Station 4	32.26	8.88	75.96	3	+ 1.04	+ 1.46	+ 2.88
Fire Station 5	23.78	8.88	64.30	4	+ 3.17	+ 1.46	+ 5.82



When considering future growth and development within the City of Barrie, a new ladder company in Fire Station No.5 is more beneficial to the Fire Department operations and community safety. The northern end of the City is considered "built out" and there are no significant plans for development. The City does have plans for growth and development in the southern end of the City. When considering the type and number of additional risks, ladder response from Fire Station No.5 will better serve the community than a ladder response from Fire Station No.2

13.4. Cost of Options

This section is intended to indicate the potential costs of the recommendations and improvements discussed in Subsection 13.3.1. The costs discussed here are estimates only and can be expected to change or vary depending on collective bargaining agreements, software developer costs (hardware available, maintenance, licensing, etc.), equipment cost and maintenance increases. The cost breakdown has been separated into capital and operational expenditures. Capital expenditures include recruitment, testing, staff training, purchase of apparatus, cost of new software and hardware. Operational expenditures are those that include maintenance of apparatus, equipment and facilities, licensing fees for software and, staff salary and wages. Other costs are more difficult to determine such as archiving existing files, building databases, collaboration with IT.

Table 13-18 outlines the estimated costs associated with improvements needed to maintain PFPC Class 4 in each fire response boundary within the City. Where PFPC Class 4 has been maintained, opportunities are available to improve to Class 3, however improvements greater than those discussed in Subsection 13.3.1 are likely needed and are discussed in Fire Safety Control Level 2 Improvements and Level 3 Improvements in addition to Pre-Incident Plan Program Continued Development.

Table 13-18 Cost Breakdown of Recommendations

Recommendations	Capital	Operational	Comments
Recommendation 1 - Improve Ladder Service and Ladder Distribution	\$1,200,000	\$50,000	apparatus maintenance, fuels, repairs, etc
Recommendation 2 - Improve Total Available Fire Force	\$230,000	\$1,460,000	10 fire fighters and 4 captains
Recommendation 3 - Develop Facility for Training	\$1,000,000	\$60,000	
Recommendation 4 - Continue Development of Pre-Incident Plans	-	\$115,000	staff salary
Recommendation 8 - Hire Additional Fire Prevention Inspectors	\$15,000	\$100,000	per inspector
Recommendation 9 - Improve Record Keeping Practices	\$20,000	\$15,000	data management software and licensing fee
Recommendation 9 - Improve Record Keeping Practices	\$10,000	unknown	mobile tablets or laptops
Recommendation 9 - Improve Record Keeping Practices	-	unknown	archive existing files into data management software
Recommendation 9 - Improve Record Keeping Practices	-	unknown	develop building stock database
Total	\$2,475,000	\$1,800,000	-



Again, the costs shown in the table above do not include archiving existing files, building databases, collaboration with IT. These are closely tied to the amount of time each staff member allocates to the task and the time needed to complete the task. These have been identified in the table above as “unknown”.

The approximate capital expenditures that can be expected to maintain PFPC Class 4 is \$2.5 million. Included in this is fire fighter and fire prevention staff training and equipment, data management software purchase and hardware to complete inspections using mobile terminals (laptops or tablets) and the purchase of an aerial apparatus.

The approximate operational expenditures that can be expected to maintain PFPC Class 4 is \$1.8 million. This includes salary and wages of additional fire fighting and fire prevention staff, training of staff, annual licensing fees,

The investments needed for improvement to PFPC 3 is significant and may be beyond the financial means of the City. When compared to the potential insurance savings that may be found throughout the community, it does not appear to be a cost effective approach to providing fire protection based on insurance premium savings alone.

It is important to note that the investments needed for improvements in one community are not necessarily comparable to one another. The fire insurance grade system is based on relative risk and existing protection levels. Communities of smaller scope have a lower risk profile and have the potential for large gains in their fire insurance grading with relatively lower investments. Conversely, a community with a wide range, type, number and density of risks may require much larger investments for similar type of gains in their fire insurance grading. Careful consideration should be given to finding comparable communities, focusing on population, the built environment, land area being protected and investment into public fire protection.



14. COST BENEFIT ANALYSIS

Fire Underwriters Survey was requested to complete an analysis of the cost benefit of the fire insurance grading classification system used by property and casualty underwriters in Canada. Each individual Canadian property and casualty underwriter has their own in house rate making calculations. The fire insurance grade is a single variable (albeit an important one) within the calculation and each underwriter weighs the fire insurance grade differently. All this considered, Fire Underwriters Survey has found that the fire insurance grade of a community can significantly impact the insurance premiums paid by the constituents.

City of Barrie Building Stock

For the purposes of this study FUS reviewed the Municipal Property Assessment Corporation (MPAC) data provided by the City. The data was first filtered to only consider Commercial Lines. With this filter established, two categories were considered; the first being sorted by property codes with the greatest cumulative assessed value and; the second being sorted by property codes with the greatest number of properties. In some instances a property code was considered in both categories because it had a high total assessed value and contained a large number of assessments. The property codes listed in each category were specifically researched to determine actual insurance rates from Canadian underwriting companies and average values for insurance cost per \$100 of insured property were determined.

Table 14-1 MPAC Property Codes Considered

MPAC Property Code	Number of Properties (2013)	Total Assessed Value (\$)
370	4230	\$841,248,574
430	99	\$376,118,860
305	703	\$158,338,790
520	128	\$197,160,553
402	45	\$156,608,571
471	98	\$43,065,497
540	180	\$197,737,867
580	107	\$240,334,835
340	101	\$409,127,161
530	67	\$130,036,328
575	102	\$20,843,545
405	91	\$34,984,181

To determine the aggregate financial impacts of the insurance premiums paid by property owners throughout the City, insurance rates (per one hundred dollars insured) were determined from several major insurance companies and averaged for the property codes considered. This information was then extrapolated to give an approximate value for the entire building stock across the City of Barrie.

Fire Insurance Cost Benefit

Property owners within the City are currently receiving significant insurance premium reductions. Without the investments made into public fire protection (municipal water supplies designed with fire fighting demand, Fire Department), it is almost a certainty that the insurance premium reductions would be less and the amount paid by each property owner would increase.



The City of Barrie is currently underwritten as PFPC Class 4. Moving to Class 3 or Class 5 has a distinct impact on property insurance rates for properties insured under Commercial Lines. Appendix F provides examples of insurance reductions for different types of Commercial Lines insured properties within the City between PFPC Class 3, Class 4 and Class 5.

This assessment has considered a total of 107 different property codes. The approximate annual insurance cost per year at PFPC Class 3 is \$11.1 million. Maintaining PFPC Class 4 would have an approximate annual insurance cost of \$12 million. The approximate annual insurance cost per year at PFPC Class 5 is \$13.2 million.

The total cost saving between Class 3 and Class 4 across the entire City is approximately \$0.98 million or an average of 8% per property. The total cost savings between Class 4 and Class 5 across the entire City is approximately \$1.2 million or an average of 9% per property

Note that individual insurance companies differ in the determinations of applicable premiums for any given property; however the change between PFPC Class 3, 4 and 5 has a significant impact across all properties insured under Commercial Lines and the percent difference between companies is similar although the underlying premium may differ substantially. This calculation is an estimate of the aggregate impact on insurance premiums and is based on broad assumptions and extrapolations but is expected to be reasonably accurate with respect to the order of magnitude of impact that change in PFPC class between 3 and 4 and against from 4 and 5 would have on the City of Barrie.



15. FIRE MASTER PLAN and FIRE STATION LOCATION REVIEW

Barrie Fire and Emergency Service (BFES) recently had a Fire Master Plan study and Fire Station Location study, each completed by Genivar Incorporated. Each study was completed in part to assist Barrie Fire and Emergency Service plan for future development and expansion of annexed lands in Innisfil which occurred in 2010.

BFES requested Fire Underwriters Survey to provide commentary on the Fire Master Plan (FMP) and Fire Station Location Study (FSL) and the potential impact of the recommendations as they relate to the fire insurance grades for the City of Barrie. This review has not considered a detailed analysis of the recommendations made within the FMP and FSL.

Fire Station Location Study (FSL)

The FSL was undertaken partly due to the annexation of land from the Town of Innisfil. The annexation represents important new residential and employment lands and has resulted in a modification to the service area of the Fire Department.

When developing a fire station location study; there are a number of factors to consider, each of which have their own relative importance to fire response and fire safety within the community. The most effective fire station location studies will consider a range of factors with varying degrees of importance (existing and projected relative risk levels, growth projections, historical responses, insurance industry response criteria, assessed values, and more,) and not just response times (statistical and theoretical) and populations.

The FSL reviews existing response capacities in addition to modelled response times considering varying assumptions (statistical response, road impedances such as posted speeds and number of available traffic lanes in any given area of the City). In addition to this, the review considers population demographic based on population per km² as well as employment per km². The following scenarios were developed and are as follows:

- 7 Stations with no Station Relocations
- 7 Stations with Station Relocations
- 7 Stations with Anchor at Big Bay Point
- 6 Stations – Relocation of Fire Station 2 and 5 and 1 New Station
- 6 Stations – Relocation of Fire Station 5 and 1 New Station

The FSL indicates that Relocation of Fire Station 5 and 1 New Station offers the best coverage by better serving residents of east of Prince William Way and not proposing overlap in coverage between stations.

It is likely that with the development of any new fire station(s) and/or relocation of a fire station(s), as discussed in the FSL, will help reduce response times and maximize coverage areas for initial response to alarms. It is difficult to determine the overall impact these changes will have on the fire insurance grading without the completion of a risk assessment that considers projected required fire flows.

If new risks and developments are consistent with the existing building stock within the City and the risk profile does not significantly increase, it is reasonable to assume that the addition of a new fire station(s) will have a



positive impact on the fire insurance grades throughout the City. This would likely be the result of the availability of additional resources (fire fighting apparatus and fire fighting crews) and shorter response times.

If new risks and developments are not consistent with the existing building stock and significantly increase the risk profile, the additional fire station(s) and relocation of fire station(s) may be inadequate to maintain the fire insurance grades. Additional improvements, beyond fire station locations and densification, may be required and are discussed in this Fire Underwriter Survey Fire Protection Services Review.

It is important to note that the FSL considers projected growth and demographics for 2031. Fire Underwriters Survey will continually review and update the fire insurance grades so that they are commensurate with the risk profile and municipal fire protection service levels.

Fire Master Plan (FMP)

A previous Fire Master Plan was adopted by Council in 2009. The Fire Master Plan dated 2013-2023 with an outlook to 2031 is the first complete review of the plan since it was first adopted. For the purposes of this study, the Fire Master Plan 2013-2023 was reviewed and commented on.

The MFP considers the following scope:

- Conduct a current gap analysis of the risks identified;
- Determine the current effectiveness and efficiency of the department against the risks identified and present options to mitigate, response and manage the risks;
- Evaluate the current and anticipated infrastructure and station locations by measuring the risk and anticipated growth identified matched with deployment standards to arrive at future facility, site, spatial and infrastructure requirements, and;
- Make recommendations to reflect short, intermediate and long term goals with an outlook to 2031

Recommendations are made throughout the FMP and are considered to be of value and can greatly help improve service levels throughout the City. Some recommendations, if implemented will help maintain and possibly improve the fire insurance grades. This depends on the timeline in which they are implemented and the degree to which they are implemented. Again, the fire insurance grades reflect existing risk levels and benchmarks them against municipal fire protection levels. Some recommendations, if made today can be of significant benefit (based on existing risk levels). Those same recommendations, if implemented 10 years from this update, may not have as large of an impact because of growth and increased risk.

The following statement in the Genivar Inc. Fire Master Plan 2013 – 2023 was found; and is inconsistent with requirements and benchmarks established by Fire Underwriters Survey.

“The Fire Underwriters Survey recommends 1 Fire Prevention Officer for every 15,000 population and 1 public educator for every 50,000 population, and do not include supervisory personnel or those dedicated to plans examination” (Barrie Fire and Emergency Services Fire Master Plan – Updated 2012 – 2013, Page 77)

The fire insurance grading benchmarks fire protection relative to the level of risk within a community. Communities with a low risk profile are measured against a lower benchmark, whereas a community with a high risk profile is measured against a high benchmark, regardless of population. Fire Underwriters Survey does not evaluate the number of Fire Prevention Inspectors and Public Educators based on population.



From the perspective of the fire insurance grading, the ideal number of inspectors that a community is measured against is the number of inspectors needed to complete routine risk based inspections for all inspectable properties. The ideal frequency of inspections for those inspectable properties is:

- Group F1 – every 3 months
- Group A, B, C, F2 and F3 (Assembly, Institutional, Residential (non single family residential or duplexes), Industrial) – every 6 months
- Group D and E (Business and Mercantile Occupancy) – every 12 month

When evaluated, the total number of inspectable properties is determined and then compared to the number of inspections that have been completed. Communities with a relatively low number of inspectable properties are then measured against a relatively low number of completed inspections. Conversely, communities with relatively high number of inspectable properties are measured against a relatively high number of completed inspections. Population does represent community size and level investments; however, it does not have a bearing on the number and type of inspections that are measured against for fire insurance grading purposes.

The following tables include commentary and insight from the perspective of the fire insurance grading as they relate to the FMP. As BFES continues to implement the changes and recommendations made within the FMP, Fire Underwriters Survey should be notified to ensure that the fire insurance grades reflect investments into municipal fire protection.



Table 15-1 – Fire Master Plan Short Term Recommendations and FUS Commentary

Short Term (3 - 5 years) 2013 - 2015	FUS Comments
The Amanda system should be integrated into the Fire Prevention Branch as soon as reasonably practicable. Complete a communications service delivery standard between ICT and BFES, and develop a communications service delivery standard between BFES and its communications customers.	Can be expected to significantly improve effectiveness of each Inspector in addition to improving fire prevention operations. See FUS Recommendation 9.
Improve statistical data with improved reporting processes.	Considered good engineering practices; but credit in this area is beyond scope of Fire Underwriters Survey review.
Land acquisition and design for a station in the south-east quadrant consistent with the Genivar Station Location Study (2013).	Contingent upon details of additional statistical data, additional credit may be awarded throughout fire insurance grading. Areas of credit will be dependent on scope of statistical analysis completed.
Increase Administration and Support Staff consistent with an organizational review of service delivery needs and anticipated growth.	Will impact awarded credit for each station grading (FD 1, 2, 3, 6, 7). Actual impact will depend on location of fire station. Some neighbouring fire stations may receive slightly higher credit whereas other fire stations may receive slightly lower credit.
BFES, the Engineering Department, Corporate Asset Management and Water Operations should conduct a Fire Protection and Water Supply Survey in conjunction with an independent consultant.	Availability of additional administration and support staff may help improve some areas of the fire insurance grading such as report and record keeping; however, this is contingent upon their roles and duties assigned. Assigned tasks and duties may be beyond scope of fire insurance grading.
Explore partnerships with other municipalities to provide technical rescue disciplines on a total cost recovery basis and possible source of revenue through response and/or training initiatives.	Barrie Public Fire Protection Services Review as completed by Fire Underwriters Survey.
Implement a sustainable back-up communications location consistent with best practices and standards.	See FUS Recommendation 3.
Review the service levels provided to maintain and repair the growing fleet balanced against capital costs of replacement.	Backup facility should be identical to primary location within Barrie Fire Dispatch Center. Back up facility should offer equal level of service with same or similar equipment and minimize service level interruptions.
Upgrade and establish position descriptions for all positions within the department consistent with the Collective Agreement.	Considered good engineering practice. Costs associated with maintaining fleet is beyond scope of Fire Underwriters Survey review; however, ensuring apparatus are well maintained and replaced in an acceptable replacement cycle ensures apparatus recognition and improved credit in the maintenance portion of the fire department review.
Begin implementation of a Computer Aided Dispatch, Automatic Vehicle Locator and GPS traffic pre-emption link project to enhance response times throughout the city.	This is a good industry practice. Though this has minimal impact on the existing fire insurance grades, a good succession plan will help maintain or improve future grades.
Enhance the online permit and fees payment system.	Enhanced communications systems and pre-emptive traffic light signalling may award "additional credit from alternative solutions". Supporting evidence and documentation that prove faster response times should be submitted for review.
Fully implement a succession plan for all positions in the department for sustainability.	Beyond scope of Fire Underwriters Survey review.
Develop and implement a Performance Development Plan process (evaluation) with the aid of Human Resources and the Association.	This is a good industry practice. Though this has minimal impact on the existing fire insurance grades, a good succession plan will help maintain or improve future grades.
Implement marine response service levels and capabilities for open water rescue.	Development and implementation of performance and development reviews for leadership roles is important. Though this is not industry practices, a highly effective training program not only includes review of firefighters skills and techniques but should also include review of Captains and Acting Captains. This review would measure the skills required to be an effective Captain and include performance benchmarks taking into account the duties and responsibilities required of Captains (leadership skills, mentoring and teaching skills, their understanding of the subject matter being taught, etc.).
Initiate accreditation with the Centre for Public Safety Excellence, a nonprofit organization that helps local public safety agencies around the world streamline and improve the services they provide their communities.	Beyond scope of Fire Underwriters Survey review.
Work with the Building Department to develop a bidirectional antenna strategy	Beyond scope of Fire Underwriters Survey review. Any changes in public fire protection programs should be reported to FUS to ensure fire insurance grades are commensurate with service levels.
Annually review and revise as necessary the Fire Master Plan.	Will allow for additional credit to be awarded in Emergency Communications portion of fire insurance grading; however, credit will be minimal. Small portion of Emergency Communications review considers poor service areas or black out areas in buildings. City should continue to review and aim towards targets and recommendations made in FMP as well as FUS Fire Protection Services Study.



Table 15-2 – Fire Master Plan Intermediate, Long Term and Outlook Recommendations and FUS Commentary

Intermediate Term Goals (3 - 5 years) 2015 - 2017	FUS Comments
Construction of Stn. 6 in the south-east.	Will impact awarded credit for each station grading (FD 1, 2, 3, 6, 7). Actual impact will depend on location of fire station.
Hire staff for Stn. 6 based on service delivery standards and legislative requirements.	Will impact awarded credit for each station grading (FD 1, 2, 3, 6, 7). Actual impact will depend on location of fire station.
Acquisition of a Pumper for Station 6.	Will impact awarded credit for each station grading (FD 1, 2, 3, 6, 7). Actual impact will depend on location of fire station.
Staff the Fire Prevention/Public Education Branch consistent with an organizational review of service delivery needs and anticipated growth.	See FUS Recommendation 7 and Recommendation 8.
Implement District Chiefs and divide the City into two districts to align with acceptable span of control standards.	May positively impact FD 6, 7 for each neighbouring fire station. Completed by Barrie.
Upgrade communications equipment and associated systems consistent with current and advanced technology.	Will impact awarded credit for each station grading (FD 1, 2, 3, 6, 7). Actual impact will depend on location of fire station.
Increase staff to staff the aerial devices with full crews of 4 consistent with an organizational review of the service delivery needs of the department and the public.	See FUS Recommendation 3
Land acquisition and design for a Training Facility to meet fire department training requirements and support other city and regional requirements.	Availability of additional administration and support staff may help improve some areas of the fire insurance grading such as report and record keeping; however, this is contingent upon their roles and duties assigned. Assigned tasks and duties may be beyond scope of fire insurance grading.
Increase Administration and Support Staff consistent with an organizational review of service delivery needs and anticipated growth. (Equipment Coordinator)	City should continue to review and aim towards targets and recommendations made in FMP as well as FUS Fire Protection Services Study. Changes and improvements should be reported to FUS to ensure fire insurance grades are commensurate with risk levels and service levels.
Review and revise the Fire Master Plan.	See FUS Recommendation 3.
Long Term (5 - 10 years) 2017 - 2013	
Phased construction (Phase 1) of the Fire Training Facility based on balancing demand and the Business Planning process.	See FUS Recommendation 3.
Construction of a permanent Stn. 5 in the south-west quadrant.	Will impact FS 5 grade and likely to impact credit for neighbouring fire stations. Actual impact will depend on location of newly constructed fire station and its response capacity to assist neighbouring stations (FD 1, 2, 3, 6, 7). Completed by Barrie.
Upgrade communications equipment and associated systems consistent with current and advanced technology.	See FUS Recommendation 7 and Recommendation 8.
Staff the Fire Prevention/Public Education Branch consistent with an organizational review of service delivery needs and anticipated growth.	City should continue to review and aim towards targets and recommendations made in FMP as well as FUS Fire Protection Services Study. Changes and improvements should be reported to FUS to ensure fire insurance grades are commensurate with risk levels and service levels.
Develop a deployment strategy based on service delivery standards and legislative requirements with a full review scheduled for 2018.	Will impact awarded credit for each station grading (FD 6, 7). Actual impact will depend on location of fire station.
Staff the Heavy Rescue based on service delivery standards and intensification.	City should continue to review and aim towards targets and recommendations made in FMP as well as FUS Fire Protection Services Study. Changes and improvements should be reported to FUS to ensure fire insurance grades are commensurate with risk levels and service levels.
Review and revise the Fire Master Plan.	See FUS Recommendation 3.
Outlook 15-2013	
Continue phased Fire Training Facility.	See FUS Recommendation 7 and Recommendation 8.
Staff the Fire Prevention/Public Education Branch consistent with an organizational review of service delivery needs and anticipated growth.	Enhanced communications systems and pre-emptive traffic light signalling may award "additional credit from alternative solutions". Supporting evidence and documentation that prove faster response times should be submitted for review.
Upgrade communications equipment and associated systems consistent with current and advanced technology.	
Replacement of Stn. 2.	Will positively impact station grading where assigned in addition to neighbouring stations.



16. STUDY CONCLUSIONS

A fire insurance grade review measures fire risk in the built environment of the community. Risk is then quantified by determining the Basic Fire Flow, which establishes benchmarks for the community's fire protection programs to be measured against. Fire Underwriters Survey measures a community's public fire protection and fire risk levels and communicates that information to the insurance industry via Public Fire Protection Classifications and Dwelling Protection Grades. This includes an assessment of water Supplies, Fire Department and Fire Safety Control (fire prevention, public education, codes and standards), and Emergency Communications.

In 2005, a survey of the City of Barrie was completed. Since the last survey in 2005, the City of Barrie has experienced growth in fire risk and fire loading within the built environment. Because of the increased Basic Fire Flow attributed to growth in the community, the Fire Department is now measured against a higher level of service as indicated by the Basic Fire Flow assigned to each fire station response boundary. It is appropriate that a survey has been completed to assess the public fire protection programs currently in place and a report commissioned to provide the benchmarks to which the City of Barrie's fire insurance grades are now based upon.

Barrie Fire & Emergency Service was evaluated in its ability to provide fire response and structural fire fighting throughout the City of Barrie. Barrie Fire & Emergency Service has made significant improvements in its response capacity throughout the City since the last survey in 2005. Those improvements consist of additional fire stations, fire fighting apparatus and fire fighting crews, greatly improved fire fighting training program and, more. With an increased risk profile since the last survey in 2005, it was necessary for the City and Fire Department to make improvements in its public fire protection capacity to maintain the PFPC Class 4. The following relative classifications have been achieved for the Barrie fire stations:

- Barrie Fire Station No.1 = relative classification 4
- Barrie Fire Station No.2 = relative classification 5
- Barrie Fire Station No.3 = relative classification 4
- Barrie Fire Station No.4 = relative classification 3
- Barrie Fire Station No.5 = relative classification 5

A fire station location analysis has been completed by a third party. Improving fire response throughout the City (through additional fire stations) will likely have a positive impact on the amount of credit awarded in the fire insurance grading. The potential credit that can be awarded will be based on an updated risk assessment and the additional resources available for fire fighting. Fire Underwriters Survey should be notified of any changes (positive or negative) in the level of service that is provided throughout the City.

The water supply system was evaluated in its ability to provide adequate and reliable water supply for the purposes of fire fighting. The water supply system is well designed with a high level of redundancy and capacity built in. Recommendations were provided and should be considered not only for improvement of fire insurance classification potential, but most importantly for the enhancements they will provide during a fire emergency event. The City of Barrie scored very well within the Water Supply portion of the assessment, achieving a relative classification of 2.



Fire Safety Control in the City of Barrie was assessed. This assessment included review of fire prevention practices and performances, training and qualifications of staff, public education initiatives, Building Codes, Fire Codes and bylaws enforced. This study has determined that the City of Barrie and Barrie Fire & Emergency Service can benefit significantly if improvements are made within the Fire Prevention Division. Those improvements have been discussed and recommendations have been made throughout this report. The City of Barrie and Barrie Fire & Emergency Service can receive significantly more credit within the fire insurance grading. Fire Safety Control within the City of Barrie has received relative classification 7.

Emergency Communications within the City of Barrie were reviewed and it was determined that there is a high degree of redundancy and reliability. Emergency communicator operators are well trained and equipped with the necessary tools and equipment to meet the intent and performance benchmarks described in NFPA 1221, *Standard for the Installation, Maintenance, and Use of Emergency Service Communications Systems*. Emergency Communications within the City of Barrie has received relative classification 1.

The municipal departments and individuals that provide public fire protection for the City of Barrie should be congratulated for continuing to receive recognition for the Public Fire Protection Classification and Dwelling Protection Grades applied throughout the City. The level of service has improved in some areas of the fire insurance grading; however, due to an increase in fire loading in the built environment, a higher level of service and response is required to achieve similar fire insurance grades as seen in the past.

Recommendations and options for improvements have been provided throughout this report and if implemented can be expected to lead to a greater level of service as well as improving the Public Fire Protection Classification throughout the City. The level to which the recommendations are implemented will determine how much more additional credit can be awarded for any specific item. Achieving improvements in the City's PFPC may be complex and implementing recommendations made throughout this report may be more involving than others.

Should the City implement any significant changes to the level of fire protection or level fire risk within the community, Fire Underwriters Survey should be notified. This included any plans to implement the recommendations that have been made throughout this report. Doing so will help ensure that insurance policies in the community are written at the rates appropriate to the level of fire protection that the community can provide.



Appendix A – Dwelling Protection Grade Summary of Basic Requirements



Dwelling Protection Grades - Minimum Requirements per Fire Station¹

Dwelling Protection Grade (DPG)	Water Works System	Fire Department		Public Fire Protection Classification (PFPC) ² Minimum Requirements
		Apparatus	Firefighters	
1	Water supply system designed in accordance with Fire Underwriters Survey standard "Water Supply for Public Fire Protection" with a relative classification of 5 or better	Response from within 8 km by road of a triple combination pumper	Minimum Response: On-duty: 3 career fire fighters, plus Off-duty: fire chief or other officer	Water Supply and Fire Department must grade PFPC Relative Class 5 or better
2	Water supply system designed in accordance with Fire Underwriters Survey standard "Water Supply for Public Fire Protection" with a relative classification of 6 or better	Response from within 8 km by road of a triple combination pumper	Minimum Response: On-duty: 1 career fire fighter, plus On-call: 15 auxiliary fire fighters	Water Supply and Fire Department must grade PFPC Relative Class 6 or better
3A	Water supply system designed in accordance with, and meeting the minimum requirements of, Fire Underwriters Survey "Water Supply for Public Fire Protection"	Response from within 8 km by road of a triple combination pumper	15 auxiliary fire fighters	No Public Fire Protection Classification required
3B	Not required – however fire department must have adequate equipment, training and access to approved water supplies to deliver standard shuttle service in accordance with NFPA 1142, Standard on Water Supplies for Suburban and Rural Fire Fighting	2 units required. Triple combination pumper <u>plus</u> a mobile water supply with a combined water carrying capacity of not less than 6820 L (1500 IG)	15 auxiliary fire fighters	No Public Fire Protection Classification required
4 ³	Not required – however fire department must have adequate equipment, training and access to approved water supplies to deliver shuttle service in accordance with NFPA 1142, Standard on Water Supplies for Suburban and Rural Fire Fighting	2 units required. Triple combination pumper <u>plus</u> a mobile water supply with a combined water carrying capacity of not less than 6820 L (1500 IG)	15 auxiliary fire fighters	No Public Fire Protection Classification required
5	Unprotected communities or communities not qualifying for Grades 1, 2, 3A, 3B, or 4 above	Unprotected communities or communities not qualifying for Grades 1, 2, 3A, 3B, or 4 above	Unprotected communities or communities not qualifying for Grades 1, 2, 3A, 3B, or 4 above	No Public Fire Protection Classification required

¹ Refer to additional notes and requirements for interpretation

² The P.F.P.C. is a sophisticated municipal fire protection grading system utilized for Commercial Lines insurance. PFPC fire insurance grades are scaled from 1 to 10. One (1) represents a high level of fire protection and 10 indicates little or no recognized fire protection. This system evaluates the ability of a community's fire defences to prevent and control major fires that may occur in commercial, industrial and institutional buildings and/or districts.

³ Dwelling Protection Grade 4 is reserved for communities that contract for fire protection services from fire service agencies with a Dwelling Protection Grade of 3B.

⁴ Requirements for Dwelling Protection Grade 4 are the same as for Dwelling Protection Grade 3B, however in some cases, an allowance may be considered for Dwelling Protection Grade 4 where all of the criteria for Dwelling Protection Grade 3B have been met with one exception. If more than one criteria has not been met (ex. less than 15 auxiliary fire fighters and a single pumper apparatus) Dwelling Protection Grade 5 is applied.

Where Dwelling Protection Grade 4 is applied, a signed letter of intent from the community is to be sent to Fire Underwriters Survey indicating that improvements will be made, within an agreed timeframe, to meet the criteria of Dwelling Protection Grade 3B.

It is important to note that the absolute minimum number of auxiliary fire fighters considered within the fire insurance grading is 10 and that maximum age of apparatus that can be considered is 30.



PERSONAL LINES

Dwelling Protection Grade Terms Of Reference

Dwelling Protection Grade 1: Career, Fully Protected

DPG 1 is an indicator to insurers that the response to typical fires in single family residences (detached dwellings) located within 8 kilometres by road from the responding fire station will be a superior level of response from a career or composite fire department with reasonable staffing and with recognized water supplies.

This grade is an indicator to insurers that the responding fire department is very well established and has a sufficient number of career fire fighters such that the initial response to fires will consistently include a minimum of 3 career fire fighters (on-duty) and the fire chief (or other career officer). Response times for DPG 1 fire stations are expected to be good due to the typically short turn-out times and consistent availability of career fire fighters.

This grade is also an indicator that the water supply system is well-designed, reliable and will provide a favourable amount of water for fire suppression activities at fires in single family residences located within 300 metres (one hose lay) of a recognized fire hydrant.

Dwelling Protection Grade 2: Composite, Fully Protected

DPG 2 is an indicator to insurers that the response to fires in single family residences within 8 kilometres by road from the responding fire station will be an intermediate level of response from a primarily volunteer fire department with limited staffing and with recognized water supplies.

This grade is an indicator to insurers that responding fire department is well established and is likely a composite of career members and volunteers. The department has a sufficient number of career fire fighters such that the initial response will include a minimum of 1 career fire fighter (on-duty), a career fire chief (may be off-duty) and a minimum of 15 volunteers (or off-shift fire fighters). Response times for DPG 2 fire stations are expected to be somewhat delayed due to the unpredictability of turn-out times and varying availability of volunteers, however significantly superior to an all volunteer response.

This grade is also an indicator that the water supply system is well-designed, reliable and will provide a reasonable amount of water for fire suppression activities in single family residences located within 300 metres (one hose lay) of a recognized fire hydrant.



Dwelling Protection Grade 3A: Volunteer, Fully Protected

DPG 3A is an indicator to insurers that the response to fires in single family residences within 8 kilometres by road from the responding fire station will be a minimum level of response from a primarily volunteer fire department with recognized water supplies.

DPG 3A is an indicator to insurers that the fire department is recognized for fire insurance grading purposes and that the fire department roster has the minimum number of volunteers who are equipped and trained to provide a reasonable minimum response in a timely manner to typical fires in single family residences (detached dwellings) located within 8 kilometres by road of the responding fire station and located within 300 metres (one hose lay) of a recognized fire hydrant. Response times for DPG 3A fire stations are expected to be somewhat delayed due to the unpredictability of turn-out times and varying availability of volunteers.

This grade also indicates to insurers that the water supply system is recognized for fire insurance grading purposes and is maintained and reasonably reliable for use in fire suppression activities.

Dwelling Protection Grades 3B: Volunteer, Standard Shuttle, Semi-Protected (aka. Firehall Protected)

DPG 3B is an indicator to insurers that the response to fires in single family residences within 8 kilometres by road from the responding fire station will be a minimum level of response from a primarily volunteer fire department without recognized water supplies.

DPG 3B is an indicator to insurers that the fire department is recognized for fire insurance grading purposes and that the fire department is adequately manned, equipped and trained to provide a reasonable minimum response in a timely manner to typical fires in single family residences (detached dwellings) located within 8 kilometres by road of the responding fire station. Response times for DPG 3B fire stations are expected to be somewhat delayed due to the unpredictability of turn-out times and varying availability of volunteers.

This grade also indicates to insurers that there is NOT a recognized water supply system, however the fire department has adequate resources to utilize the "Specified Shuttle Service" when responding to fires. This grade typically requires the use of a pumper and mobile water supply apparatus together to provide limited quantities of water to the fire scene and may or may not be adequate to extinguish typical fires.



Dwelling Protection Grades 3B-S: Superior Tanker Shuttle Service Accredited

Superior Tanker Shuttle Service Accreditation indicates to insurers that the accredited fire hall has adequate equipment and resources to provide the minimum amount of water required for fire insurance grading purposes. The minimum amount of water required is 200 l/gpm (one hose stream) and is the same flow rate required as a minimum for fire hydrants.

For a risk to be considered as STSS protected, the risk must lie within 8 kilometres by road of the responding fire station and within 5 kilometres by road of a recognized alternative water supply point.

This accreditation is an equivalency to the minimum requirements for hydrant protection as set out by the insurance industry and the Fire Underwriters Survey.

It is important to note that providing the minimum of one hose stream (200 l/gpm) is not necessarily adequate for effective fire fighting, however it is the lowest rate of water delivery that is recognized for fire insurance grading. Communities should be encouraged to develop water supplies that provide required fire flows as calculated using the method specified in the Fire Underwriters Survey "Water Supply for Public Fire Protection"

Dwelling Protection Grades 3B-L: Large Diameter Hose Lay Accredited

Large Diameter Hose Lay Accreditation indicates to insurers that the accredited fire hall carries the appropriate equipment and has incorporated specialized procedures to allow extended coverage from recognized fire hydrants to a distance of 600 metres (two hose lays) from hydrants. This procedure involves relay pumping and large diameter hose. To be accredited the fire department must demonstrate that it can continuously deliver service within the same allotted time for set up as per normal hydrant operations.

For a risk to be considered as LDHL protected, the risk must lie within 8 kilometres by road of the responding fire station and within 600 metres (two hose lays) of a recognized fire hydrant.

This accreditation is an equivalency to the minimum requirements for hydrant protection as set out by the insurance industry and the Fire Underwriters Survey.

Dwelling Protection Grade 4: Volunteer, Limited Protection (Semi or Unprotected)

DPG 4 is an indicator to insurers that the fire department is recognized for fire insurance grading purposes however there are serious deficiencies in at least one significant area of fire protection that prohibit the delivery of a minimum level of response to typical fires in single family residences (detached dwellings) located within 8 kilometres by road of the responding fire station.

DPG 4 is normally given to communities with only one piece of apparatus (ex. a pumper) and no recognized water supplies. Without a second piece of apparatus (ex. mobile water supply), such a fire department will not be able to shuttle water to the fire scene. DPG 4 is also given to communities "borrowing" fire protection service from an adjacent community with a DPG 3B, and to communities who generally qualify for DPG 3B, but have one major deficiency.



Dwelling Protection Grade 5: Unprotected

DPG 5 is an indicator to insurers that there is no fire protection or that the fire protective service levels do not meet the minimum fire insurance grading standards.

Note: In some areas of Canada, Dwelling Protection Grades from 6 through 10 are used. This is carried over from previous editions of the Fire Insurance Grading Index and will be phased out. In all cases, the Dwelling Protection Grades from 6 through 10 have identical definitions to those from 1 through 5:

- Dwelling Protection Grade1 = Dwelling Protection Grade 6
- Dwelling Protection Grade2 = Dwelling Protection Grade 7
- Dwelling Protection Grade3A = Dwelling Protection Grade 8C
- Dwelling Protection Grade3B = Dwelling Protection Grade 8D
- Dwelling Protection Grade4 = Dwelling Protection Grade 9
- Dwelling Protection Grade5 = Dwelling Protection Grade 10*

DPG 10 is represented as DPG 0 in the grading index.

Dwelling Location - Note 1

Hydrant protection is not credited owing to a weak water supply or the failure to meet grading minimums. In addition to water supply limitations, deficiencies may exist in the fire department.

Dwelling Location - Note 2

Denotes those locations with fire protection grades 5 or 0, other than those receiving borrowed fire department service, that have sufficient water supply to receive creditable hydrant protection but, the fire department deficiencies preclude giving a protected grade.

Dwelling Location - Note 3

Hydrant protected area is situated further than 8 kilometres by road from the responding fire department.



Appendix B – Fire Underwriters Survey Water Supply for Public Fire Protection



**WATER SUPPLY
FOR
PUBLIC FIRE PROTECTION**

1999



FIRE UNDERWRITERS SURVEY

A SERVICE TO INSURERS AND MUNICIPALITIES

For further information on this document or any matters relating to the Fire Underwriters Survey please contact the appropriate offices of CGI Risk Management Services (formerly the Insurers' Advisory Organization) as follows:

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FIRE UNDERWRITERS SURVEY is financed by the Canadian Insurance industry and utilizes technical staff of CGI Risk Management Services (formerly the Insurers' Advisory Organization Inc.) Its purpose is to survey fire protection conditions in Canadian communities and municipalities, providing data and advisory services to fire insurance underwriters and public officials concerned.

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WATER SUPPLY FOR PUBLIC FIRE PROTECTION

PREFACE

This guide summarizes the more significant recommendations of Fire Underwriters Survey with respect to fire protection requirements in municipal water works system design. It reflects the manner in which FUS assesses the water supply aspect of a municipality's fire risk potential during surveys on behalf of the Canadian property insurance industry and represents the accumulated experience of many years of study of actual fires. Water supply is one of a number of components evaluated by FUS in the municipal fire protection system. Recommendations applying to the fire departments and code enforcement are covered in other publications of Fire Underwriters Survey. FUS local offices are prepared to assist municipal officials or their consultants with advice on special problems, as time limits permit, in accordance with the intent of this guide. The minimum size water supply credited by FUS must be capable of delivering not less than 1000 L/min for two hours or 2000 L/min for one hour in addition to any domestic consumption at the maximum daily rate. Static suction supplies to fire department pumpers are recognized as a supplement to the piped system.

In the FUS assessment of a water supply system, the major emphasis is placed upon its ability to deliver **adequate** water to control major fires throughout the municipality on a **reliable** basis via sufficient and suitable **hydrants**. What is ultimately available to the fire department is the critical test in this fire protection evaluation.

Rates of flow for firefighting purposes are expressed in litres per minute as this is the adopted unit for the firefighting field.

In this edition all quantities are specified in S.I. units.

PART I

GENERAL

ADEQUACY AND RELIABILITY. An adequate and reliable water supply for firefighting is an essential part of the fire protection system of a municipality. This is normally a piped system in common with domestic potable water service for the community.

A water supply system is considered to be fully adequate if it can deliver the necessary fire flow at any point in the distribution gridiron for the applicable time period specified in the table "Required Duration of Fire Flow" with the consumption at the maximum daily rate (average rate on maximum day of a normal year). When this delivery is also possible under certain emergency or unusual conditions as herein specified, the system is considered to be reliable. In cities of population in excess of 250,000 (or smaller places with high fire incident and severe hazard conditions) it is usually necessary to consider the possibility of two simultaneous major fires in the area served by the system.

Fire flows are amounts of water necessary to control fires. These are determined as shown in Part II. System design should contemplate meeting the required fire flows existing or probable with the possible exception of gross anomalies where there is no fire threat to the remainder of the community. In these cases, the properties should preferably be modified in hazard to reduce the required flow as part of a coordinated community fire protection system.

The protection of buildings by automatic sprinkler systems is a significant contribution to the fire protection of the community and should be encouraged, not penalized by onerous service charges or metering requirements.

In order to provide reliability, duplication of some or all parts of the system will be necessary, the need for duplication being dependent upon the extent to which the various parts may reasonably be expected to be out of service as a result of maintenance and repair work, an emergency or some unusual condition. The introduction of storage, either as part of the supply works or on the distribution system, may partially or completely offset the need for duplicating various parts of the system, the value of the storage depending upon its amount, location and availability.

STORAGE. In general, storage reduces the requirements of those parts of the system through which supply has already passed. Since storage usually fluctuates, the normal daily minimum maintained is the amount that should be considered as available for fires. Because of the decrease in pressure when water is drawn down in standpipes, only the portion of this normal daily minimum storage that can be delivered at a residual pressure of 150kPa at the point of use is considered as available. As well as the quantity available, the rate of delivery of water to the system from storage for the fire flow period is critical to this consideration.

PRESSURE. The principal requirement to be considered is the ability to deliver water in sufficient quantity to permit fire department pumpers to obtain an adequate supply from hydrants. To overcome friction loss in the hydrant branch, hydrant and suction hose, a minimum residual water pressure of 150 kPa in the street main is required during flow. Under conditions of exceptionally low suction losses, a lower residual may be possible. This includes the use of 100 mm and larger outlets for fire department pumper use and hydrants with large waterways.

Higher sustained pressure is of importance in permitting direct continuous supply to automatic sprinkler systems, to building standpipe and hose systems, and in maintaining a water plan so that no portion of the protection area is without water, such as during a fire at another location. Residual pressures that exceed 500 kPa during large flows are of value as they permit short hose-lines to be operated directly from hydrants without supplementary pumping.

SUPPLY WORKS

NORMAL ADEQUACY OF SUPPLY WORKS. The source of supply, including impounding reservoirs, and each part of the supply works should normally be able to maintain the maximum daily consumption rate plus the maximum required fire flow. Each distribution service within the system should similarly support its own requirements. In large cities where fire frequency may result in simultaneous fires, additional flow must be considered in accordance with the potential. Filters may be considered as capable of operating at a reasonable overload capacity based upon records and experience. In general, overload capacity will not exceed 25 percent, but may be higher in well designed plans operating under favourable conditions.

The absolute minimum supply available under extreme dry weather conditions should not be taken as the measure of the normal ability of the source of supply such as supply from wells. The normal or average capacity of wells during the most favourable nine month period should be considered, or the normal sustained flow of surface supplies to the source.

RELIABILITY OF SOURCE OF SUPPLY. The effect on adequacy must be considered for such factors as frequency, severity and duration of droughts, physical condition of dams and intakes; danger from earthquakes, floods, forest fires, and ice dams or other ice formations; silting-up or shifting of channels; possibility of accidental contamination of watershed or source; absence of watchmen or electronic supervision where needed; and injury by physical means. Where there is a risk of disruption, special precautions or alternate supplies should be arranged.

Where the supply is from wells, some consideration should be given to the absolute minimum capacity of the wells under the most unfavourable conditions; also to the length of time that the supply from the wells would be below the maximum daily consumption rate, and the likelihood of this condition recurring every year or only at infrequent intervals. It should be recognized that some water is generally available from wells and that the most extreme conditions are not as serious as a total interruption of the supply, as would be the case in the breaking of a dam or shifting of a channel. The possibility of clogging, salinity, and the need for periodic cleaning and overhauling must be considered. Dependence upon a single well, even where records are favourable, may be considered a feature of unreliability.

Frequent cleaning of reservoirs and storage tanks may be considered as affecting reliability.

Continuity of, and delay in implementing water supplies obtained from systems or sources not under the control of the municipality or utility should be considered also from these aspects.

GRAVITY SYSTEMS. A gravity system delivering supply from the source to distribution directly without the use of pumps is advantageous from a fire protection point of view because of its inherent reliability, but a pumping system can also be developed to a high degree of reliability.

PUMPING

RELIABILITY OF PUMPING CAPACITY. Pumping capacity, where the system or service is supplied by pumps, should be sufficient, in conjunction with storage when the two most important pumps are out of service, to maintain the maximum daily consumption rate plus the maximum required fire flow at required pressure for the required duration. For smaller municipalities (usually up to about 25,000 population) the relative infrequency of fires is assumed as largely offsetting the probability of a serious fire occurring at times when two pumps are out of service. (The most important pump is normally, but not always, the one of largest capacity, depending upon how vital is its contribution to maintaining flow to the distribution system.)

To be adequate, remaining pumps in conjunction with storage, should be able to provide required fire flows for the specified durations at any time during a period of five days with consumption at the maximum daily rate. Effect of normal minimum capacity of elevated storage located on the distribution system and storage of treated water above low lift pumps should be considered. The rate of flow from such storage must be considered in terms of any limitation of water main capacity. The availability of spare pumps or prime movers that can quickly be installed may be credited, as may pumps of compatible characteristics which may be valved from another service.

POWER SUPPLY FOR PUMPS. Electric power supply to pumps should be so arranged that a failure in any power line or the repair or replacement of a transformer, switch, control unit or other device will not prevent the delivery, in conjunction with elevated storage, of required fire flows for the required durations at any time during a period of two days with consumption at the maximum daily rate.

Power lines should be underground from the station or substation of the power utility to water plants and pumping stations and have no other consumers enroute. The use of the same transmission lines by other consumers introduces unreliability because of the possibility of interruption of power or deterioration of power characteristics.

Overhead power lines are more susceptible to damage and interruption than underground lines and introduce a degree of unreliability that depends upon their location and construction. In connections with overhead lines, consideration should be given to the number and duration of lightning, wind, sleet, and snow storms in the area; the type of poles or towers and wires; the nature of the country traversed; the effect of earthquakes, forest fires, and floods; the lightning and surge protection provided; the extent to which the system is dependent upon overhead lines; and the ease of, and facilities for, repairs.

The possibility of power systems or network failures affecting large areas should be considered. In-plant auxiliary power or internal combustion driver standby pumping are appropriate solutions to these problems in many cases, particularly in small plants where high pumping capacity is required for fire protection service. When using automatic starting, prime movers' for auxiliary power supply and pumping should have controllers listed by Underwriters' Laboratories of Canada to establish their reliability.

FUEL SUPPLY. At least a five day supply of fuel for internal combustion engines or boilers used for regular domestic supply should be provided. Where long hauls, condition of roads, climatic conditions, or other circumstances could cause interruptions of delivery longer than five days, a greater storage should be provided. Gas supply should be from two independent sources or from duplicate gas-producer plants with gas storage sufficient for 24 hours. Unreliability of regular fuel supply may be offset in whole or in part by suitable provisions for the use of an alternate fuel or power supply.

BUILDINGS AND PLANT

BUILDINGS AND STRUCTURES. Pumping stations, treatment plants, control centres and other important structures should be located, constructed, arranged, and protected so that damage by fire, flooding, or other causes will be held to a minimum. They should contain no combustible material in their construction, and, if hazards are created by equipment or materials located within the same structure, the hazardous section should be suitably separated by fire-resistive partitions or fire walls.

Buildings and structures should have no fire exposures. If exposures exist, suitable protection should be provided, Electrical wiring and equipment should be installed in accordance with the Canadian Electrical Code. All internal hazards should be properly safeguarded in accordance with good practice. Private in-plant fire protection should be provided as needed.

MISCELLANEOUS SYSTEM COMPONENTS, PIPING AND EQUIPMENT. Steam piping, boiler-feed lines, fuel-piping (gas or oil lines to boilers as well as gas, oil or gasoline lines to internal-combustion engines), and air lines to wells or control systems should be so arranged that a failure in any line or the repair or replacement of a valve, fuel pump, boiler-feed pump, injector, or other necessary device, will not prevent the delivery, in conjunction with storage, of the required fire flows for the specified duration at any time during a period of two days with consumption at the maximum daily rate.

Plants should be well arranged to provide for effective operation. Among the features to be considered are: ease of making repairs and facilities for this work, danger of flooding because of broken piping; susceptibility to damage by spray; reliability of priming and chlorination equipment; lack of semi-annual inspection of boilers or other pressure vessels; dependence upon common non-sectionalized electric bus bars; poor arrangement of piping; poor condition or lack of regular inspections of important valves; and factors affecting the operation of valves or other devices necessary for fire service such as design, operation, and maintenance of pressure regulating valves, altitude valves, air valves, and other special valves or control devices, provision of power drives, location of controls, and susceptibility to damage.

Reliability of treatment works is likely to be influenced by the removal from service of at least one filter or other treatment unit; the reduction of filter capacity by turbidity, freezing or other conditions of the water; the need for cleaning basins; and the dependability of power for operating valves, wash-water pumps, mixers and other appurtenances.

OPERATIONS. Reliability in operation of the supply system and adequate response to emergency or fire demands are essential. Instrumentation, controls and automatic features should be arranged with this in mind. Failure of an automatic system to maintain normal conditions or to meet unusual demands should result in the sounding of an alarm where remedial action will be taken.

The operating force should be competent, adequate, and continuously available as may be required to maintain both the domestic and fire services.

EMERGENCY SERVICES. Emergency crews, provided with suitable transportation, tools and equipment, should be continuously on duty in the larger systems and be readily available upon call in small systems. Spare pipe and fittings, and construction equipment should be readily available. Alarms for fires in buildings should be received by the utility at a suitable location where someone is always on duty who can take appropriate action as required, such as placing additional equipment in operation, operating emergency or special valves, or adjusting pressures. Receipt of alarms may be by fire alarm circuit, radio, outside alerting device, or telephone, but where special operations are required, the alarm service should be equivalent to that needed for a fire station.

Response of an emergency crew should be made to major fires to assist the fire department in making the most efficient use of the water system and to ensure the best possible service in the event of a water main break or other emergency. The increase of pressures by more than 25 percent for fires is considered to increase the possibility of breaks.

PIPING

RELIABILITY OF SUPPLY MAINS. Supply mains cut off for repair should not drastically reduce the flow available to any district. This includes all pipe lines or conduits on which supply to the distribution system is dependent, including intakes, suction or gravity lines to pumping stations, flow lines from reservoirs, treatment plant piping, force mains, supply and arterial mains, etc. Consideration should be given to the greatest effect that a break, joint separation or other failure could have on the delivery of the maximum daily consumption rate plus required fire flow at required pressure over a three day period. Aqueducts, tunnels or conduits of substantial construction may be considered as less susceptible to failure and equivalent to good mains with a long history of reliability.

INSTALLATION OF PIPE. Mains should be in good condition and properly installed. Pipe should be suitable for the service intended. Asbestos-cement, poly-vinyl chloride (PVC), cast and ductile iron, reinforced concrete and steel pipe manufactured in accordance with appropriate Canadian Standards Association or ANSI/AWWA standards, or any pipes listed by Underwriters' Laboratories of Canada for fire service are considered satisfactory. Normally, pipe rated for a maximum working pressure of 1000 kPa is required. Service records, including the frequency and nature of leaks, breaks, joint separations, other failures and repairs, and general conditions should be considered as indicators of reliability. When mains are cleaned they should be lined.

Mains should be so laid as not to endanger one another, and special construction should be provided to prevent their failure at stream crossings, railroad crossings, bridges, and other points where required by physical conditions; supply mains should be valved at one and one half kilometre intervals and should be equipped with air valves at high points and blow offs at low points. Mains should not be buried extremely deep or be unusually difficult to repair, though depths to ten feet may be required because of frost conditions.

The general arrangement of important valves, of standard or special fittings, and of connections at cross-overs, intersections, and reservoirs, as well as at discharge and suction headers, should be considered with respect to the time required to isolate breaks. The need for check valves on supply or force mains and for other arrangements to prevent flooding of stations or emptying of reservoirs at the time of a break in a main should also be considered, as well as the need for relief valves or surge chambers. Accessibility of suitable material and equipment and ease of making repairs should be considered.

Arterial feeder mains should provide looping throughout the system for mutual support and reliability, preferably not more than 1000 metres between mains. Dependence of a large area on a single main is a weakness. In general the gridiron of minor distributors supplying residential districts should consist of mains at least 150mm in size and arranged so that the lengths on the long sides of blocks between intersecting mains do not exceed 200 metres. Where longer lengths of 150mm pipe are necessary 200mm or larger intersecting mains should be used. Where initial pressures are unusually high, a satisfactory gridiron may be obtained with longer lengths of 150mm pipe between intersecting mains.

Where deadends and a poor gridiron are likely to exist for a considerable period or where the layout of the streets and the topography are not well adapted to the above arrangement, 200mm pipe should be used. Both the ability to meet the required fire flows and reliability of a reasonable supply by alternate routing must be taken into account in this consideration.

VALVES. A sufficient number of valves should be installed so that a break or other failure will not affect more than 400 metres of arterial mains, 150 metres of mains in commercial districts, or 250 metres of mains in residential districts. Valves should be maintained in good operating condition. The recommended inspection frequency is once a year, and more frequently for larger valves and valves for critical applications.

A valve repair that would result in reduction of supply is a liability, but because of the probable infrequency of occurrence, it might be considered as introducing only a moderate degree of unreliability even if it resulted in total interruption. The repair of a valve normally should be accomplished in two days. Valves opening opposite to the majority are undesirable and when they do occur they should be clearly identified.

HYDRANTS

SIZE, TYPE AND INSTALLATION. Hydrants should conform to American Water Works Standard for Dry Barrel Fire Hydrants or Underwriters' Laboratories of Canada listing. Hydrants should have at least two 65mm outlets. Where required fire flows exceed 5000 l/min or pressures are low there should also be a large pumper outlet. The lateral street connection should not be less than 150mm in diameter. Hose threads, operating and cap nuts on outlets should conform to Provincial Standard dimensions. A valve should be provided on lateral connections between hydrants and street mains.

Hydrants that open in a direction opposite to that of the majority are considered unsatisfactory. Flush hydrants are considered undesirable because of delay in getting into operation; this delay is more serious in areas subject to heavy snow storms. Cisterns are considered unsatisfactory as an alternative to pressure hydrants. The number and spacing of hydrants should be as indicated in the table titled "Standard Hydrant Distribution".

INSPECTION AND CONDITION. Hydrants should be inspected at least semi-annually and after use. The inspection should include operation at least once a year. Where freezing temperatures occur, the semi-annual inspections should be made in the spring and fall of each year. Because of the possibility of freezing they should be checked frequently during extended periods of severe cold. Hydrants should be kept in good condition and suitable records of inspections and repairs be maintained. Hydrants should be painted in highly visible colours so that they are conspicuous and be situated with outlets at least twelve inches above the grade. There should be no obstruction that could interfere with their operation. Snow should be cleared promptly after storms and ice and snow accumulations removed as necessary.

HYDRANT DISTRIBUTION. Hydrant locations and spacing should be convenient for fire department use. Hydrants should be located at intersections, in the middle of long blocks and at the end of long dead-end streets. To allow for convenient utilization of water supplies, distribution density of hydrants should be in accordance with the required fire flows indicated in the table titled "Standard Hydrant Distribution" (page 16). The maximum recommended spacing of hydrants in commercial, industrial, institutional and multi-family residential areas is 90 metres; in single family residential areas 180 metres is recommended. In areas where fire apparatus have access (e.g. large properties, private developments, etc.), hydrants should be required by bylaw. The planning of hydrant locations should be a cooperative effort between the water utility and fire department.

RECORDS

PLANS AND RECORDS. Complete, up-to-date plans and records essential for the proper operation and maintenance of the system should be available in a convenient form, suitably indexed and safely filed. These should include plans of the source as well as records of its yield and a reliable estimate of the safe yield; plans of the supply works including dams, intakes, wells, pipelines, treatment plants, pumping stations, storage reservoirs and tanks; and a map of the distribution system showing mains, valves, and hydrants. Plans and maps should be in duplicate and stored at different locations.

Detailed distribution system plans, in a form suitable for field use, should be available for maintenance crews. Records of consumption, pressures, storage levels, pipes, valves, hydrants, and of the operations of the supply works and distribution system, including valve and hydrant inspections and repairs should be maintained.

TABLES

STANDARD HYDRANT DISTRIBUTION		REQUIRED DURATION OF FIRE FLOW	
Fire Flow Required (litres per minute)	Average Area per Hydrant (m ²)	Fire Flow Required (litres per minute)	Duration (hours)
2,000	16,000	2,000 or less	1.0
4,000	15,000	3,000	1.25
6,000	14,000	4,000	1.5
8,000	13,000	5,000	1.75
10,000	12,000	6,000	2.0
12,000	11,000	8000	2.0
14,000	10,000	10,000	2.0
16,000	9,500	12,000	2.5
18,000	9,000	14,000	3.0
20,000	8,500	16,000	3.5
22,000	8,000	18,000	4.0
24,000	7,500	20000	4.5
26,000	7,000	22,000	5.0
28,000	6,500	24,000	5.5
30,000	6,000	26,000	6.0
32,000	5,500	28,000	6.5
34,000	5,250	30,000	7.0
36,000	5,000	32000	7.5
38,000	4,750	34,000	8.0
40,000	4,500	36,000	8.5
42,000	4,250	38,000	9.0
44,000	4,000	40,000 and over	9.5
46,000	3,750		
48,000	3,500		

Interpolate for intermediate figures

Area refers to surface area of blocks and bounding streets. For a street without adjacent streets, a depth of one-half block is used.

A water supply system is considered to be adequate for fire protection when it can supply water as indicated above with consumption at the maximum daily rate. Certain types of emergency supplies may be included where reasonable conditions for their immediate use exist. Storage on the system is credited on the basis of the normal daily minimum maintained insofar as pressure permits its delivery at the rate considered.

PART II

GUIDE FOR DETERMINATION OF REQUIRED FIRE FLOW COPYRIGHT I.S.O.

N.B. It should be recognized that this is a "guide" in the true sense of the word, and requires a certain amount of knowledge and experience in fire protection engineering for its effective application. Its primary purpose is for the use of surveyors experienced in this field, but it is made available to municipal officials, consulting engineers and others interested as an aid in estimating fire flow requirements for municipal fire protection.

Required Fire Flow may be described as the amount and rate of water application required in firefighting to confine and control the fires possible in a building or group of buildings which comprise essentially the same fire area by virtue of immediate exposure. This may include as much as a city block.

1. An estimate of the fire flow required for a given area may be determined by the formula:

$$F = 220C\sqrt{A}$$

where

F = the required fire flow in litres per minute.

C = coefficient related to the type of construction.

= 1.5 for wood frame construction (structure essentially all combustible).

= 1.0 for ordinary construction (brick or other masonry walls, combustible floor and interior).

= 0.8 for non-combustible construction (unprotected metal structural components, masonry or metal walls).

= 0.6 for fire-resistive construction (fully protected frame, floors, roof).

Note: For types of construction that do not fall within the categories given, coefficients shall not be greater than 1.5 nor less than 0.6 and may be determined by interpolation between consecutive construction types as listed above. Construction types are defined in the Appendix.

A = The total floor area in square metres (including all storeys, but excluding basements at least 50 percent below grade) in the building being considered.

For fire-resistive buildings, consider the two largest adjoining floors plus 50 percent of each of any floors immediately above them up to eight, when the vertical openings are inadequately protected. If the vertical openings and exterior vertical communications are properly protected (one hour rating), consider only the area of the largest floor plus 25 percent of each of the two immediately adjoining floors.

For one family and two family dwellings not exceeding two storeys in height, see **Note J**.

2. The value obtained in No. 1 may be reduced by as much as 25% for occupancies having a low contents fire hazard or may be increased by up to 25% surcharge for occupancies having a high fire hazard. Those may be classified as to contents as follows:

Non-Combustible	-25%	Free Burning	+15%
Limited Combustible	-15%	Rapid Burning	+25%
Combustible	No Charge		

As guide for determining low or high fire hazard occupancies, see the list in the Appendix. The fire flow determined shall not be less than 2,000 L/min,

3. The value obtained in No.2 above may be reduced by up to 50% for complete automatic sprinkler protection depending upon adequacy of the system. The credit for the system will be a maximum of 30% for an adequately designed system conforming to NFPA 13 and other NFPA sprinkler standards. Additional credit of up to 10% may be granted if the water supply is standard for both the system and fire department hose lines required. The percentage reduction made for an automatic sprinkler system will depend upon the extent to which the system is judged to reduce the possibility of fires spreading within and beyond the fire area. Normally this reduction will not be the maximum allowed without proper system supervision including water flow and control valve alarm service. Additional credit may be given of up to 10% for a fully supervised system.
4. To the value obtained in No. 2 above a percentage should be added for structures exposed within 45 metres by the fire area under consideration. This percentage shall depend upon the height, area, and construction of the building(s) being exposed, the separation, openings in the exposed building(s), the length and height of exposure, the provision of automatic sprinklers and/or outside sprinklers in the building(s) exposed, the occupancy of the exposed building(s), and the effect of hillside locations on the possible spread of fire.

The charge for any one side generally should not exceed the following limits for the separation:

Separation	Charge	Separation	Charge
0 to 3m	25%	20.1 to 30 m	10%
3.1 to 10m	20%	30.1 to 45m	5%
10.1 to 20m	15%		

The total percentage shall be the sum of the percentage for all sides, but shall not exceed 75%.

The fire flow shall not exceed 45,000 L/min nor be less than 2,000 L/min.

Notes to Calculation

Note A: The guide is not expected to necessarily provide an adequate value for lumber yards, petroleum storage, refineries, grain elevators, and large chemical plants, but may indicate a minimum value for these hazards.

Note B: Judgment must be used for business, industrial, and other occupancies not specifically mentioned.

Note C: Consideration should be given to the configuration of the building(s) being considered and accessibility by the fire department.

Note D: Wood frame structures separated by less than 3 metres shall be considered as one fire area.

Note E: Fire Walls: - In determining floor areas, a fire wall that meets or exceeds the requirements of the current edition of the National Building Code of Canada (provided this necessitates a fire resistance rating of 2 or more hours) may be deemed to subdivide the building into more than one area or may, as a party wall, separate the building from an adjoining building.

Normally any unpierced party wall considered to form a boundary when determining floor areas may warrant up to a 10% exposure charge.

Note F: High one storey buildings: When a building is stated as 1=2, or more storeys, the number of storeys to be used in the formula depends upon the use being made of the building. For example, consider a 1=3 storey building. If the building is being used for high piled stock, or for rack storage, the building would probably be considered as 3 storeys and, in addition, an occupancy percentage increase may be warranted.

However, if the building is being used for steel fabrication and the extra height is provided only to facilitate movement of objects by a crane, the building would probably be considered as a one storey building and an occupancy credit percentage may be warranted.

Note G: If a building is exposed within 45 metres, normally some surcharge for exposure will be made.

Note H: Where wood shingle or shake roofs could contribute to spreading fires, add 2,000 L/min to 4,000 L/min in accordance with extent and condition.

Note I: Any non-combustible building is considered to warrant a 0.8 coefficient.

Note J: Dwellings: For groupings of detached one family and small two family dwellings not exceeding 2 stories in height, the following short method may be used. (For other residential buildings, the regular method should be used.)

Exposure distances	Suggested required fire flow	
	Wood Frame	Masonry or Brick
Less than 3m	See Note "D"	6,000 L/min
3 to 10m	4,000 L/min	4,000 L/min
10.1 to 30m	3,000 L/min	3,000 L/min
Over 30m	2,000 L/min	2,000 L/min

If the buildings are contiguous, use a minimum of 8,000 L/min. Also consider Note H.

OUTLINE OF PROCEDURE

- A. Determine the type of construction.
- B. Determine the ground floor area.
- C. Determine the height in storeys.
- D. Using the fire flow formula, determine the required fire flow to the nearest 1,000 L/min.
- E. Determine the increase or decrease for occupancy and apply to the value obtained in D above. Do not round off the answer.
- F. Determine the decrease, if any, for automatic sprinkler protection. Do not round off the value.
- G. Determine the total increase for exposures, Do not round off the value.
- H. To the answer obtained in E, subtract the value obtained in F and add the value obtained in G.

The final figure is customarily rounded off to the nearest 1,000 L/min.

APPENDIX

TYPES OF CONSTRUCTION

For the specific purpose of using the Guide, the following definitions may be used:

Fire-Resistive Construction - Any structure that is considered fully protected, having at least 3-hour rated structural members and floors. For example, reinforced concrete or protected steel.

Non-combustible Construction - Any structures having all structural members including walls, columns, piers, beams, girders, trusses, floors, and roofs of non-combustible material and not qualifying as fire-resistive construction. For example, unprotected metal buildings.

Ordinary Construction - Any structure having exterior walls of masonry or such non-combustible material, in which the other structural members, including but not limited to columns, floors, roofs, beams, girders, and joists, are wholly or partly of wood or other combustible material.

Wood Frame Construction - Any structure in which the structural members are wholly or partly of wood or other combustible material and the construction does not qualify as ordinary construction.

OCCUPANCIES

Examples of Low Hazard Occupancies:

Apartments	Hotels	Prisons
Asylums	Institutions	Public Buildings
Churches	Libraries, except Large	Rooming Houses
Clubs	Stack Room Areas	Schools
Colleges & Universities	Museums	Tenements
Dormitories	Nursing, Convalescent	
Dwellings	and Care Homes	
Hospitals	Office Buildings	

Generally, occupancies falling in National Building Code Groups A, B, C and D are of this class.

Examples of High Hazard Occupancies:

Aircraft Hangars	Linseed Oil Mills
Cereal, Feed, Flour and Grist Mills	Match Manufacturing
Chemical Works - High Hazard	Oil Refineries
Cotton Picker and Opening Operations	Paint Shops
Explosives & Pyrotechnics Manufacturing	Pyroxylin Plastic Manufacturing & Processing
Shade Cloth Manufacturing	Solvent Extracting
Foamed Plastics, Storage or use in Manufacturing	Varnish and Paint Works
High Piled Combustibles Storage in excess of 6.5 metres high	Woodworking with Flammable Finishing
	Linoleum and Oilcloth Manufacturing

Other occupancies involving processing, mixing storage and dispensing flammable and/or combustible liquids. Generally, occupancies falling in National Building Code Group F, Divisions 1 and 2 would be in this class.

For other occupancies, good judgment should be used, and the percentage increase will not necessarily be the same for all buildings that are in the same general category - for example "Colleges and Universities": this could range from a 25% decrease for buildings used only as dormitories to an increase for a chemical laboratory. Even when considering high schools, the decrease should be less if they have extensive shops.

It is expected that in commercial buildings no percentage increase or decrease for occupancy will be applied in most of the fire flow determinations. In general, percentage increase or decrease will not be at the limits of plus or minus 25%.

EXPOSURES

When determining exposures it is necessary to understand that the exposure percentage increase for a fire in a building (x) exposing another building (y) does not necessarily equal the percentage increase when the fire is in building (y) exposing building (x). The Guide gives the maximum possible percentage for exposure at specified distances. However, these maximum possible percentages should not be used for all exposures at those distances. In each case the percentage applied should reflect the actual conditions but should not exceed the percentage listed.

The maximum percentage for the separations listed generally should be used if the exposed building meets all of the following conditions:

- a. Same type or a poorer type of construction than the fire building.
- b. Same or greater height than the fire building.
- c. Contains unprotected exposed openings.
- d. Unsprinklered.

CONVERSION FACTORS

Multiply	By	To Obtain
Centimetre	0.3937	Inches
Cubic Foot	0.0283	Cubic Metres
Cubic Metre	35.3145	Cubic Feet
Cubic Metre	219.97	Imperial Gallons
Cubic Metre	1.000	Litres
Foot	0.3048	Metres
Horsepower	0.7457	Kilowatt
Imperial Gallon	4.546	Litres
Inch	2.54	Centimetres
Kilogram	2.2046	Pounds
Kilogram of Water	1	Litres
Kilopascal	0.1450	Pounds per sq. inch
Kilowatt	1.341	Horsepower
Litre	0.21997	Imperial Gallons
Litre of Water	1	Kilograms
Metre	3.281	Feet
Metre of Water	10	Kilopascals
Pound	0.4536	Kilograms
Pound per sq. inch	6.89476	Kilopascals
U.S. Gallons	0.8327	Imperial Gallons
Imperial Gallons	1.201	U.S. Gallons



Appendix C – Required Fire Flow Summary



RFF #	Address	Number of Storeys	Effective Total Area (sq. m)	Coeff	Occupancy Charge	Sprinkler Protection Reduction	Exposure Charge	Flow (LPM)	Flow (IGPM)
1	44.412687°, -79.708648°	1	64,000	0.8	-20%	-40%	0%	22,000	4,800
2	44.411182°, -79.676502°	3	11,100	1.5	-20%	-10%	20%	31,000	6,800
3	44.411312°, -79.675254°	4	3,200	1.5	-20%	0%	12%	17,000	3,700
4	44.411591°, -79.675676°	4	3,200	1.5	-20%	0%	24%	19,000	4,200
5	44.411858°, -79.676111°	4	3,200	1.5	-20%	0%	12%	17,000	3,700
6	44.410022°, -79.674227°	9	8,730	0.8	-15%	-10%	10%	14,000	3,100
7	44.409689°, -79.674678°	8	10,400	0.8	-15%	-10%	5%	15,000	3,300
8	44.411572°, -79.677767°	4	7,200	1.5	-15%	0%	5%	25,000	5,500
9	44.411843°, -79.677120°	4	7,200	1.5	-15%	0%	5%	25,000	5,500
10	44.395706°, -79.656251°	9	16,200	0.8	-15%	-10%	0%	17,000	3,700
11	44.396831°, -79.656301°	6	7,200	0.8	-15%	0%	0%	13,000	2,900
12	44.405970°, 44.405970°	1	6,600	1.5	-20%	0%	0%	22,000	4,800
13	44.399774°, -79.652038°	7	6,160	0.8	-15%	0%	0%	12,000	2,600
14	44.410189°, -79.676286°	1	2,700	0.8	-10%	0%	5%	9,000	2,000
15	44.409236°, -79.680494°	1	7,000	0.8	-10%	0%	0%	14,000	3,100
16	44.409236°, -79.680494°	1	5,200	0.8	0%	0%	10%	14,000	3,100
17	44.408393°, -79.682159°	1	3,300	0.8	-10%	0%	5%	9,000	2,000
18	44.408948°, -79.682882°	1	3,200	0.8	-10%	0%	5%	9,000	2,000
19	44.409126°, -79.684885°	1	4,000	0.8	0%	0%	0%	11,000	2,400
20	44.406868°, -79.686625°	1	17,000	0.8	-10%	-40%	0%	12,000	2,600
21	44.397940°, -79.655898°	2	4,000	1.5	-20%	0%	10%	18,000	4,000
22	44.395907°, -79.658917°	3	4,200	1	-20%	0%	10%	12,000	2,600
23	44.410777°, -79.679055°	2	2,200	1.5	-20%	0%	20%	14,000	3,100
24	44.400832°, -79.650647°	3	1,620	1	-20%	0%	10%	8,000	1,800
25	44.405012°, -79.648564°	1	1,100	1.5	-10%	0%	0%	10,000	2,200
26	44.409394°, -79.647540°	3	3,600	1.5	-20%	0%	0%	16,000	3,500
27	44.410793°, -79.667977°	2	12,500	0.8	-20%	-40%	10%	11,000	2,400
28	44.411434°, -79.669436°	2	22,000	0.8	-20%	-40%	25%	18,000	4,000
29	44.412291°, -79.668042°	2	10,000	0.8	-20%	-40%	15%	11,000	2,400
30	44.414284°, -79.660900°	4	68,000	0.8	-20%	-50%	0%	18,000	4,000
31	44.414543°, -79.658799°	3	14,100	0.8	-20%	-40%	0%	10,000	2,200
32	44.405344°, -79.661890°	2	22,000	0.8	-20%	-40%	0%	12,000	2,600
33	44.394253°, -79.662737°	3	4,200	0.8	-15%	0%	10%	10,000	2,200
34	44.394253°, -79.662737°	4	5,400	0.8	-15%	0%	10%	12,000	2,600
35	44.393987°, -79.676993°	4	4,200	0.8	-20%	0%	10%	10,000	2,200
36	44.397029°, -79.674596°	1	2,600	0.8	-15%	-30%	0%	5,000	1,100
37	44.403074°, -79.671425°	1	4,260	0.8	-15%	-30%	0%	7,000	1,500
38	44.407629°, -79.672992°	1	2,527	1	-10%	0%	0%	10,000	2,200
39	44.408858°, -79.673128°	6	5,520	0.8	-10%	0%	10%	13,000	2,900
40	44.411623°, -79.686480°	1	6,300	0.8	-10%	-20%	0%	10,000	2,200
41	44.410675°, -79.686396°	2	4,300	0.8	-20%	-30%	0%	7,000	1,500
42	44.411199°, -79.684866°	2	6,200	0.8	-20%	-50%	0%	6,000	1,300
43	44.412826°, -79.683998°	2	16,800	0.8	-20%	-40%	0%	11,000	2,400
44	44.415002°, -79.703819°	2	22,600	0.8	-20%	-50%	0%	10,000	2,200



45	44.416031°, -79.702349°	2	5,200	0.8	-20%	-50%	0%	5,000	1,100
46	44.406220°, -79.706262°	2	32,000	0.8	-20%	-40%	0%	15,000	3,300
47	44.408097°, -79.707566°	4	9,200	0.8	-15%	0%	0%	14,000	3,100
48	44.404190°, -79.706943°	16	17,600	0.8	-15%	-20%	0%	16,000	3,500
49	44.405075°, -79.707373°	10	9,500	0.8	-15%	-10%	0%	13,000	2,900
50	44.400445°, -79.703079°	1	40,845	0.8	-15%	-30%	0%	21,000	4,600
51	44.400038°, -79.705201°	13	14,040	0.8	-10%	-15%	0%	16,000	3,500
52	44.407956°, -79.709991°	6	9,600	0.8	-15%	-10%	0%	13,000	2,900
53	44.409888°, -79.711145°	2	25,600	0.8	-10%	-40%	5%	16,000	3,500
54	44.411478°, -79.712871°	2	23,800	0.8	-20%	-40%	0%	13,000	2,900
55	44.409642°, -79.705598°	1	11,500	0.8	-10%	0%	0%	17,000	3,700
56	44.405330°, -79.689200°	2	13,000	0.8	-5%	0%	0%	19,000	4,200
57	44.399722°, -79.699760°	2	5,200	1.5	-15%	-20%	0%	16,000	3,500
58	44.397122°, -79.696099°	4	3,600	1	-15%	0%	0%	11,000	2,400
59	44.402974°, -79.716611°	3	8,445	1	-15%	-20%	0%	14,000	3,100
60	44.402663°, -79.665968°	1	4,200	0.8	-20%	-30%	0%	6,000	1,300
61	44.368028°, -79.707482°	1	13,800	0.8	10%	-40%	0%	14,000	3,100
62	44.366658°, -79.705983°	2	12,600	0.8	-10%	-40%	0%	11,000	2,400
63	44.358390°, -79.694895°	2	13,200	0.8	-10%	-40%	0%	11,000	2,400
64	44.354286°, -79.691554°	2	8,800	0.8	10%	-40%	0%	11,000	2,400
65	44.355392°, -79.695421°	3	5,100	1.5	-20%	-30%	0%	13,000	2,900
66	44.356232°, -79.696211°	6	10,800	0.8	-20%	-30%	0%	10,000	2,200
67	44.344836°, -79.704291°	2	3,000	1.5	-15%	0%	20%	18,000	4,000
68	44.347183°, -79.703238°	1	2,100	0.8	-15%	0%	0%	7,000	1,500
69	44.363237°, -79.702562°	2	14,000	0.8	0%	-30%	8%	16,000	3,500
70	44.362905°, -79.701563°	1	5,800	0.8	0%	-20%	20%	13,000	2,900
71	44.356422°, -79.723450°	2	5,800	0.8	-20%	-40%	0%	6,000	1,300
72	44.349206°, -79.732822°	2	16,000	0.8	-20%	-40%	0%	11,000	2,400
73	44.352126°, -79.700104°	3	3,600	1.5	-15%	0%	0%	17,000	3,700
74	44.352585°, -79.700619°	3	2,240	1.5	-15%	0%	12%	15,000	3,300
75	44.350721°, -79.702798°	3	3,300	1.5	-15%	0%	5%	17,000	3,700
76	44.354576°, -79.699768°	3	3,600	1.5	-15%	0%	10%	19,000	4,200
77	44.355205°, -79.700060°	3	3,600	1.5	-15%	0%	25%	21,000	4,600
78	44.353965°, -79.713296°	3	1,950	1.5	-15%	0%	35%	17,000	3,700
79	44.353605°, -79.713104°	3	1,950	1.5	-15%	0%	35%	17,000	3,700
80	44.354285°, -79.713376°	3	1,950	1.5	-15%	0%	35%	17,000	3,700
81	44.358095°, -79.716182°	2	6,600	1.5	-20%	-40%	0%	13,000	2,900
82	44.357475°, -79.701764°	2	2,600	1.5	-10%	0%	0%	15,000	3,300
83	44.365190°, -79.702988°	2	8,000	0.8	0%	-30%	10%	13,000	2,900
84	44.364317°, -79.703912°	2	5,000	0.8	0%	0%	15%	14,000	3,100
85	44.360328°, -79.699404°	1	3,700	0.8	0%	0%	20%	13,000	2,900
86	44.369435°, -79.707606°	1	3,400	0.8	0%	0%	10%	11,000	2,400
87	44.361313°, -79.693517°	5	10,200	0.8	-15%	-30%	0%	11,000	2,400
88	44.365139°, -79.695930°	3	7,500	1.5	-15%	-20%	0%	20,000	4,400
89	44.334480°, -79.697514°	3	51,300	0.8	10%	-50%	0%	22,000	4,800
90	44.335968°, -79.701115°	2	38,800	0.8	15%	-40%	0%	24,000	5,300
91	44.334966°, -79.705611°	3	58,500	0.8	0%	-40%	0%	26,000	5,700



92	44.337283°, -79.694992°	2	24,000	0.8	0%	-40%	10%	19,000	4,200
93	44.337192°, -79.697463°	2	7,400	0.8	0%	-40%	25%	13,000	2,900
94	44.338151°, -79.698365°	2	8,800	0.8	0%	-40%	10%	12,000	2,600
95	44.332318°, -79.692493°	2	18,800	0.8	-10%	-40%	0%	13,000	2,900
96	44.332496°, -79.686461°	2	23,000	0.8	-10%	-40%	20%	19,000	4,200
97	44.329183°, -79.686836°	1	4,300	0.8	-10%	0%	20%	13,000	2,900
98	44.323784°, -79.684439°	3	13,050	0.8	-15%	-40%	0%	10,000	2,200
99	44.325298°, -79.706384°	2	13,000	0.8	0%	-40%	0%	12,000	2,600
100	44.326385°, -79.726777°	3	4,500	1.5	-20%	0%	10%	19,000	4,200
101	44.331849°, -79.733459°	2	24,000	0.8	-20%	-40%	0%	13,000	2,900
102	44.339439°, -79.717076°	2	22,000	0.8	-10%	-40%	0%	14,000	3,100
103	44.339892°, -79.687322°	2	20,800	0.8	-10%	-40%	10%	16,000	3,500
104	44.338994°, -79.690224°	1	8,300	0.8	-10%	-20%	5%	12,000	2,600
105	44.335934°, -79.689813°	4	4,400	1.5	-20%	-20%	0%	14,000	3,100
106	44.335592°, -79.691215°	2	7,800	0.8	-5%	-30%	0%	11,000	2,400
107	44.337186°, -79.689940°	1	3,200	0.8	-10%	0%	10%	10,000	2,200
108	44.332029°, -79.690283°	4	4,000	1.5	-20%	-30%	10%	13,000	2,900
109	44.324531°, -79.686567°	1	3,000	0.8	-10%	0%	10%	10,000	2,200
110	44.324166°, -79.688993°	2	6,600	0.8	-15%	0%	10%	13,000	2,900
111	44.323280°, -79.691698°	2	7,400	0.8	-15%	0%	10%	14,000	3,100
112	44.322609°, -79.694310°	2	12,800	0.8	-15%	0%	5%	18,000	4,000
113	44.328306°, -79.685757°	2	6,000	0.8	-10%	0%	20%	15,000	3,300
114	44.342588°, -79.707267°	4	11,200	1.5	-10%	-20%	0%	25,000	5,500
115	44.342199°, -79.708532°	3	8,400	0.8	-10%	-20%	20%	14,000	3,100
116	44.338674°, -79.702088°	2	1,300	1.5	-15%	0%	45%	15,000	3,300
117	44.339035°, -79.701686°	3	1,260	1.5	-15%	0%	55%	16,000	3,500
118	44.338186°, -79.720131°	2	920	1.5	-15%	0%	40%	12,000	2,600
119	44.359613°, -79.669787°	1	44,000	0.8	0%	-40%	0%	22,000	4,800
120	44.355507°, -79.680130°	2	38,000	0.8	0%	-40%	0%	20,000	4,400
121	44.353244°, -79.685265°	1	28,500	0.8	0%	-40%	0%	18,000	4,000
122	44.348898°, -79.666871°	2	18,800	0.8	-10%	0%	10%	24,000	5,300
123	44.348272°, -79.668651°	1	8,200	0.8	0%	0%	10%	18,000	4,000
124	44.353297°, -79.672990°	2	37,600	0.8	10%	-40%	0%	22,000	4,800
125	44.359341°, -79.685284°	2	21,600	0.8	-20%	-40%	0%	12,000	2,600
126	44.361147°, -79.683952°	1	8,600	0.8	-20%	-40%	0%	8,000	1,800
127	44.358867°, -79.683660°	2	22,000	0.8	-10%	-20%	10%	21,000	4,600
128	44.358191°, -79.683441°	1	8,300	0.8	10%	0%	10%	19,000	4,200
129	44.357476°, -79.683416°	1	10,100	0.8	10%	0%	10%	22,005	4,800
130	44.356101°, -79.685056°	2	14,400	0.8	0%	-20%	15%	20,000	4,400
131	44.372446°, -79.669437°	3	2,700	0.8	-15%	0%	0%	8,000	1,800
132	44.373539°, -79.669639°	3	2,010	1.5	-15%	0%	30%	17,000	3,700
133	44.371552°, -79.671619°	1	6,400	0.8	-10%	0%	0%	13,000	2,900
134	44.368847°, -79.655285°	4	11,600	1.5	-15%	0%	0%	31,000	6,800
135	44.369763°, -79.654800°	3	7,800	1.5	-15%	0%	0%	25,000	5,500
136	44.369333°, -79.668587°	2	9,000	0.8	-15%	0%	0%	14,000	3,100
137	44.355422°, -79.648766°	2	16,200	0.8	-15%	-20%	0%	15,000	3,300
138	44.353386°, -79.644077°	5	25,000	0.8	-15%	-30%	0%	17,000	3,700



139	44.354686°, -79.639820°	2	19,000	0.8	-20%	-40%	0%	12,000	2,600
140	44.370112°, -79.657369°	3	7,800	1.5	-20%	0%	0%	23,000	5,100
141	44.334687°, -79.679567°	2	22,000	0.8	0%	-40%	0%	16,000	3,500
142	44.334221°, -79.682142°	2	26,000	0.8	-10%	-40%	0%	15,000	3,300
143	44.337639°, -79.677674°	3	16,800	0.8	-10%	-40%	0%	12,000	2,600
144	44.330769°, -79.676095°	2	10,600	0.8	10%	-20%	20%	20,000	4,400
145	44.337336°, -79.670381°	2	11,200	0.8	10%	-20%	15%	20,000	4,400
146	44.337108°, -79.671904°	2	9,000	0.8	10%	0%	10%	21,000	4,600
147	44.332849°, -79.672026°	2	12,800	0.8	10%	-30%	10%	18,000	4,000
148	44.349622°, -79.669293°	2	16,000	0.8	0%	0%	0%	22,000	4,800
149	44.343559°, -79.650342°	2	1,200	1.5	-20%	0%	30%	11,000	2,400
150	44.349744°, -79.633581°	3	750	1.5	-20%	0%	20%	9,000	2,000
151	44.348397°, -79.626197°	1	850	1.5	-10%	0%	0%	9,000	2,000
152	44.356367°, -79.644613°	1	2,800	0.8	-10%	0%	10%	9,000	2,000
153	44.370256°, -79.674097°	2	1,700	0.8	-10%	0%	5%	7,000	1,500
154	44.367021°, -79.691358°	2	4,000	0.8	-20%	-30%	20%	8,000	1,800
155	44.368431°, -79.687393°	2	9,000	0.8	-20%	0%	5%	14,000	3,100
156	44.368943°, -79.686634°	4	8,000	0.8	-20%	-40%	20%	10,000	2,200
157	44.369079°, -79.685655°	2	3,200	1.5	-20%	0%	0%	15,000	3,300
158	44.370355°, -79.683796°	4	4,400	1	-15%	0%	10%	14,000	3,100
159	44.362176°, -79.684792°	3	3,345	1.5	-20%	0%	20%	18,000	4,000
160	44.362269°, -79.683863°	3	2,340	1.5	-20%	0%	15%	15,000	3,300
161	44.361932°, -79.685505°	3	2,280	1.5	-20%	0%	20%	15,000	3,300
162	44.361809°, -79.686273°	3	2,475	1.5	-20%	0%	20%	15,000	3,300
163	44.371952°, -79.689978°	2	2,320	1.5	-20%	0%	0%	13,000	2,900
164	44.375809°, -79.706961°	2	65,600	0.8	0%	-40%	0%	27,000	5,900
165	44.374497°, -79.705459°	2	33,200	0.8	0%	-30%	0%	22,000	4,800
166	44.372555°, -79.706245°	1	13,600	0.8	0%	-20%	0%	17,000	3,700
167	44.375926°, -79.702316°	2	19,000	0.8	0%	-15%	10%	23,000	5,100
168	44.374301°, -79.694769°	2	1,640	1.5	-15%	0%	0%	11,000	2,400
169	44.379420°, -79.699928°	2	14,000	0.8	-10%	0%	0%	19,000	4,200
170	44.379009°, -79.691308°	14	19,000	0.8	-20%	-25%	0%	14,000	3,100
171	44.380159°, 44.380159°	16	21,000	0.8	-20%	-25%	10%	18,000	4,000
172	44.380846°, -79.691522°	2	5,800	1.5	-20%	0%	0%	20,000	4,400
173	44.382300°, -79.703804°	8	12,000	0.8	-20%	-10%	10%	15,000	3,300
174	44.384953°, -79.691601°	15	19,725	0.8	-20%	-40%	10%	14,000	3,100
175	44.383987°, -79.694974°	2	51,000	0.8	-15%	-40%	0%	20,000	4,400
176	44.386088°, -79.710169°	13	14,300	0.8	-15%	-10%	0%	16,000	3,500
177	44.385206°, -79.711809°	6	9,600	0.8	-15%	0%	0%	14,000	3,100
178	44.384513°, -79.711271°	3	3,300	1.5	-20%	0%	0%	15,000	3,300
179	44.383969°, -79.712604°	3	4,200	1.5	-20%	0%	0%	17,000	3,700
180	44.382761°, -79.716089°	3	3,750	1.5	-20%	0%	0%	16,000	3,500
181	44.382108°, -79.715301°	3	5,100	1.5	-20%	0%	0%	19,000	4,200
182	44.391559°, -79.717256°	3	15,000	1.5	-20%	-40%	0%	19,000	4,200
183	44.378555°, -79.710010°	2	2,800	1.5	-15%	0%	0%	14,000	3,100
184	44.379632°, -79.709193°	2	4,600	1.5	-15%	-10%	0%	17,000	3,700
185	44.380086°, -79.708349°	3	3,000	1.5	-15%	-10%	0%	14,000	3,100



186	44.380572°, -79.702216°	2	7,500	0.8	10%	0%	20%	20,000	4,400
187	44.390972°, -79.726073°	1	5,700	0.8	-15%	-30%	0%	8,000	1,800
188	44.401101°, -79.715323°	1	3,900	1.5	-15%	0%	0%	18,000	4,000
189	44.376744°, -79.691232°	2	30,000	0.8	15%	-50%	0%	17,000	3,700
190	44.386196°, -79.695382°	2	19,000	0.8	-20%	-40%	20%	15,000	3,300
191	44.387901°, -79.694194°	3	11,000	0.8	-10%	0%	15%	19,000	4,200
192	44.390101°, -79.691087°	1	8,000	0.8	-10%	0%	20%	17,000	3,700
193	44.392001°, -79.691171°	7	9,100	0.8	-15%	-10%	15%	15,000	3,300
194	44.389654°, -79.684660°	13	14,000	0.8	-15%	-30%	35%	19,000	4,200
195	44.391641°, -79.677604°	4	3,160	1.5	-15%	0%	10%	18,000	4,000
196	44.390895°, -79.678165°	13	12,350	0.8	-15%	-10%	5%	16,000	3,500
197	44.390469°, -79.678839°	6	4,800	0.8	-15%	0%	20%	12,000	2,600
198	44.390841°, -79.679210°	8	4,560	0.8	-15%	0%	10%	11,000	2,400
199	44.389611°, -79.678499°	3	3,600	0.8	-15%	0%	30%	12,000	2,600
200	44.391755°, -79.674948°	4	4,800	0.8	-10%	0%	15%	12,000	2,600
201	44.391351°, -79.683854°	15	12,750	0.8	-15%	0%	10%	19,000	4,200
202	44.391882°, -79.683960°	2	12,400	0.8	-20%	-30%	15%	14,000	3,100
203	44.390733°, -79.686581°	9	9,900	0.8	-20%	-30%	25%	14,000	3,100
204	44.389179°, -79.686096°	2	4,800	1.5	-10%	0%	25%	26,000	5,700
205	44.389477°, -79.686616°	2	7,200	1.5	-10%	0%	15%	29,000	6,400
206	44.389114°, -79.688981°	2	5,600	1.5	-10%	0%	10%	25,000	5,500
207	44.388432°, -79.689775°	10	10,400	0.8	-15%	-30%	20%	14,000	3,100
208	44.388221°, -79.690144°	13	23,400	0.8	-15%	-30%	20%	21,000	4,600
209	44.391295°, -79.698064°	5	25,000	0.8	-15%	-30%	0%	17,000	3,700
210	44.391234°, -79.699267°	4	3,200	1	-15%	0%	5%	11,000	2,400
211	44.392641°, -79.693308°	5	7,500	0.8	-15%	0%	20%	15,000	3,300
212	44.393087°, -79.692847°	6	3,240	0.8	-10%	0%	25%	11,000	2,400
213	44.396719°, -79.698691°	2	7,600	0.8	-15%	-20%	0%	10,000	2,200
214	44.388491°, -79.704083°	8	8,800	0.8	-15%	0%	15%	17,000	3,700
215	44.388140°, -79.705128°	6	5,640	0.8	-15%	0%	20%	13,000	2,900
216	44.387740°, -79.702777°	1	2,600	1.5	-15%	0%	20%	17,000	3,700
217	44.386366°, -79.704751°	1	6,300	0.8	-10%	0%	0%	13,000	2,900
218	44.388345°, -79.709169°	11	19,800	0.8	-15%	-10%	0%	19,000	4,200
219	44.387710°, -79.709981°	5	3,300	0.8	-15%	0%	10%	9,000	2,000
220	44.387005°, -79.710129°	3	3,300	1.5	-15%	0%	10%	18,000	4,000
221	44.369883°, -79.703318°	1	15,500	0.8	10%	-25%	0%	18,000	4,000
222	44.371510°, -79.697246°	3	3,900	1.5	-15%	0%	0%	18,000	4,000
223	44.372532°, -79.694137°	2	6,400	0.8	0%	0%	0%	14,000	3,100
224	44.373428°, -79.700000°	1	9,600	0.8	0%	0%	0%	17,000	3,700
225	44.372149°, -79.714154°	2	9,600	0.8	10%	-40%	0%	11,000	2,400
226	44.376682°, -79.712632°	2	10,200	0.8	0%	-30%	0%	13,000	2,900
227	44.380569°, -79.721397°	2	12,200	0.8	0%	0%	0%	19,000	4,200
228	44.376121°, -79.718151°	2	4,000	0.8	10%	0%	20%	15,000	3,300
229	44.379472°, -79.714596°	1	3,800	0.8	0%	0%	15%	13,000	2,900
230	44.381872°, -79.711374°	1	7,500	0.8	-10%	0%	10%	15,000	3,300

5th Highest 5700
Peak RFF 6,800



RFF #	Address	Number of Storeys	Effective Total Area (sq. m)	Coef	Occupancy Charge	Sprinkler Protection Reduction	Exposure Charge	Flow (LPM)	Flow (IGPM)
1	44.367021°, -79.691358°	2.0	4,000	0.8	-20%	-30%	25%	8,000	1,800
2	44.368431°, -79.687393°	2.0	9,000	0.8	-20%	0%	5%	14,000	3,100
3	44.368943°, -79.686634°	4.0	8,000	0.8	-20%	-40%	20%	10,000	2,200
4	44.369079°, -79.685655°	2.0	3,200	1.5	-20%	0%	0%	15,000	3,300
5	44.370355°, -79.683796°	4.0	4,400	1	-15%	0%	10%	14,000	3,100
6	44.362176°, -79.684792°	3.0	3,345	1.5	-20%	0%	20%	18,000	4,000
7	44.362269°, -79.683863°	3.0	2,340	1.5	-20%	0%	15%	15,000	3,300
8	44.361932°, -79.685505°	3.0	2,280	1.5	-20%	0%	20%	15,000	3,300
9	44.361809°, -79.686273°	3.0	2,475	1.5	-20%	0%	20%	15,000	3,300
10	44.371952°, -79.689978°	2.0	2,320	1.5	-20%	0%	0%	13,000	2,900
11	44.375809°, -79.706961°	1.0	65,600	0.8	-10%	0%	0%	20,000	4,400
12	44.374497°, -79.705459°	2.0	33,200	0.8	0%	-30%	0%	22,000	4,800
13	44.372555°, -79.706245°	1.0	13,600	0.8	0%	-20%	0%	17,000	3,700
14	44.375926°, -79.702316°	2.0	19,000	0.8	0%	-15%	10%	23,000	5,100
15	44.374301°, -79.694769°	2.0	1,640	1.5	-15%	0%	0%	11,000	2,400
16	44.379420°, -79.699928°	2.0	14,000	0.8	-10%	0%	0%	19,000	4,200
17	44.379009°, -79.691308°	14.0	19,000	0.8	-20%	-25%	0%	14,000	3,100
18	44.380159°, 44.380159°	16.0	21,000	0.8	-20%	-25%	10%	18,000	4,000
19	44.380846°, -79.691522°	2.0	5,800	1.5	-20%	0%	0%	20,000	4,400
20	44.382300°, -79.703804°	8.0	12,000	0.8	-20%	-10%	10%	15,000	3,300
21	44.384953°, -79.691601°	15.0	19,725	0.8	-20%	-40%	10%	14,000	3,100
22	44.383987°, -79.694974°	2.0	51,000	0.8	-15%	-40%	0%	20,000	4,400
23	44.386088°, -79.710169°	13.0	14,300	0.8	-15%	-10%	0%	16,000	3,500
24	44.385206°, -79.711809°	6.0	9,600	0.8	-15%	0%	0%	14,000	3,100
25	44.384513°, -79.711271°	3.0	3,300	1.5	-20%	0%	0%	15,000	3,300
26	44.383969°, -79.712604°	3.0	4,200	1.5	-20%	0%	0%	17,000	3,700
27	44.382761°, -79.716089°	3.0	3,750	1.5	-20%	0%	0%	16,000	3,500
28	44.382108°, -79.715301°	3.0	5,100	1.5	-20%	0%	0%	19,000	4,200
29	44.391559°, -79.717256°	3.0	15,000	1.5	-20%	-40%	0%	19,000	4,200
30	44.378555°, -79.710010°	2.0	2,800	1.5	-15%	0%	0%	14,000	3,100
31	44.379632°, -79.709193°	2.0	4,600	1.5	-15%	-10%	0%	17,000	3,700
32	44.380086°, -79.708349°	3.0	3,000	1.5	-15%	-10%	0%	14,000	3,100
33	44.380572°, -79.702216°	2.0	7,500	0.8	10%	0%	20%	20,000	4,400
34	44.390972°, -79.726073°	1.0	5,700	0.8	-15%	-30%	0%	8,000	1,800
35	44.401101°, -79.715323°	1.0	3,900	1.5	-15%	0%	0%	18,000	4,000
36	44.376744°, -79.691232°	2.0	30,000	0.8	15%	-50%	0%	17,000	3,700
37	44.386196°, -79.695382°	2.0	19,000	0.8	-20%	-40%	20%	15,000	3,300
38	44.387901°, -79.694194°	3.0	11,000	0.8	-10%	0%	15%	19,000	4,200
39	44.390101°, -79.691087°	1.0	8,000	0.8	-10%	0%	20%	17,000	3,700
40	44.392001°, -79.691171°	7.0	9,100	0.8	-15%	-10%	15%	15,000	3,300
41	44.389654°, -79.684660°	13.0	14,000	0.8	-15%	-30%	35%	19,000	4,200
42	44.391641°, -79.677604°	4.0	3,160	1.5	-15%	0%	10%	18,000	4,000
43	44.390895°, -79.678165°	13.0	12,350	0.8	-15%	-10%	5%	16,000	3,500
44	44.390469°, -79.678839°	6.0	4,800	0.8	-15%	0%	20%	12,000	2,600
45	44.390841°, -79.679210°	8.0	4,560	0.8	-15%	0%	10%	11,000	2,400
46	44.389611°, -79.678499°	3.0	3,600	0.8	-15%	0%	30%	12,000	2,600
47	44.391755°, -79.674948°	4.0	4,800	0.8	-10%	0%	15%	12,000	2,600
48	44.391351°, -79.683854°	15.0	12,750	0.8	-15%	0%	10%	19,000	4,200
49	44.391882°, -79.683960°	2.0	12,400	0.8	-20%	-30%	15%	14,000	3,100
50	44.390733°, -79.686581°	9.0	9,900	0.8	-20%	-30%	25%	14,000	3,100
51	44.389179°, -79.686096°	2.0	4,800	1.5	-10%	0%	25%	26,000	5,700
52	44.389477°, -79.686616°	2.0	7,200	1.5	-10%	0%	15%	29,000	6,400
53	44.389114°, -79.688981°	2.0	5,600	1.5	-10%	0%	10%	25,000	5,500
54	44.388432°, -79.689775°	10.0	10,400	0.8	-15%	-30%	20%	14,000	3,100
55	44.388221°, -79.690144°	13.0	23,400	0.8	-15%	-30%	20%	21,000	4,600
56	44.391295°, -79.698064°	5.0	25,000	0.8	-15%	-30%	0%	17,000	3,700



57	44.391234°, -79.699267°	4.0	3,200	1	-15%	0%	5%	11,000	2,400
58	44.392641°, -79.693308°	5.0	7,500	0.8	-15%	0%	20%	15,000	3,300
59	44.393087°, -79.692847°	6.0	3,240	0.8	-10%	0%	25%	11,000	2,400
60	44.396719°, -79.698691°	2.0	7,600	0.8	-15%	-20%	0%	10,000	2,200
61	44.388491°, -79.704083°	8.0	8,800	0.8	-15%	0%	15%	17,000	3,700
62	44.388140°, -79.705128°	6.0	5,640	0.8	-15%	0%	20%	13,000	2,900
63	44.387740°, -79.702777°	1.0	2,600	1.5	-15%	0%	20%	17,000	3,700
64	44.386366°, -79.704751°	1.0	6,300	0.8	-10%	0%	0%	13,000	2,900
65	44.388345°, -79.709169°	11.0	19,800	0.8	-15%	-10%	0%	19,000	4,200
66	44.387710°, -79.709981°	5.0	3,300	0.8	-15%	0%	10%	9,000	2,000
67	44.387005°, -79.710129°	3.0	3,300	1.5	-15%	0%	10%	18,000	4,000
68	44.369883°, -79.703318°	1.0	15,500	0.8	10%	-25%	0%	18,000	4,000
69	44.371510°, -79.697246°	3.0	3,900	1.5	-15%	0%	0%	18,000	4,000
70	44.372532°, -79.694137°	2.0	6,400	0.8	0%	0%	0%	14,000	3,100
71	44.373428°, -79.700000°	1.0	9,600	0.8	0%	0%	0%	17,000	3,700
72	44.372149°, -79.714154°	2.0	9,600	0.8	10%	-40%	0%	11,000	2,400
73	44.376682°, -79.712632°	2.0	10,200	0.8	0%	-30%	0%	13,000	2,900
74	44.380569°, -79.721397°	2.0	12,200	0.8	0%	0%	0%	19,000	4,200
75	44.376121°, -79.718151°	2.0	4,000	0.8	10%	0%	20%	15,000	3,300
76	44.379472°, -79.714596°	1.0	3,800	0.8	0%	0%	15%	13,000	2,900
77	44.381872°, -79.711374°	1.0	7,500	0.8	-10%	0%	10%	15,000	3,300

Fire Station 1

5th Highest 4,800
Peak RFF 6,400



RFF #	Address	Number of Storeys	Effective Total Area (sq. m)	Occupancy Coeff	Occupancy Charge	Sprinkler Protection Reduction	Exposure Charge	Flow (LPM)	Flow (IGPM)
1	44.412687°,-79.708648°	1.0	64,000	0.8	-20%	-40%	0%	22,000	4,800
2	44.411182°,-79.676502°	3.0	8,100	1.5	-20%	0%	15%	28,000	6,200
3	44.411312°,-79.675254°	4.0	3,200	1.5	-20%	0%	12%	17,000	3,700
4	44.411591°,-79.675676°	4.0	3,200	1.5	-20%	0%	24%	19,000	4,200
5	44.411858°,-79.676111°	4.0	3,200	1.5	-20%	0%	12%	17,000	3,700
6	44.410022°,-79.674227°	9.0	8,730	0.8	-15%	-10%	10%	14,000	3,100
7	44.409689°,-79.674678°	8.0	10,400	0.8	-15%	-10%	5%	15,000	3,300
8	44.411572°,-79.677767°	4.0	6,800	1.5	-15%	0%	5%	24,000	5,300
9	44.411843°,-79.677120°	4.0	6,800	1.5	-15%	0%	5%	24,000	5,300
10	44.395706°,-79.656251°	9.0	16,200	0.8	-15%	-10%	0%	17,000	3,700
11	44.396831°,-79.656301°	6.0	7,200	0.8	-15%	0%	0%	13,000	2,900
13	44.399774°,-79.652038°	7.0	6,160	0.8	-15%	0%	0%	12,000	2,600
14	44.410189°,-79.676286°	1.0	2,700	0.8	-10%	0%	5%	9,000	2,000
15	44.409236°,-79.680494°	1.0	7,000	0.8	-10%	0%	0%	14,000	3,100
16	44.409236°,-79.680494°	1.0	5,200	0.8	0%	0%	10%	14,000	3,100
17	44.408393°,-79.682159°	1.0	3,300	0.8	-10%	0%	5%	9,000	2,000
18	44.408948°,-79.682882°	1.0	3,200	0.8	-10%	0%	5%	9,000	2,000
19	44.409126°,-79.684885°	1.0	4,000	0.8	0%	0%	0%	11,000	2,400
20	44.406868°,-79.686625°	1.0	17,000	0.8	-10%	-40%	0%	12,000	2,600
21	44.397940°,-79.655898°	2.0	4,000	1.5	-20%	0%	10%	18,000	4,000
22	44.395907°,-79.658917°	3.0	4,200	1	-20%	0%	10%	12,000	2,600
23	44.410777°,-79.679055°	2.0	2,200	1.5	-20%	0%	20%	14,000	3,100
24	44.400832°,-79.650647°	3.0	1,620	1	-20%	0%	10%	8,000	1,800
25	44.405012°,-79.648564°	1.0	1,100	1.5	-10%	0%	0%	10,000	2,200
26	44.409394°,-79.647540°	3.0	3,600	1.5	-20%	0%	0%	16,000	3,500
27	44.410793°,-79.667977°	2.0	12,500	0.8	-20%	-40%	10%	11,000	2,400
28	44.411434°,-79.669436°	2.0	22,000	0.8	-20%	-40%	25%	18,000	4,000
29	44.412291°,-79.668042°	2.0	10,000	0.8	-20%	-40%	15%	11,000	2,400
30	44.414284°,-79.660900°	4.0	68,000	0.8	-20%	-50%	0%	18,000	4,000
31	44.414543°,-79.658799°	3.0	14,100	0.8	-20%	-40%	0%	10,000	2,200
32	44.405344°,-79.661890°	2.0	22,000	0.8	-20%	-40%	0%	12,000	2,600
33	44.394253°,-79.662737°	3.0	4,200	0.8	-15%	0%	10%	10,000	2,200
34	44.394253°,-79.662737°	4.0	5,400	0.8	-15%	0%	10%	12,000	2,600
35	44.393987°,-79.676993°	4.0	4,200	0.8	-20%	0%	10%	10,000	2,200
36	44.397029°,-79.674596°	1.0	2,600	0.8	-15%	-30%	0%	5,000	1,100
37	44.403074°,-79.671425°	1.0	4,260	0.8	-15%	-30%	0%	7,000	1,500
38	44.407629°,-79.672992°	1.0	2,527	1	-10%	0%	0%	10,000	2,200
39	44.408858°,-79.673128°	6.0	5,520	0.8	-10%	0%	10%	13,000	2,900
40	44.411623°,-79.686480°	1.0	6,300	0.8	-10%	-20%	0%	10,000	2,200
41	44.410675°,-79.686396°	2.0	4,300	0.8	-20%	-30%	0%	7,000	1,500
42	44.411199°,-79.684866°	2.0	6,200	0.8	-20%	-50%	0%	6,000	1,300
43	44.412826°,-79.683998°	2.0	16,800	0.8	-20%	-40%	0%	11,000	2,400
44	44.415002°,-79.703819°	2.0	22,600	0.8	-20%	-50%	0%	10,000	2,200
45	44.416031°,-79.702349°	2.0	5,200	0.8	-20%	-50%	0%	5,000	1,100
46	44.406220°,-79.706262°	2.0	32,000	0.8	-20%	-40%	0%	15,000	3,300
47	44.408097°,-79.707566°	4.0	9,200	0.8	-15%	0%	0%	14,000	3,100
48	44.404190°,-79.706943°	16.0	17,600	0.8	-15%	-20%	0%	16,000	3,500
49	44.405075°,-79.707373°	10.0	9,500	0.8	-15%	-10%	0%	13,000	2,900
50	44.400445°,-79.703079°	1.0	40,845	0.8	-15%	-40%	0%	18,000	4,000
51	44.400038°,-79.705201°	13.0	14,040	0.8	-10%	-15%	0%	16,000	3,500
52	44.407956°,-79.709991°	6.0	9,600	0.8	-15%	-10%	0%	13,000	2,900
53	44.409888°,-79.711145°	2.0	25,600	0.8	-10%	-40%	5%	16,000	3,500
54	44.411478°,-79.712871°	2.0	23,800	0.8	-20%	-40%	0%	13,000	2,900
55	44.409642°,-79.705598°	1.0	11,500	0.8	-10%	0%	0%	17,000	3,700
56	44.405330°,-79.689200°	2.0	13,000	0.8	-5%	0%	0%	19,000	4,200
57	44.399722°,-79.699760°	2.0	5,200	1.5	-15%	-20%	0%	16,000	3,500



58	44.397122°, -79.696099°	4.0	3,600	1	-15%	0%	0%	11,000	2,400
59	44.402974°, -79.716611°	3.0	8,445	1	-15%	-20%	0%	14,000	3,100
60	44.402663°, -79.665968°	1.0	4,200	0.8	-20%	-30%	0%	6,000	1,300
78	44.403549°, -79.683479°	4.0	2,740	1	-15%	0%	25%	13,000	2,900
79	44.404923°, -79.694628°	1.0	1,500	1.5	-10%	0%	5%	12,000	2,600
80	44.400383°, -79.689404°	2.0	14,900	0.8	-20%	-30%	0%	12,000	2,600

Fire Station 2

5th Highest
Peak RFF
4,200
6,200

Fire Underwriters Survey



RFF #	Address	Number of Storeys	Effective Total Area (sq. m)	Coeff	Occupancy Charge	Sprinkler Protection Reduction	Exposure Charge	Flow (LPM)	Flow (IGPM)
1	44.359613°, -79.669787°	1.0	44,000	0.8	0%	-50%	0%	19,000	4,200
2	44.355507°, -79.680130°	2.0	38,000	0.8	0%	-40%	0%	20,000	4,400
3	44.353244°, -79.685265°	1.0	28,500	0.8	0%	-40%	0%	18,000	4,000
4	44.348898°, -79.666871°	2.0	17,200	0.8	-10%	-30%	10%	17,000	3,700
5	44.348272°, -79.668651°	1.0	8,200	0.8	0%	0%	10%	18,000	4,000
6	44.353297°, -79.672990°	2.0	37,600	0.8	10%	-50%	0%	19,000	4,200
7	44.359341°, -79.685284°	2.0	21,600	0.8	-20%	-40%	0%	12,000	2,600
8	44.361147°, -79.683952°	1.0	8,600	0.8	-20%	-40%	0%	8,000	1,800
9	44.358867°, -79.683660°	2.0	22,000	0.8	-10%	-20%	10%	21,000	4,600
10	44.358191°, -79.683441°	1.0	8,300	0.8	10%	0%	10%	19,000	4,200
11	44.357476°, -79.683416°	1.0	10,100	0.8	0%	-20%	10%	16,000	3,500
12	44.356101°, -79.685056°	2.0	14,400	0.8	0%	-20%	15%	20,000	4,400
13	44.372446°, -79.669437°	3.0	2,700	0.8	-15%	0%	0%	8,000	1,800
14	44.373539°, -79.669639°	3.0	2,010	1.5	-15%	0%	30%	17,000	3,700
15	44.371552°, -79.671619°	1.0	6,400	0.8	-10%	0%	0%	13,000	2,900
16	44.368847°, -79.655285°	4.0	11,600	1.5	-15%	-30%	0%	21,000	4,600
17	44.369763°, -79.654800°	3.0	7,800	1.5	-15%	-30%	0%	17,000	3,700
18	44.369333°, -79.668587°	2.0	9,000	0.8	-15%	0%	0%	14,000	3,100
19	44.355422°, -79.648766°	2.0	16,200	0.8	-15%	-20%	0%	15,000	3,300
20	44.353386°, -79.644077°	5.0	25,000	0.8	-15%	-30%	0%	17,000	3,700
21	44.354686°, -79.639820°	2.0	19,000	0.8	-20%	-40%	0%	12,000	2,600
22	44.370112°, -79.657369°	3.0	7,800	1.5	-20%	-40%	0%	14,000	3,100
23	44.334687°, -79.679567°	2.0	22,000	0.8	0%	-40%	0%	16,000	3,500
24	44.334221°, -79.682142°	2.0	26,000	0.8	-10%	-40%	0%	15,000	3,300
25	44.337639°, -79.677674°	3.0	16,800	0.8	-10%	-40%	0%	12,000	2,600
26	44.330769°, -79.676095°	2.0	10,600	0.8	10%	-20%	20%	20,000	4,400
27	44.337336°, -79.670381°	2.0	11,200	0.8	10%	-20%	15%	20,000	4,400
28	44.337108°, -79.671904°	2.0	9,000	0.8	10%	0%	10%	21,000	4,600
29	44.332849°, -79.672026°	2.0	12,800	0.8	10%	-30%	10%	18,000	4,000
30	44.349622°, -79.669293°	2.0	16,000	0.8	0%	0%	0%	22,000	4,800
31	44.343559°, -79.650342°	2.0	1,200	1.5	-20%	0%	30%	11,000	2,400
32	44.349744°, -79.633581°	3.0	750	1.5	-20%	0%	20%	9,000	2,000
33	44.348397°, -79.626197°	1.0	850	1.5	-10%	0%	0%	9,000	2,000
34	44.356367°, -79.644613°	1.0	2,800	0.8	-10%	0%	10%	9,000	2,000
35	44.370256°, -79.674097°	2.0	1,700	0.8	-10%	0%	5%	7,000	1,500

Fire Station 3

5th Highest 4,400
Peak RFF 4,800

Fire Underwriters Survey



RFF #	Address	Number of Storeys	Effective Total Area (sq. m)	Coeff	Occupancy Charge	Sprinkler Protection Reduction	Exposure Charge	Flow (LPM)	Flow (IGPM)
1	44.368028°, -79.707482°	1.0	13,800	0.8	10%	-40%	0%	14,000	3,100
2	44.366658°, -79.705983°	2.0	12,600	0.8	-10%	-40%	0%	11,000	2,400
3	44.358390°, -79.694895°	2.0	13,200	0.8	-10%	-40%	0%	11,000	2,400
4	44.354286°, -79.691554°	2.0	8,800	0.8	10%	-40%	0%	11,000	2,400
5	44.355392°, -79.695421°	3.0	5,100	1.5	-20%	-30%	0%	13,000	2,900
6	44.356232°, -79.696211°	6.0	10,800	0.8	-20%	-30%	0%	10,000	2,200
7	44.344836°, -79.704291°	2.0	3,000	1.5	-15%	0%	20%	18,000	4,000
8	44.347183°, -79.703238°	1.0	2,100	0.8	-15%	0%	0%	7,000	1,500
9	44.363237°, -79.702562°	2.0	14,000	0.8	0%	-30%	8%	16,000	3,500
10	44.362905°, -79.701563°	1.0	5,800	0.8	0%	-20%	20%	13,000	2,900
11	44.356422°, -79.723450°	2.0	5,800	0.8	-20%	-40%	0%	6,000	1,300
12	44.349206°, -79.732822°	2.0	16,000	0.8	-20%	-40%	0%	11,000	2,400
13	44.352126°, -79.700104°	3.0	3,600	1.5	-15%	0%	0%	17,000	3,700
14	44.352585°, -79.700619°	3.0	2,240	1.5	-15%	0%	12%	15,000	3,300
15	44.350721°, -79.702798°	3.0	3,300	1.5	-15%	0%	5%	17,000	3,700
16	44.354576°, -79.699768°	3.0	3,600	1.5	-15%	0%	10%	19,000	4,200
17	44.355205°, -79.700060°	3.0	3,600	1.5	-15%	0%	25%	21,000	4,600
18	44.353965°, -79.713296°	3.0	1,950	1.5	-15%	0%	35%	17,000	3,700
19	44.353605°, -79.713104°	3.0	1,950	1.5	-15%	0%	35%	17,000	3,700
20	44.354285°, -79.713376°	3.0	1,950	1.5	-15%	0%	35%	17,000	3,700
21	44.358095°, -79.716182°	2.0	6,600	1.5	-20%	-40%	0%	13,000	2,900
22	44.357475°, -79.701764°	2.0	2,600	1.5	-10%	0%	0%	15,000	3,300
23	44.365190°, -79.702988°	2.0	8,000	0.8	0%	-30%	10%	13,000	2,900
24	44.364317°, -79.703912°	2.0	5,000	0.8	0%	0%	15%	14,000	3,100
25	44.360328°, -79.699404°	1.0	3,700	0.8	0%	0%	20%	13,000	2,900
26	44.369435°, -79.707606°	1.0	3,400	0.8	0%	0%	10%	11,000	2,400
27	44.361313°, -79.693517°	5.0	10,200	0.8	-15%	-30%	0%	11,000	2,400
28	44.365139°, -79.695930°	3.0	7,500	1.5	-15%	-20%	0%	20,000	4,400

Fire Station 4

5th Highest 3,700
Peak RFF 4,600

Fire Underwriters Survey



RFF #	Address	Number of Storeys	Effective Total Area (sq. m)	Coeff	Occupancy Charge	Sprinkler Protection Reduction	Exposure Charge	Flow (LPM)	Flow (IGPM)
1	44.334480°, -79.697514°	3.0	51,300	0.8	0%	-50%	0%	20,000	4,400
2	44.335968°, -79.701115°	2.0	38,800	0.8	0%	-50%	0%	18,000	4,000
3	44.334966°, -79.705611°	3.0	58,500	0.8	0%	-50%	0%	22,000	4,800
4	44.337283°, -79.694992°	2.0	24,000	0.8	0%	-40%	10%	19,000	4,200
5	44.337192°, -79.697463°	2.0	7,400	0.8	0%	-40%	25%	13,000	2,900
6	44.338151°, -79.698365°	2.0	8,800	0.8	0%	-40%	10%	12,000	2,600
7	44.332318°, -79.692493°	2.0	18,800	0.8	-10%	-40%	0%	13,000	2,900
8	44.332496°, -79.686461°	2.0	23,000	0.8	-10%	-40%	20%	19,000	4,200
9	44.329183°, -79.686836°	1.0	4,300	0.8	-10%	0%	20%	13,000	2,900
10	44.323784°, -79.684439°	3.0	13,050	0.8	-15%	-40%	0%	10,000	2,200
11	44.325298°, -79.706384°	2.0	13,000	0.8	0%	-40%	0%	12,000	2,600
12	44.326385°, -79.726777°	3.0	4,500	1.5	-20%	0%	10%	19,000	4,200
13	44.331849°, -79.733459°	2.0	24,000	0.8	-20%	-40%	0%	13,000	2,900
14	44.339439°, -79.717076°	2.0	22,000	0.8	-10%	-40%	0%	14,000	3,100
15	44.339892°, -79.687322°	2.0	20,800	0.8	-10%	-40%	10%	16,000	3,500
16	44.338994°, -79.690224°	1.0	8,300	0.8	-10%	-20%	5%	12,000	2,600
17	44.335934°, -79.689813°	4.0	4,400	1.5	-20%	-20%	0%	14,000	3,100
18	44.335592°, -79.691215°	2.0	7,800	0.8	-5%	-30%	0%	11,000	2,400
19	44.337186°, -79.689940°	1.0	3,200	0.8	-10%	0%	10%	10,000	2,200
20	44.332029°, -79.690283°	4.0	4,000	1.5	-20%	-30%	10%	13,000	2,900
21	44.324531°, -79.686567°	1.0	3,000	0.8	-10%	0%	10%	10,000	2,200
22	44.324166°, -79.688993°	2.0	6,600	0.8	-15%	0%	10%	13,000	2,900
23	44.323280°, -79.691698°	2.0	7,400	0.8	-15%	0%	10%	14,000	3,100
24	44.322609°, -79.694310°	2.0	12,800	0.8	-15%	0%	5%	18,000	4,000
25	44.328306°, -79.685757°	2.0	6,000	0.8	-10%	0%	20%	15,000	3,300
26	44.342588°, -79.707267°	4.0	11,200	1.5	-10%	-40%	0%	19,000	4,200
27	44.342199°, -79.708532°	3.0	8,400	0.8	-10%	-20%	20%	14,000	3,100
28	44.338674°, -79.702088°	2.0	1,300	1.5	-15%	0%	45%	15,000	3,300
29	44.339035°, -79.701686°	3.0	1,260	1.5	-15%	0%	55%	16,000	3,500
30	44.338186°, -79.720131°	2.0	920	1.5	-15%	0%	40%	12,000	2,600

Fire Station 5

5th Highest 4,200
Peak RFF 4,800



Appendix D – Fire Insurance Grading Recognition of Used or Rebuilt Fire Apparatus



TECHNICAL BULLETIN

FIRE UNDERWRITERS SURVEY™

A Service to Insurers and Municipalities

INSURANCE GRADING RECOGNITION OF USED OR REBUILT FIRE APPARATUS

The performance ability and overall acceptability of older apparatus has been debated between municipal administrations, the public fire service and many others for years. Fire Underwriters Survey (FUS) has reviewed experiences across Canada and in other countries and has developed a standard for acceptance of apparatus as the apparatus becomes less reliable with age and use.

The public fire service is unique compared to other emergency services in that fire apparatus vehicles are not continuously in use. However, when in use, the apparatus is subject to considerable mechanical stress due to the nature of its function. This stress does not normally manifest itself on the exterior of the equipment. It is effectively masked in most departments by a higher standard of aesthetic care and maintenance. Lack of replacement parts further complicates long term use of apparatus. Truck and pump manufacturers maintain a parts inventory for each model year for a finite time. After that period, obtaining necessary parts may be difficult. This parts shortage is particularly acute with fire apparatus due to the narrow market for these devices.

Fire Underwriters Survey lengthy experience in evaluating fire apparatus indicates that apparatus should be designed to an acceptable standard. The standard that is accepted throughout Canada by Fire Underwriters Survey is the Underwriters' Laboratories of Canada (ULC) Standard S515 (most updated version) titled, "Automobile Fire Fighting Apparatus," which was adopted as a National Standard of Canada in September 2004. Alternatively, NFPA 1901, the Standard for Automotive Fire Apparatus (most updated version) is also accepted by Fire Underwriters Survey with respect to apparatus design. Fire apparatus should be built by recognized manufacturers and tested by a suitably accredited third party.

Fire apparatus should respond to first alarms for the first fifteen years of service. During this period it has reasonably been shown that apparatus effectively responds and performs as designed without failure at least 95% of the time. For the next five years, it should be held in reserve status for use at major fires or used as a temporary replacement for out-of-service first line apparatus. Apparatus should be retired from service at twenty years of age. Present practice indicates the recommended service periods and protocols are usually followed by the first purchaser. However, at the end of that period, the apparatus is either traded in on new apparatus or sold to another fire department. At this juncture, the unit may have one or more faults which preclude effective use for emergency service. These deficiencies include:

- a. Inadequate braking system
- b. Slow pick-up and acceleration



- c. Structurally weakened chassis due to constant load bearing and/or overloading
- d. Pump wear

FUS has modified its application of the age requirement for used or rebuilt apparatus. Due to municipal budget constraints within small communities we have continued to recognize apparatus over twenty years of age, provided the truck successfully meets the recommended annual tests and has been deemed to be in excellent mechanical condition. The specified service tests are outlined below under the heading "Recommended Service Tests for Used or Modified Fire Apparatus". Testing and apparatus maintenance should only be completed by a technician who is certified to an appropriate level in accordance with NFPA 1071, *Standard for Emergency Vehicle Technician Professional Qualifications*.

Insurance grading recognition may be extended for a limited period of time if we receive documentation verifying that the apparatus has successfully passed the specified tests. If the apparatus does not pass the required tests or experiences long periods of "downtime" we may request the municipal authority to replace the equipment with new or newer apparatus. If replacement does not occur, fire insurance grading recognition may be revoked for the specific apparatus which may adversely affect the fire insurance grades of the community. This can also affect the rates of insurance for property owners throughout the community.

Table 1 Service Schedule for Fire Apparatus For Fire Insurance Grading Purposes

Apparatus Age	Major Cities ³	Medium Sized Cities ⁴	Small Communities ⁵ and Rural Centres
0 – 15 Years	First Line Duty	First Line Duty	First Line Duty
16 – 20 Years	Reserve	2 nd Line Duty	First Line Duty
20 – 25 Years ¹	No Credit in Grading	No Credit in Grading or Reserve ²	No Credit in Grading or 2 nd Line Duty ²
26 – 29 Years ¹	No Credit in Grading	No Credit in Grading or Reserve ²	No Credit in Grading or Reserve ²
30 Years +	No Credit in Grading	No Credit in Grading	No Credit in Grading

¹ All listed fire apparatus 20 years of age and older are required to be service tested by recognized testing agency on an annual basis to be eligible for grading recognition. (NFPA 1071)

² Exceptions to age status may be considered in a small to medium sized communities and rural centres conditionally, when apparatus condition is acceptable and apparatus successfully passes required testing.

³ Major Cities are defined as an incorporated or unincorporated community that has:

- a populated area (or multiple areas) with a density of at least 400 people per square kilometre; AND
- a total population of 100,000 or greater.

⁴ Medium Communities are defined as an incorporated or unincorporated community that has:

- a populated area (or multiple areas) with a density of at least 200 people per square kilometre; AND/OR
- a total population of 1,000 or greater.

⁵ Small Communities are defined as an incorporated or unincorporated community that has:

- no populated areas with densities that exceed 200 people per square kilometre; AND
- does not have a total population in excess of 1,000.



Table 2 Frequency of Listed Fire Apparatus Acceptance and Service Tests

	Frequency of Test					
	@ Time of Purchase New or Used	Annual Basis	@ 15 Years	@ 20 Years See Note 4	20 to 25 Years (annually)	After Extensive Repairs See Note 5
Recommended For Fire Insurance Purposes	Acceptance Test if new; Service Test if used & < 20 Years	Service Test	Acceptance Test	Acceptance Test	Acceptance Test	Acceptance or Service Test depending on extent of repair
Required For Fire Insurance Purposes	Acceptance Test if new; Service Test if used & < 20 Years	No Test Required	No Test Required	Acceptance Test	Acceptance Test	Acceptance or Service Test depending on extent of repair
Factor in FUS Grading	Yes	Yes	Yes	Yes	Yes	Yes
Required By Listing Agency	Acceptance Test	No	No	No	N/A	Acceptance Test
Required By NFPA See Note 6	Acceptance Test	Annual Service Test	Annual Service Test	Annual Service Test	Annual Service Test	Service Test

Note 1: See: 'Service Tests for Used or Rebuilt Fire Apparatus' for description of applicable tests

Note 2: Acceptance Tests consist of 60 minute capacity and 30 minute pressure tests

Note 3: Service Tests consist of 20 minute capacity test and 10 minute pressure test in addition to other listed tests

Note 4: Apparatus exceeding 20 years of age may not be considered to be eligible for insurance grading purposes regardless of testing. Application must be made in writing to Fire Underwriters Survey for an extension of the grade-able life of the apparatus.

Note 5: Testing after extensive repairs should occur regardless of apparatus age within reason.

Note 6: Acceptance Tests: See NFPA 1901, Standard for Automotive Fire Apparatus

Service Tests: See NFPA 1911, Standard for Service Tests of Fire Pump Systems on Fire Apparatus, Article 5.1



SERVICE TESTS FOR USED OR MODIFIED FIRE APPARATUS

The intent of this document is to ensure that all used or modified fire apparatus, equipped with a pump or used for tanker service, essentially meet the requirements of Underwriters' Laboratories of Canada (ULC) "Standard for Automobile Fire Fighting Apparatus" S515-04 or subsequent (current) editions of the Standard. Full adherence with the following specified tests is recommended when purchasing used apparatus.

Weight Tests

Load Balance Test:

When fully laden (including a 460kg (1000 lbs) personnel weight, full fuel and water tanks, specified load of hose and miscellaneous equipment), the vehicle shall have a load balance of 22% to 50% of total vehicle mass on the front axle and 50% to 78% of this mass on the rear axle.

Distribution of mass of 33% and 67% respectively on the front and rear axles is preferable for a vehicle having dual rear tires or tandem rear axles.

For a vehicle having tandem rear axles and dual tires on each axle, a loading of between 18% and 25% on the front axle with the balance of mass on the rear axles is permissible.

Road Tests

Acceleration Tests:

2.1.1) From a standing start, the apparatus shall attain a true speed of 55 km/h (35 mph) within 25 seconds for Pumpers carrying up to 3,150 litres (700 gallons) of water.

For apparatus carrying in excess of 3,150 litres (700 gallons) or apparatus equipped with aerial ladders or elevating platforms, a true speed of 55 km/h (35 mph) in 30 seconds should be attained.

2.1.2) The vehicle should attain a top speed of at least 80 km/h (50mph).

Braking Test:

The service brakes shall be capable of bringing the fully laden apparatus to a complete stop from an initial speed of 30 km/h (20 mph) in a distance not exceeding 9 metres (30 feet) by actual measurement. The test should be conducted on a dry, hard surfaced road that is free of loose material, oil and grease.



Pump Performance Tests

Hydrostatic Test

Recent evidence of hydrostatic testing of the pump for 10 minutes at a minimum pressure of 3,400 kPa (500 psi). APPLICABLE TO NEW OR REBUILT PUMPS ONLY (see 3.3).

Priming and Suction Capability Tests

Vacuum Test:

The pump priming device, with a capped suction at least 6 metres (20 feet) long, shall develop -75 kPa (22 inches of mercury) at altitudes up to 300 metres (1000 feet) and hold the vacuum with a drop of not in excess of 34 kPa (10 inches of mercury) in 10 minutes.

For every 300 metres (1000 feet) of elevation, the required vacuum shall be reduced 3.4 kPa (1 inch mercury).

The primer shall not be used after the 10-minute test period has been started. The test shall be made with discharge outlets uncapped.

Suction Capability Test:

The pump (in parallel or series) when dry, shall be capable of taking suction and discharging water with a lift of not more than 3 metres (10 feet) through 6 metres (20 feet) of suction hose of appropriate size, in not more than 30 seconds and not over 45 seconds for 6000 L/min (1320 lpm) or larger capacity pumps. Where front or rear suction is provided on midship pumps, an additional 10 seconds priming time will be allowed. The test shall be conducted with all discharge caps removed.

Pump Performance

Capacity Test:

Consists of drafting water (preferably with a 10 feet lift) and pumping the rated capacity at 1000 kPa (150 psi) net pump pressure for a continuous period of at least 1 hour.

Pressure Test:

Under the same conditions as in 3.3.1 above pumping 50% of the rated capacity at 1700 kPa (250 psi) net pump pressure for at least ½ hour



For additional information on the above noted tests and test procedures, the following documents provide useful data:

- Underwriters Laboratories of Canada (ULC) publication titled S515 Standard for Automobile Fire Fighting Apparatus, latest edition.
- Fire Underwriters Survey (FUS) publication titled Fire Stream Tables and Testing Data latest edition.
- International Fire Service Training Association (IFSTA) publication titled Fire Department Pumping Apparatus, latest edition.
- National Fire Protection Association (NFPA) 1901 Standard for Automotive Fire Apparatus, latest edition.
- National Fire Protection Association (NFPA) 1911 Standard for the Inspection, Maintenance, Testing, and Retirement of In-Service Automotive Fire Apparatus, latest edition.
- National Fire Protection Association (NFPA) 1912 Standard for Fire Apparatus Refurbishing, latest edition.

For further information regarding the acceptability of emergency apparatus for fire insurance grading purposes, please contact:

Western Canada	Quebec	Ontario	Atlantic Canada
Risk Management Services Fire Underwriters Survey 3999 Henning Drive Burnaby, BC V5C 6P9 1-800-665-5661	Risk Management Services Fire Underwriters Survey 1611 Cremazie Blvd. East Montreal, Quebec H2M 2P2 1-800-263-5361	Risk Management Services Fire Underwriters Survey 150 Commerce Valley Drive, West Markham, Ontario L3T 7Z3 1-800- 268-8080	Risk Management Services Fire Underwriters Survey 238 Brownlow Avenue, Suite 300 Dartmouth, Nova Scotia B3B 1Y2 1-800-639-4528





Appendix E – Fire Underwriters Survey Ladder Requirement

TECHNICAL BULLETIN

FIRE UNDERWRITERS SURVEY™

A Service to Insurers and Municipalities

LADDERS AND AERIALS: WHEN ARE THEY REQUIRED OR NEEDED?

Numerous standards are used to determine the need for aerial apparatus and ladder equipment within communities. This type of apparatus is typically needed to provide a reasonable level of response within a community when buildings of an increased risk profile (fire) are permitted to be constructed within the community.

Please find the following information regarding the requirements for aerial apparatus/ladder companies from the Fire Underwriters Survey Classification Standard For Public Fire Protection.

Fire Underwriters Survey

Ladder/Service company operations are normally intended to provide primary property protection operations of

- 1.) Forcible entry;
- 2.) Utility shut-off;
- 3.) Ladder placement;
- 4.) Ventilation;
- 5.) Salvage and Overhaul;
- 6.) Lighting.

Response areas with 5 buildings that are 3 stories or 10.7 metres (35 feet) or more in height, or districts that have a Basic Fire Flow greater than 15,000 LPM (3,300 IGPM), or any combination of these criteria, should have a ladder company. The height of all buildings in the community, including those protected by automatic sprinklers, is considered when determining the number of needed ladder companies.

When no individual response area/district alone needs a ladder company, at least one ladder company is needed if the sum of buildings in the fire protection area meets the above criteria.”

The needed length of an aerial ladder, an elevating platform and an elevating stream device shall be determined by the height of the tallest building in the ladder/service district (fire protection area) used to determine the need for a ladder company. One storey normally equals at least 3 metres (10 feet). Building setback is not to be considered in the height determination. An allowance is built into the ladder design for normal access. The maximum height needed for grading purposes shall be 30.5 metres (100 feet).



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Exception: When the height of the tallest building is 15.2 metres (50 feet) or less no credit shall be given for an aerial ladder, elevating platform or elevating stream device that has a length less than 15.2 metres (50 feet). This provision is necessary to ensure that the water stream from an elevating stream device has additional "reach" for large area, low height buildings, and the aerial ladder or elevating platform may be extended to compensate for possible topographical conditions that may exist. See Fire Underwriters Survey - Table of Effective Response (attached).

Furthermore, please find the following information regarding communities' need for aerial apparatus/ladder companies within the National Fire Protection Association.

NFPA

Response Capabilities: The fire department should be prepared to provide the necessary response of apparatus, equipment and staffing to control the anticipated routine fire load for its community.

NFPA Fire Protection Handbook, 20th Edition cites the following apparatus response for each designated condition:

HIGH-HAZARD OCCUPANCIES (schools, hospitals, nursing homes, explosive plants, refineries, high-rise buildings, and other high-risk or large fire potential occupancies):

*At least four pumpers, **two ladder trucks** (or combination apparatus with equivalent capabilities), two chief officers, and other specialized apparatus as may be needed to cope with the combustible involved; not fewer than 24 firefighters and two chief officers.*

MEDIUM-HAZARD OCCUPANCIES (apartments, offices, mercantile and industrial occupancies not normally requiring extensive rescue or firefighting forces):

*At least three pumpers, **one ladder truck** (or combination apparatus with equivalent capabilities), one chief officer, and other specialized apparatus as may be needed or available; not fewer than 16 firefighters and one chief officer.*

LOW-HAZARD OCCUPANCIES (one-, two-, or three-family dwellings and scattered small businesses and industrial occupancies):

*At least two pumpers, **one ladder truck** (or combination apparatus with equivalent capabilities), one chief officer, and other specialized apparatus as may be needed or available; not fewer than 12 firefighters and one chief officer.*



In addition to the previous references, the following excerpt from the 2006 BC Building Code is also important to consider when selecting the appropriate level of fire department response capacity and building design requirements with regard to built-in protection levels (passive and active fire protection systems).

Excerpt: National Building Code 2006

A-3 Application of Part 3.

In applying the requirements of this Part, it is intended that they be applied with discretion to buildings of unusual configuration that do not clearly conform to the specific requirements, or to buildings in which processes are carried out which make compliance with particular requirements in this Part impracticable. The definition of "building" as it applies to this Code is general and encompasses most structures, including those which would not normally be considered as buildings in the layman's sense. This occurs more often in industrial uses, particularly those involving manufacturing facilities and equipment that require specialized design that may make it impracticable to follow the specific requirements of this Part. Steel mills, aluminum plants, refining, power generation and liquid storage facilities are examples. A water tank or an oil refinery, for example, has no floor area, so it is obvious that requirements for exits from floor areas would not apply. Requirements for structural fire protection in large steel mills and pulp and paper mills, particularly in certain portions, may not be practicable to achieve in terms of the construction normally used and the operations for which the space is to be used. In other portions of the same building, however, it may be quite reasonable to require that the provisions of this Part be applied (e.g., the office portions). Similarly, areas of industrial occupancy which may be occupied only periodically by service staff, such as equipment penthouses, normally would not need to have the same type of exit facility as floor areas occupied on a continuing basis. It is expected that judgment will be exercised in evaluating the application of a requirement in those cases when extenuating circumstances require special consideration, provided the occupants' safety is not endangered.

The provisions in this Part for fire protection features installed in buildings are intended to provide a minimum acceptable level of public safety. It is intended that all fire protection features of a building, whether required or not, will be designed in conformance with good fire protection engineering practice and will meet the appropriate installation requirements in relevant standards. Good design is necessary to ensure that the level of public safety established by the Code requirements will not be reduced by a voluntary installation.

Firefighting Assumptions

The requirements of this Part are based on the assumption that firefighting capabilities are available in the event of a fire emergency. These firefighting capabilities may take the form of a paid or volunteer public fire department or in some cases a private fire brigade. If these firefighting capabilities are not available, additional fire safety measures may be required.



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Firefighting capability can vary from municipality to municipality. Generally, larger municipalities have greater firefighting capability than smaller ones. Similarly, older, well established municipalities may have better firefighting facilities than newly formed or rapidly growing ones. The level of municipal fire protection considered to be adequate will normally depend on both the size of the municipality (i.e., the number of buildings to be protected) and the size of buildings within that municipality. Since larger buildings tend to be located in larger municipalities, they are generally, but not always, favoured with a higher level of municipal protection.

Although it is reasonable to consider that some level of municipal firefighting capability was assumed in developing the fire safety provisions in Part 3, this was not done on a consistent or defined basis. The requirements in the Code, while developed in the light of commonly prevailing municipal fire protection levels, do not attempt to relate the size of building to the level of municipal protection. **The responsibility for controlling the maximum size of building to be permitted in a municipality in relation to local firefighting capability rests with the municipality. If a proposed building is too large, either in terms of floor area or building height, to receive reasonable protection from the municipal fire department, fire protection requirements in addition to those prescribed in this Code, may be necessary to compensate for this deficiency.** Automatic sprinkler protection may be one option to be considered.

Alternatively, the municipality may, in light of its firefighting capability, elect to introduce zoning restrictions to ensure that the maximum building size is related to available municipal fire protection facilities. This is, by necessity, a somewhat arbitrary decision and should be made in consultation with the local firefighting service, who should have an appreciation of their capability to fight fires.

The requirements of Subsection 3.2.3. are intended to prevent fire spread from thermal radiation assuming there is adequate firefighting available. It has been found that periods of from 10 to 30 minutes usually elapse between the outbreak of fire in a building that is not protected with an automatic sprinkler system and the attainment of high radiation levels. During this period, the specified spatial separations should prove adequate to inhibit ignition of an exposed building face or the interior of an adjacent building by radiation. Subsequently, however, reduction of the fire intensity by firefighting and the protective wetting of the exposed building face will often be necessary as supplementary measures to inhibit fire spread.

In the case of a building that is sprinklered throughout, the automatic sprinkler system should control the fire to an extent that radiation to neighbouring buildings should be minimal. Although there will be some radiation effect on a sprinklered building from a fire in a neighbouring building, the internal sprinkler system should control any fires that might be ignited in the building and thereby minimize the possibility of the fire spreading into the exposed building. NFPA 80A, "Protection of Buildings from Exterior Fire Exposures," provides additional information on the possibility of fire spread at building exteriors.

The water supply requirements for fire protection installations depend on the requirements of any automatic sprinkler installations and also on the number of fire streams that may be needed



at any fire, having regard to the length of time the streams will have to be used. Both these factors are largely influenced by the conditions at the building to be equipped, and the quantity and pressure of water needed for the protection of both the interior and exterior of the building must be ascertained before the water supply is decided upon. Acceptable water supplies may be a public waterworks system that has adequate pressure and discharge capacity, automatic fire pumps, pressure tanks, manually controlled fire pumps in combination with pressure tanks, gravity tanks, and manually controlled fire pumps operated by remote control devices at each hose station.

For further information regarding the acceptability of emergency apparatus for fire insurance grading purposes, please contact:

Western Canada	Quebec	Ontario	Atlantic Canada
Risk Management Services Fire Underwriters Survey 3999 Henning Drive Burnaby, BC V5C 6P9 1-800-665-5661	Risk Management Services Fire Underwriters Survey 1611 Crémazie Blvd. East Montreal, Quebec H2M 2P2 1-800-263-5361	Risk Management Services Fire Underwriters Survey 150 Commerce Valley Drive, West Markham, Ontario L3T 7Z3 1-800- 268-8080	Risk Management Services Fire Underwriters Survey 238 Brownlow Avenue, Suite 300 Dartmouth, Nova Scotia B3B 1Y2 1-800-639-4528



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Appendix F – Cost Benefit of Fire Insurance Grading



Property Code	Number of Properties	Assessment Total	Cost Per Year at PFPC 3	Cost Per Year at PFPC 4	Cost Per Year at PFPC 5	PFPC 3/4 Difference	PFPC 4/5 Difference	PFPC 3/5 Difference
370	4230	\$841,248,574	\$712,257	\$745,907	\$799,186	\$33,650	\$53,279	\$86,929
340	101	\$409,127,161	\$425,492	\$445,949	\$486,861	\$20,456	\$40,913	\$61,369
430	99	\$376,118,860	\$2,672,951	\$2,957,548	\$3,160,652	\$284,597	\$203,104	\$487,701
428	3	\$240,432,384	\$515,594	\$560,775	\$620,716	\$45,181	\$59,941	\$105,122
580	107	\$240,334,835	\$356,897	\$385,137	\$409,771	\$28,239	\$24,634	\$52,874
540	180	\$197,737,867	\$990,667	\$1,107,332	\$1,314,957	\$116,665	\$207,625	\$324,290
520	128	\$197,160,553	\$291,798	\$312,171	\$348,317	\$20,373	\$36,146	\$56,519
605	55	\$188,820,000	\$404,914	\$440,396	\$487,470	\$35,482	\$47,074	\$82,556
427	3	\$174,651,575	\$374,531	\$407,351	\$450,892	\$32,820	\$43,542	\$76,362
305	703	\$158,338,790	\$201,090	\$212,174	\$234,341	\$11,084	\$22,167	\$33,251
402	45	\$156,608,571	\$147,212	\$155,042	\$166,005	\$7,830	\$10,963	\$18,793
530	67	\$130,036,328	\$85,824	\$88,425	\$92,326	\$2,601	\$3,901	\$6,502
625	9	\$103,132,500	\$221,162	\$240,542	\$266,254	\$19,380	\$25,712	\$45,092
429	2	\$80,725,250	\$173,111	\$188,280	\$208,406	\$15,170	\$20,125	\$35,295
422	24	\$75,219,250	\$161,304	\$175,438	\$194,191	\$14,135	\$18,753	\$32,888
436	7	\$73,067,228	\$156,689	\$170,419	\$188,635	\$13,731	\$18,216	\$31,947
425	5	\$72,482,552	\$155,435	\$169,055	\$187,126	\$13,621	\$18,070	\$31,691
621	1	\$68,269,750	\$146,401	\$159,230	\$176,250	\$12,829	\$17,020	\$29,849
125	35	\$63,272,385	\$135,684	\$147,574	\$163,348	\$11,890	\$15,774	\$27,664
535	2	\$61,424,108	\$131,721	\$143,263	\$158,577	\$11,543	\$15,313	\$26,856
626	10	\$58,144,000	\$124,687	\$135,613	\$150,108	\$10,926	\$14,496	\$25,422
403	12	\$57,682,923	\$123,698	\$134,537	\$148,918	\$10,840	\$14,381	\$25,220
421	62	\$55,112,689	\$118,186	\$128,543	\$142,283	\$10,357	\$13,740	\$24,096
435	3	\$53,785,750	\$115,341	\$125,448	\$138,857	\$10,107	\$13,409	\$23,516
445	10	\$52,243,500	\$112,033	\$121,851	\$134,875	\$9,817	\$13,025	\$22,842
352	17	\$47,278,750	\$101,387	\$110,271	\$122,058	\$8,884	\$11,787	\$20,671
721	8	\$47,272,500	\$101,373	\$110,257	\$122,042	\$8,883	\$11,785	\$20,669
471	98	\$43,065,497	\$82,255	\$89,146	\$102,065	\$6,890	\$12,920	\$19,810
410	73	\$41,118,423	\$88,176	\$95,903	\$106,154	\$7,727	\$10,251	\$17,978
400	53	\$39,331,940	\$84,345	\$91,736	\$101,542	\$7,391	\$9,806	\$17,197
701	41	\$38,633,000	\$82,846	\$90,106	\$99,738	\$7,260	\$9,631	\$16,891
405	91	\$34,984,181	\$87,460	\$93,758	\$104,603	\$6,297	\$10,845	\$17,142
601	1	\$33,122,793	\$71,030	\$77,254	\$85,512	\$6,224	\$8,258	\$14,482
372	2	\$32,366,750	\$69,409	\$75,491	\$83,560	\$6,082	\$8,069	\$14,151
409	10	\$31,978,089	\$68,575	\$74,584	\$82,557	\$6,009	\$7,972	\$13,982
434	4	\$31,488,251	\$67,525	\$73,442	\$81,292	\$5,917	\$7,850	\$13,767
374	2	\$28,467,250	\$61,046	\$66,396	\$73,493	\$5,349	\$7,097	\$12,447
420	23	\$27,194,990	\$58,318	\$63,429	\$70,208	\$5,110	\$6,780	\$11,890
336	46	\$26,385,500	\$56,582	\$61,541	\$68,119	\$4,958	\$6,578	\$11,536
341	2	\$23,295,000	\$49,955	\$54,332	\$60,140	\$4,378	\$5,808	\$10,185
575	102	\$20,843,545	\$30,953	\$33,402	\$35,538	\$2,449	\$2,136	\$4,586
735	7	\$19,370,000	\$41,538	\$45,178	\$50,007	\$3,640	\$4,829	\$8,469
624	1	\$18,342,750	\$39,335	\$42,782	\$47,355	\$3,447	\$4,573	\$8,020
510	1	\$16,738,750	\$35,895	\$39,041	\$43,214	\$3,145	\$4,173	\$7,319
478	7	\$15,663,751	\$33,590	\$36,534	\$40,439	\$2,943	\$3,905	\$6,849
472	10	\$15,439,626	\$33,109	\$36,011	\$39,860	\$2,901	\$3,849	\$6,751
531	9	\$15,391,001	\$33,005	\$35,897	\$39,734	\$2,892	\$3,837	\$6,729
303	49	\$14,849,508	\$31,844	\$34,634	\$38,336	\$2,790	\$3,702	\$6,493
411	15	\$14,556,000	\$31,215	\$33,950	\$37,579	\$2,735	\$3,629	\$6,364
423	12	\$14,139,500	\$30,321	\$32,978	\$36,503	\$2,657	\$3,525	\$6,182
414	15	\$13,995,093	\$30,012	\$32,642	\$36,131	\$2,630	\$3,489	\$6,119
333	44	\$13,486,000	\$28,920	\$31,454	\$34,816	\$2,534	\$3,362	\$5,896
444	1	\$11,239,000	\$24,101	\$26,213	\$29,015	\$2,112	\$2,802	\$4,914
432	9	\$10,762,250	\$23,079	\$25,101	\$27,785	\$2,022	\$2,683	\$4,705
415	2	\$10,319,250	\$22,129	\$24,068	\$26,641	\$1,939	\$2,573	\$4,512



590	22	\$10,109,750	\$21,680	\$23,580	\$26,100	\$1,900	\$2,520	\$4,420
433	2	\$8,247,000	\$17,685	\$19,235	\$21,291	\$1,550	\$2,056	\$3,606
496	6	\$7,964,250	\$17,079	\$18,576	\$20,561	\$1,497	\$1,986	\$3,482
75	5	\$7,550,250	\$16,191	\$17,610	\$19,492	\$1,419	\$1,882	\$3,301
36	6	\$7,239,250	\$15,524	\$16,885	\$18,689	\$1,360	\$1,805	\$3,165
731	2	\$7,030,500	\$15,077	\$16,398	\$18,150	\$1,321	\$1,753	\$3,074
334	17	\$6,656,000	\$14,273	\$15,524	\$17,184	\$1,251	\$1,659	\$2,910
477	13	\$6,488,537	\$13,914	\$15,134	\$16,751	\$1,219	\$1,618	\$2,837
720	3	\$5,778,500	\$12,392	\$13,478	\$14,918	\$1,086	\$1,441	\$2,526
480	15	\$5,756,250	\$12,344	\$13,426	\$14,861	\$1,082	\$1,435	\$2,517
350	14	\$5,661,500	\$12,141	\$13,205	\$14,616	\$1,064	\$1,411	\$2,475
407	2	\$5,576,500	\$11,958	\$13,006	\$14,397	\$1,048	\$1,390	\$2,438
475	21	\$5,325,000	\$11,419	\$12,420	\$13,747	\$1,001	\$1,328	\$2,328
441	5	\$5,314,335	\$11,396	\$12,395	\$13,720	\$999	\$1,325	\$2,324
700	4	\$5,060,500	\$10,852	\$11,803	\$13,065	\$951	\$1,262	\$2,213
492	3	\$4,832,000	\$10,362	\$11,270	\$12,475	\$908	\$1,205	\$2,113
412	5	\$4,643,000	\$9,957	\$10,829	\$11,987	\$872	\$1,158	\$2,030
335	9	\$4,434,250	\$9,509	\$10,342	\$11,448	\$833	\$1,105	\$1,939
610	4	\$4,318,750	\$9,261	\$10,073	\$11,150	\$812	\$1,077	\$1,888
408	3	\$4,277,000	\$9,172	\$9,976	\$11,042	\$804	\$1,066	\$1,870
302	14	\$4,233,483	\$9,078	\$9,874	\$10,929	\$796	\$1,055	\$1,851
438	1	\$4,227,543	\$9,066	\$9,860	\$10,914	\$794	\$1,054	\$1,848
304	7	\$4,120,729	\$8,837	\$9,611	\$10,638	\$774	\$1,027	\$1,802
490	3	\$4,108,000	\$8,809	\$9,581	\$10,605	\$772	\$1,024	\$1,796
450	4	\$4,073,750	\$8,736	\$9,501	\$10,517	\$766	\$1,016	\$1,781
596	1	\$3,930,079	\$8,428	\$9,166	\$10,146	\$739	\$980	\$1,718
413	2	\$3,477,250	\$7,457	\$8,110	\$8,977	\$653	\$867	\$1,520
365	12	\$3,419,260	\$7,332	\$7,975	\$8,827	\$643	\$852	\$1,495
627	2	\$3,321,000	\$7,122	\$7,746	\$8,574	\$624	\$828	\$1,452
72	8	\$3,139,225	\$6,732	\$7,322	\$8,104	\$590	\$783	\$1,373
110	5	\$3,134,250	\$6,721	\$7,310	\$8,092	\$589	\$781	\$1,370
730	1	\$3,074,500	\$6,593	\$7,171	\$7,937	\$578	\$766	\$1,344
805	1	\$3,036,000	\$6,511	\$7,081	\$7,838	\$571	\$757	\$1,327
360	9	\$2,926,000	\$6,275	\$6,824	\$7,554	\$550	\$729	\$1,279
481	1	\$2,591,501	\$5,557	\$6,044	\$6,690	\$487	\$646	\$1,133
473	3	\$2,052,251	\$4,401	\$4,787	\$5,298	\$386	\$512	\$897
406	5	\$1,717,340	\$3,683	\$4,005	\$4,434	\$323	\$428	\$751
710	2	\$1,687,750	\$3,619	\$3,936	\$4,357	\$317	\$421	\$738
611	2	\$1,601,250	\$3,434	\$3,735	\$4,134	\$301	\$399	\$700
702	5	\$1,551,700	\$3,328	\$3,619	\$4,006	\$292	\$387	\$678
401	1	\$1,489,750	\$3,195	\$3,475	\$3,846	\$280	\$371	\$651
512	1	\$1,183,000	\$2,537	\$2,759	\$3,054	\$222	\$295	\$517
608	2	\$1,176,500	\$2,523	\$2,744	\$3,037	\$221	\$293	\$514
711	1	\$875,000	\$1,876	\$2,041	\$2,259	\$164	\$218	\$383
462	1	\$736,750	\$1,580	\$1,718	\$1,902	\$138	\$184	\$322
220	1	\$638,000	\$1,368	\$1,488	\$1,647	\$120	\$159	\$279
487	2	\$539,500	\$1,157	\$1,258	\$1,393	\$101	\$135	\$236
377	11	\$458,063	\$982	\$1,068	\$1,183	\$86	\$114	\$200
489	1	\$317,000	\$680	\$739	\$818	\$60	\$79	\$139
734	1	\$301,250	\$646	\$703	\$778	\$57	\$75	\$132
632	1	\$284,500	\$610	\$664	\$734	\$53	\$71	\$124
221	1	\$234,250	\$502	\$546	\$605	\$44	\$58	\$102
Totals		\$5,128,215,867	\$11,065,567	\$12,043,157	\$13,250,830	\$977,590	\$1,207,673	\$2,185,263



Appendix G – Recommended Frequency of Fire Prevention Inspections



TECHNICAL BULLETIN

FIRE UNDERWRITERS SURVEY™

A Service to Insurers and Municipalities

FIRE UNDERWRITERS SURVEY RECOMMENDED FREQUENCY OF FIRE PREVENTION INSPECTIONS

The frequency of fire prevention inspections for all occupancies should be specifically appropriate for the level of fire risk within the occupancy. The frequency of inspections will vary from one occupancy to another depending on:

1. Type of occupancy.
2. Occupant load.
3. Function.
4. Grade of hazard.

As the fire risk increases, the frequency of inspections should also be increased.

The following table is a minimum frequency guideline for major occupancy classifications from the National Building Code of Canada.

<i>Group - Division National Building Code Occupancy</i>	<i>Minimum Inspection Frequency</i>
A-1	6 months
A-2	6 months
A-3	6 months
A-4	6 months
B-1	6 months
B-2	6 months
C	6 months
D	12 months
E	12 months
F-1	3 months
F-2	6 months
F-3	6 months



Sample Customized Frequency Schedule

Group - Division National Building Code Occupancy	Inspection Frequency	Group - Division National Building Code Occupancy	Inspection Frequency
A-1 Movie Theaters Theaters	6 months 6 months	C Apartments Boarding Houses Hotels (Unsprinklered) Hotels (Sprinklered) Lodging Houses Motels Residential Schools	6 months 6 months 2 months 4 months 6 months 6 months 6 months
A-2 Bowling Alleys Churches Non-Residential Clubs Community Halls Dance Halls Exhibition Halls Gymnasiums Libraries Licensed Beverage Premises (Unsprinklered) Licensed Beverage Premises (Sprinklered) Museums Restaurants Schools Daycares Undertaker Premises	6 months 6 months 6 months 6 months 6 months 6 months 6 months 2 months 4 months 6 months 6 months 4 months 6 months 6 months		D Banks Barbers/Hairdressers Beauty Parlours Dental Offices Self-Services Laundries Medical Offices Offices Radio Stations Appliance Service/Rentals
A-3 Arenas Rinks Indoor Pools	6 months 6 months 6 months	E Department Stores Shops Stores Supermarkets	12 months 12 months 12 months 12 months
A-4 Stadiums	6 months	F-1 Feed Mills Spray Paint Booths	3 months 3 months
B-1 Jails Police Stations	6 months 6 months	F-2 Warehouses, Service Stations	12 months
B-2 Children's Custodial Homes Hospitals Nursing Homes	2 months 2 months 4 months	F-3 Storage Garages, Medical Labs	12 months

For further information regarding frequency of fire prevention inspections for fire insurance grading purposes, please contact a Fire Underwriters Survey office.

Western Canada	Quebec	Ontario	Atlantic Canada
Risk Management Services Fire Underwriters Survey 3999 Henning Drive Burnaby, BC V5C 6P9 1-800-665-5661	Risk Management Services Fire Underwriters Survey 1611 Crémazie Blvd. East Montreal, Quebec H2M 2P2 1-800-263-5361	Risk Management Services Fire Underwriters Survey 150 Commerce Valley Drive, West Markham, Ontario L3T 7Z3 1-800- 268-8080	Risk Management Services Fire Underwriters Survey 238 Brownlow Avenue, Suite 300 Dartmouth, Nova Scotia B3B 1Y2 1-800-639-4528



Fire Underwriters Survey
A SERVICE TO INSURERS AND MUNICIPALITIES

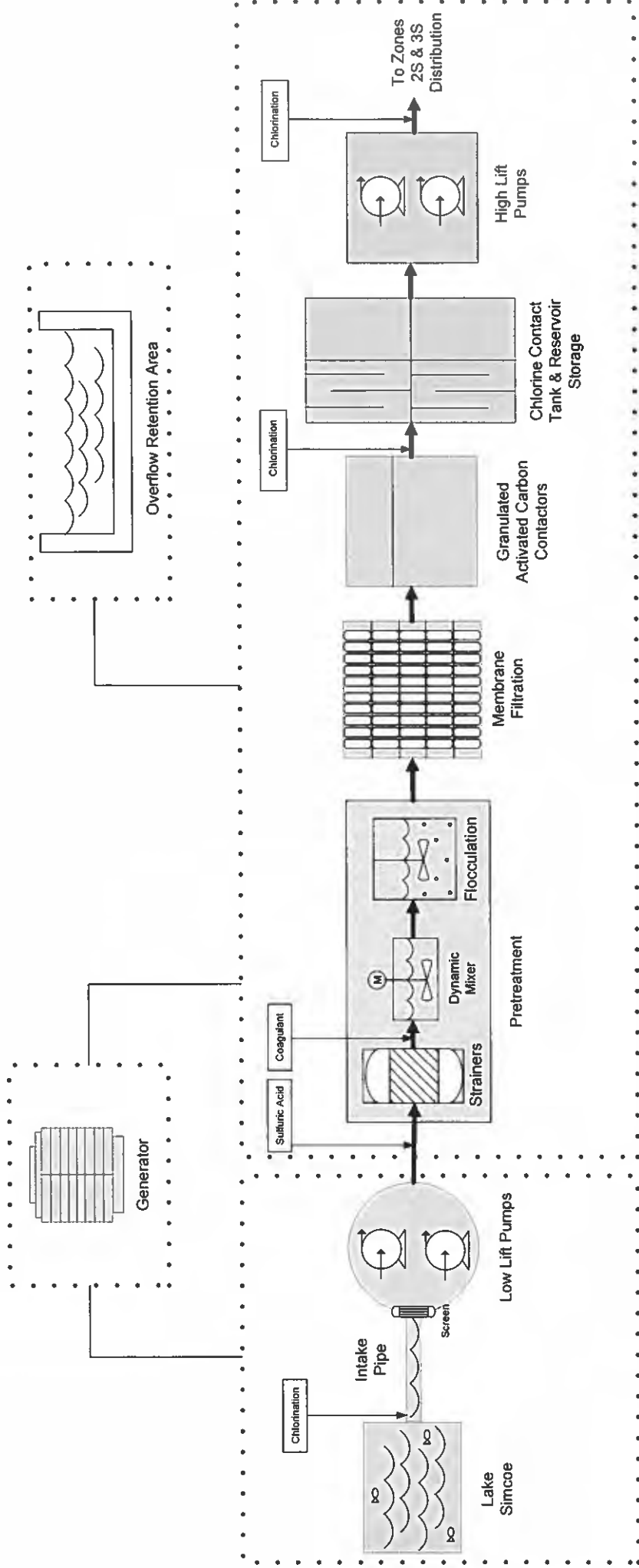
3999 Henning Drive
Suite 101
Burnaby, British Columbia
V5C 6P9

T: 604.609.4146
Toll Free: 1.800.665.5661
F: 604.688.6986

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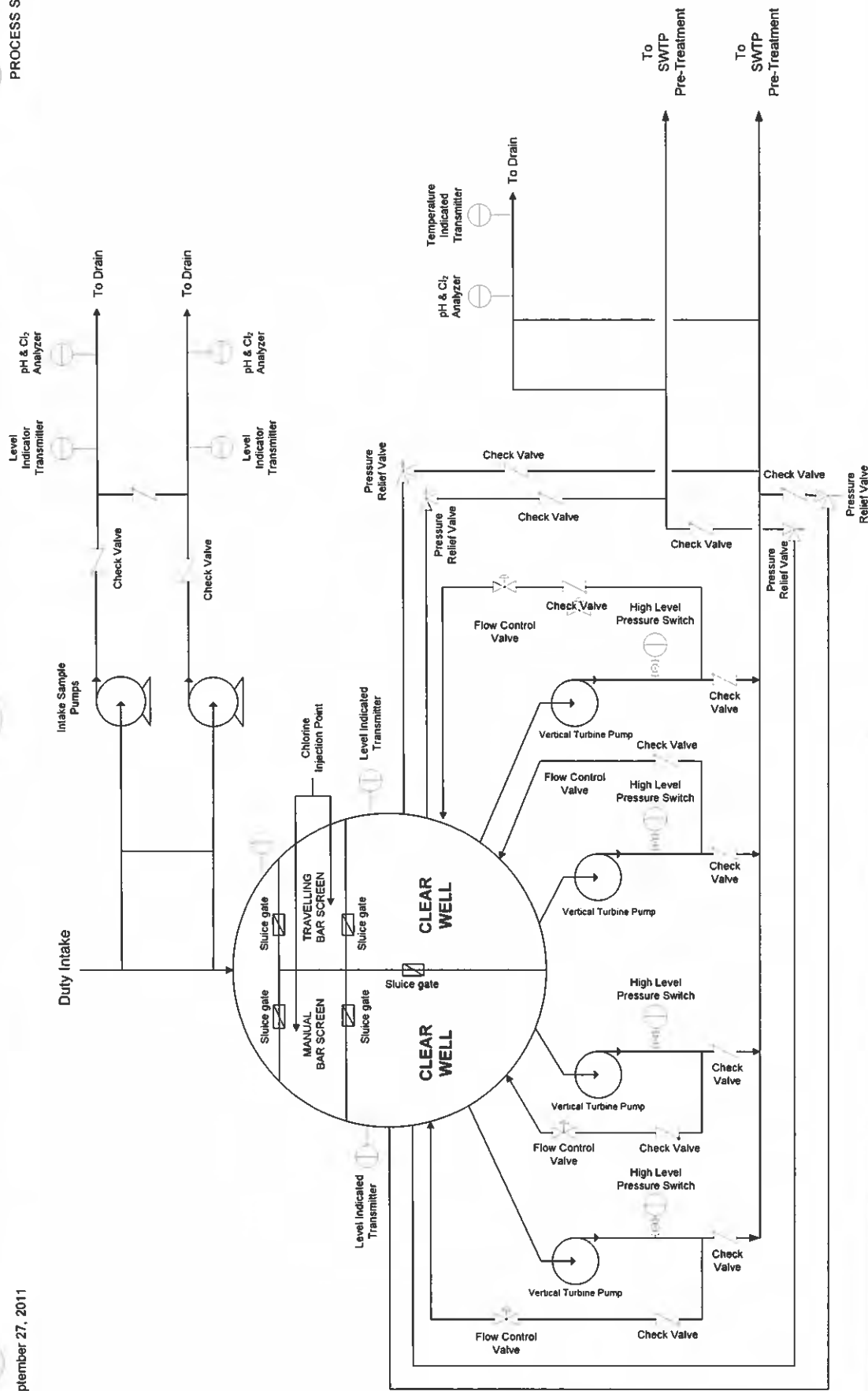


Appendix H – Water System Schematics



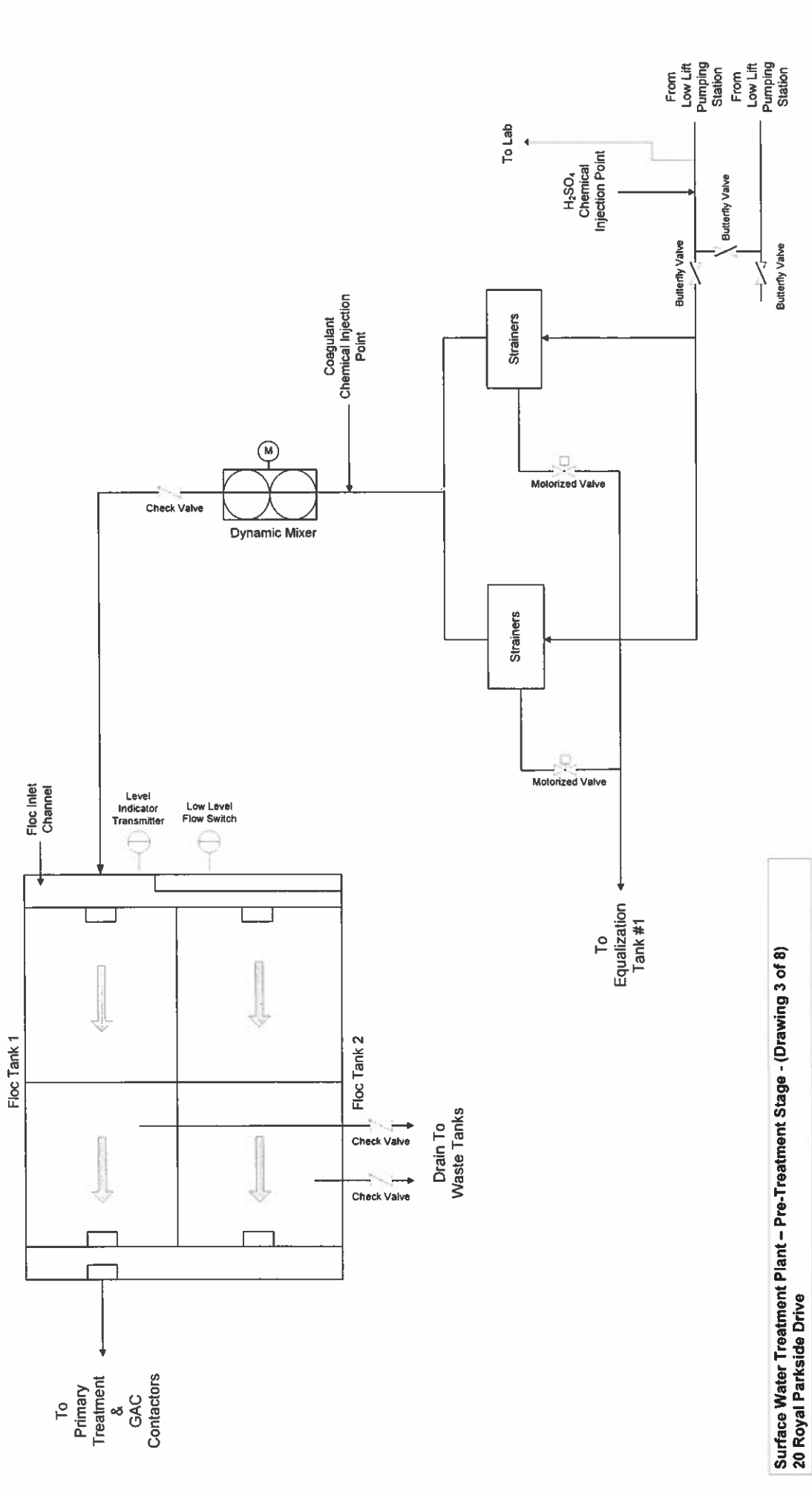
Surface Water Treatment Plant - Overall Process Flow Diagram (Drawing 1 of 8)
20 Royal Parkside Drive & 23 Camelot Square

The Surface Water Treatment Plant draws water from Lake Simcoe through the low lift pumping station located at 23 Camelot Square where raw water is screened and pumped using low lift pumps through to the Surface Water Treatment Plant located at 20 Royal Parkside Drive. The plant has pretreatment, membrane filtration, granulated activated carbon contactors, disinfection, storage, and then enters into the distribution system feeding Barrie's 2S and 3S pressure zones via the Harvie Rd Reservoir/Booster Station, Big Bay Booster and Mapleview Tower. Plant processes are monitored by a Surface Water Supply section dedicated SCADA system and a 2 MW generator provides emergency back-up power in the result of a power fail to ensure the uninterrupted delivery of safe drinking water. For more specifics on the Surface Water Treatment Plant processes, see individual process section schematics.



Surface Water Treatment Plant - Low Lift Pumping Station (LLPS) (Drawing 2 of 8)
23 Camelot Square

The Surface Water Treatment Plant Low Lift Pumping Station has a 1,500mm diameter raw water intake running a distance of 750m into Lake Simcoe, which supplies water to the low lift pump station. The intake structure is situated at a depth of approximately 22 m, constructed of HDPE and fitted with screens to prevent wildlife and debris from entering the pipe. Zebra mussel control is carried out by pre-chlorination at the entrance of the intake pipe when temperatures rise above 12°C. Two sample pumps draw from a sample inlet line that is located on the outside of the raw water intake in order to sample raw water before and after the chlorine injection point. Upon entering the pumping station, the raw water passes through a manually operated sluice gate and an automatic travelling screen with 9.5 mm mesh openings. A manually operated standby screen is present should the automatic screen require maintenance. If required, chlorine can also be injected into the raw water as it enters into the clear well. Four (4) low lift vertical turbine pumps (two 15.75ML/d capacity pumps and two 31.5ML/d capacity pumps) transport the raw water through a 900 mm diameter raw water main to the pre-treatment stage of the surface water treatment plant.



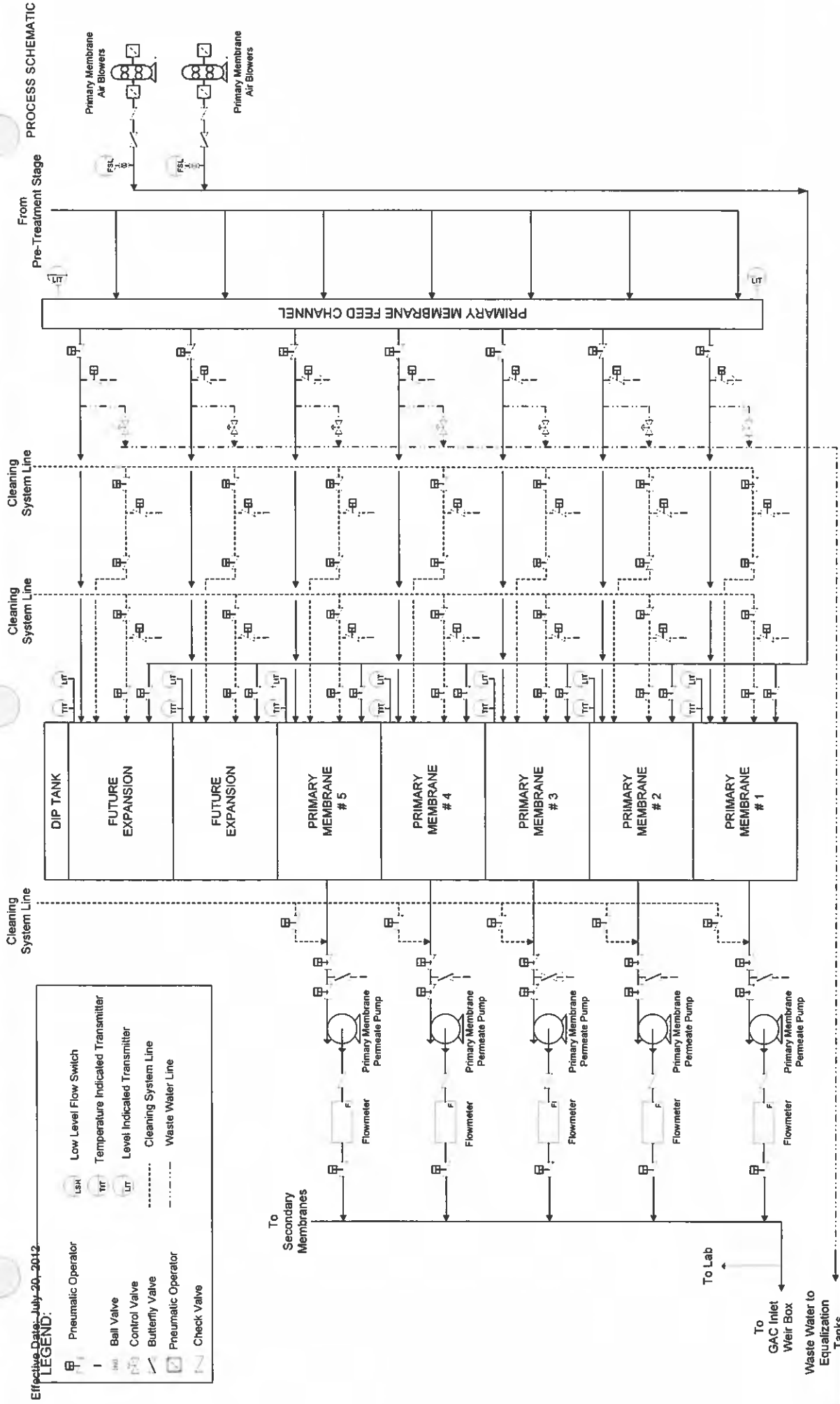
Surface Water Treatment Plant – Pre-Treatment Stage - (Drawing 3 of 8)
20 Royal Parkside Drive

The pre-treatment stage of the surface water treatment plant consists of an in-line rapid mixer with associated chemical injection points and 0.5 mm membrane strainers that are located along the raw water header. Sulfuric acid is injected and used for pH suppression which maximizes the effectiveness of the coagulant and the flocculation process. Coagulant is added to assist in the reduction of dissolved organic carbon DOC and to aid in the flocculation process by binding particulate together. The raw water is then distributed equally between two parallel flocculation tanks that are designed to provide gentle mixing and maximize contact between coagulant and water. This builds filterable floc particles and pulls dissolved compounds out of solution.

Effective Date: July 20, 2012

LEGEND:

	Pneumatic Operator		Low Level Flow Switch
	Bail Valve		Temperature Indicated Transmitter
	Control Valve		Level Indicated Transmitter
	Butterfly Valve		Cleaning System Line
	Pneumatic Operator		Waste Water Line
	Check Valve		



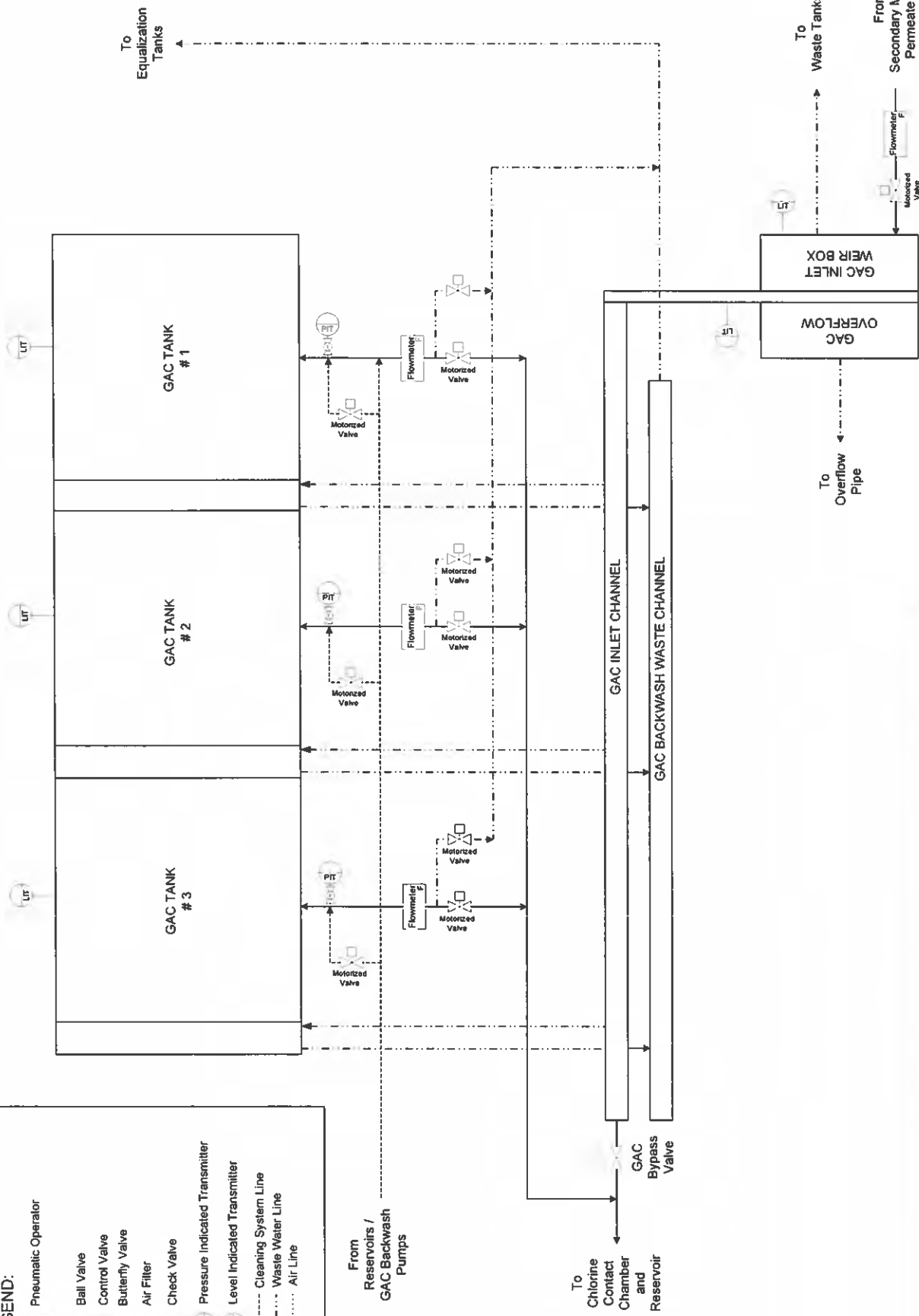
Surface Water Treatment Plant – Primary Membrane Filtration - (Drawing 4 of 8)

The primary membrane treatment stage of the plant consists of five (5) primary membrane trains equipped with immersed ultra-filtration membranes that are each capable of treating 20 MLD. Each train will have a dedicated permeate pump (equipped with a VFD) that is used to generate the vacuum required for membrane filtration and to transport permeate filtered water to the Granulated Activated Carbon (GAC) weir box or to the final stage of treatment. Chemical pumps (peristaltic pumps in a duty and standby configuration) are used for dosing the cleaning and neutralization chemicals. Duty/Standby air compressors will provide air for all pneumatically actuated valves and supply air for membrane integrity testing. Two positive displacement blowers will be used for air scour during membrane cleanings for the primary membranes.

Effective Date: September 27, 2011

LEGEND:

- Pneumatic Operator
- Ball Valve
- Control Valve
- Butterfly Valve
- Air Filter
- Check Valve
- Pressure Indicated Transmitter
- Level Indicated Transmitter
- Cleaning System Line
- Waste Water Line
- Air Line



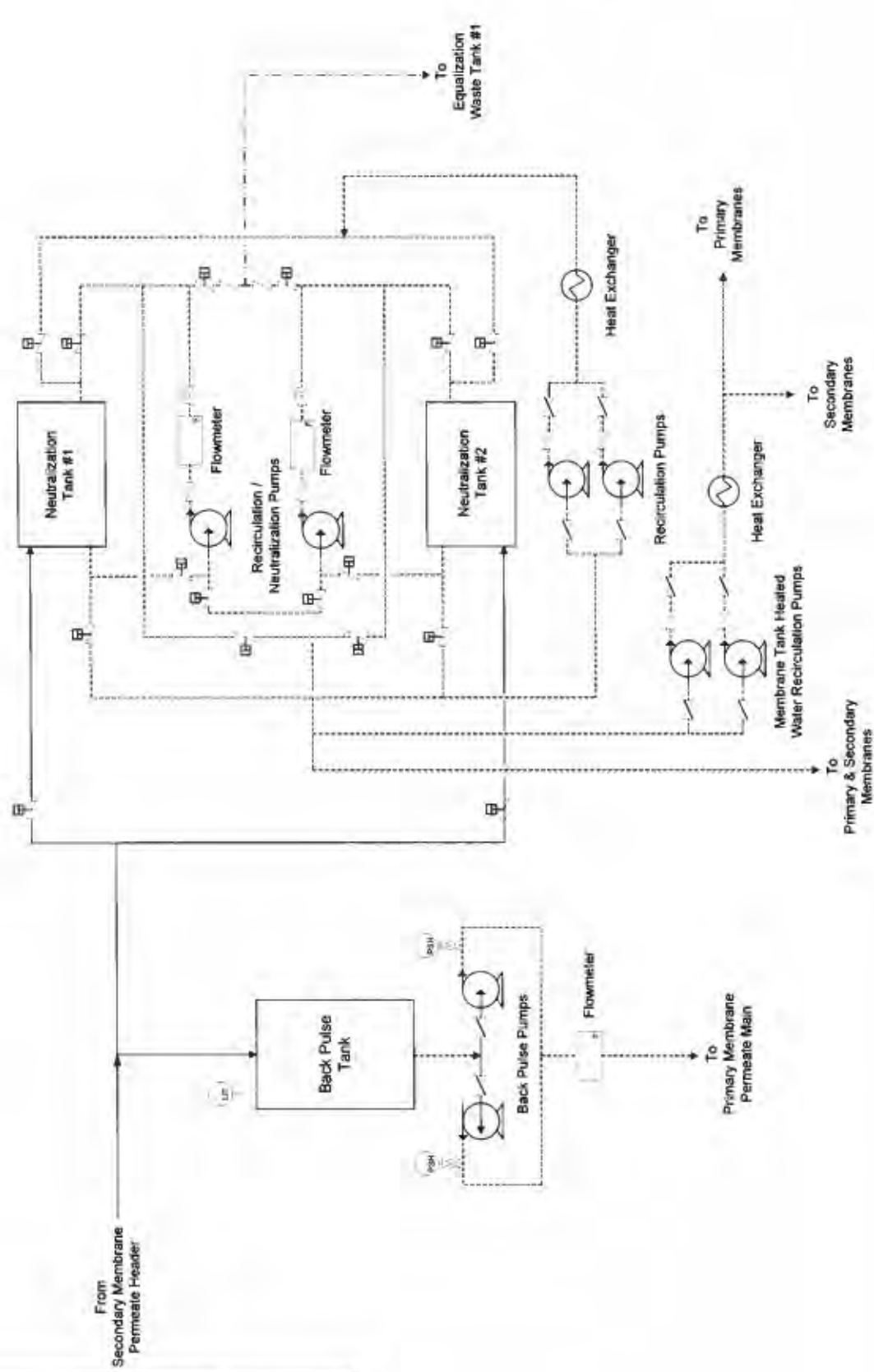
Surface Water Treatment Plant – Granulated Activated Carbon (GAC) Contactors - (Drawing 5 of 8)
20 Royal Parkside Drive

In this stage of the treatment plant, three (3) Granular Activated Carbon (GAC) Contactor systems remove natural organic compounds to reduce taste and odour. Each GAC contactor has a capacity of 20 ML/d. The natural organic compounds are retained inside the GAC contactors while the water passes through.

Effective Date: September 27, 2011

LEGEND:

	Pneumatic Operator
	Ball Valve
	Control Valve
	Butterfly Valve
	Air Filler
	Check Valve
	Temperature Indicator Transmitter
	High Level Pressure Switch
	Level Indicated Transmitter
	Cleaning System Line
	Waste Water Line
	Air Line

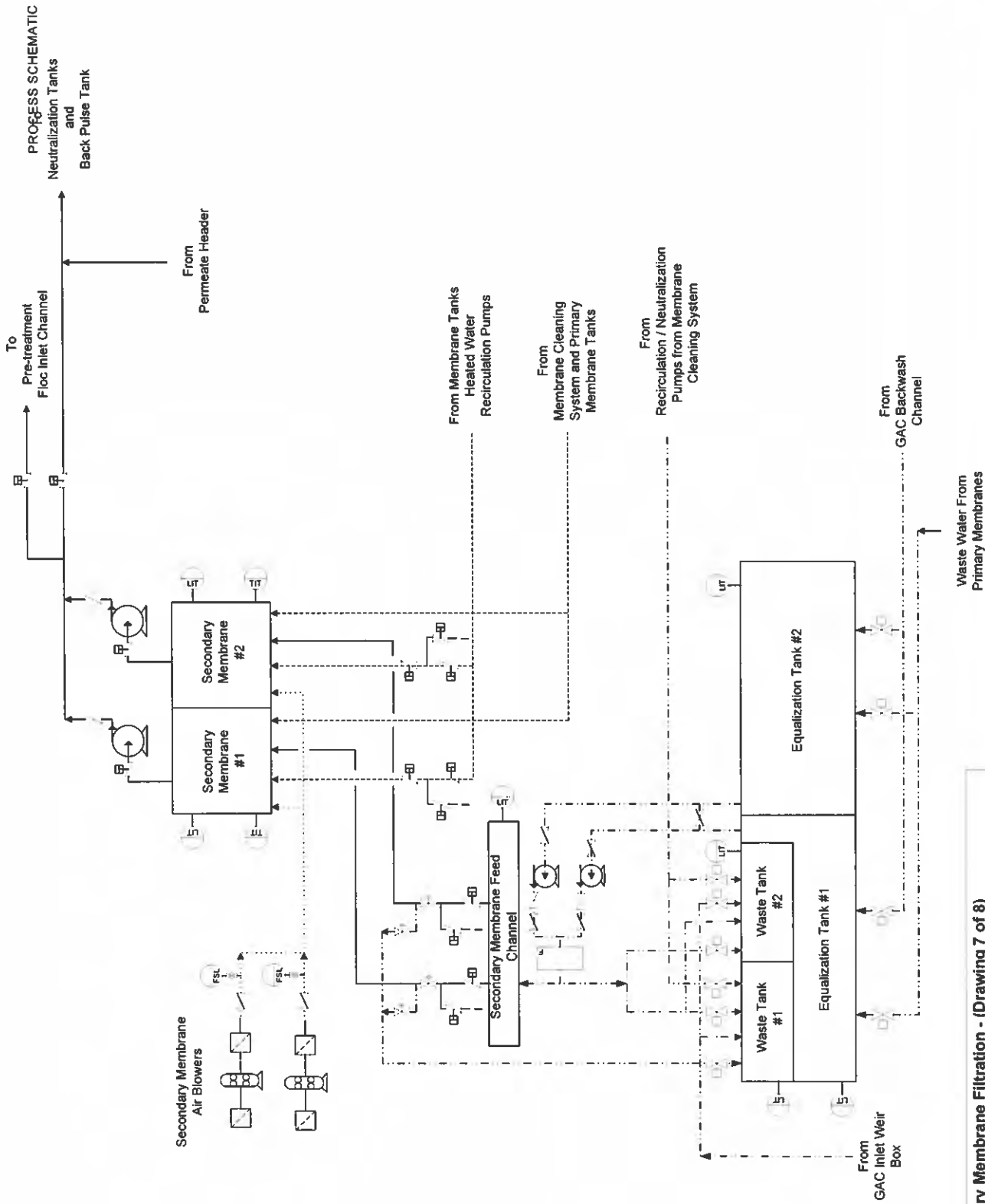


Surface Water Treatment Plant – Membrane Cleaning Systems – (Drawing 6 of 8)
 20 Royal Parkside Drive

The membrane cleaning system consists of a duty and standby heat recirculation pumps that supply heat to the filtered water within the neutralization tanks for cleaning. A separate set of duty/standby pumps re-circulate the water in the membrane tank during a recovery clean, in order to maintain the temperature of the cleaning solution. Both of these sets of pumps are designed to re-circulate water through separate heat exchangers that use hot water from the plant boiler to heat the filtered water. Chemical pumps (peristaltic pumps in a duty and standby configuration) are used for dosing the cleaning and neutralization chemicals.

Effective Date: September 27, 2011

LEGEND:	
	Pneumatic Operator
	Ball Valve
	Control Valve
	Butterfly Valve
	Air Filter
	Check Valve
	Temperature Indicator Transmitter
	Low Level Flow Switch
	Level Indicated Transmitter
	Cleaning System Line
	Waste Water Line
	Air Line



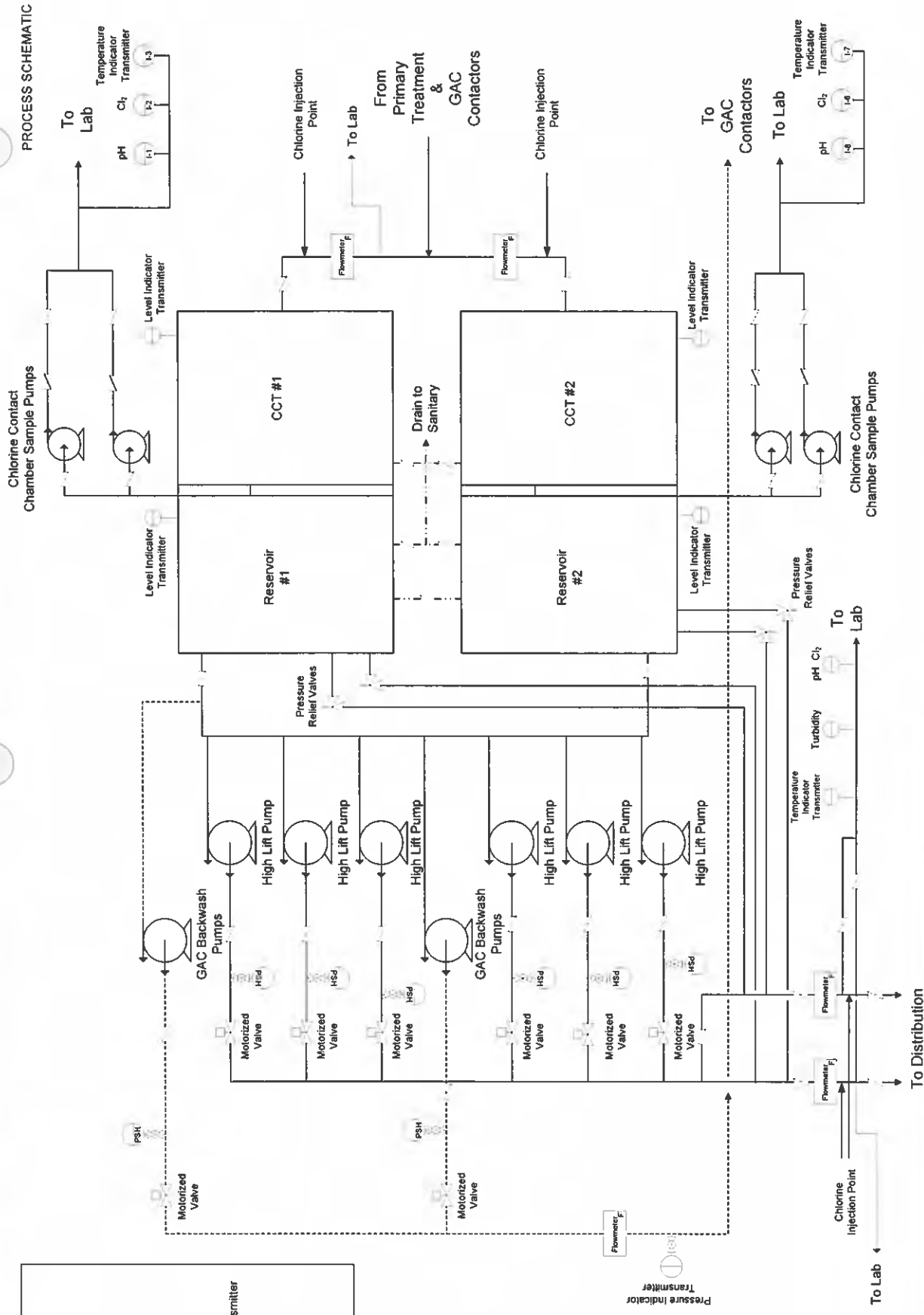
Surface Water Treatment Plant – Secondary Membrane Filtration - (Drawing 7 of 8)
20 Royal Parkside Drive

The secondary membrane filtration system is designed to treat reject and backwash water generated from the primary membrane treatment stage and the GAC backwash cycles. The reject and backwash water is stored in two concrete equalization tanks prior to being pumped to the secondary membrane filtration systems. Two positive displacement blowers will be used for air scour during membrane cleanings for the secondary membranes.

Effective Date: July 20, 2012

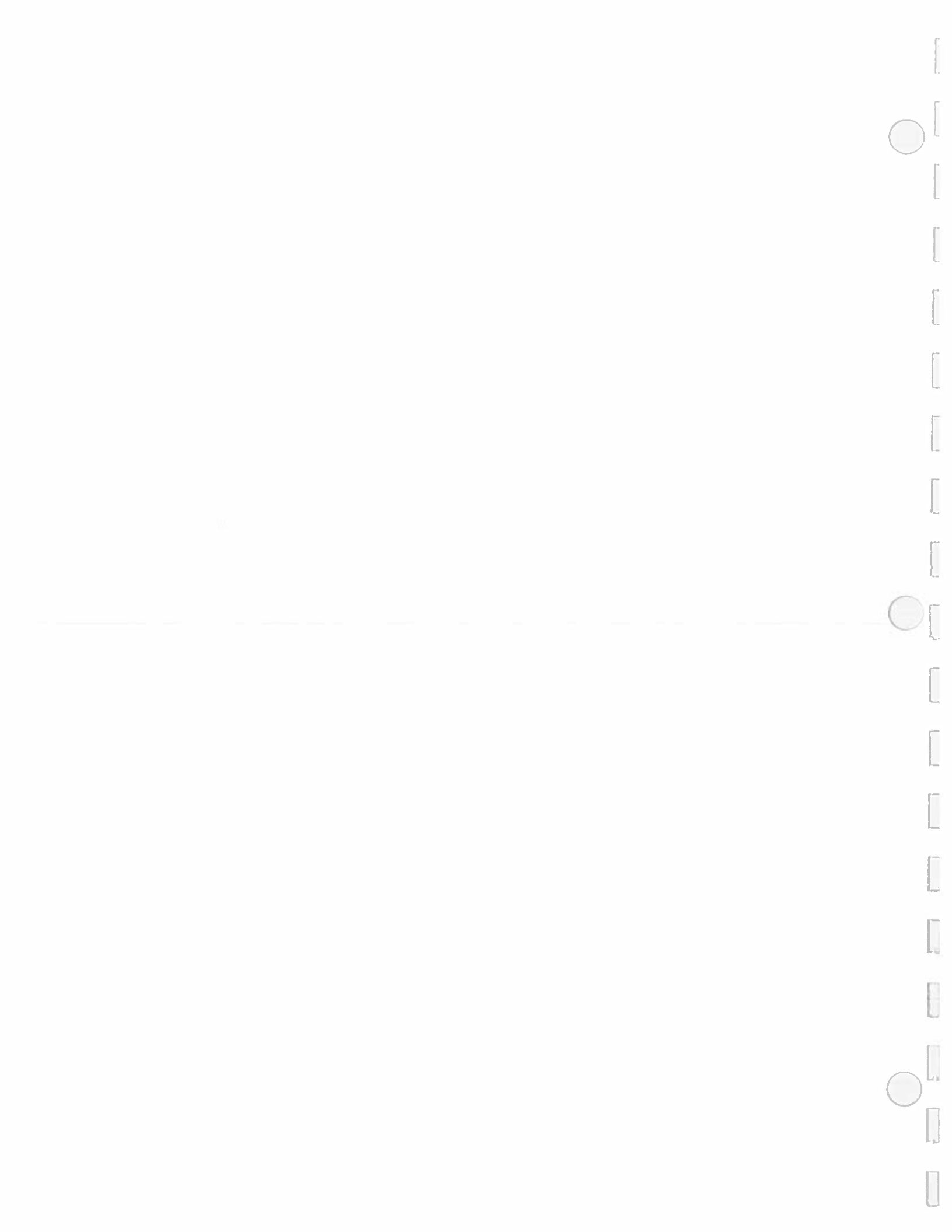
PROCESS SCHEMATIC

- LEGEND:**
- Pneumatic Operator
 - Ball Valve
 - Control Valve
 - Butterfly Valve
 - Air Filler
 - Check Valve
 - Temperature Indicator Transmitter
 - High Level Pressure Switch
 - Level Indicated Transmitter
 - Cleaning System Line
 - Waste Water Line
 - Air Line



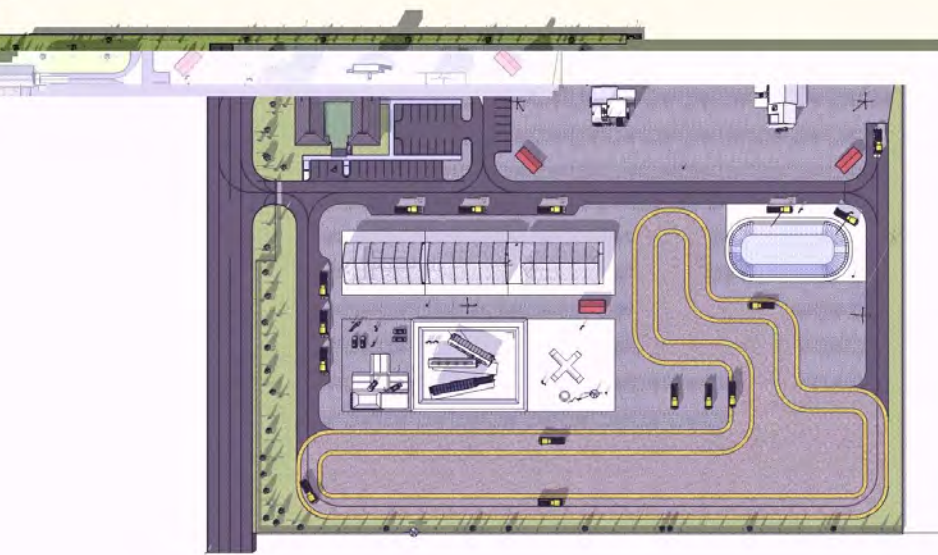
Surface Water Treatment Plant – Disinfection, Storage & Distribution Reservoir, Chlorine Contact Tank & High Lift Pumping Station - (Drawing 8 of 8)
 20 Royal Parkside Drive

The final stage of treatment consists of two (2) 5 ML chlorine contact tanks and two (2) 5 ML reservoirs run in series. First, water is transported to the chlorine contact tanks (CCT) that are equipped with four concrete baffles to provide sufficient contact time. The water is continuously monitored by online analyzers and SCADA to ensure a sufficient chlorine dosage. The treated water is injected with gas chlorine once more before the point of entry into the distribution as a means of maintaining disinfection in the distribution system. Six (6) high lift vertical turbine pumps deliver water to Harvie Rd Reservoir/Booster Station and Big Bay Booster based on demand to feed the 2S and 3S pressure zones of Barrie's distribution system.



APPENDIX G

Thomas Brown – Design Study for a New Training Facility



**Design Study for the New
Barrie Fire and Emergency Service Training Facility**

November 26, 2009

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Introduction

Barrie Fire and Emergency Services formed a committee to conduct a training needs analysis as a result of the Coroner's Inquest into the death of a fire fighter that same year. In the Coroner's report dated June 4, 2004, two of the recommendations focus on the need for live fire training. Specifically, that more live fire training centres be created throughout the province of Ontario and more live fire training exercises in the form of realistic scenarios be provided for all suppression personnel as soon as possible. These recommendations were identified in the Master Fire Plan which was endorsed by Council.

This report, prepared by Thomas Brown Architects at the request of the City of Barrie, documents the current state of Fire Academy facilities, buildings and grounds available to the members of the City of Barrie Fire and Emergency Service for training purposes. The purpose of this review is to provide a baseline from which the City of Barrie can develop a Training Centre in order to provide additional or new facilities thereby meeting current training requirements. It should be noted that where a type of service is being made available by the Fire Department there is a clear obligation that appropriate training and facilities for same are available to the providers.

Included in this report are descriptions of each facility and/or training prop necessary to meet current training standards, including servicing requirements, spatial separations, and physical property requirements along with cost estimates for each of the items.

The development of the total project has been established based on the priorities from basic necessities through to additional facilities to be added based on the greatest benefit to all users. To this end, three phases of development have been created to facilitate the preparation of cost estimates in this report. It should be noted that the eventual 'phasing' of the various components may vary as regards timing but the size of the final land area required for their conclusion is determined as part of Phase One.

Since the City of Barrie presently plans to initiate land acquisition and design services for Fire Station 5 in 2010, this report has considered the possible ramifications and associated costs and savings that could be achieved by the integration of the Fire Training Centre and Fire Station 5 into one ongoing, 3-phase project. To this end, this report includes two alternative theoretical Site Plans, one including a possible Fire Station 5 (Option 2) and one without Fire Station 5 (Option 1).

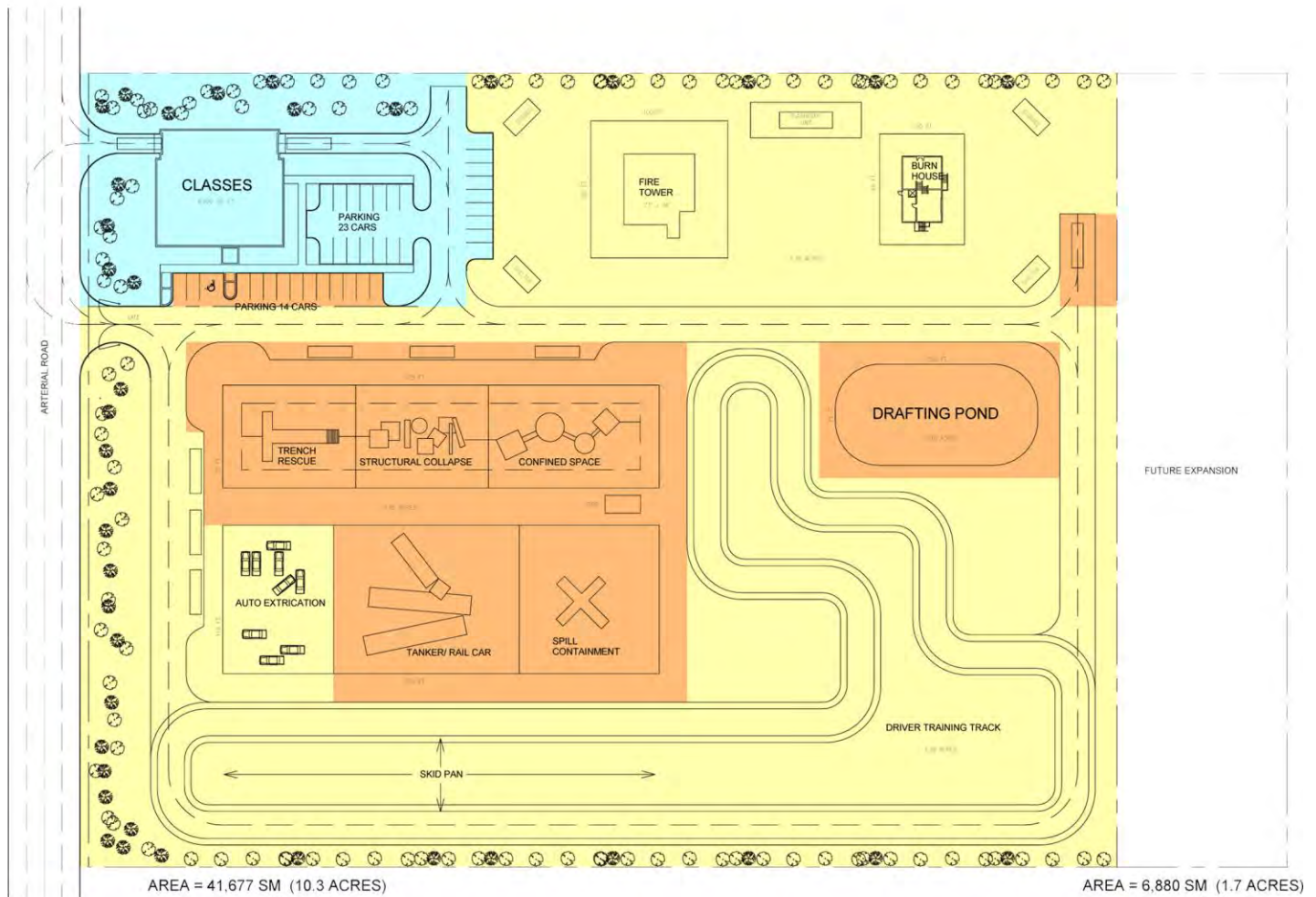
Executive Summary

Thomas Brown Architects Inc. would like to thank the City of Barrie and Barrie Fire and Emergency Services for the opportunity to present this report. The Training Facility Committee and the Architects visited the Richmond Hill Fire Training Tower and the Toronto HUSAR sites, gathered information from specialized manufacturers and, drawing on the Architects' experience on past projects, including the Waterloo Region Emergency Services Training and Research Facility, developed the recommendations contained herein.

It is proposed to construct a number of buildings and props, over a three year period, which will facilitate the training of Fire Fighters to meet current recommended standards for Fire Fighter Certification and NFPA 1402 – Guide to Building Fire Service Training Centers. It is suggested that the acquisition of an appropriately sized property of 12 acres would meet the requisite needs of a Fire Training facility and provide for possible future expansion. It is proposed that if a site can be found in a location appropriate for

the proposed Fire Station 5, the two projects should be linked on one site to reduce financial costs to the City of Barrie.

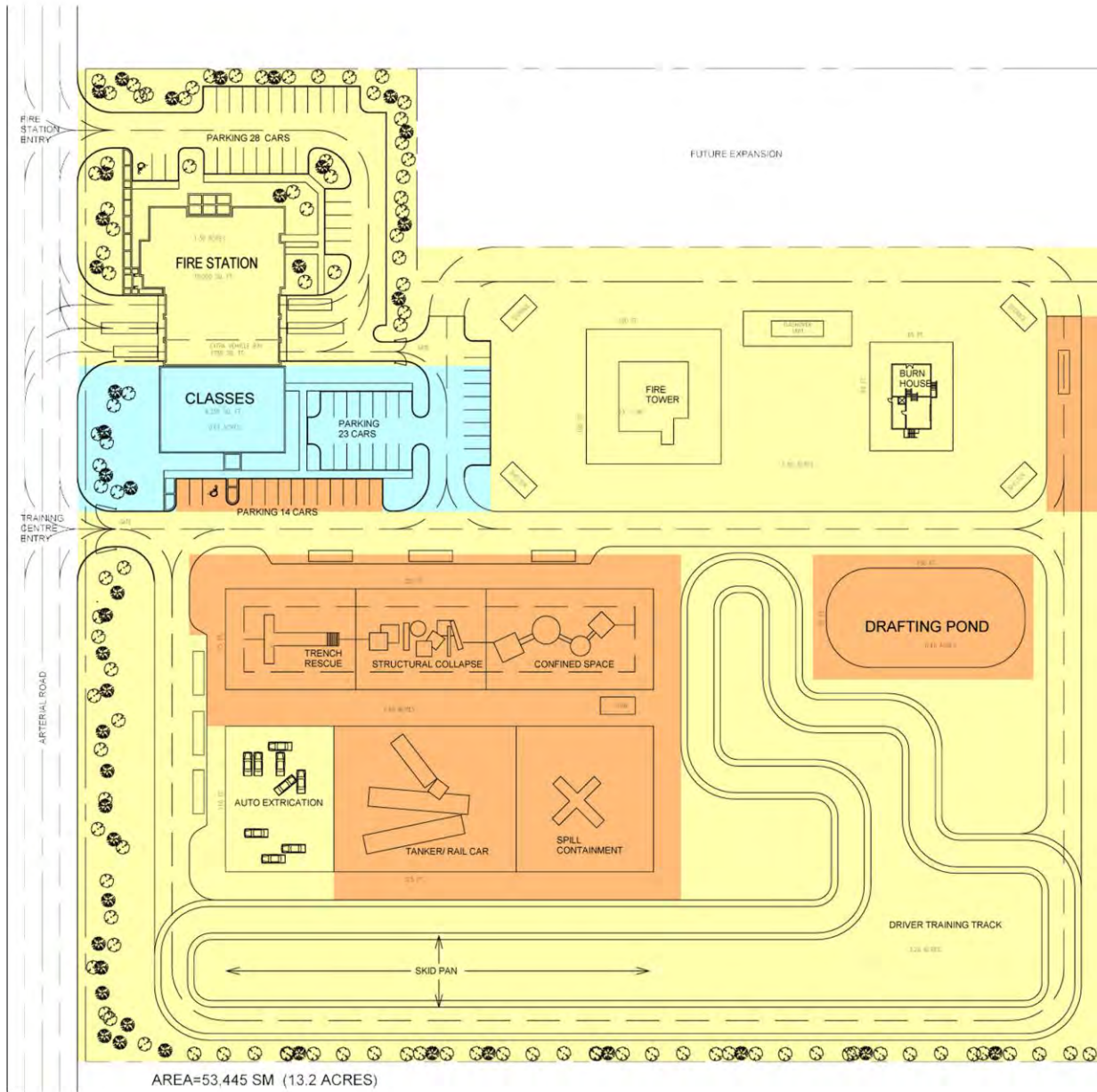
It is also recommended that this facility contain areas for all Fire Attack classes including Class A and Class B burns, as well as other Training Props including a Driver Training Course, all of which can be used to generate on-going income to cover the expense of operations.



Site Plan Option 1

Phasing

- Phase One
- Phase Two
- Phase Three



Phasing

- Phase One
- Phase Two
- Phase Three

Site Plan Option 2

Recommendations

- For a stand-alone Fire Training Centre, it is recommended that the City of Barrie purchase 12 acres of land. This area will include 10.3 acres for a fully-developed Fire Training Centre plus 1.7 acres for future expansion.
- If Fire Station 5 is to be located on this property, it is recommended that the City of Barrie purchase 13.2 acres of land. This will accommodate an approx. 10,000 sq.ft. Fire Station, a fully developed Fire Training Centre, plus 1.9 acres for future expansion. Recognition should be given to financial benefits gained through cost-sharing of land purchase and servicing costs, as well as design and engineering fees, for both the Training Centre and Fire Station on one site.
- A combined site for both Fire Station 5 and the Training Centre would provide potential savings in land costs, servicing costs and design fees of \$420,000.00.

Phase One of both Site Plan Options should consist of:

- Driver Training Course
- Fire Tower (Class B burns)
- Residential Burn House (Class A burns)
- Auto Extrication Area
- Storage and Ancillary Shelter plus Parking and Road Facilities
- Possible Fire Station 5

Phase Two of both Site Plan Options should consist of:

- Drafting Pond and ponds for settlement and storm management
- Trench Rescue Prop
- Structural Collapse Prop
- Confined Space Prop
- Storage plus Road and Parking Facilities
- Stretched Fabric Covered Structure
- Tanker/Railcar Prop
- Spill Containment Prop
- Ring Road and Fire Hydrant Loop

Phase Three of both Site Plan Options should consist of:

- Teaching and Administrative Centre

Elsewhere in this report, the various physical props and structures required for the project are itemized, described and shown (in three dimensions and on the site plans). Training facilities shown as part of Phase One are critical not only to the basic training necessary but will also provide an inflow of rental revenue from external sources right from the initial operation of the Centre. This will ensure almost

constant use of the project by other Fire Departments (from the surrounding area), by private industry and by Georgian College, as well as by the City of Barrie.

A suitable site for this project should, as much as possible, meet the dimensional shape shown on the attached site plan. It should feature a reasonably flat topographic quality, be environmentally appropriate (open, rather than treed, space) in an area where noise, activity and some smoke will not cause disturbance to adjacent properties.

Before purchase of the selected property, sub-soil investigation should be undertaken, the City Planning department, Engineering department and environmental agencies should be advised of the impending acquisition and their input considered. Consideration should also be given to the tendering process for the work involved in the various stages of this project.

In reviewing the timing of construction, indicated on the charts on pages 24 and 25, it is apparent that the construction work for Phases One, Two and Three will be virtually continuous over the three years of 2011, 2012 and 2013. Additionally, if Fire Station 5 is to be built in 2011, whether on a separate site or on the site of the Fire Training Centre, it will take a year to build.

Therefore, it is suggested that considerable cost savings could accrue to the City of Barrie if all the work was tendered to pre-qualified contractors as a single 'packaged' contract with the various portions of the work (and payment for same) phased over the three years of 2011, 2012 and 2013.

This process would also ensure, with only one contractor, that the interfaces between phases of construction do not overlap or conflict, that there are no conflicts between multiple contractors and contracts and that the work is the responsibility of one General Contractor. The financial magnitude of the packaged contract would also result in cost savings for the City.

Existing Training Facilities and Ongoing Status

The current indoor facilities housed at the Barrie Fire Department Headquarters are as follows:

➤ One classroom	840 SF
➤ Administration office	900 SF
➤ Chief Training Officer	120 SF
➤ Training Officers (2)	130 SF
➤ Library	160 SF
➤ Storage	160 SF

Current 'remote training facilities' are presently scattered across the City of Barrie and are a combination of publicly and privately owned properties. A Training Cost Comparison of all available facilities was prepared by BFES and is contained in Appendix 5.

Auto Extrication Training

- Bray's auto Recycling (private ownership) consists of 30' x 30' area available from 9:00 a.m. to 5:00 p.m. five days per week, subject to owner's use.

Driver Training

- 36,000 SF (less than one acre) at Barrie Event Centre (private ownership) Access to this site has been terminated.

RIT and Search and Rescue

- Chubb building (City owned). 2,000 SF of area for props, etc. Use of this property will be terminated in Spring of 2010.

Residential Training

- Edgehill Drive – 1800 SF. Bungalow for non-destructive evolutions. The Operations Centre will soon take over this facility.
- Ferndale Drive – 1000 SF. Bungalow for non-destructive evolutions. City-owned property. To be eventually demolished.

Drafting, Ice/Water Rescue

- City of Barrie waterfront: restricted use during waterfront events.

High Angle Rescue Training

- City of Barrie water towers: restricted use due to on-going installation of communication antennae and microwave dishes.
- Privately-owned High-rises: based on availability and approvals by boards. Complaints from residents.

Flashover Unit and Trench Rescue

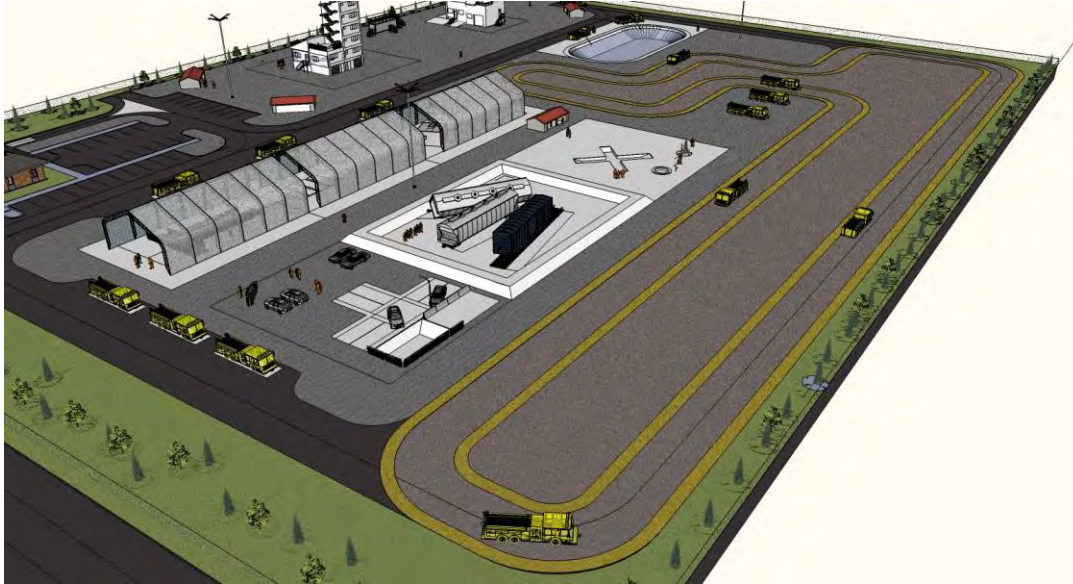
- City of Barrie landfill site: restricted to Sundays and Mondays only. Landfill staff concerns.

Facility and Training Prop Analysis

The following components, listed as 'Phase One', 'Phase Two' and 'Phase Three' are considered necessary for training purposes in order to meet the standards set by:

- NFPA 472 Standard for Competence of Responders to Hazardous Materials / Weapons of Mass Destruction Incidents, 2008 Edition,
- NFPA 1402 Guide to Building Fire Service Training Centers,
- NFPA 1403 Standard on Live Fire Training Evolutions, 2007 Edition,
- NFPA 1670 Standards on Operation and Training for Technical Search and Rescue Incidents, 2009 Edition,

and the requirements of the Province of Ontario for Fire Fighter Certification and Renewal.



Phase One

Driver Training Course

Purpose: Trainees will learn to manoeuvre fire department vehicles through testing routes.

BFES is compliant with National Association of Professional Drivers standards that require yearly training. Due to the loss of their current driver training area, it is recommended that a compliant Driver Training Course be included as part of Phase One. Comprising the largest area for a single prop at 3.2 acres, (NFPA 1402 suggests an area of up to 4 acres) this allows for a configuration similar to the attached rendering. It would consist of a flat area of concrete or asphaltic concrete upon which a training course will be laid out using either bollards or painted lines on the surface.

The Driver Training Course can be used for other mobile training props on a temporary basis when not functioning as a track. This area can also serve as a 'skid pad' for police training or private participants.

The Driver Training Course will require only storm water collection and disposal for daylight usage. Some street lighting could be useful for a night training program.

A cost of approximately \$850,000 will apply assuming surface drainage is available to an on-site pond. A 'collected drainage system' would cost an additional \$75,000.



Phase One Fire Tower

Propose: To create live fire training exercises for Class B fires with controlled smoke production, to provide high-angle and elevator rescue training and ensure unlimited attack scenarios simulating actual encounters faced by Fire and Emergency Services personnel. It should also provide for standpipe and sprinkler operations.

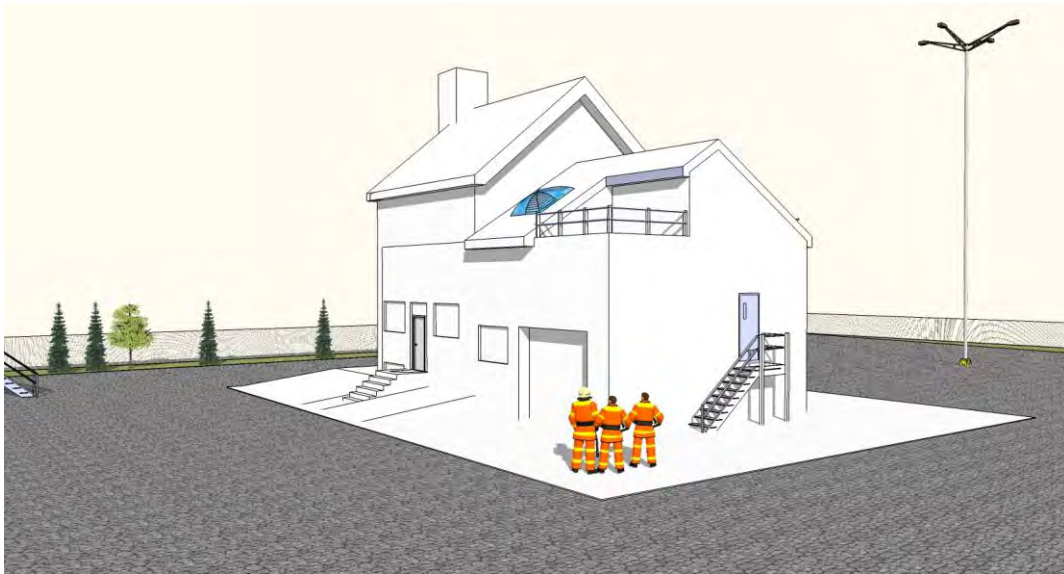
It is critical that a Fire Tower be included as part of Phase One in accordance with recommendations from the Coroner's Report because it provides for the most extensive training options as well as 'live-fire' operations. In addition, this prop would be one of the most highly sought after for rental purposes.

The Tower would consist of a reinforced concrete structure five to seven storeys high with a single propane fired live-fire facility within the structure. Each floor of the Tower would provide a different and variable layout for live-fire, smoke, and search and rescue training. The Tower will facilitate training in the following areas:

- High angle evolutions
- Sprinkler operations
- Standpipe operations
- Fire behavior studies
- Pump operations
- Fire streams
- Search and rescue
- SCBA training
- Ventilation
- Ladder Work
- Aerial operations
- RIT operations/Firefighter survival
- Incident Command
- Water supply
- Building Construction types
- Fire cause determination
- Radio communications

The Fire Tower will require storm drainage, electrical power and water supply. A site area of approximately 1.0 acres should be allowed for both the tower and for vehicle movement and manoeuvring.

A cost of \$2,750,000 for the Fire Tower can be anticipated subject to the number of storeys. This includes the cost of the Tower structure at \$2,350,000, and the cost of \$400,000 for the installation of propane live-fire systems.



Phase One **Residential Burn House**

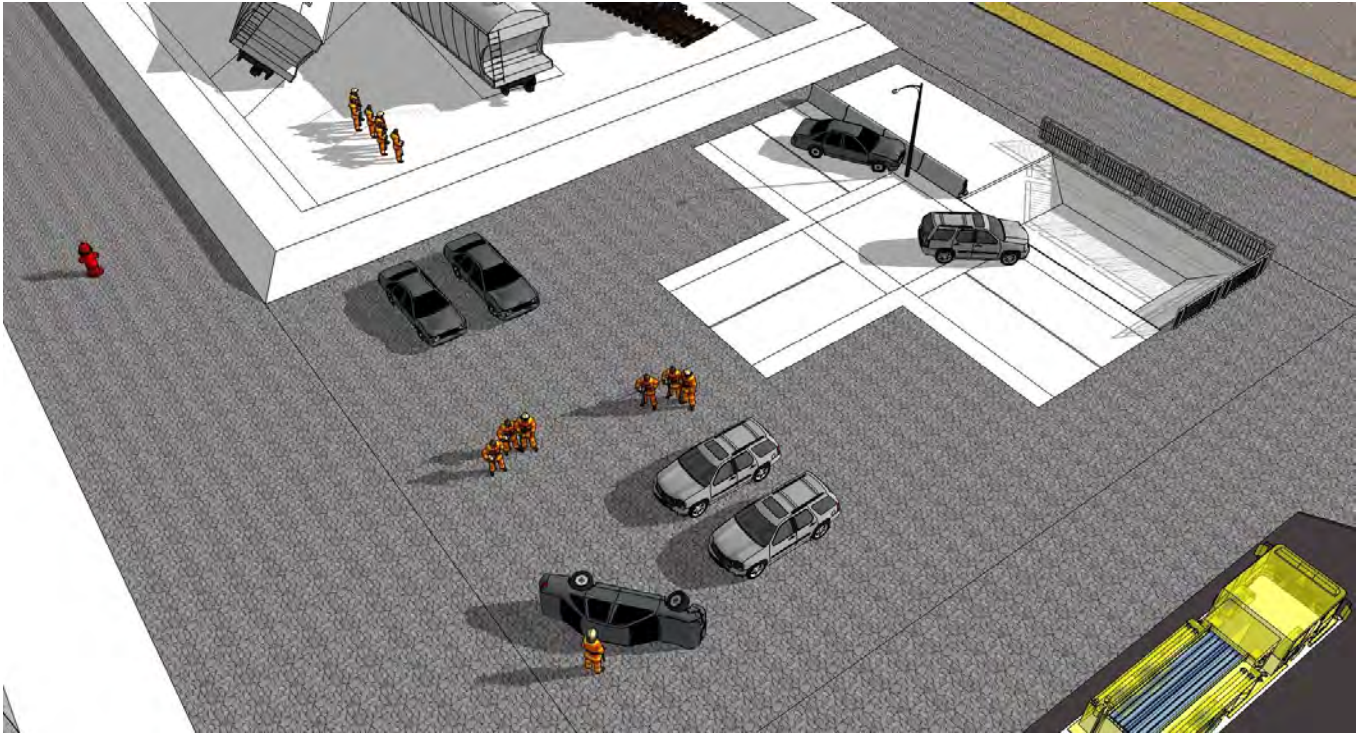
Purpose: To provide training at a 'residential scale' complete with fire venues encountered in house fires.

Recommendations for inclusion of a Burn House in Phase One are similar to those for the Fire Tower. This facility offers training of a specifically residential nature as opposed to the broader characteristics for training provided in the Fire Tower. Together, both the Tower and the Burn House will allow for multiple training evolutions to occur at the same time, better utilizing training hours and travel times.

This two-storey concrete building will simulate conditions encountered in houses with basement apartments, garages and interlocked, multi-floor conditions with pitched roofs of differing slopes for training in roof operations. It is anticipated that there will be several Class A burn areas within. The Burn House will require approximately .08 acres of land.

Storm drainage will be required from this building and the surrounding paved apron.

A cost of \$ 375,000 can be anticipated for the Burn House and concrete apron.



Phase One **Auto Extrication Area**

Purpose: To provide a training setting for vehicle extrication, to teach usage of hand tools, and pneumatic and hydraulic tools.

In light of the major highway (Hwy. 400) that bisects the City of Barrie as well as the number of vehicle-related incidents dealt with by Barrie Fire and Emergency Services, it is recommended that Phase One accommodate this training prop. BFES's current extrication area is located at a private business premises, resulting in access and operating hours restrictions.

This prop contains automobiles set on a gravel or paved parking lot and is also utilized in simulating multiple casualty incidents. Its physical characteristics include a ditch, an intersection, box beam, a jersey barrier and wreckable vehicles such as cars, buses and tractor trailers.

The site area required for this prop is approximately 0.2 acres.

Site services for this prop will consist mainly of an electrical supply for night lighting.

This prop is estimated at a cost of \$70,000.



Phase One **Storage and Ancillary Items**

Phase One will require on-site storage buildings, some paved asphalt road for access to the Fire Tower and Burn House and a modest parking lot as well as small shelter buildings adjacent to the Fire Tower and Burn House to be used as a 'discussion and assessment area' during and after training sessions.

The storage buildings are estimated at \$40,000.

The roadway and parking area for 14 cars is estimated at \$20,000.

The shelter structures are estimated at \$20,000.



Phase One
Fire Station 5 (potential)

Purpose: Emergency Response.

Fire Station 5 would comprise approximately 10,000 sq.ft. and include two double-depth drive-through bays with associated utility rooms, crew quarters with kitchen/dining/lounge and dormitories, lockers, washrooms and showers. Provision is made for administrative and Fire Prevention offices and storage.

Site size required is 1.3 acres.



Facility and Training Prop Analysis – Phase Two

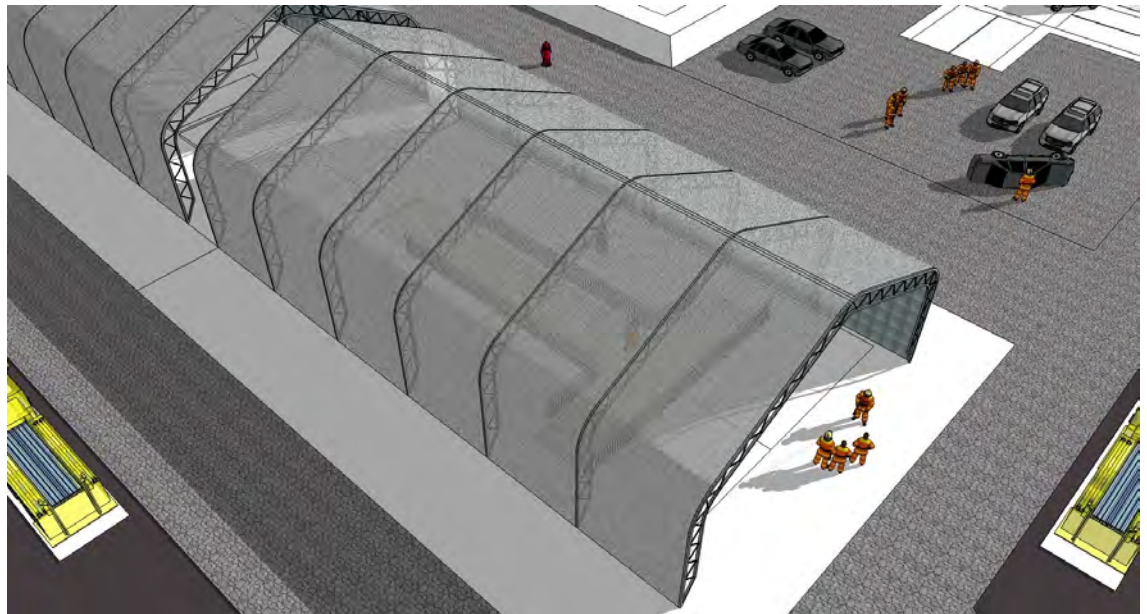
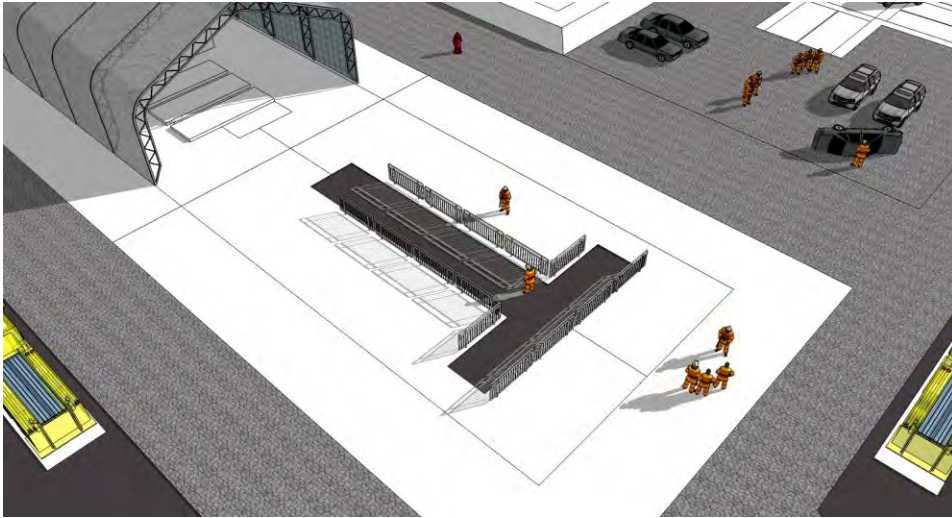
‘Drafting’ Pond/Settling Pond and Storm Water Management Pond

Purpose: Class A Fires and the related training procedures will require storm water drainage to a separate settling pond for the extraction of contaminants and debris. In addition, a pond allows for the introduction of rural operations within the expanded boundaries lands.

The settlement pond is expected to drain into a secondary storm management pond which will be utilized for drafting exercises, for ice and water rescue scenarios, as well as storm water management for the entire site. The use of a bubbler will allow for simulations of varying ice conditions.

A drafting pond system would occupy approximately 0.4 acres. Electrical power will be required for operation of pumps controlling ice conditions in the pond.

Cost estimate for the ponds is \$275,000.

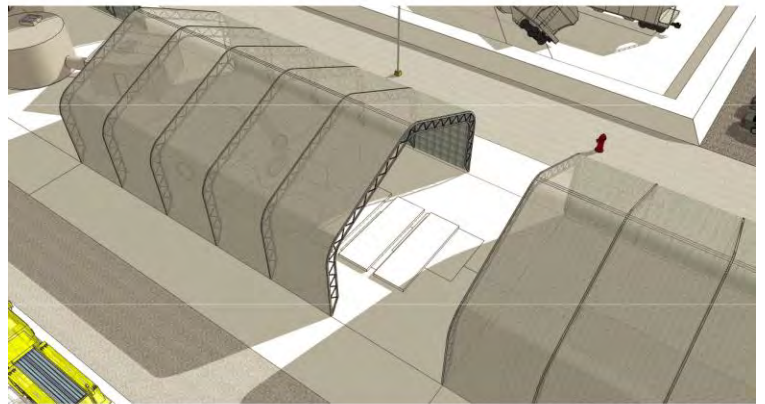
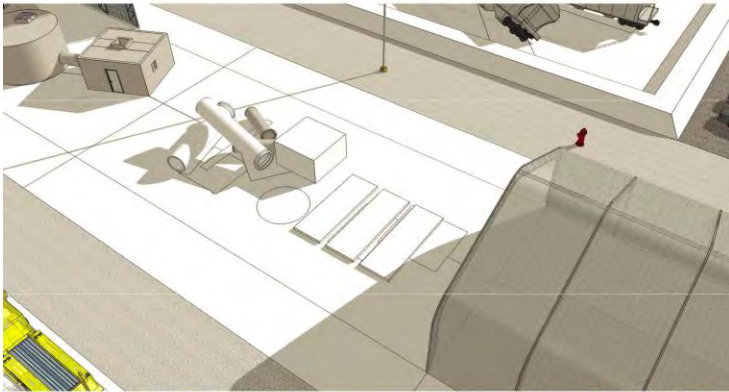


Phase Two Trench Rescue Prop

Purpose: To facilitate multiple scenarios for rescue techniques and shoring types.

This prop will consist of a 'T-shape' trench approximately 20 feet by 20 feet, 5 feet wide and 10 feet deep. Training will involve shoring and extrication evolutions from various types of collapse scenarios. The basic trench will be constructed of concrete and will occupy an area of 0.17 acres. Drainage will be required from this prop.

Cost estimate for the trench is \$75,000.



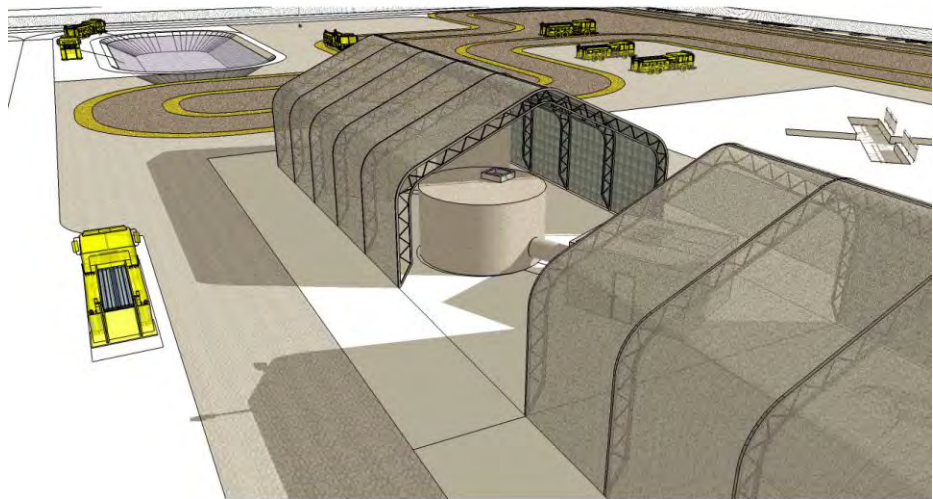
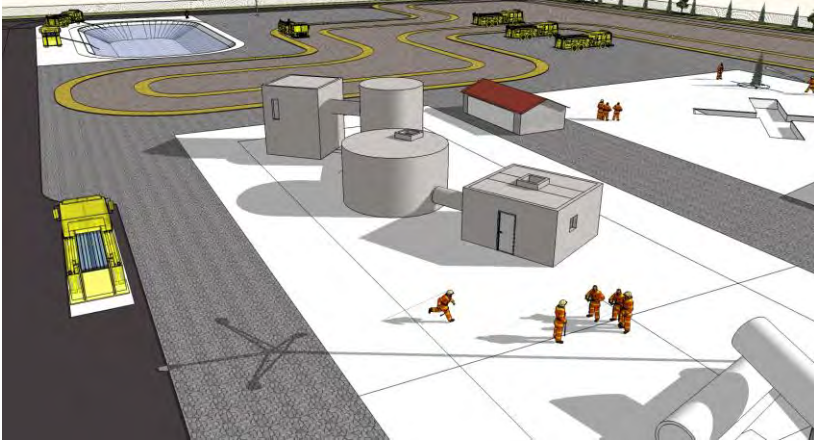
Phase Two Structural Collapse Area

Purpose: To provide training in heavy construction movement and manoeuvring.

This prop will simulate a building collapse utilizing heavy concrete slabs and steel objects. Exercises will provide training in search and rescue encounters with voids, entanglements and moving of large, heavy objects.

This prop will occupy and area of 0.17 acres. Electrical power will be required for this prop.

Cost estimate for structural collapse area is \$50,000



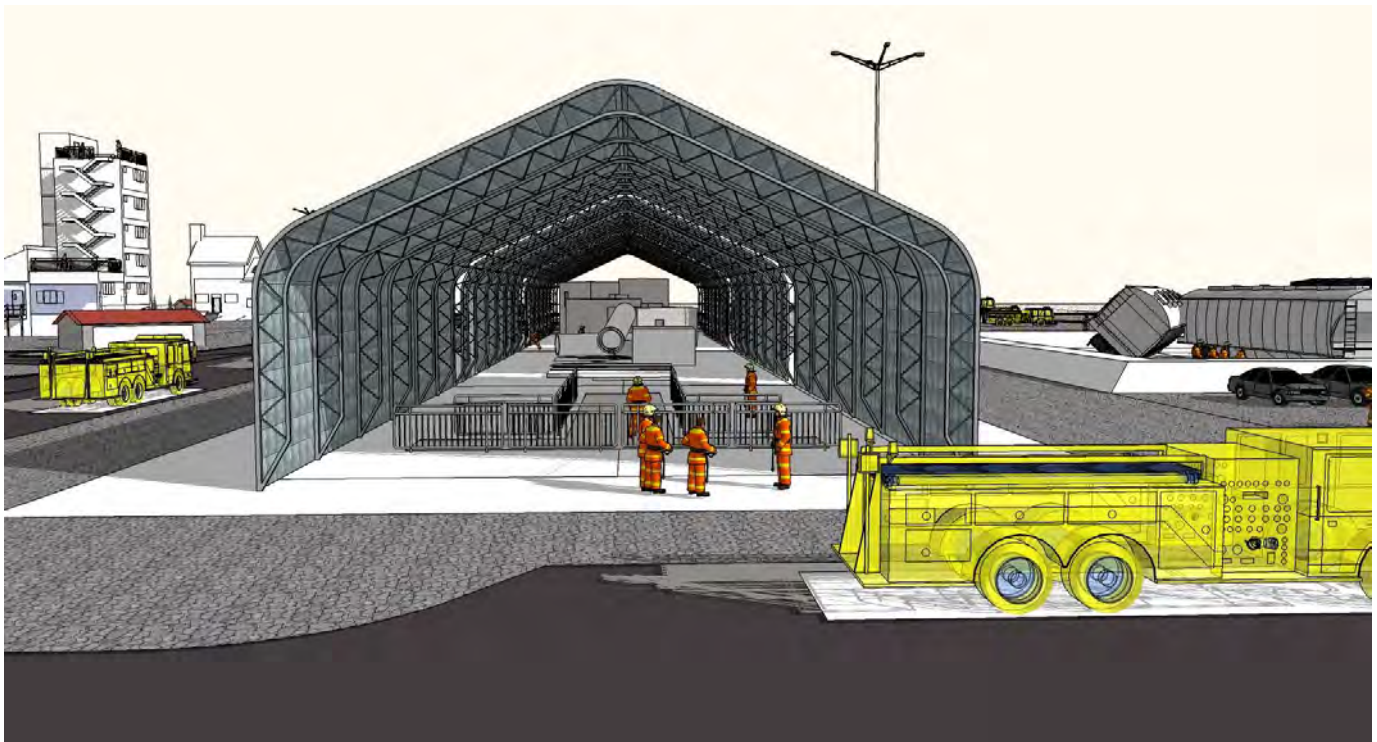
Phase Two **Confined Space**

Purpose: To simulate hazards and environments of limited size in which various types of rescue evolutions can occur.

This prop will consist of closed compartments with 'above-ground tunnels' of varying diameters with access doors and hatches for observation and evacuation purposes. The tunnels will connect several types and sizes of sewer pipes, hydro vaults and concrete or steel tanks through which training can be undertaken.

This prop will occupy an area of 0.21 acres.

Cost estimate for confined space prop is \$150,000.

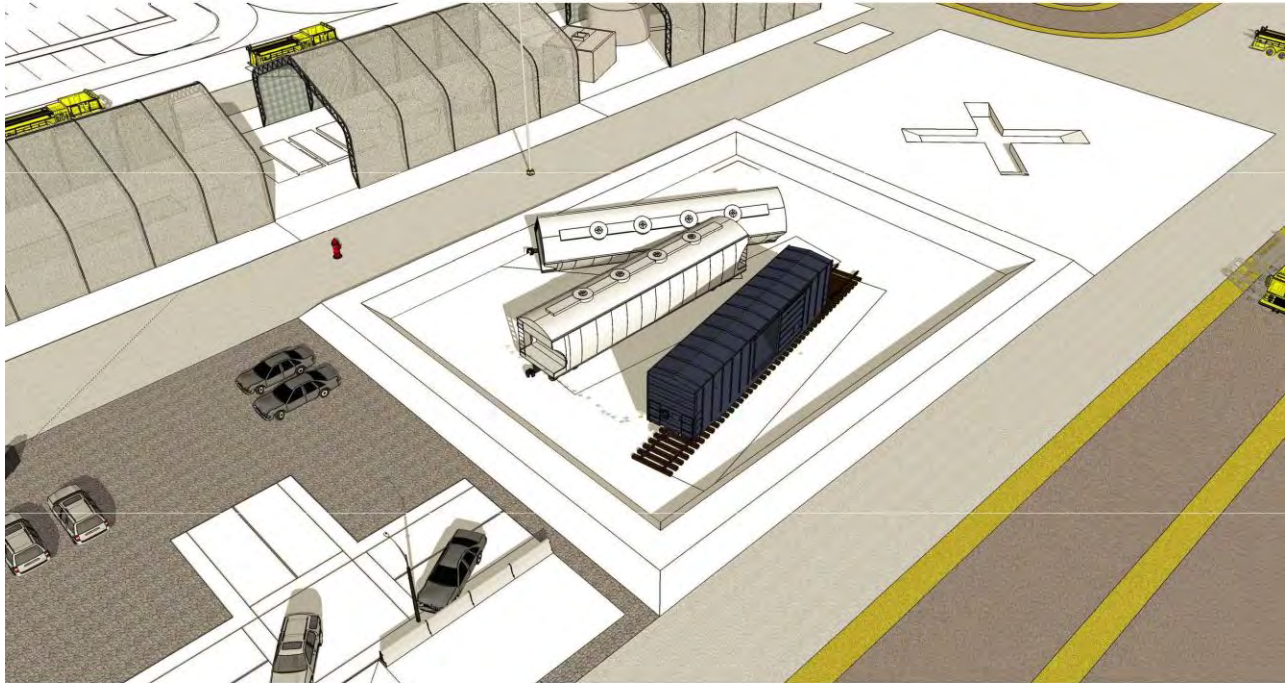


Phase Two Storage and Ancillary Items

Phase Two will require an on-site storage building, some paved asphalt access road and fire truck parking area adjacent to the area of these props.

The 'pull-off' parking space for fire trucks is estimated at \$10,000 and the storage buildings, at \$40,000.

Fabric covered structures are illustrated over these three props. This would extend the usable hours for their use. Such covers would cost approximately \$40,000 each. This cost has not been included in the Acquisition and Expenditure Time Frame Charts.



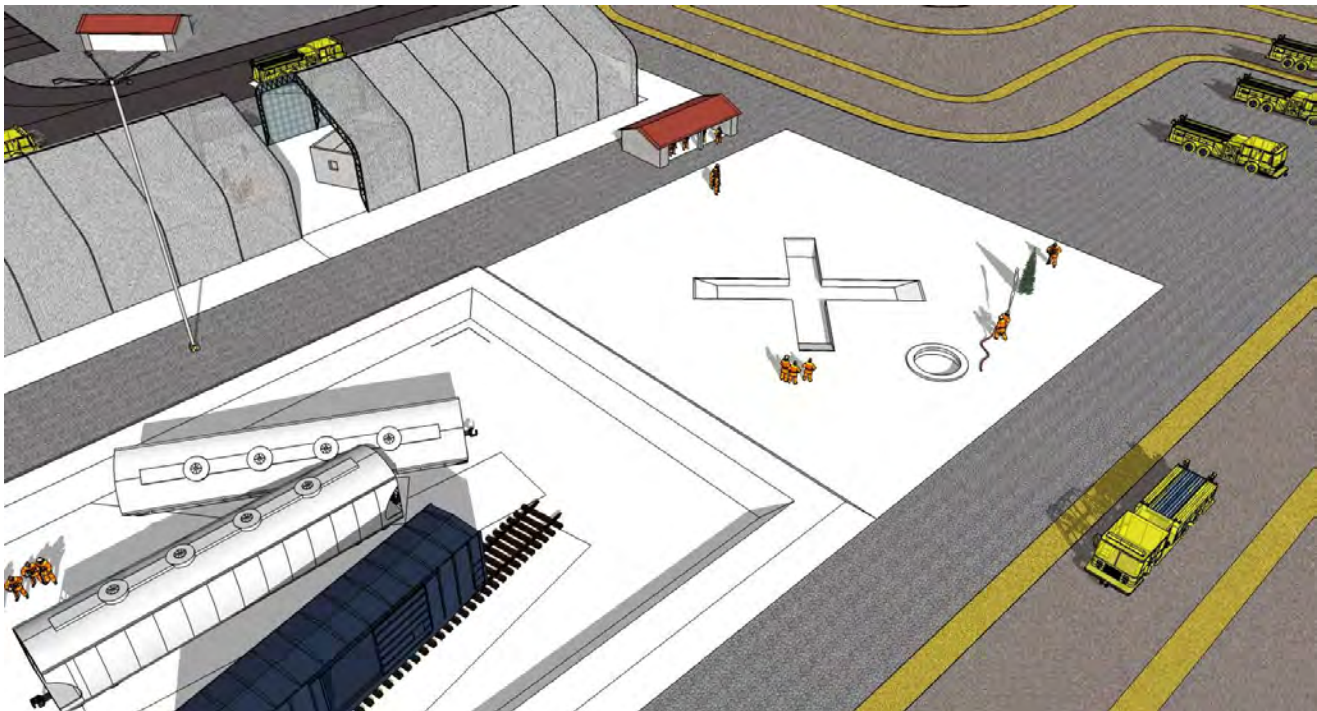
Phase Two **Tanker/Railcar Prop**

Purpose: To simulate large scale train derailments and heavy vehicle collisions.

This prop will provide training using rail tanker cars and trucks for hazardous materials encounters, developing awareness, operations and technical training capabilities.

This prop would occupy an area of 0.35 acres.

The estimated cost for the tanker/railcar prop is \$200,000.



Phase Two
Spill Containment Prop

Purpose: To develop skill in containment techniques for hazardous materials.

Class B firefighting techniques will be developed utilizing concrete burn trenches, pits and a Christmas tree for various foam applications. This prop will occupy an area of 0.25 acres.

The estimated cost of the spill containment prop is \$50,000.



Phase Two **Ring Road and Fire Hydrant Loop**

Purpose: To provide access to all buildings and props, and additional driver training. The Ring Road is estimated at an area of 2-1/2 acres.

The estimated cost of the Ring Road is \$1,000,000

A Fire-Hydrant Loop should be installed on site providing municipal water throughout the facility for training, relay pumping and hydrant operations exercises and to ensure adequate water for safety requirements. Additional training areas can be utilized within the loop.

The estimated cost of a Fire-Hydrant Loop is \$ 400,000.



Facility and Training Prop Analysis – Phase Three

Teaching and Administrative Centre

Purpose: To provide adequate teaching space and support facilities to meet current and future training requirements.

The Teaching Admin Building will provide a dividable teaching classroom, equipment storage space, lunchroom, showers, locker space, washrooms, equipment repair space and a double-depth bay vehicle storage space. Additional parking would be required. This facility would be approximately 8,000 square feet and is estimated to cost \$2,500,000.

Site size required is 2 (two) acres.

Acquisition and Expenditure Time Frames

Option 1 – Separate Fire Station Development and 12 Acre Training Facility

1.5 Acre Fire Station Development						
Projects and Phasing	Training Prop	Construction Estimates (yearly – 2010, 2011, 2012, 2013)				
		2010	2011	2012	2013	TOTAL
Fire Station 5 Land acquisition	@ 200,000/acre	300,000				
Fire Station 5 Design	@ 8%	240,000				
Fire Station 5 Construction			3,000,000			
		540,000	3,000,000			\$3,540,000

12 Acre Training Facility						
Fire Training Centre Land acquisition	@100,000/acre	1,200,000				
Fire Training Centre Design	@ 7%	630,000				
Fire Training Centre Phase One	Driving Track Fire Tower Burn House Auto Extrication Storage/Ancillary		925,000 2,750,000 375,000 70,000 80,000			
Fire Training Centre Phase Two	Drafting Pond Trench Rescue Structural Collapse Confined Space Storage/Ancillary Tanker/Railcar Spill Containment Ring Road & Hydrants			275,000 75,000 50,000 150,000 50,000 200,000 50,000 1,400,000		
Fire Training Centre Phase Three	Teaching Admin Centre				2,500,000	
		1,830,000	4,200,000	2,250,000	2,500,000	\$10,780,000
						\$14,320,000

Acquisition and Expenditure Time Frames

Option 2 – 13.2 Acre Training Facility with Fire Station

Projects and Phasing	Training Prop	Construction Estimates (yearly – 2010, 2011, 2012, 2013)				
		2010	2011	2012	2013	TOTAL
Fire Training Centre /Fire Station Land acquisition	@ 100,000/acre	1,320,000				
Fire Training Centre /Fire Station Design	@ 6.5%	780,000				
Fire Training Centre Phase One	Driving Track Fire Tower Burn House Auto Extrication Storage/Ancillary Fire Station		925,000 2,750,000 375,000 70,000 80,000 2,850,000			
Fire Training Centre Phase Two	Drafting Pond Trench Rescue Structural Collapse Confined Space Storage/Ancillary Tanker/Railcar Spill Containment Ring Road & Hydrants			275,000 75,000 50,000 150,000 50,000 200,000 50,000 1,400,000		
Fire Training Centre Phase Three	Teaching Admin Centre				2,500,000	
		2,100,000	7,050,000	2,250,000	2,500,000	\$13,900,000